Editorial

Group working in industry – an important report

In the past five years, and with the aim of seeking solutions to some of the more intractable problems of industrialisation, 'work' – in the widest possible sense of the term – has come under increasing scrutiny. It is interesting to note that dissatisfaction with long-established working practices in manufacturing industry has emerged simultaneously on an international scale, and research to uncover remedies has been carried out on a similar basis.

Especial importance attaches, therefore, to the recently-published final report* by the International Centre for Advanced Technical and Vocational Training, Turin, Italy (prepared under contract to the International Labour Office), on 'The effects of group production methods on the humanisation of work'. In its preamble, the report draws attention to the remarkable consistency with which traditional factories are organised, laid out, and operated in all parts of the world, and identifies as key factors the influence of the ideas of two men, namely Adam Smith in respect of manufacturing principles, and Frederick W Taylor in the field of management practice.

Smith, in his book 'The Wealth of Nations' believed that the key to economic production was to divide the work to be done into the smallest possible tasks, and the influence of this concept, first propounded in 1776, can be seen all around us. Taylor suggested that there was 'one best way' of doing any task, and that workers were unlikely to be in a position to find it. The planning, direction and control functions, he believed, were therefore the responsibilities of highly-trained specialised managers. Each of these beliefs is now being strongly challenged, notably in Western Europe, and the effects can be seen on the one hand in the elaborately planned experiments introduced by management in some countries, and on the other hand in the 'workers co-operative' ventures in others.

The challenges to established practice have come, the report claims, from two principal sources, namely from behavioural scientists and from production engineers. The former claim that traditional manufacturing practices dehumanise the worker, reduce the quality of working life, and are socially divisive, and production engineers assert that the practices are fundamentally inefficient, give rise to excessively complex control systems, require high capital investment (notably in stock holding), have high indirect labour costs, and generate an inflexible bureaucracy.

The behavioural scientists and the production engineers, working independently, appear to have arrived at the same solution, in that each advocates the principle of group working, with varying degree of group autonomy, and it is reported that currently more than 400 companies in 32 countries are at various stages of introducing the practice. Whilst the approaches to 'group working' vary greatly in detail, important characteristics are common to all and they are readily distinguishable from traditional practice.

The study by the ICATVT mentioned above set out to investigate what changes to manufacturing practices have *actually* been made under the heading 'group production' and to establish what results have been achieved. Data have been assembled and analysed by correspondence with more than 800 organisations in 37 countries, and from detailed studies of 54 companies in 11 countries. As can be imagined, therefore, the report represents a possibly unique collection of facts and observations on a subject which is of immense current interest, and is likely to be of critical importance in the immediate future. It should be studied by those at all levels of industry who carry responsibility for the creation of wealth by manufacturing.

It is appropriate here to outline the main conclusions drawn in the report, which are eight in number. Realistically, the report cautions that group working is still at a very early stage of development, and is used 'in only a tiny proportion of the world's industrial organisations', so that its conclusions 'should be considered as hypotheses which still need further testing'. On the subject of 'job satisfaction' in group working, the report concludes that whereas there is much subjective evidence to support this claim there is as yet no truly objective means of measuring it.

Nearly all the companies investigated, it claims, reported some economic benefit from the introduction of group working, and these benefits seem to be most significant in component processing industries. Whereas absolute technological constraints to the introduction of group working seem few, there are some factories where the design and layout of existing plant make it very difficult to form reasonable 'groups'.

Group working appears to facilitate decision-delegating, in contrast to the traditional method of working which, with its centralised co-ordination, tends to inhibit the sharing of responsibility. Thus, the claim made frequently for group working that it increases worker participation appears to be substantiated. On the subject of the introduction of group working into an established plant, the report concludes that maximum success is likely to be achieved if it is dealt with on a total-company basis, led or strongly supported by a senior executive. There is evidence to suggest, it goes on, that the tentative (or pilot project) approach may induce opposition and may make it difficult for the system to be extended.

Two years is thought to be a realistic time span for the changeover from traditional to group working, since it must be recognised that the concept is by any standards a major innovation. Finally, the report looks realistically at the disadvantages of the practice, and identifies the possibility that delegation of some areas of decision-making to the shop floor may result in redundancy for the specialised personnel previously responsible.

Group production has already been described by informed opinion in this country as a development which can be as significant in its own right as was the introduction of numerical control in the 1950s. We support this view, and cannot, too strongly recommend the ICATVT report for detailed study. ⊙

*'A study of the effects of group production methods on the humanisation of work', Professor John F Burbidge, International Centre for Advanced Technical and Vocational Training, 201 Via Ventimiglia, 10127 Turin, Italy. Price $5.

Dr Wisner

PRODUCTION ENGINEER'S DILEMMA

Can mass-production survive job enrichment?

By RICHARD G. GREEN and DONALD E. HEGLAND
Associate Editor Assistant Editor

Does growth of the job enrichment movement mean the beginning of the end of mass-production? Behind that question lie a number of conflicting opinions on the rationale of job enrichment and the imperatives of scientific shop management. Each offers a different approach to greater productivity.

Advocates of job enrichment say that the principles of mass production—embodied in such things as task simplification, dulling repetition, and close control over the worker's function—relegate the worker to the status of a machine, designed to perform small tasks, precisely specified on the basis of time and motion studies. He is assumed to be motivated primarily by economic needs and classified by a known degree of strength, dexterity, and perseverance. The worker is considered by management as incapable of dealing with variables in the production flow; any unplanned occurrances are to be handled by supervisory personnel.

According to social scientists and industrial psychologists, this view of the worker's abilities and his traditional function in the mass production world are behind the cause of his feelings of dissatisfaction and account for his discontentment with his lot in the manufacturing scheme. As a result, today's factory worker is demanding a voice in restructuring work to make it more satisfying, meaningful, and fulfilling. Practitioners of job enrichment say, give him that voice and productivity will improve.

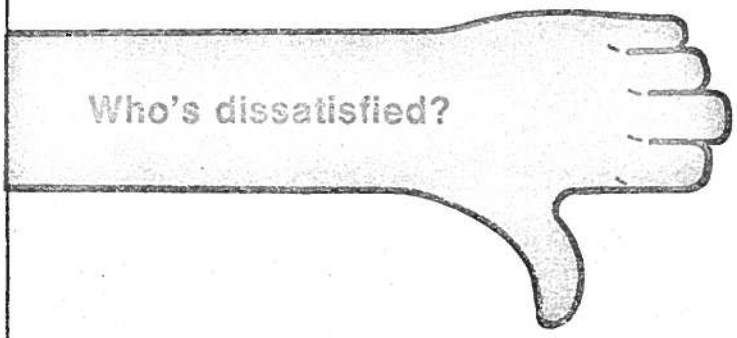
Where does this leave the production engineer? Traditionally, he has been concerned with machinery and methods by which materials are turned into finished products. His management asks him to apply machine elements and manufacturing concepts with the highest degree of efficiency possible—limited only by the state-of-the-art of technology and guided by sound business practices. Manpower needs have been the production engineer's concern only to the extent that these needs must be filled by qualified workers.

The picture of the production engineer as a tyrannical representative of management—complete with stopwatch in hand and concerned only with the efficient output of a manufacturing process at the expense of the worker—is unfair. As S.A. Levitan and W. B. Johnston[1] put it:

> Production methods have been developed not from the arbitrary decisions of engineers, or even as a result of the inevitable progression of technology, but in a rational search for efficiency. Industrial survival of the fittest has produced a species not easily changed for the better.

By the same token, to picture the blue-collar worker as a radical, bent on overthrowing the bondage of management and installing himself as ruler of the shop domain—ostensibly with greater concern for improving social values than for economic gain—is equally inaccurate. Daniel Yankelovich[2] observed:

> The important question of whether or not Americans are satisfied with their work is presently bogged down in a heated but fruitless controversy. On the one side are those observers of the work scene who cite public opinion polls to prove that the overriding majority of Americans are satisfied with their work. The other side, represented by many sociologists, industrial psychologists, journalists, and other observers, point to a variety of statistics, observations, and studies that show a rising tide of disaffection in



Are workers in general really dissatisfied with their jobs or has the whole flap about job enrichment been created by some well-meaning but misguided industrial psychologists and social scientists?

There is no denying that a rash of labor-related problems in the late 1960s and early 1970s included reports of worker apathy, absenteeism, industrial sabotage, and general unrest. Some of these incidents were widely publicized—such as the General Motor's Lordstown strike. This type of worker unrest was interpreted as the reaction of a new type of worker who had new goals and aspirations and who wouldn't stand still for the old ways any longer. However, there are those who take a very different view of the Lordstown and other incidents and who do not agree with the popular analyses which appeared in the news media.

One union leader—an outspoken critic of job enrichment—says he can't buy the conclusion that the Lordstown strike was carried out by counterculture youth rebellion against the traditional work ethic. His view is that they rebelled against the same kind of management-imposed work standards as their elders did on many earlier occasions. William W. Winpisinger, general vice president, International Association of Machinists and Aerospace Workers, AFL-CIO, has expressed his opinion of the way to cure blue-collar blues—enrich the job by enriching the paycheck.

Another view taken by some analysts of the job enrichment controversy is that, along with the industry-related incidents of the 1960s, there has been a rising tide of social consciousness which touches many aspects of peoples lives, not just their employment. Consumerism, civil rights, women's liberation, ecology, and other causes have all had an influence on many traditionally-held views including the work ethic. There is an acknowledged change in people's attitudes, hopes, and aspirations which has been brought about by new social forces. Some of these new forces have found their way to the shop floor.

Regardless of the debate over underlying causes of worker dissatisfaction, many industrial and governmental leaders are concerned over the trend of declining national productivity. Eventually, this concern—and the view that worker unrest was a major contributing factor—led to the appointment of a 10-member task force late in 1971 by the then Secretary of Health, Education, and Welfare, Elliot Richardson. The task force's assignment was to study the institution of work. Their work resulted in the publication of a report entitled *Work in America,* published in December 1972. This very comprehensive report comes to the conclusion that, although the work ethic is still a strong factor on the American scene, a major problem exists among workers at all occupational levels; they are suffering from widespread job dissatisfaction and are being deprived of fulfilling, meaningful jobs.

It is interesting that this report has probably raised more questions over the job enrichment controversy than it has answered. Several critics have pointed out that the government official who initiated the work—Elliot Richardson—also indicated that he did not necessarily go along with the report's conclusions. This is noticeable in the cautious tone of the book's forward written by Richardson.

While the book examines all of the aspects of worker discontent, it has also been the target of a number of critical reviews—some of which cast much doubt on the extent of worker discontent and the need for job enrichment programs.

One of the report's critics—Harold Wool, senior economist at the Research Center of the National Planning Association—feels that the report's strength (and weaknesses) lie in its advocacy of a humanistic approach to the assessment of work as a social institution. He says the report's perspective is that of a behavioral scientist in contrast to the market-oriented perspective of economists. A major criticism, however, is that the report, in its zeal to advance the cause of work humanization, overgeneralizes on the extent and nature of work dissatisfaction and overstates the potentials of work redesign as a primary solution to work-related ills.

Both Wool and H.R. Kaplan—assistant professor of sociology, State University of New York at Buffalo—point out that assumptions about the labor force are not backed up by statistical facts. Kaplan contends that considerable sociological evidence indicates that many people do *not* seek greater opportunities for creativity and responsibility in their jobs—preferring security, decent working conditions, and good fringe benefits and wages instead . Work may not be a central life interest of *all* workers.

Wool says that one reason the worker dissatisfaction trend—claimed to exist in *Work in America*—is not visible and measurable is because the theoretical ideas and concepts about worker behavior and attitudes simply do not conform to reality.

Perhaps one way to discover reality is to talk to the workers. David Sirota, associate management professor, University of Pennsylvania's Wharton School says just that. He asserts that the most logical way to find out whether job enrichment can help is to go directly to the people involved and ask. Employees, he says, are the most knowledgeable sources of information about their situations and generally report their conditions truthfully.

With the economic situation what it is today, one wonders what the workers' concensus about job satisfaction would be if it were feasible to poll the majority. Is lack of job satisfaction preferable to lack of income?

the work force.

Which side is correct? Well ... both are. Each party to the controversy has fastened onto a different facet of a complex, multifaceted problem. The seeming contradiction between them is more apparent than real.

Production engineer sets the stage

Increasingly, however, the production engineer must learn to deal with the realities of the job enrichment movement. Recognition of the importance of the production engineer's role in determining the industrial relations climate in a shop is not a new idea. In 1964, Joan Woodward—who, at the time was senior lecturer at England's Imperial College of Science and Technology—pointed out that the production engineer is the key figure in the industrial relations scene. For example, the personnel manager tries to resolve labor disputes and solve personnel problems as they arise; the first-line supervisor can only work within the prescribed framework of shop organization and control; the shop steward is only concerned with getting the best for his union members out of the situation on the shop floor. The production engineer is responsible for production administration and sets the stage on which the others play out their parts. Specifically, when the production engineer is engaged in activities as setting batch sizes, determining plant layout, establishing process specifications, ordering changes in the priority of work to be done, or when making any decision about matters involving shop operations, he influences the behavior pattern on the shop floor.

According to Woodward, the production engineer is well trained to calculate the cost implications of such process-related decisions and the consequences they will have on the mechanics of production operations. However, he is usually not equipped to handle the industrial relations implications of his decisions—nor calculate their cost—even though they are probably of equal importance in terms of overall efficiency of the plant.

It was Woodward's contention that the social scientists had not reached a point of agreement in their deliberations where they could give the production engineer data which would spell out behavioral consequences of production engineering decisions—data which could be fed into a computer. She felt, however, that they could give him something more refined than the behavioral assumptions on which scientific management was originally based.

It is interesting to note that more than ten years later the misunderstanding between the practitioners of job enrichment—who

Let the thrust come from the people themselves

The major thrust by management at Eaton Corp. is not toward job enrichment per se, but rather toward enriching the relationship—creating a work environment which recognizes the dignity of the individual employee. The policies and practices in such a climate reflect respect for and trust in the individual workers. Furthermore, an environment is created in which the thrust for job enrichment comes naturally from those workers who are interested in broadening the scope of their jobs—a thrust to which management must be receptive.

Although all workers presumably want an enriched workplace, not all may want an enriched job. However, a surprisingly large percentage have specific, identifiable job enrichment interests, according to Donald N. Scobel, Eaton's employee relations manager. For example, 80 to 85 percent of the people want to get more involved with their own quality measurement. After becoming proficient at their job, they want to do their own inspection instead of waiting for feedback from a quality control station. Another 15 to 25 percent, particularly workers in machining operations, want to concern themselves with maintenance—keeping their own equipment operating. This particular facet of job enrichment also results in job enrichment for the maintenance people—they are immediately elevated to the position of instructors.

The traditional separatist climate—jobs with very narrow classifications—inhibits individual workers from becoming knowledgeable about the total manufacturing process. However, the plant culture where each person is made to feel that he is a part of the team encourages people to learn the whole factory process and become aware of the overall product flow. As a result, supervisors are able to use workers in the production planning and flow process much more than in a traditional plant environment. Also, at least 25 percent of the work force become involved in devising improvements to their own production processes—another reaction which is stifled by the "nobody listens" syndrome common to traditional plants.

The scope of Eaton's six-year experience includes manufacturing facilities spanning the company's product line from locks and hardware to giant forestry equipment. The 14 plants have two things in common; they are new facilities and they are unorganized. Eaton is now in the process of adopting the knowledge about enriching relationships, which has been gained at these new plants, into an action plan for their traditional plants. Eaton is currently involved in joint projects with several major unions to transform the quality of work life in traditional plants—to achieve the same kind of change in the quality of work relationships which has been achieved in the new plants.

One of the specific steps in this action plan involves a three-part program for improving the engineering-manufacturing interface. First; when production or process engineering changes are contemplated that would have a significant effect upon what the people do, the engineering department representative will meet with supervision and employees affected to seek their inputs before such changes are finalized. It is important that this consulting process become a way of life within the facility. Second; suggestions for process change originating from employees themselves, that can be put into effect within the judgement of the immediate supervisor, will be identified as employee suggestions for purposes of expediting consideration and recognition. Third; for such employee-initiated suggestions that might require dialog beyond the supervisor, with perhaps engineering maintenance or quality personnel, a specific avenue will be provided for such dialog.

advocate human needs—and the engineers—who concentrate on precise technical needs of production—still exists. In a forthcoming book[3], Roy W. Walters & Associates point out that the very precision of the measurement capabilities of (industrial) engineering can lead to conflicts which are unnecessary:

> The reasons are quite obvious. The industrial engineer can measure and talk about highly concrete phenomena—parts processed per hour, conveyor speeds in feet per minute, man-hours, etc. By contrast, the Job Enrichment practitioner has to convince management that equal attention must be paid to such vague-sounding abstractions as *job satisfaction, meaningful work,* and *client relationships.*
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> In some cases unwary Job Enrichment practitioners add to their troubles by performing their own variation on the McNamara fallacy (reliance on measurements, carried to the extreme). They concede that they are working mainly with variables that cannot be measured very precisely, or perhaps not at all. Therefore, they set up no criteria, no hard results, by which management could judge the value of Job Enrichment's contribution to organizational effectiveness and productivity.

They go on to examine the possibilities of both sides finding common ground on which both sides can meet, and advocate the common objective of an enlightened design of the total sociotechnical system. Job enrichment should not replace the scientific method with an equally unsuitable alternative; the design of work in the name of job satisfaction with no regard for technical imperatives. In most cases, jobs must be enriched within existing technological systems.

Critics of the job enrichment movement emphasize this point. They say that theorists of work reform like to point out that the roles of workers are not inalterably defined by the technology of production; within any technological

The workplace—an island of authoritarianism

So stated the UAW's Irving Bluestone in a paper entitled "Democratizing the workplace." In this paper and several others, Mr. Bluestone, vice president and director—General Motors dept. —UAW, explores employer-employee relationships: "In terms of material advantage to the worker—an improved standard of living and economic security—and in terms of the improvement in working conditions, American unions have made commendable progress. But vast areas of decision-making seriously affecting the welfare and security of the worker remain largely beyond his reach."

The UAW feels that the democratic principles of society are not available to the worker at his workplace as they are elsewhere. To be sure, industrial democracy is a broader concept than is currently incorporated in the provisions of the usual labor contract; it is essentially the extension of worker's rights and responsibilities in the management of his work and in the decisions of the enterprise. For the worker, participation in decision-making at the workplace is another step along the path toward industrial democracy.

Bluestone states that the union movement is a natural vehicle for workers to achieve democratization at work because an essential task of a union is to help "humanize the workplace." He also identifies several areas toward which the efforts of workers to participate in decision-making will probably be directed, including decisions on plant shutdowns or relocation, subcontracting of work, disciplinary action, production scheduling, application of technical innovations, and excessive or persistent overtime: "Improving the quality of worklife is not simply a matter of 'enlarging, rotating, or enriching' jobs. It is giving workers a participative role in managing their jobs and ultimately even a participative role in managing certain aspects of the enterprise. Participation in decision-making is the essence of democracy. Democratizing industrial life is the key element in improving the quality of worklife."

During the 1973 negotiations for national agreements with Chrysler, Ford, and General Motors the UAW submitted a proposal whereby the development and implementation of programs directed toward "job enrichment, humanizing the workplace, and improving the quality of worklife" would be a joint union-management effort. In all three cases, an agreement was reached that such a joint and mutually cooperative effort would be undertaken. To this end, a national committee to improve the quality of worklife was established, consisting of representatives of all three companies and the UAW.

Even if it were not too soon to assess the results of this joint effort, which it is, the ravages of the recession would render meaningless any attempt at evaluation. Significant enough is the fact that major industries and a major union have thus far agreed to cooperate on programs addressed to such a sensitive issue.

Few workers have had the opportunity to compare work as it might be with work as it is—Irving Bluestone, UAW

framework there are equally productive alternatives.

Some critics concede that technology is not an absolute determinant of jobs, but this does not diminish its influence; the hardware of manufacturing is of utmost importance in job design. For example, milling machines, forklifts, and arc welders determine what tasks will be done; how work is arranged or how worker's tasks are assigned does not negate the fact that the operations performed by these machines must still be done.

Costs involved in altering equipment or changing a manufacturing process can deter job enrichment, according to Levitan and Johnston:

> The capital investment required to significantly alter methods of production is awesome. If manufacturing jobs have hardened in molds cast generations ago, much of the reason lies in the physical plant and machinery accumulated over the years. Plants manufacturing durable goods average over $25,000 of fixed capital per worker. In the oil industry, this rises to over $125,000.
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> Because product cost in capital-intensive industries is less affected by variations in employee productivity, employers may be more willing to experiment with innovations to improve working conditions because failure would entail little risk. But changes which would require replacement of expensive capital are less appealing, particularly if managers cannot be assured the changes will lead to greater profits as well as better quality work. If changes in technology and hardware to improve the quality of work are to be made, they must also promise higher profits.

Putting theory to work

Some behavioral scientists believe that enough has been said about job enrichment over the last several years so that production engineers have become well aware of its theories and its implications on the factory floor. They feel that the emphasis should now be directed toward the application of job enrichment. It is suggested that the isolationist approach of many specialists—including behavioral scientists—should give way to a team effort as a way to improve operations on the shop floor by looking at the job, the equipment, and manufacturing methods being used.

The numerically-controlled, multipurpose machine tool is an example of what can be done. The only manual skills required are to load the machine and press the button, providing a good opportunity to utilize and develop other skills in the operator. However, one often sees such an operator doing nothing while waiting for the completion of a cycle. He could be planning his daily or weekly workload, modifying punched tapes, or working out other part's programs. He could, alternatively, be used to control several machines or be given the responsibility of inspecting his own work. This would not necessarily remove work from inspection or planning departments, but it would free them from day-to-day details in order to concentrate on shop-wide or long-term problems.

There are many examples of large-scale implementation of job enrichment programs. Most are in Europe. One of the most elaborate is the Volvo automobile assembly plant in Kalmar, Sweden. In this case, an entirely new factory was designed from the ground up to eliminate traditional assembly-

Flexibility is important

Job enrichment is a relatively new concept at Black and Decker Mfg. Co., Towson, Md., and the company realized at the outset that a certain amount of trial and error would be inevitable. For example, switching to the work team approach—where specific work assignment decisions are made within the work team—turned out to be inappropriate for some operations, and those plant areas reverted to the traditional structured approach.

The job enrichment program was started in 1966, when the company began a change to participative management. The organizational development approach is a way of life at Black and Decker, and job enrichment is only one of several important elements in this management philosophy. Gordon Anderson, manager of human resources development, stressed that the distinction between job enrichment as an added-on appendage, and job enrichment as a way of life, is critical. Job enrichment as an appendage will never benefit the worker, or management, as much as will job enrichment which is sincerely believed by management to part of their way of life. He added that: "Systems and machinery are about as sophisticated as they will get—our real resource is our people."

Flexibility is also important to Rockwell International, where a job enrichment program has been underway at the Battle Creek plant of the Off-Highway Products Div. since January of this year. There are many questions on work practices and approaches which have not yet been resolved at this plant, because there are just now beginning to be enough people there to work with and management feels decisions on the issues in question should not be unilateral on the part of management and the UAW.

Arthur P. Ronan, vice president and general manager of the division, emphasized that the program is a two-way cooperative experimental venture on the part of Rockwell and the UAW—the union representing plant workers. He added that progress to date is encouraging, the workforce is enthusiastic, and cooperation between Rockwell and the UAW has been excellent.

line concepts, and use, instead, group-assembly techniques. The company felt that this new approach was important enough to permit investing an additional ten percent into construction costs over what a conventional plant would cost.

Assembly of each auto is handled by a team of about 15 workers each. Each team is responsible for one production phase such as installing the electrical system or interior upholstery. Chassis move about the plant on specially-built carriers which are guided by computer from one production phase to another. The carriers also permit tilting the cars at 90 degrees, thus eliminating tiring overhead work on the undersides of the chassis.

The arrangement of the production facilities is such that team members can form mini-assembly lines with each member doing a different job in sequence on a number of cars; or each worker (or a group) can do a complete installation on one car. The team system permits each worker to learn each job in the team's specific function, so jobs can be rotated to avoid boredom and to equalize distribution of good and bad jobs.

One reason that such an extensive undertaking was accomplished is that, in Sweden, there is a close working relationship between the government, industry, and labor unions. Some critics feel however, that Volvo has developed a whole new technological system that will ultimately make only a small improvement in the worker's lives.

Regardless of the conflicts with traditional production engineering methods, the fact remains that a good number of companies *have* taken steps to implement job enrichment programs. Many of these have been widely publicized and some go back a few years in terms of experience which they have built up in their shops. Some of those who have instituted programs are described in accompanying boxes. Job enrichment experiments received their greatest impetus in the 1960s when the economy was at a peak. It is interesting to note the adjustments which have been brought about in a down economy by those companies who have had enrichment programs operating.

One researcher who has done extensive work in assessing companies, both here and abroad, who have implemented job enrichment programs is Professor Richard E. Walton,[4] of Harvard University. He notes some of the common features of the companies in which restructuring of work was done.

One feature is division of labor which is central to all organization plans and is of primary consideration. Three design approaches are used: work teams, whole tasks, and flexible assignment patterns.

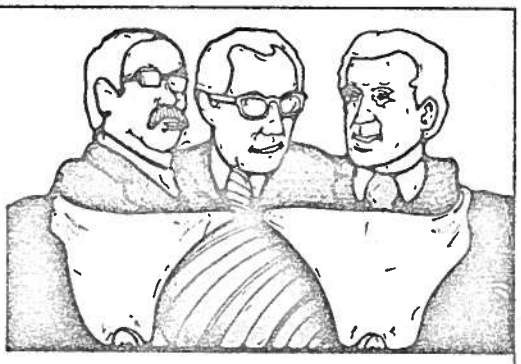
Self-managing work teams favor groups that take collective responsibility for performing a set of tasks as well as for some self-management. The size of the team depends on the technological and social requirements.

Whole task approaches have a single worker assemble whole units rather than merely adding one part. This usually requires more operator knowledge and skill. In some batch processing operations workers set up their own machines.

Flexible work assignment methods are employed in various ways such as: temporary reassignments from one position to another to cover for absences; temporary redivision of work in order to handle a cluster of tasks at different manning levels; progressive movement from one set of tasks to the next in order to master an increasingly larger segment of all work in a team; and systematic rotation through a set of positions.

In the eleven companies which he studied, Walton found that most had features designed to enhance the status of operators and to communicate trust in their exercise of self-control. Typically, there were no time clocks and workers were placed on salary and given the normal privileges of salaried employees. Other devices used to minimize status differen-

The importance of the individual



"Job enrichment" has been a way of life at Donnelly Mirrors Inc. since long before the term was coined. The Holland, Mich. firm operates under a participative management philosophy—mainly as a result of president John Donnelly's high regard for the individual and his feeling that human beings are valuable resources for solving problems.

The company has an open-influence system in which the solution of problems is made a specific part of the responsibilities of each individual within the organization. Such a system encourages continuous feedback—feedback based on the assumption that the organization has to evolve. There are no reservations about expressing problems except to define the problems in such a way as to depersonalize them. The emphasis is on correcting the problems, not fixing blame.

Donnelly's manager of personnel and organization development, John Thomas, feels that their system has helped the company and its workers weather the effects of the recession in two ways. First, they have an extremely cost-conscious organization because the people are tied closely into the overall goals of the company. Hence, employees and management react rapidly to a well-understood need to cut costs. Second, there is a minimum morale problem during such times, mainly because of the open lines of communication. The system works because people are informed and are able to exert some influence over their own destiny.

tials include an open parking lot, a single entrance for both office and plant, and common decor throughout offices and locker rooms.

Of those pilot programs studied by Walton, he noted several conditions especially favorable to their successful implementation which were present in most cases:

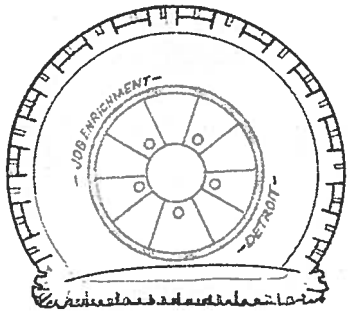
- Typically, small towns provide a community context and a work force that is more amenable to the innovation. Half of the experiments were implemented in this type location.
- Smaller work forces make individual recognition and identification easier. Half of the initial experiments involved fewer than one hundred employees.
- It is easier to change employees' deeply ingrained expectations about work and management in a new plant culture. About half of the experiments were in situations of substantial "newness."
- Geographic separation of the experimental unit from other parts of the firm helps develop a unique plant culture.
- Outside consultants provided objectivity and know-how to the experiments. The majority of the firms had a pattern of using outside consultation in organization development, knew how to use this type of assistance, and were not subject to criticism.
- The long lead times that are implicit in start-ups allow large blocks of time for training and acculturation. This was a significant factor in several cases.
- Where there is no union, or where union-management relations are positive, it is much easier to introduce the type of work systems studied. The seven unionized plants had positive union-management relations when the experiment was undertaken. Here, the parties typically agreed to a "sheltered" experiment, in which the normal contract provisions and practices were relaxed for a limited time period, and the changes would not set precedents for other units and that the experimental unit would return to its earlier pattern in absence of mutual consent.

Job enrichment stumbles in the auto industry

An experimental group assembly program started two years ago by General Motors' Truck & Coach Div., Pontiac, Mich. has been discontinued. Sources at the division feel there is considerable potential for group assembly in low-volume production, however, they admit that their timing was not the best in this case.

A new motor home production operation, in a new facility, with new employees seemed to be a logical subject for such an experiment in 1972. However—when production began in January, 1973, management quickly found that they had grossly underestimated the time required to train people to do a variety of jobs on a vehicle as complex as a motor home.

In the fall of 1973, the bottom dropped out of the motor home market and the plant was eventually shut down in January, 1974. When production resumed late in 1974, management felt that that was not the appropriate time to reinstate group assembly procedures, so production at this point is by conventional methods. Management is quick to absolve the employees of any blame in connection with the decision to fall back on conventional assembly techniques.



They simply felt, in retrospect, that they should not have combined a group assembly experiment with a new, complex product.

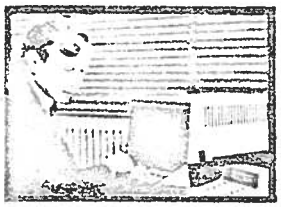
The truck & coach division may undertake another team assembly experiment in the future, but only after gaining experience with conventional assembly procedures applied to the same product.

Job enrichment programs were begun by Chrysler Corp. roughly two years ago. Corporate management regards the concept of job enrichment as worthwhile and there is no indication that the programs will not be continued. However, sources at Chrysler stated that the massive cutback in staff because of the recession has crippled their information feedback system. Therefore, Chrysler is at this point unable to evaluate progress and results or to make any prediction of the direction which future activities will take.

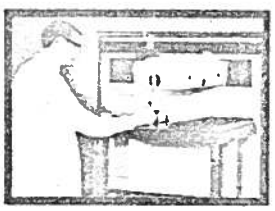
Levitan and Johnston have put the whole question of enriched jobs for the worker versus the efficient production of goods into perspective. The prediction that workers will increasingly reject meaningless jobs ignores the fact that the economic system determines whether a job is worth doing. Jobs are established by aggregate demand—and the willingness of society to pay someone to do them—coupled with technical possibility. Societycurrently supports hundreds of thousands of unfulfilling jobs. These can be eliminated either by reducing demand for them or by building machines to do the work.

But there is no reason that the workplace should stay the same. Job reform results thus far indicate that substantial improvments can be made within the framework of efficient, profitable enterprises. The upgrading of work which can be realized from redesigned jobs may not promise perfection for all workers, but it is clearly a change for the better. The various strategies for reinvolving alienated workers deserve to be tried, not because they can be expected to solve the problem of the workplace but because they are likely to raise in some measure the quality of work and of life.

(1) Work Is Here To Stay, Alas; *S.A. Levitan and W.B. Johnston, Olympus Publishing Co.*
(2,4) The Worker and the Job: Coping with Change; *edited by J.M. Rosow, Prentice-Hall Inc.*
(3) Job Enrichment for Results: *R. W. Walters & Associates, Addison Wesley Publishing Co.*



Production Know-How



Production workers can now come and go as they please

The system of working to hours which suit individual requirements rather than having set clocking on and off times has been thought of by many companies as being a possibility for office workers but impracticable for production. Not so, says Graham Reinelt national sales manager of Hengstler Flextime Ltd, the company which introduced its recording equipment for flexible working hours to the UK in 1971. He believes that it not only benefits individual employees by allowing them to make their own decisions as to start and stop times but can actually improve the planning and scheduling side.

One of the advantages of working to flexible hours is that it enables the production or assembly worker to complete a particular stage of manufacture before going home, instead of downing tools at the recognised knocking-off time. This is normally done willingly since the worker knows that he will be able to take time off at a later date to compensate. And since the job is often seen through to completion it makes the time and costs logged against a particular operation that much easier to record.

The main reason for scepticism over flexible hours of working on the shop floor is that the flow of work from one stage to the next may be jeopardised. Graham Reinelt also believes this to be a bit of a red herring because there is generally a certain amount of slack time scheduled between the various stages. In any event contingency planning usually avoids disruption of flow due to unforseen absenteeism through sickness or other reasons, so the predictable absence of a worker from his post in flexible time is hardly likely to make appreciable difference.

Flextime Hengstler is now campaigning not only for flexible working hours but also for a more versatile type of shop floor worker, capable of performing several manufacturing functions. This is in the belief that as well as helping to solve the problems of finding a man to step into the position of another in his absence it will also help promote increased job satisfaction — something that is becoming more and more depleted in modern industry.

It has also been estimated that there are now approximately 200,000 people working flexibly in Great Britain with over 100,000 of these on the Flextime system. Although the major percentage of this figure is made up of people working in clerical areas there is an increasing number of people in production and research areas changing over to this comparatively new concept.

The technique involves dividing the working day into two types of time duration: core time and flexible time. Core time, in many cases, occupies the periods 10.00 hours to 12 noon and 14.00 hours to 16.00 hours. During this time all staff must be present, while in the flexible time bands, say, 08.00–10.00, 12.00 to 14.00, and 16.00 to 18.00 hours, staff can choose their arrival and departure times to fit in with their work and to meet their individual requirements. For example to blend personal and business commitments, to avoid travelling difficulties, and so on.

The total number of hours worked by an individual may vary from day to day, depending on the emphasis of work and personal needs. In this case staff can build up credit time and take it off as a whole or half day flexleave. The employer benefits in a number of ways including: reduced staff turnover and absenteeism, less overtime and improved morale and productivity.

One manufacturer that is operating on flexible working hours is W H Dickinson Engineering. This company began operating in 1969 in Southampton on the manufacture of machinery for the tobacco industry. It now employs 55 people and has a current turnover in excess of £1million. Flextime was introduced at the end of August 1974 when they moved from Southampton to new premises in Winchester. The main objects for introducing the system are said to be twofold: to maintain the company's image of having a progressive, modern way of working and to aid staff recruitment.

It was decided to have a time bandwidth of 08.00 until 18.00 with core time from 09.00 until 12.30 and 14.00–16.00. The accounting period of four weeks duration, makes the target for office staff of 150 hours and in production, 160 hours. During the accounting period staff work on average a 7½ or 8 hour day. A credit of 7½ hours can be built up to be used as flexleave.

The management of W H Dickinson say no changes in the working patterns have had to be made as everyone has responded well to the introduction of Flextime. Mr John Price, the works manager, would perhaps be the person most affected by the new concept which allows staff a considerable say in the times which they work. He stressed that Flextime only operates during the 'normal flexible day' and overtime is kept completely separate. This is kept at a guaranteed amount starting from 18.00 hours each day with most people working an average of 40 hours per accounting period of overtime. A further factor relating to pay is that production staff can choose to take any credit hours built up in the form of pay or as time off.

'The principle of flexible working hours is very good and the men appreciate it very much,' said John Price. 'No disadvantages leap to mind. The system is quick and easy as you can always see the number of hours worked by each person. Before we introduced Flextime, I thought there would be problems and it would affect the work considerably. Now I find that this new flexible principle has proved to be comparatively simple and easy to work.'

This attitude is born out by Mr Dearlove, one of the leading hands: 'I cannot find any faults; it's very handy. I find most of my men work a routine, so planning work is no problem. I have some people in my team who come in later than most of us but I can plan the work because this is their usual pattern.'

Mr Ramsbottom the company's accountant, who at the request of his managing director, looked into flexible working hours and introduced Flextime to the company has found that staff, particularly in the office, come in earlier and leave earlier. Most people have built up a credit which they tend to carry forward. Although most people have not made great use of the flexleave facility the times of arrival and departure do vary considerably. From his point of view, Flextime has greatly facilitated the accounting side making the preparation of pay considerably easier.

Although the principle of flexible working hours has been largely applied to small factories there is apparently no reason why the same philosophy could not apply to large organisations. It has already been adopted by many large factories in West Germany with up to 3000 employees involved and a British university is assessing its value for similar applications in this country.

7 Mai 1975

Monsieur Petersson
National Board of Occupational
Safety and Health
Fack
S-100 26 STOCKHOLM
(Suède)

Cher ami,

Nous serions très heureux de vous revoir à Paris, mais je ne suis pas sûr que la date du 16 Mai soit la bonne, car je serai peut-être en Algérie à cette date.

Vous avez bien raison de vous retourner vers l'Ergonomie, et en particulier celle des handicapés qui est si remarquable en Suède.

Nous participons au début d'une équipe ergonomie pour les aveugles. Cette équipe est dirigée par un Professeur de physique au C.N.A.M., le Professeur Avan.

Vous trouverez, ci-joint, le certificat demandé.

Recevez, je vous prie, toutes mes amitiés ainsi que votre compagne.

A. Wisner

C E R T I F I C A T

Je soussigné, A. Wisner, Professeur au Conservatoire National des Arts et Métiers, Directeur du Laboratoire de Physiologie du Travail-Ergonomie, certifie que Monsieur Nils Petersson a travaillé comme chercheur dans le laboratoire que je dirige, du 1er Novembre 1972 au 15 Juillet 1973.

Son salaire a été assuré grâce à un contrat de recherche avec la Commission des Communautés Européennes, portant sur les effets des vibrations sur l'homme.

Monsieur Petersson a réalisé une bonne étude bibliographique, et un travail expérimental intéressant sur le refroidissement de la peau des mains sous l'effet d'un outil vibrant.

Monsieur Petersson est un jeune chercheur actif, intelligent, et sachant bien relier les problèmes réels du travail aux résultats des travaux scientifiques.

Fait à Paris, le 7 Mai 1975.

A. Wisner

NATIONAL BOARD OF OCCUPATIONAL
SAFETY AND HEALTH
Department of Occupational Health

Monsieur le Directeur
Professeur A WISNER
41, rue Gay- Lussac
75005 PARIS Frankrike

Cher Monsieur,

Dans quelques jours partent deux amis a moi qui travaillent chez Åberg pour un voyage en Allemagne et France ou ils vont visiter des laboratoires. Je pense qu'ils veulent aussi visitez rue Gay-Lussac et j'ai bien eu envie de les joindre.
J'ai peut-etre l'intention de chercher une autre poste ici dans notre institut et quitter les questions des lois pour m'occuper avec des problemes plus proche en vie reelle c'est a dire de trouver des solutions plus acceptable pour les conditions de travail et surtout pour des handicapes. Je vous serais tres oblige de recevoir un certificat que j'ai travaille chez vous du novembre 72 jusquáu juillet 73.
Je vous en remercie par avance et vous prie d'agreer, cher Monsieur, l'expression de mes sentiments les meilleurs.

Nils F Petersson

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Telegrams
Occuphealth

NATIONAL BOARD OF OCCUPATIONAL
SAFETY AND HEALTH
Department of Occupational Health

Stockholm, le 4.3.75

Monsieur le Directeur
Professeur A WISNER
41, rue Gay - Lussac
PARIS

Cher Monsieur,

Je vous remercie de votre gentille carte et comme nous sommes deja en mois de Mars je pense qu'il est grandement temps de vous ecrire.

S'il y a guelquechose que je peux faire pour vous aider vous savez deja que je le fera avec un grand plaisir.

Rien de nouveau est passe en Suede les derniers mois en ce que concerne le question d'ergonomie que je sache.

Le nouveau "list of limit values" est sorti et apres de discussion le limit pour vinylchlorid est baisse de 50 ppm a 1 ppm cause par des cas de cancer. Vous trouvez ci joint la liste malgre gue je pense gue c'est un peu perifirique. Vous trouvez aussi la nouvelle loi pour protection des travailleurs.

Je sera tres heureux de vous revoir et en attendant je vous priee d'agreer, cher Monsieur, l'expression de mes sentiments les meilleurs.

Nils F Petersson

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ARBETARSKYDDSSTYRELSEN
NATIONAL BOARD OF OCCUPATIONAL
SAFETY AND HEALTH

Translation

DIRECTIONS NO 100

L I M I T V A L U E S

Directions concerning limit values for air contaminants at places of work

Issued by the
National Board of Occupational Safety and Health, Sweden, in October, 1974.

Mailing address
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S-100 26 STOCKHOLM SWEDEN

CONTENTS

INTRODUCTION

In 1969, after consultations with the National Board of Occupational Safety and Health and other bodies, the National Institute of Occupational Health published its Report No 13 entitled "Recommended threshold limit values for air pollutants at places of work". The Institute now forms part of the National Board of Occupational Safety and Health. The report laid down threshold limit values for some 70 substances, based on a selection of values from the 1969 edition of the Threshold Limit Value List of the American Conference of Governmental Industrial Hygienists (ACGIH). In only a few cases did the Swedish values differ from the American ones.

The basis for the values in the directions presented here has primarily been documentation published by the U.S. National Institute of Occupational Safety and Health (NIOSH), the U.S. Occupational Safety and Health Administration (OSHA) and the American National Standards Institute (ANSI), as well as by the Arbeitsstoffkommission der Deutschen Forschungsgemeinschaft in the Federal Republic of Germany (BRD) and the Czech Threshold Limit Value Committee. Information in current technical literature and Swedish experience, as well as available publications by the International Labour Organisation (ILO) at Geneva, were also made use of.

This list of limit values supersedes the 1969 list issued by the National Institute of Occupational Health. Limit values have been added for a number of substances which are important for working life and at present constitute practical problems as air contaminants at places of work. Account has been taken of essential new findings in laying down these values. At the same time, the list of limit values has been made part of directions issued by the National Board of Occupational Safety and Health. A list of carcinogens of occupational importance has been appended. The Board is intensifying its work on limit values, and the individual values will be reconsidered from time to time. It is also the intention to add further substances to the list now published.

DIRECTIONS

In order to provide guidance for the application of the Workers' Protection Act, the National Board of Occupational Safety and Health, on the authority of Section 74 of the above Act, hereby issues the following directions concerning limit values for air contaminants at places of work.

THE SIGNIFICANCE AND APPLICATION OF THE LIMIT VALUES

The general significance of the limit values

A limit value is stated as a highest concentration of a substance in the air at the place of work (an air contaminant). This concentration is usually given either in terms of mg per m^3 air or of litres of gas (vapour) per one million litres of air (ppm). The object of the limit value is to prevent employees at the place of work from being exposed to the air contaminants in injurious or annoying quantities. The limit value shall thus be so low that an employee who, in the course of his work, is exposed to the air contaminant in amounts not exceeding the limit value, is protected from injury or annoyance due to the air contaminant. As far as this can be ascertained, this should also apply in the case of work of long duration, i.e. also for a complete working life, and for every employee. There is, however, great variation in individual sensitivity. Therefore, the possibility cannot be excluded of a few people in a large group which is exposed to concentrations around or even below the limit value, being slightly affected for a short time. Nor can the possibility be completely excluded of an even smaller number of people in such a group getting symptoms of illness.

The difference between individuals is particularly great with regard to the risk of allergy. Even if an allergy develops more rapidly and easily at a high level of exposure, it is difficult to say that there is an exposure so low that an allergy cannot develop in single individuals. Once an allergic condition has arisen, only an extremely small new exposure is generally needed for the allergic reaction to develop. For this reason it is difficult to lay down limit values which ensure that no allergy will develop, even if the values specified for substances of a highly allergenic nature are particularly low. People who have developed an allergy to a certain substance should not be exposed to this substance again. In certain cases, mea-

sures can be taken on the basis of a medical examination to ensure that particularly sensitive individuals are not employed in work which entails a special risk that an allergy will develop.

From the medical point of view, there is no absolute or distinct border line between injurious and non-injurious concentration, as the basis of the limit values laid down. Even if the concentration of an individual substance of the order of the limit value does not, as a rule, entail a health hazard or entails only an insignificant health hazard, efforts must nevertheless be made to keep all air contaminants at the lowest possible concentration below the limit value. This is particularly important if an employee is exposed to several kinds of air contaminants simultaneously or if an employee is exposed to air contaminants in the course of heavy work which causes a considerable increase in the lung ventilation.

It must be emphasized that the limit values must not be used as some kind of acceptable values in the sense that such preventive measures are not applied as can be taken in order to prevent exposure to various substances at concentrations below the limit values. The aggregate exposure to a number of substances during the lifetime of a man may be significant with regard to his health. Every opportunity must therefore be taken to reduce exposure of an employee to air contaminants or the injurious substances in other forms.

If an employee who is exposed to a substance at concentrations below the limit value is troubled or has symptoms of illness, then it shall not be regarded as impossible that the troubles or symptoms are related to the exposure just because the limit value had not been exceeded. The circumstances of the case must be investigated. In this connection attention is drawn to the obligation on the part of a doctor who, in the course of his work, gets to know of an illness which may be connected with working conditions, to report this to the supervisory authority (Section 52 of the Workers' Protection Act).

Generally speaking, the ratio of the limit values of two substances does not constitute a measure of the relative injurious effects of these substances. One of the reasons for this is that two substances have often been considered in view of different properties when the limit value has been decided upon.

Some limit values have for instance been laid down in order to prevent injury on chronic exposure, while others have been laid down to prevent acute effects such as intoxication effects due to solvents or inflammation of the mucous membranes due to irritant gases. It has been endeavoured to achieve a certain margin of safety between the limit value and a hazardous concentration, which is always desirable and of greater or lesser importance depending on the nature of the risk. In this connection a relatively low limit value has been assigned for certain substances in view of the fact that this concentration is considered attainable without practical difficulties. Thus, the margin of safety inherent in the limit value varies from substance to substance.

Considerable difficulties are often experienced in determining accurately the quantities of an air contaminant to which an employee es exposed. It is difficult to obtain an air sample which gives an accurate representation of the air which the employee breathes at the place of work, and it can also be difficult to perform the analysis of the air sample with a high degree of accuracy. In order to obtain representative air samples one must plan and carry out the sampling in a correct manner. For analysis of the samples, improved, special methods are gradually being developed for dealing with the small quantities in question.

It is important that staff who perform occupational hygiene investigations are aware of these circumstances and that they have access to the appropriate equipment for their investigations. The staff involved must have been trained for their duties, for instance by attending the courses arranged by the National Board of Occupational Safety and Health.

In view of the limited accuracy and the chances of error which must always be taken into account in connection with measurements, care must be taken in evaluating the results of these measurements and in determining whether or not the limit value has been exceeded, unless a clear decision in one or the other direction is obtained in the course of measurements of not too short a duration, or in the course of repeated measurements.

It is recommended that even measurements, which indicate concentrations of the same order as the limit value, are taken as the basis of measures with a view to improving the environment. If, in a certain case,

there is reason to suppose that a result is unreliable due to accidental circumstances, more thorough investigations of the circumstances must be made in order that the basis for decision may be more reliable.

The National Board of Occupational Safety and Health and the Labour Inspectorate can give recommendations concerning methods of sampling and analysis, and also advice concerning evaluation of the results. The intention is that this activity shall be expanded. Information can also be obtained from the Clinics of Occupational Medicine.

In cases where it is doubtful whether the limit value is being exceeded at a certain place of work so that preventive measures are called for, the Labour Inspectorate is responsible for the decision.

Level values and ceiling values

The limit values laid down are either level values or ceiling values (denoted by T in the list).

The level value states a maximum permissible time-weighted average concentration over an eight-hour working day. It is therefore permissible for the numerical value of the level value to be exceeded by a certain amount for a short period, provided that the concentration is otherwise below the value specified, so that the time-weighted average value is less than the limit value.

The amount by which the specified value can be exceeded and the length of time over which this is permissible should be decided in each individual case on the basis of the properties and method of action of the substance in question. Such an assessment should be carried out by a person of good occupational hygiene training and practical experience. It may be taken as an approximate guide line with respect to preventive work that the numerical value of the level value should not be exceeded over a period longer than 15 minutes per hour, and by an amount in excess of

approximately 25% in the case of a substance with a limit value above 100 ppm or mg/m^3

approximately 50% in the case of a substance with a limit value between 10 and 100 ppm or mg/m^3

approximately 100% in the case of a substance with a limit value between 1 and 10 ppm or mg/m^3

approximately 200% in the case of a substance with a limit value less than 1 ppm or mg/m^3

The above approximate rules primarily refer to substances, e.g. solvents and certain gases, which may have an injurious effect already during one working day or parts of a day if the exposure is too high. In the case of some substances, for instance silica dust, whose effect becomes apparent after long exposure, these rules do not have the same importance. Generally speaking, it must be emphasized that the average concentration over a working day is of fundamental importance in comparing it with a level value. In the case of certain substances with a level value, a ceiling value has also been laid down, and in these cases this ceiling value takes precedence over the approximate guide lines given above.

The ceiling value indicates a maximum permissible time-weighted average concentration over a 15-minute period. The acceptable time-weighted average value for a substance for which a ceiling value is specified is normally considerably below this ceiling value. The ceiling value is applied in the case of substances which have a rapid action or are otherwise specially hazardous. The ceiling value may incorporate higher concentrations of short duration. When necessary, the Labour Inspectorate should be asked for advice concerning the implications of this.

Fields of application of the limit values

The limit values are used, inter alia, as the basis in the planning and calculating of ventilation installations. The aim in this connection must be that the values obtained are below the limit values. The air flows which are calculated on the basis of the limit values and other conditions must therefore be multiplied by a factor of safety greater than one. This will assure that the quality of air will be satisfactory even if the performance of the ventilation plant is not entirely as planned. In addition, every effort must always be made to maintain a margin between the concentrations in the air at the place of work and the limit value. The magnitude of the factor of safety should be chosen in consultation with specialists in ventilation engineering, occupational hygiene and occupational medicine.

The limit values are furthermore used in checking the quality of air at places of work. The concentrations of contaminants in the air are measured and compared with the limit values. If it is then found that a limit value is exceeded, measures must be taken to ensure that the employees will not in the future be excessively exposed to the air contaminant. If the value is exceeded as the result of a temporary cause, which it is considered will not be repeated, measures may not be necessary.

The measures necessary in order to ensure that adverse conditions at the place of work are eliminated, can be of several different kinds. The measures can for instance be technical or organizational ones. Measures of this or similar type shall be applied if possible. In the case of certain working processes, however, in the present state of technology, personal safety equipment must be used. The period after which a certain measure shall be completed depends primarily on the kind of air contaminant and the extent to which its limit value is being exceeded. If other measures require a long time to apply, then personal safety equipment must be supplied and used in order to prevent harmful or annoying exposure before the measures have been applied.

In some of the directions issued by the National Board of Occupational Safety and Health for different kinds of work, there are special requirements concerning limit values.

It is finally pointed out that the limit values can be used as general information concerning the properties of different substances from the hygienic point of view. It is chiefly the extent of the preventive measures which will be evident from this. To a certain extent, if the information concerning the limit value is combined with other information relating, for instance, to the method of action and volatility of the substance, then some idea is also obtained concerning the extent of the risk associated with handling the substance concerned. Such general information may be of value, for instance in conjunction with the choice of raw materials for the manufacture of composite products. By using, for a composite product or a working process, substances which have the most favourable properties possible from the hygienic point of view, a considerable contribution can be made to the improvement of the working environment.

Occupational hygiene investigations

In order to ensure that occupational hygiene investigations elucidate

the conditions of the working environment in a penetrating and objective manner, they should consist of measurements of the concentration of contaminants in the air and of a correct evaluation of the results of the measurement. Other stages of the investigation may comprise, e.g. control of the products used and an examination of the working process.

One of the objects of occupational hygiene measurements is to provide as accurate an idea as possible of the concentration of contaminants in the air which the employee breathes, in relation to the limit value.

Measurements shall as a rule be performed in such a way that the air sample is taken directly in the breathing zone of the employee (exposure measurement), either by personnel accompanying the employee and collecting air samples, or by the whole sampling equipment with air pump etc being carried by the employee.

At places of work where work is of a less mobile character, samples can in certain cases be collected by means of stationary equipment.

Analysis of the sample can in certain cases be performed directly in instruments which form part of the sampling equipment. In other cases the sample is taken from the sampling equipment and analyzed in a laboratory. In certain cases this is the only way in which analysis is possible.

When air contaminants with an assigned level value are measured, the total sampling period must be so long that a representative average value is obtained. Efforts must also be made to show the manner in which the concentrations vary at different times. A sampling period of two or three complete working days in the same week is often necessary in the case of normal operation. At places of work which operate on a shift basis, all the shifts must be investigated.

The occurrence of a number of substances in a mixture may necessitate the taking of separate samples for each substance, unless the analytical method permits the taking of a composite sample which is then analyzed with respect to the different substances.

In order to check a ceiling value samples must be collected over a period of 15 minutes for analysis. Continuously recording instruments can also be used.

The times of sampling and the durations of the sampling periods must be determined in view of operational, working and other conditions and the consequent variations in the concentrations of harmful substances in the air. Sampling shall take place when work is proceeding in the normal manner and when both the natural and mechanical ventilation function in the usual way. Special attention should be devoted to the commencement and finish of working processes, charging and discharge operations and cleaning and repair work or other special circumstances, since these may give rise to high concentrations of contaminants in the air. In cases where production has a seasonal variation and where there are seasonal variations in ventilation (such as open doors and windows in the summer), measurements must be carried out during different times of the year. One method is to use measurement periods with random distribution and then to make a statistical analysis to see whether or not the limit value has been exceeded, presuming a certain probability is aimed at.

When the results of the air investigations are available, they are compared with the limit value for the substance concerned.

In assessing results of the measurement, consideration shall be given to the simultaneous occurrence of a number of substances in the air, since certain substances are capable of interaction. Such assessments are often of a complex character and should be carried out in consultation with specialists in the field of occupational medicine. In cases where specific information concerning the interaction of the substances is not available, it should be assumed that the effect of substances of similar action will be additive. The following formula can then be applied.

$$\frac{C1}{G1} + \frac{C2}{G2} + \frac{C3}{G3} + \cdots\cdots \leqq 1$$

where C denotes the concentrations of the various substances and G denotes the limit values in the list in the same units.

The quotients may be regarded as a measure of the contribution of the individual substances to their aggregate effect. The sum of these quotients must not exceed unity.

In connection with occupational hygiene investigations, there shall be consultation between measuring personnel, the employer and the safety delegate (chief safety delegate) at the part of the working

place where the investigation is to be carried out. The safety delegate and - directly or through him - the employees shall be informed of the results of the investigation. The safety committee must be kept informed. The company health service has an important function in this connection.

Absorption through the skin etc

Certain chemical substances can penetrate through the skin even if it is undamaged, and become absorbed in the body in this way. This applies primarily to substances in liquid or solid form, but also to air contaminants in high concentrations. The absorption from a liquid (and also from a concentrated gas) can be very considerable. Substances which can easily penetrate through the skin have been marked with an H in the list. For such substances the stated limit value gives sufficient protection only on condition that absorption through the skin, as a result of direct contact with the substance in concentrated form, cannot occur. Special measures must be taken to prevent absorption through the skin if such absorption may take place.

It may be pointed out in this connection that many substances can be harmful not only on absorption into the body but also due to their action on the skin. Solvents remove the natural fats from the skin and render it more sensitive to the action of other substances.

CARCINOGENIC SUBSTANCES

Substances which have been found to be carcinogens in man or in animal experiments have been listed on p. 17. If they have not been included in the main list, they have been grouped in two classes which have been denoted A and B. There is also a summary, denoted C, of the carcinogenic substances which have been included in the list of limit values.

The first class, A, contains substances which must not occur in the working environment.

These substances are considered to be highly carcinogenic and to be capable of causing cancer even at low exposures. No absorption into the body is permitted of the substances in this class, whether through the respiratory passages, the mouth or the skin. No limit values are specified for these substances. Their limit values may be said to be equal to zero.

The second class, B, contains substances which may occur in conjunction with work only after the Labour Inspectorate has specified the method of work to be employed in each individual case.

These substances are suspected of being carcinogenic even in low concentrations.

In the case of substances in Class B also, exposure must be prevented or in any case reduced to an absolute minimum. There are no limit values specified for substances in Class B either. There is not enough information available for this to be done.

It must be emphasized that exposure to all carcinogenic substances shall at all times be as low as possible. Compare section 2 p. 5.

BIOLOGICAL VALUES - MEDICAL CONTROL

In certain cases it may be appropriate to assess the degree of exposure to dangerous substances at a place of work by means of blood and urine tests. It is possible by means of these tests to obtain a good estimate of the quantities of harmful substances absorbed by the exposed person. This is important when, for instance, absorption can occur both through the lungs and through the skin.

Medical control comprising analysis of blood or urine samples may in some cases be stipulated by the National Board of Occupational Safety and Health. The Board will in such cases also specify the appropriate control method and the acceptable values.

LIST OF LIMIT VALUES

The values in this list are level values, except in the cases where the letter T appears in the Remarks column. In these cases the values are ceiling values. The letter H indicates that the substance can be absorbed to a considerable extent also through the skin. As will be seen on p.12, special measures may have to be taken in connection with these substances. The letter K indicates that the substance has carcinogenic properties, and the letter S indicates that the substance has considerable sensitising (allergenic) properties. If a ppm value is stated, the corresponding mg/m^3 value refers to exposure to gas or vapour.

Substance	Limit value ppm	Limit value mg/m³	Remarks
Acetaldehyde	50	90	
Acetone	500	1 200	
Acrolein	0.1	0.25	
Allyl alcohol	2	5	H
Ammonia	25	18	
Amyl acetate	100	525	
Aniline	5	19	H
Antimony and its oxides (as Sb)	-	0.5	
Antimony hydride (stibine)	0.05	0.25	
Arsenic and its inorganic compounds except hydrogen arsenide (as As)	-	0.05	K
Hydrogen arsenide (arsine)	0.01	0.05	
Asbestos a) (with the exception of chrocydolite, see p. 18)	-	2 fibres/ml	K
Benzene, level value	10	30	HK
Benzene, ceiling value	20	60	HKT
Gasoline b) c)	300	1 400	
Beryllium	-	0.002	K
Lead (inorganic compounds, fumes and dust)	-	0.1	
Cotton dust (raw cotton)	-	0.5	
Bromine	0.1	0.7	
Butyl acetate	150	710	
Butanol (butyl alcohol)	50	150	
Cyanides (as CN)	-	5	H
Hydrogen cyanide	10	11	H
Dust, inert, mineral, total content	-	10	
Dust, inert, mineral, fine fraction d)	-	5	
Dust, inert, organic, total content	-	5	
Diphenyl	0.2	1	
Diglycidyle ether	0.5	2.8	ST
1,2-dichloroethane	20	80	
Dimethyl formamide	10	30	H
Dioxan	25	90	HK
Ethanol (ethyl alcohol)	1 000	1 900	
Ethyl acetate	300	1 100	
Ethylene oxide	20	36	H
Ethyl ether	400	1 200	
Phenol	5	19	H
p-phenylene diamine	-	0.1	HKS
Fluor	0.1	0.2	

Substance	Limit value ppm	Limit value mg/m^3	Remarks
Fluorides (as F)	-	2.5	
Hydrogen fluoride	3	2	T
Formaldehyde	2	3	TS
Phosphine (hydrogen phosphide)	0.3	0.4	
Phosphoric acid (mist)	-	1	
Phosgene (carbonyl chloride)	0.05	0.2	T
Phthalic anhydride	2	12	
Ethyline glycol monobutyl ether (butyl glycol, butyl cellosolve)	50	240	H
Ethyline glycol monoethyl ether (ethyl glycol, cellosolve)	100	370	H
Ethyline glycol monomethyl ether (methyl cellosolve)	25	80	H
Hydrazine	0.1	0.13	HKS
Iodine	0.1	1	T
Iron oxide, fumes	-	5	
Cadmium and its inorganic compounds, total content (as Cd)	-	0.05	
Cadmium and its inorganic compounds, fine fraction d) e.g. fumes (as Cd)	-	0.02	
Calcium oxide	-	2	
Chlorine	1	3	T
Chlorine dioxide	0.1	0.3	
Chloroform	25	125	
Chloroprene (2-chloro-1,3-butadiene)	25	90	H
Hydrogen chloride	5	7	T
Cobalt and its inorganic compounds, dust and fumes (as Co)	-	0.1	K
Carbon dioxide	5 000	9 000	
Carbon disulphide	10	30	H
Carbon monoxide	35	40	
Carbon tetrachloride	10	65	H
Cristobalite	-	0.1 d)	
Chromic acid and chromates (as CrO_3)	-	0.05	K f) S
Quartz	-	0.2 d)	
Mercury, vapour	-	0.05	
Mercury, alkyl compounds (as Hg)	-	0.01	HT
Mercury, its compounds with the exception of alkyl (as Hg)	-	0.05	HT
Nitrogen dioxide	5	9	T
White spirit e)	100	600	
Maleic acid anhydride	0.3	1	
Manganese and its inorganic compounds (as Mn) level value	-	2.5	

Substance	Limit value ppm	Limit value mg/m³	Remarks
Manganese and its inorganic compounds (as Mn) ceiling value	-	5	T
Methanol (methyl alcohol)	200	260	
Methylene bisphenyl isocyanate (MDI)	0.01	0.1	TS
Methylene chloride	100	350	
Methyl ethyl ketone (MEK)	150	440	
Methyl isobutyl ketone (MIBK)	50	210	
Methyl chloroform, see 1.1.1-trichloroethane			
Sodium hydroxide	-	2	T
Nickel, metal and low-solubility compounds (as Ni)	-	0.01	K
Nickel carbonyl	0.001	0.007	K
Nitrobenzene	1	5	H
Nitroglycerine (Glycerol trinitrate)	0.2	2	H
Nitroglycol (ethylene glycol dinitrate, glycol dinitrate)	0.1	1	H
Octane g)	300	1 400	
Oil mist	-	5	
Ozone	0.1	0.2	
PCB (polychlorinated biphenyls)	-	0.5	H
Pentachlorophenol	-	0.5	H
Perchloroethylene, see tetrachloroethylene			
Pyridine	5	15	
Nitric acid	2	5	
Selenium and its inorganic compounds, with the exception of selenic acid (as Se)	-	0.1	
Selenic acid	0.01	0.05	
Styrene	50	210	
Sulphur dioxide	2	5	
Sulphuric acid (mist)	-	1	
Hydrogen sulphide	10	15	
Turpentine	100	560	S
Tetraethyl lead (as Pb)	-	0.075	H
Tetramethyl lead (as Pb)	-	0.075	H
Tetrachloroethylene	30	200	
Toluene	100	375	
Toluene diisocyanate (TDI)	0.01	0.07	TS
Tridymite	-	0.1 d)	
1.1.1-trichloroethane	100	540	
Trichloroethylene	30	160	

Substance	Limit value ppm	Limit value mg/m^3	Remarks
Trimethyl benzene	25	120	
Vanadium oxide, fumes (as V)	-	0.05	T
Vanadium oxide, dust (as V)	-	0.5	
Vinyl acetate	10	30	
Vinyl chloride, level value h)	1	3	HK
Vinyl chloride, ceiling value h)	5	15	HKT
Xylene	100	435	
Zinc chloride, fumes	-	1	
Zinc oxide, fumes	-	5	
Acetic acid	10	25	
Acetic anhydride	5	20	T

a) For method of determination, see Notice 1974:31, Appendix of the Asbestos Directions of the National Board of Occupational Safety and Health.

b) Industrial gasoline (calculated as octane) with a maximum 0.2% aromatics, and usual boiling point interval (65-100°C). See also octane.

c) The effect of gasoline is generally evaluated according to the formula on p. 11 once its composition has been determined.

d) Refers to particles with an equivalent Stoke diameter < 0.005 mm.

e) With a maximum 17% aromatics content and 150-200°C boiling point interval.

f) Low-solubility compounds.

g) See also gasoline.

h) See Notice 1974:30 of the Board for special transitional regulations.

Special list of certain carcinogenic substances

A. Substances which shall not be used in work

4-aminodiphenyl

Benzidine and its salts

Bis-chloromethyl ethyl

Methyl chloromethyl ether

β-naphthylamine

4-nitrodiphenyl

B. Substances which may be used according to the instructions of the Labour Inspectorate

2-acetylamine fluorene

Auramine (4,4'-imidocarbonyl-bis(N,N'-demethyl)aniline)

Dianisidine (3,3'-dimethoxybenzidine)

Diazomethane

4-dimethyl aminoazobenzene

3,3'-dichlorobenzidine

Diethyl sulphate

Dimethyl sulphate

Ethylenimine

Ethyl thiocarbimide

Chrocydolite

Methylene-o-chloraniline (3,3'-dichloro-4,4'-diaminodiphenyl methane, 'MOCA')

Methyl nitrosocarbimide (MNU)

α-naphthylamine

N-nitrosodimethylamine (N,N'-dimethyl nitrosamine)

1,3-propane sulphone

β-propiolactone

Propylen imine

o-tolidine (3,3'-dimethyl benzidine)

C. Substances for which limit values are specified in the list

Arsenic and its inorganic compounds with the exception of hydrogen arsenide

Asbestos (with the exception of chrocydolite, see B above)

Benzene

Beryllium

Dioxan

p-Phenylene diamine

Hydrazine

Cobalt

Chromates (low-solubility compounds)

Nickel (metal and low-solubility compounds)

Nickel carbonyl

Vinyl chloride

OPERATIVE DATE

These directions are effective from 1st January 1975. Preventive measures which are necessary in order that the requirements in these directions should be met shall, however, be taken, or commmenced, as soon as possible.

Stockholm, 14th October 1974.

THE NATIONAL BOARD OF OCCUPATIONAL SAFETY AND HEALTH

In case of difference of opinion on the interpretation and content of the text, the Swedish version shall be determining.

NATIONAL BOARD OF OCCUPATIONAL SAFETY AND HEALTH

Department of Occupational Health
S-100 26 STOCKHOLM 34, Sweden

Arbetarskyddsstyrelsen

Arbetsmedicinska avdelningen
100 26 STOCKHOLM 34

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Dr Wisner —

Editorial

Improving the working environment

Reference has been made previously in *Machinery* to the considerable attention being devoted by industrialists in Sweden to provision for unusually high standards as regards the overall working environment in plants engaged in high-volume repetition manufacturing operations. Many of the factors that are being taken into consideration are aimed at achieving the best possible conditions at the working positions – by such measures as ensuring low noise levels, clean air and avoidance of the risk of splashing of fluids. Others are directed towards the more personal needs of employees – to provide for enhanced interest and less monotony in the work and to allow for relaxation in congenial surroundings, for example. Further indication of this trend results from the recent opening of two new factories in the country.

One of these new factories is specifically for the manufacture of motor-car engines at the rate of 275 000/year, and a notable feature is that automatic handling arrangements have been incorporated to obviate heavy lifting to such an extent that it is envisaged women will form 40 per cent of the work force. The well-publicized group assembly procedure is employed to permit job rotation and variation, and the provision of buffer stocks enables all the workers to take individual rest periods. For the latter purpose, each production department has a directly-accessible rest area, and there are 10 larger such areas in special annexes. An unusual design feature is that the building is of 'winged' form, with lawn areas between the wings. In conjunction with this arrangement, each wing has extensive windows at eye level in all three outer walls 'to create the best possible contact with the surrounding countryside' for the occupants. Noise-absorbing cladding materials are applied to the walls and roof, and suppliers of machine tools 'have been obliged to conform with very stringent noise levels'.

The other new factory is for the production of ball bearings, and is very extensively automated. Again, the group method of organizing the work-force is employed, to enable individual workers to take advantage of readily-accessible rest rooms. The groups have separate changing rooms, equipped with clothes lockers that are ventilated by ducted warm air, also saunas. Very considerable roof height, specially-designed decoration schemes, and an unusual ventilation system – together with effective centralized arrangements to remove fumes and mist from individual machines – ensure good working conditions, and the effectiveness with which noise-reduction techniques have been applied is such that normal conversation is possible even close to 8-spindle automatics in operation. Even so, the concern with effects of noise is such that the hearing of each employee is checked annually, and a person is transferred to different work if any marked deterioration in detected.

Such measures, no doubt, involve considerable financial expenditure, and in many cases they can be implemented with full effectiveness only when the construction of a new factory building is envisaged. The experience of an Italian motor-car manufacturer indicates that the group method for assembly operations results in lower overall efficiency as compared with the line procedure, to cause some increase in the cost of the product. On the other hand, the objective person will realise that the aim with adoption of such measures is the reduced labour turnover and diminished absenteeism that should result from improved job satisfaction – with a consequent improvement in productivity.

It has been stated that there is a particular problem in this connection in Sweden, due to the very high standard of general education and the consequent need for persons to derive greater satisfaction from their working tasks than is normally possible with the repetition functions of relatively low work content that are usual for the successive stations on a conventional high-output production line. The frequent disputes that occur in various sectors of the British vehicle industry, however, indicate that Swedish manufacturers are not alone in experiencing this problem, for enquiries have often revealed that although the announced reason for a dispute is real, there is the underlying factor that the workers are so bored by their activities – or so affected by the noise, poor air, or general dirtiness in which they must perform these activities – that they willingly respond to a call to withdraw their labour merely because it affords them a respite.

Despite these production-orientated motives for the innovations in factory design and equipment that are being implemented in Sweden, a remark of some interest was made by the group managing director for the company that set up the ball-bearing plant mentioned earlier. He indicated that in many instances, automation arrangements had been introduced by his company because it had been considered that the physical and mental strains imposed on the members of the work-force by the former manual techniques were becoming too high. 'Although our task is to produce goods and services,' he stated, 'this must never become an excuse for harming human beings in the process.'

COMMUNAUTE EUROPEENNE
DU CHARBON ET DE L'ACIER

HAUTE AUTORITE

PROGRAMME DE RECHERCHES TECHNIQUES
EN MATIERE D'HYGIENE ET DE MEDECINE
DU TRAVAIL

DEMANDE DE SUBVENTION POUR VOYAGE D'ETUDE

(à remplir en triple exemplaire) 1)

L'INSTITUT LABORATOIRE DE PHYSIOLOGIE DU TRAVAIL (ERGONOMIE) DU CONSERVATOIRE NATIONAL DES ARTS ET METIERS

A L'INTENTION D'ENVOYER EN MISSION M. Alain WISNER

PROFESSION ET TITRES: CHEF DE TRAVAUX, MEMBRE DE LA COMMISSION DE RECHERCHES ERGONOMIE DE LA CECA

LIEU DE DEPART: PARIS

LIEUX DE DESTINATION: STOCKHOLM

BUT DE LA MISSION: Etudier les méthodes utilisées en Suède, en particulier par le Pr LUNDGREN, pour introduire dans les entreprises en matière ergonomique

(En cas de visite de plusieurs centres, indiquer l'itinéraire envisagé)

LA MISSION COMMENCERA LE 3 Sept 1965 (jour du départ du voyage) LA DURE DE SEJOUR DANS LE CENTRE ~~OU LES CENTRES RESPECTIFS~~ EST DE 10 JOURS; LE RETOUR S'EFFECTUERA PAR CONSEQUENT LE 14 Sept 1965 (jour du retour du voyage)

L'INTERESSE VOYAGERA PAR

~~CHEMIN DE FER~~ Peut-être en Suède

AVION ~~soit~~ PARIS-STOCKHOLM A et R

~~AUTRE MOYEN DE TRANSPORT~~

(indiquer ci-dessous ce moyen de transport)

rayer les mentions inutiles

OBSERVATIONS: Cette mission doit aider le D: WISNER à remplir son rôle de coordinateur des études d'aménagement des postes dans la Sidérurgie. Elle comprendra probablement une étude sur le terrain

DATE: 29 Juillet 1965

Par délégation du Président de la Haute Autorité

LE PROFESSEUR J. SCHERRER, DIRECTEUR DU LABORATOIRE

Le Directeur de l'Institut et éventuellement le Directeur de l'organisme de tuteile financière et administrative de l'Institut

Le service de l'Administration Financière certifie que les dépenses qui résulteront du voyage d'étude ci-dessus sont couvertes par les provisions affectées à la recherche technique en matière d'hygiène et de médecine du travail.

LUXEMBOURG, LE .....

.....

1) Ce formulaire doit être adressé en triple exemplaire à la Haute Autorité quinze jours avant d'effectuer le voyage. La Haute Autorité renvoie une copie avec la signature pour accord. Cette copie doit être annexée à la demande de remboursement.

2) En cas de prolongation nécessaire de la mission, il y a lieu d'établir une demande supplémentaire pour faire régulariser cette prolongation.

REGLEMENT

RELATIF AUX FRAIS DE VOYAGE ET DE SEJOUR D'ETUDE

L'institut envoyant en mission (voyage d'étude) un de ses collaborateurs, en accord avec la Haute Autorité, a droit:

1. Au remboursement des frais de voyage du lieu de départ au lieu de destination et vice-versa:
   - en chemin de fer, 1ère classe, sur la base de l'itinéraire le plus court;
   - pour les voyages comportant un parcours nocturne de plus de six heures, au remboursement du prix du wagon-lit sur présentation du bulletin;
   - pour les voyages en avion, au remboursement du prix du billet sur présentation de ce dernier;
   - pour les voyages effectués en voiture personnelle, à un remboursement correspondant au coût du parcours en chemin de fer (1ère classe), sur la base de l'itinéraire le plus court, sans toutefois pouvoir y comprendre le coût du wagon-lit. Seul celui qui a la charge de la voiture peut réclamer le remboursement de ces frais, les autres experts en mission, dans les mêmes conditions de remboursement des frais de voyage, qui voyagent dans la même voiture n'y ont pas droit.
2. A une indemnité forfaitaire de frs.b. 950 par jour pour les experts allant à un lieu situé à 50 km ou plus, et de frs.b. 500 pour ceux allant à un lieu situé à une distance inférieure à 50 km.

   Mission d'une durée supérieure à 24 heures:
   - pour chaque période de 24 heures: indemnité journalière;
   - pour la période résiduelle inférieure à 6 heures: pas de remboursement;
   - pour la période résiduelle comprise entre 6 hrs et 12 hrs: moitié de l'indemnité journalière;
   - pour la période résiduelle supérieure à 12 heures: indemnité journalière.
3. Toutes demandes d'indemnité ou de remboursement des frais de voyage dépassant ceux prévus dans ce réglement, devront être soumises par l'Administration au Président de la Haute Autorité ou à son délégué pour approbation, après avoir été dûment justifiées.
4. Le paiement des indemnités et le remboursement des frais de voyage pourront s'effectuer en espèces en francs belges à Luxembourg, ou par virement, au cours officiel de la Haute Autorité, à une banque désignée par l'Institut, de la contrevaleur en monnaie nationale de son pays de résidence.

COMMUNAUTE EUROPEENNE
DU CHARBON ET DE L'ACIER

HAUTE AUTORITE

DIVISION DES PROBLEMES DU TRAVAIL

REGLEMENT POUR VOYAGES D'ETUDE

Intérêt des voyages d'étude

Afin de favoriser l'échange d'idées et d'informations, la Haute Autorité aide financièrement aux réunions des groupes de travail, voyages et stages consacrés à la recherche en matière de médecine du travail.

Si, en règle générale, les réunions des groupes de travail s'avèrent suffisants pour les échanges de vues, on rencontre des circonstances où la documentation visuelle s'avère indispensable pour apporter aux chercheurs une documentation rapide et précise sur certaines méthodes ou appareils utilisés.

Conditions requises pour bénéficier ultérieurement du remboursement des frais de voyage

1. L'institut ou l'organisme employeur intéressé adressera à la Haute Autorité une demande avec toutes indications utiles sur le spécialiste chargé de faire le voyage d'étude et le but du voyage d'étude. Il sera fait mention notamment des instituts dont la visite est souhaitée. L'institut utilisera à cet effet un formulaire spécial qui sera mis à sa disposition.

   Au cas où l'institut demandeur n'a pas de personnalité juridique, l'institut ou l'organisme employeur devra indiquer l'organisme de tutelle administrative auquel devra être fait le remboursement des frais de voyage.

2. Le voyage d'étude doit se référer à des questions faisant partie du programme de recherches.

3. Le voyage d'étude doit avoir pour objet une documentation dans un ou plusieurs instituts, mais non une participation à des congrès pour laquelle les instituts disposent généralement de fonds spéciaux.

4. En principe, seuls les spécialistes de l'institut ou de l'organisme employeur, qui sont membres du Comité de Recherches d'Hygiène et de Médecine du Travail de la Haute Autorité ou qui sont membres d'un groupe de travail constitué dans le cadre de ce Comité, pourront être proposés par l'institut ou l'organisme employeur intéressé pour faire un voyage d'étude.

5. En cas de visite successive de plusieurs centres voisins, l'institut ou l'organisme employeur intéressé établira un circuit rationnel.

6. En principe, tout voyage supérieur à 10 jours dans un centre est assimilé à un stage et donne lieu à une procédure spéciale.

7. A la demande présentée par l'institut ou l'organisme employeur intéressé, la Haute Autorité fait réponse dans les meilleurs délais. Elle fait connaître à l'institut ou à l'organisme employeur intéressé si elle prend à sa charge les frais de voyage et fait mention, le cas échéant, de la durée de séjour prise en charge.

Formalités à remplir pour le remboursement

1. Dans le délai de huitaine, l'institut ou l'organisme employeur intéressé adressera à la Haute
1. Autorité une demande de remboursement de frais de voyage. Il utilisera dans ce but le formulaire spécialement prévu à cet effet.

2. Il sera adressé en même temps à la Division des Problèmes du Travail un rapport sur les résultats de la mission et les personnalités rencontrées. La Haute Autorité pourra faire état de ce rapport, exception faite des renseignements auxquels l'institut ou l'organisme employeur intéressé désire attacher un caractère confidentiel. Ce rapport est transmis aux membres du Comité de Recherches.

3. Le remboursement des frais de voyage et de séjour est effectué par la Haute Autorité aux conditions mentionnées dans un règlement spécial.

4. Le remboursement des frais de séjour est effectué dans les limites de la durée prévue lors de l'agrément de la demande.

OCCUPATIONAL HEALTH

The Causes of Tenosynovitis in Industry

R. Welch, B.Sc.

Tenosynovitis in industry is expensive. It results in many lost working days. The author summarizes "it is hoped that a better understanding of the causes of tenosynovitis will result in re-appraisal of work-place design and hand-tool design, and the correct training of operators."

INTRODUCTION

Tenosynovitis of occupational origin is a continuing problem in factories in New South Wales. The disease is most common in industries where light assembly is carried out. In this type of assembly, the work pieces are light and this results in rapid finger and hand movements.

The peak of the disease was reached in 1963-1964; since then remedial steps have been taken in most factories and the incidence has decreased. In some factories the decrease has been dramatic.

Predisposition

In most instances, it appears that tenosynovitis will only occur if the worker has a predisposition to the disease. This fact has been recognized in Germany[1] and apparatus is commercially available for detecting this predisposition, and has been used by the author. Predisposition can be caused by a number of factors, but the main factor seems to be small muscles, with inadequate blood supply. If we accept this hypothesis that predisposition is necessary if tenosynovitis occurs, it then follows that a person's predisposition or degree of predisposition may change; that is, it is not fixed. For example, training of muscles, by increasing their blood supply, will lessen the degree of predisposition, while absence from work will increase the degree of predisposition.

There are, of course, other causes of predisposition. If a worker is emotionally upset, then he (or she) will tend to work with tensed muscles. The tensed muscles cause the working movements to be jerky and the finger grip to be excessively tight. If the emotional upset is prolonged then the worker's degree of predisposition is elevated and tenosynovitis may result. It is considered that many cases of tenosynovitis which appear to be inexplicable or which are attributed to other causes may be due to this predisposition of psychologic origin.

3 The jerky worker, that is, the person who habitually works with a jerky, instead of a smooth action, and whose work is accompanied by excessive arm, shoulder and sometimes even head movements, is predisposed to tenosynovitis, due to the excessive and useless muscular activity.

4 A second job or housework can result in the worker starting work with tired muscles. It is probable that there is an accumulation of metabolites at the start of the day's work. Such a person is predisposed to tenosynovitis.

Precipitating Causes

As previously stated, only a worker who is predisposed will develop tenosynovitis; the mere existence of a predisposition will not cause tenosynovitis. A precipitating cause is necessary. The basic precipitating causes are movements and posture.

1. *Movements*

For each part of the body (arm, hand, fingers, thumb), the movements can be analyzed in terms of force, direction, speed, frequency and number.

(a) *Force*

The use of excessive force is the greatest single precipitating cause of tenosynovitis; in the author's experience, it was found to be the major cause in over 30% of 500 cases investigated.

Excessive force is caused by one or more of the following:

(i) *Inexperience*

An inexperienced operator will often use excessive force, because of the misconception that it "does a better job." When inexperience is coupled with lack of training and lack of supervision, then the use of excessive force is common.

(ii) *Aggressive Working Methods*

Aggressive working methods may be habitual (used at all times), temporary, or of variable duration and caused by such factors as domestic arguments or stress at work, for example, a rebuke by a supervisor. This cause could also be considered a type of predisposition.

(iii) *Tools*

Excessive force may be required because the tool is unsuitable for the job or the operator is using it incorrectly. Figure 1 shows an end-cutting tool used to cut 2 mm diameter nichrome pins. A sustained squeeze of 22 kg is required for a slow cut. The photograph shows that the tool is too large for a typical female hand, for when the pin is being cut the handles are 93 mm apart. Figure 2 shows electromyographs of a rapid cut and the finish of a slow cut of a pin (with external electrodes on flexor digitorum sublimis), compared with a steady squeeze of 5, 10, 15 and 20 kg on a hand dynamometer. It is remarkable that a female operator was able to use this tool, cutting 600 pins per day, even for a limited period before developing tenosynovitis. Nine out of ten female office workers were unable to cut even one pin. This is a typical example of a tool requiring not only excessive force but also a high number of operations per day. The tool was replaced by an air-operated cutter.

(iv) *Controls*

Many controls require excessive force for their operation and power assistance should be provided; the force that can be considered excessive is not an independent quantity but must be considered in relation to the frequency of operation – a subject on which ergonomic texts are strangely silent.

(v) *Components*

Off-specification work pieces, and work components, are responsible for many cases of tenosynovitis because of the increased force required for assembly. These off-specification parts are seldom detected before causing strain, and it has been found that operators will often accept bad components without complaint. In addition to wrong dimensions of components necessitating the use of excessive force, the weather can even be a factor. For example, plastic inserts which had to be pushed into holes in a steel sheet became very hard in cold weather; the increased muscular action required for the insertion resulted in tenosynovitis.

(b) *Direction*

Work should be planned so that the necessary movements of fingers, hands and arms do not cause strain. In general it may be said that movements away from the body or across the front of the body should be avoided when any substantial force is involved; however, reaching for light work components is permissible. While Murrell in *Ergonomics* says "For normal operation, the forces to be called for for [sic] one-handed operation (across body) should be not more than about 20 lb . . ." in theory this may be quite sound; in practice, 5-10 lb pulls across the front of the body have been found to cause tenosynovitis.

Frequent use of the hand to rotate objects is undesirable, particularly if movement is in an anti-clockwise direction.

(c) *Speed*

Fast movements of the fingers, hands or arms require considerable muscular activity, which, if repeated without adequate rest, can lead to tenosynovitis. Obviously, there must be a reasonable compromise between the slow speed which might be preferred by a worker and the demands of production. Excessive speed of movements is normally only encountered where there is a bonus system, which obviously encourages the operator to work at too fast a rate, or on machine-paced operations.

A factory with a production bonus had a fairly high rate of tenosynovitis; however, when the organization was taken over by a company which did not have a production bonus, the incidence of tenosynovitis decreased to about one-tenth of the former rate while the work (assembly of small appliances) and the work force remained unchanged.

In some assembly operations, the speed of working is determined by the speed of the assembly-line conveyor. In one factory, the speed is varied by agreement between the workers and management. In some instances, it could be advantageous to vary the conveyor speed so as to match the established variations in production rate during the work period.

(d) *Frequency*

The frequency of movement will, like the speed of movement, be greatest when there is a production bonus or when the work is machine-paced. A high frequency of movement means that the muscles are being used most of the time and fatigue may result, with the probability of tenosynovitis, unless there are adequate rest periods for muscle recovery. Rest periods need not mean that the operator must be idle; but that he does work in which other muscles will be used. When the bonus is high, the operator is not likely to take voluntary rest periods to allow tired muscles to recover. There are many instances where an operator has worked until the muscles, and the wrist, were so sore that further work was impossible. In these cases, the bonus payments were

high and had probably been spent in advance by the worker. In such cases, the operator can be expected to be away from the job for several weeks or even months and an operation is often necessary.

(c) *Number*

The total number of movements of a particular part of the body (arm, finger, etc.) will depend on the time actually worked and the frequency of the movement. By reducing the number and length of rest periods, bonus payments will increase the total number of movements made. Overtime, by increasing the time worked, will also increase the total number of movements per day.

Posture

The adoption of an incorrect posture while working will result in much useless muscular work due to the static loading of groups of muscles. When a muscle group is statically loaded the circulation is diminished and partial anaerobic working results. The increase of metabolites in the muscle probably causes inflammation of the attached tendon. While it is improbable that static loading of muscles in the legs or back will cause tenosynovitis, there is no doubt that improved working posture will result in a lower incidence of tenosynovitis in the wrist. For example, if the static loading on upper arm and shoulder muscles is reduced by providing rests for the forearms then tenosynovitis will be eliminated in categories of workers which formerly had a high incidence of the disease, even though the work of the lower-arm muscles appears to be unchanged.

There would appear to be some connection, at present inexplicable, between general posture and tenosynovitis. The ideal work posture is posture which reduces the static load on muscles to a minimum. This means in practice that the worker should be seated on a stable seat, with adequate back support; the work should be done with the elbows by the side and the forearms horizontal or slightly inclined downwards. The wrists should not be flexed; fingers should not be widely spread nor tightly clenched. The feet should be supported on the floor or on a footrest of adequate size and foot pedals should be located and designed so that extreme or tiring ankle flexion is avoided. Even with careful work place design there will be some static loading of muscles.

Posture will now be briefly discussed under the headings of body, upper arm, forearm, wrist, hand, thumb and fingers and legs. This separation is convenient as it enables the posture of the operator to be checked systematically.

Body

To minimize unnecessary static loading and to maintain stability, a worker requires a firm seat without wobble and with a usable back-rest. The standing operator uses large groups of muscles to maintain, statically, an upright position. The operation of a foot pedal, at short intervals, results in the operator standing on one leg with the working foot poised above the pedal, thus requiring a very large amount of static muscular work to stabilize the body. Foot pedals should only be used by seated operators.

Swivelling chairs are not suitable for operators engaged in repetition work (nor should they be used for typing), as arm movements cause oscillatory rotation of the seat and static muscular work is needed to prevent this movement of the seat. The swivelling chair, due to poor construction and wear, often wobbles in the vertical plane, which results in static work to stabilize the body.

Bad posture is common in watch repairers, who typically work seated on an 18" high seat at a 30" high bench. Since the working distance from the eye is only several inches, a bent back and hunched shoulders result. The solution (Fig. 3) is to use a high bench on which the forearms are supported. This keeps the back straight and a back-rest is probably not necessary.

A bent back often results when there is a visual problem: the operator may need glasses or a large magnifying lens.

Upper Arm

Ideally, the upper arm should be close to the body; if this is not practicable then the weight should be taken by padded elbow or forearm supports. Inexperienced operators tend to use screwdrivers in the vertical position, with their wrists above the top of the screwdriver handle and the elbow level with the top of their heads. The static muscular work causes fatigue and the raised position of the arm reduces blood supply to the muscles, resulting in partial anaerobic conditions which often lead to tenosynovitis after one or two days.

Forearm

As mentioned, the forearms should ideally be slightly inclined downwards; it is unfortunate that this ideal posture is very seldom practicable. However, a reasonable compromise can often be achieved by the correct seat-to-bench relationship, by having a thin bench top, by avoiding angle framing under the front of the bench, and by eliminating unnecessary height in jigs and fittings.

Some typists, working on piecework, have found that this downwards inclination of the forearms is essential; they work with their knees touching the front of the typewriter frame to achieve this forearm posture.

When the work requires the forearms to be elevated, then padded arm rests or elbow rests are often practicable. In the case of the watch repairer, previously mentioned, padding is not necessary as most of the forearm rests on the high bench. While it is preferable to work with the forearms parallel and at right angles to the front of the body, this is usually not practicable; nevertheless, better work design can result in some improvement. For example, to improve working posture, the typewriter keyboard should be cut in half vertically and the halves separated by about 9 inches.

Wrist

Working with a bent wrist should be avoided because static muscular work is required to maintain this position.

Hand

Ideally, the backs of the hands should be inclined laterally at an angle of about 30° to the horizontal, the back of the right hand inclined downwards to the right and the back of the left hand inclined downwards to the left. This ideal posture is not usually practicable but considerable improvement can often be achieved. The action of writing with a pad on one's thigh demonstrates a good working posture of the hand, plus hand support, in addition to some of the desirable features previously mentioned, such as elbow and upper arm by the side of the body. Typical bad hand posture is unavoidable in the use of a typewriter; the halves of the keyboard of the ideal typewriter, separated 9" apart as previously mentioned, should be inclined downwards to the left and right at 30° to the horizontal.

It is often possible, by the use of a simple jig, or fitting, to redesign the work so that a great improvement in arm position is obtained with consequent reduction in useless muscular work.

It is unfortunate that ergonomic and work study texts give such delightful diagrams showing the range of arm and hand movements. While such movements and extreme reaches are anatomically possible, they should not form the basis of design for repetitive work.

Thumb and Fingers

While man, in contradistinction to animals, has an opposable thumb, its use must be avoided as far as possible on repetitive jobs so as not to rapidly cause tenosynovitis. A major cause of tenosynovitis on repetition assembly work was formerly the air-driver with a thumb push-button. Extension levers that can be operated by several fingers or hand squeeze have eliminated most tenosynovitis caused by excessive use of the thumb to operate this tool.

In my view, it is unfortunate that a well-known worker in the field of ergonomics has recently been reported[3] as advocating the replacement of finger-squeeze actuating levers by thumb-push buttons "to give more work to the thumb, the most powerful digit of all."

Some pliers with a 30° bend, specifically designed for wiring inclined racks, appear to place excessive work on the thumb. The type of pliers shown in Figure 4 is obviously preferable.

Incorrect work methods often result in excessive use of the thumb and tenosynovitis develops. For example, a hand screwdriver can be held with the correct wrist and arm position with the elbow by the side; but the use of the thumb to push down on top of the screwdriver can be expected to result in tenosynovitis.

In general, repetition work should be carried out with a relaxed thumb when hand or powered tools are being used. The use of the thumb is obviously essential when objects are being picked up. Many cases of tenosynovitis are caused by incorrect finger grip of pliers. Usually, the pliers supplied are not suitable for the job. Figure 5 shows the common grip on typical pliers. This type of grip can be expected to cause tenosynovitis as all the squeezing is done by one finger, the other fingers being used to open the pliers. Contrast this grip with that shown in Figure 6 where three fingers are being used to squeeze the spring-loaded pliers; notice that the thumb is relaxed and is not being used.

Tightness of finger-grip is an important factor, as a very tight or "death grip" imposes a heavy static loading on the muscles. This may be caused by inexperience, tenseness or poor tool design.

Legs

Tenosynovitis is rare in the lower extremities, occurring usually in the Achilles tendon. A few cases have been seen where tenosynovitis has been caused by the operation of a foot pedal.

SUMMARY

Tenosynovitis in industry is expensive. For example, one factory lost 2,000 working-days-in-a-year due to tenosynovitis.

Some persons are pre-disposed to tenosynovitis because of poor circulation and small muscles; others can become temporarily pre-disposed because of illness. Stresses at work, or at home, result in working with tensed muscles, and tenosynovitis may result. Incorrect or excessive movements of the fingers, hands and arms are precipitating causes. Most work-places and hand tools are badly designed, and most operators are either untrained or incorrectly trained.

It is hoped that a better understanding of the causes of tenosynovitis will result in re-appraisal of work-place design and hand-tool design, and the correct training of operators. It has been said that the bonus system is a confession of failure; its elimination would certainly reduce the incidence of tenosynovitis.

Permission to publish this paper was given by the Director-General of Public Health, New South Wales.

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Reprint requests: Industrial Medicine and Surgery, P.O. Box 7151, Fort Lauderdale, Fla. 33304.

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18 Dec TAHT

Les patrons „obligés", ~~origine~~ cause de
charge de travail et licenci de celle-ci

(15')

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19 Dec Institut

L'analyse des travail dans
la production de masse : travail
prescrit et travail réel. Leurs
relation avec la charge de travail

(10')

Attention aux délais initialement
par les fondateurs alternatives :
- on dit le 1/3 de ce qu'on dirait
  initialement
- tout paraît solennel
- Mais on a le temps de réfléchir.
-

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Russia Suede - 1

8 Avril matin + déjeuner

OMS . B. S. FORSMAN ayant accepté médecin conseil du patronat suédois, directeur de l'Institut du travail à Stockholm et décideur du Fonds d'action sur les conditions de travail suédois a quitté ces postes car il n'a pas réussi, c'est un caractère.

Il est à l'O.M.S. 1/2 temps COPENHAGUE 1/2 à LODZ pour organiser l'Institut du travail de ce pays.

Très ouvert à mon égard : me présente son ancien patron SEDEVICH (français, à déjeuner), son patron actuel , un collègue revenant de 8 mois de voyage en Asie MALAN

Orientation : toxicologie

- Rôle de l'accélération des dispositifs de production sur :
  - les grands stress - la silicose
  - le bruit dans les mines
  - la charge physique
- considérer l'Homme comme un tout en pensant en considération l'ensemble de qu'il subit
- Les changes de pointe : utiliser les ergonomistes avec changes de pointe, à l'avènement des exigences vis à vis de l'Homme
- Augmenter le nombre des experts en hygiène industrielle
- Développer la méthodologie ergonomique
- Améliorer l'information sur les résultats de la recherche.
- Programmes d'enseignement
  - médecins
  - infirmiers
  - ingénieurs en hygiène industrielle
  - ingénieurs de production
  - travailleurs de société (ingénieurs et techniciens.

En Norvège vu RODAHL
LANGE-ANDERSEN

Développer l'épidémiologie sans esprit de compensation, dans les situations de morbidité élevée, de retraite prématurée.

Chez les travailleurs vieillissants, montrer ce qui s'améliore avec l'âge : stabilité, sûreté.

—

Relation entre travail et nerveux

Différences individuelles dans les manifestations : anxiété ou agressivité

Symptômes précoces : absentéisme, alcoolisme

—

Eviter les approches limitées : études interdisciplinaires des professions, Analyser les attitudes négatives, l'absentéisme.

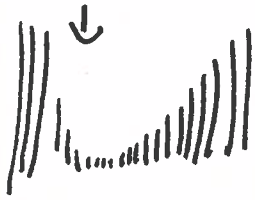
par exemple : l'exploitation forestière
les transports à grande distance

ASMUSSEN - LANGE ANDERSEN — 8 Avril A. midi

~~[illegible]~~

Laboratoire de physiologie spatiale

Etude de l'effet de ~~l'injection de glucose intraveineuse sur~~ l'injection de curare et de curarisants sur l'effet physique maximal. Vu une expérience où le sujet perd la motricité oculaire, la parole et la tenue générale du corps, en particulier de la tête. Très impressionnant. Etude de la force musculaire de la musculature des M.I.



Grand laboratoire moderne avec : chambre thermique
à dépression
piscine à courant inverse
permettant d'étudier en situation stable un nageur à effort maximal

LANGE-ANDERSEN (médecin chez les aveugles)

Etude sur la circulation sanguine:

La circulation cérébrale est étudiée par INGVAR à l'Hopital Universitaire de LUND dans le département de neurologie mais ce n'est guère sûr car on ne connaît jamais l'étendue des anastomoses capillaires.

A COPENHAGUE il fonctionne une université (projet annulé) à l'Université technique

FANGER (chaleur)
BUCHTAL (EMG)
KEIDING (Ergonomie)

Le laboratoire ASMUSSEN ne s'intéresse pas à l'ergonomie et aux conditions de travail.

Un immense Tableau très curieux

Biochemical pathways

de GERARD MICHAL

à demander à BOEHRINGER - MANNHEIM

Biochemical division

9.4.74 Visite à l'Institut du Travail que dirige maintenant Nils LUNDGREN qui était en vacances

- aperçu le chef de la division ergonomie HANSSON (connu auparavant en visitant LUNDGREN dans son île), patron de PETERSON, ne cherche pas à me voir, juste bonjour.

- visite à une équipe du laboratoire de HAGBARTH spécialisé dans l'effet sur le S.N.C. de l'embryon des toxiques absorbés par la mère. Dans le cas, une brebis préalablement intoxiquée, on note la réponse des yeux de l'embryon (sorti de la mère) à une stimulation lumineuse (tirés à part)

- Laboratoire de IRMA ÅSTRAND qui a succédé à N. LUNDGREN comme chef du Laboratoire de Physiologie du Travail de l'Institut. Y travaille l'ami de N. PETERSON. C'est très classique : O_2 sur bicyclette ergométrique.

10.4.74 - KRONLUND

- Chercheur d'extrême gauche en rapport avec l'Université Technique
- Situation dans une espèce de rez de chaussée en dessous de l'ascenseur - Même place qu'Ergolab.
- Que veulent dire : les facteurs intrinsèques du travail
  la démocratie industrielle

si pour des raisons d'enquête, on accroît la vitesse : la charge s'accroît ainsi que les accidents

- Actuellement, en Suède, la tendance à la restructuration des tâches est le fait d'une grande crise sociale et ce changement ne peut être évité.

Il y a des liens de communication entre la politique générale des syndicats, les notions d'entreprises et les travailleurs.

Les pratiques les effets sont faibles au point de départ.

—

SAAB a fait beaucoup de réclame pour sa nouvelle organisation de la production

Si on interroge des travailleurs dans cette usine ; ils se plaignent de la charge de travail et du fait que l'on n'a pas réalisé les changements qu'ils souhaitaient.

—

le problème est de donner des moyens d'expression aux travailleurs ;

give words to the workers

demander l'intervention des travailleurs pour les faire choisir

Ici cela pose nettement le problème des relations entre Science et politique

—

→ le problème est de l'aider à la prise de conscience des travailleurs, à une mode de maïeutique

---

proposer à ODESCALCHI d'inviter KRONLUND à RIMINI

SKOGLUND - programme à la Radio

Walter BUCKLEY

Sociology and modern system theory

PRENTICE HALL 1967

-W.B

Il y devrait de la part des conflits dans le changement, le changement faisant avoir des aspects positifs

---

Il faut faire la Théorie de l'approche multidimensionnelle qui n'est absolument pas faite dans un institut comme celui

de LUNDAREN, ai tout été justifié.

Il faut développer la place de la discussion avec les travailleurs dans l'engineering - à travers le langage

---

KRONLUND vu à PARIS 15-18 Octobre

10.4.74 L.O. (C.G.T. majorité avec socialistes et communistes)

- Un jeune médecin (adjoint du médecin conseil de L.O. absent) Anders ENGLUND

- un jeune syndicaliste très brillant, chargé de l'idéologie de L.O. pour les conditions de travail comme OMBUDSMAN (représentant politique). Est très à gauche et va devoir jouer du politique à l'intérieur du parti de L.O. : Enge JANERUS. Dans la discussion, c'est lui qui a presque tout dit.

- Un jeune syndicaliste, OMBUDSMAN sociale aussi comme manière, a peu parlé, est parti avant la fin Löf KJELLSTRAND

JANERUS : Les propositions de THORSRUD nécessitent une ~~participation~~ action au niveau de l'atelier mais pour qu'il y ait changement réel, il faut que conseil d'administration soutiennent ces changements, il est donc nécessaire que les travailleurs aient une place importante dans ce conseil.

- Il existe un nouveau système d'influence syndicale dans les sociétés ; ce sont les investissements de fonds syndicaux les investissements des caisses de retraite dont les conseils sont contrôlés par L.O. Cette action est très efficace car les fonds de placement collectifs sont énormes.

- Dans les conseils d'administration des Sociétés, la

politique de L.O. est de ne prendre des places que dans les secteurs dont on peut changer la politique. C'est en particulier dans les domaines economiques nouveaux qu'il faut agir.

—

Les relations avec l'atelier est capitale : ~~[illegible]~~
Quand ~~l'union~~ la section locale est forte pas de problème
Si elle est faible, la puissance de negociation est confederale mais la confederation ne doit pas agir derrière ~~le~~ dos de la section locale.

—

Une nouvelle loi est en preparation qui protègera mieux les travailleurs des ateliers. Ceux-ci auront plus de pouvoir sur l'environnement du travail. Les representants syndicaux pourront arrêter le travail en cas de danger

—

1/10 des travailleurs doit disposer de temps et de liberté de deplacement dans les ateliers pour les conditions de travail

—

1975 revision de l'article 32
– partage du pouvoir de decision patronal
– discussions collectives

—

Le problème est participer à la decision à des niveaux plus bas
– politique du personnel
– departement des ventes.

—

KJELLSTRAND

Une nouvelle loi – la place des delegues securité.
– ils auront la place de l'usine nouvelle
– L'avis des travailleurs sur le plan est indispensable pour obtention du permis de construire.
– En cas de danger, les delegues ont le droit d'arrêter

le travail jusqu'à l'arrivée de l'inspecteur du travail, qui peut faire appel à l'inspecteur supérieur.

- les inspecteurs locaux ont parfois une attitude défavorable mais les inspecteurs supérieurs sont une attitude favorable aux travailleurs. Ils peuvent d'ailleurs s'appuyer sur l'avis d'une comité légalement établi dans chaque région.

- Il faut critiquer la formation (et le choix) des inspecteurs locaux

---

L'indépendance de l'administration par rapport à la politique est fondamentale en Suède.

Dans cette nouvelle loi :

- meilleurs critères d'hygiène industrielle
- droit d'arrêter le travail dangereux
- essai de contrôle de la victime au niveau de la préparation du travail (rôle des travailleurs dans le bureau des méthodes)
- changement des lois de salaire (suppression des salaires aux pièces, fixation d'une vitesse normale)

A VOLVO, il y a liberté de cadence à l'intérieur d'un certain niveau de production. A KALMAR, VOLVO n'atteint pas une productivité plus élevée. Ce qui est considéré, c'est le coût économique total

---

Tendance à développer la formation permanente, la culture complémentaire

---

Pas de démocratie industrielle ~~dans~~ avec des travailleurs exclus par le développement technique, qui ne sont pas libres de communiquer.

Il existe un vaste dispositif de formation syndicale.

—

Il faut changer la formation en général, leur donner un nouveau contenu ~~qui aille au sens~~ que ce contenu ne soit pas celui des patrons, purement technique. Quelque chose d'autre

—

Les dirigeants de L.O. ne sont pas assez compétents dans les programmes de recherche

—

ENGLUND On connaît en général les produits toxiques classiques mais on découvre les relations entre

P.V.C (fabrication) et cancer

CS_2 et infarctus

Il faut faire des efforts épidémiologiques et de labo, contrôler les nouveaux produits.

—

Il faut enregistrer les gens, les suivre (registre des cancers, établir les tables de maladie différentielle.; établir la liste des maladies en rapport avec le travail

—

Influence des travailleurs sur les seuils de Toxicité. Il faut obtenir pour les travailleurs les résultats nouveaux des travaux de recherche sur la Toxicité, les solutions techniques de réduction de l'émission de toxiques

—

Sensibilité différentielle

—

Valeur des fréquences cardiaques élevées

STELLMAN J.M., DAUM S.M.

Work is dangerous for your health

VINTAGE RANDOM House NEW-YORK 1.973

10.4.74 Bertil GARDELL

. Grande patrie de Psychologie du Travail à l'Université. Ici Psychologie veut souvent dire Psycho-sociologie (voir GOLOWSCA à OSLO)

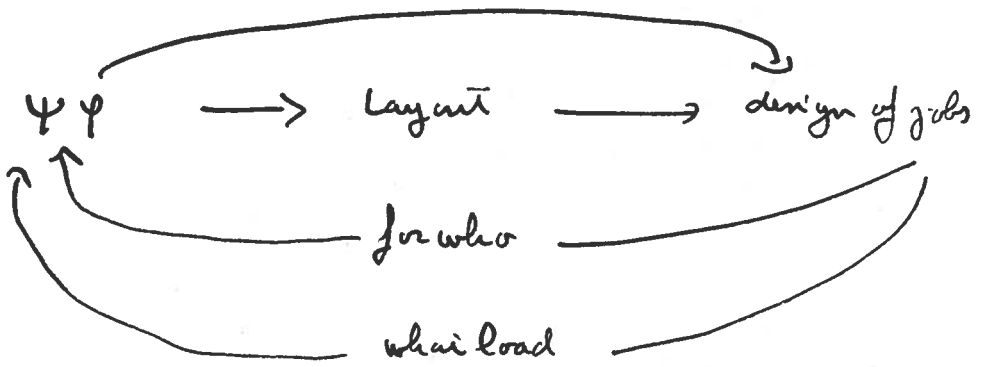
. les psychiatres, les psychologistes n'apportent la contribution qu'ils donnaient à une nouvelle théorie de l'Homme au point de vue social.

- Tentative de GARDELL (ψ social) et FRANKENHAEUSER (hormonal)

- FRANKENHAUSER s'occupe de contrôle de la stimulation et les gens de laboratoire vont voir les situations de travail réelles.

- Notion de stress professionnel de FRENCH et KAHN : utilisation de résultats divers obtenus grâce à des théories diverses.

- Concept des facteurs agressifs - puissants
  - effectifs (valeurs)
- modèles qualitatifs et quantitatifs.
- les stress ψ donnent des réactions φ



- d'autres mécanismes | aliénation
  | santé mentale
- application de beaucoup de concepts de santé
- trop de distance entre la santé et l'état de la société
- une vue qui change sur la société ; un changement dans la santé : la notion d'aspiration. Un choix social pour la Suède

- l'enrichissement des tâches

Design of jobs LOUIS DAVIS

PENGUIN 1972

- les conditions de travail et le vécu de la vie

—

Alienation || attitude instrumentale vis à vis du travail
peu d'intérêt au changement

en cas de travail autonome, les demandes s'accroissent

—

Une nouvelle conception des tâches est nécessaire à la démocratie

—

La perception des vœux de leurs représentants est une forme chère pour les gens

—

la perception du syndicat comme faible conduit à des demandes faibles vis à vis du travail

—

critique de THORSRUD succinct.

le lien entre la satisfaction au travail et la productivité n'est pas cohérent avec les aspirations à la démocratie industrielle.

Des limites à l'enrichissement des tâches sont mises en place par les patrons

A SUDSVANIA, les ouvrières de l'expérience SAAB demandent plus de droits non seulement le contrôle de la vitesse mais la répartition des tâches dans l'équipe mais aussi l'enrichissement de la tâche et le contrôle des syndicats. Refus de la direction. Pour GUSTAVSON, responsable syndical chez SAAB : on doit — on peut tenir compte de ces demandes dans le cadre de la démocratie industrielle !

Ainsi on dépasse le problème des vœux économiques de LOUIS DAVIS.

11.4.74 _ Lennart LEVI qui s'en va assez vite. Il paraît s'intéresser au travail lui-même (voir le début de l'entretien)

Pr Aubrey KAGAN (G-B) prêté par ~~OTTO~~ OMS à Lennart LEVI en année sabbatique. Entretien difficile, refus de la spécificité du travail.

_ Le labo de LEVI est très lancé ; laboratoire ~~OTTO~~ OMS soutenu par les pays du 1/3 monde. Gros contrats militaires suédois et OTAN. Atmosphère americano - commerciale, très SELYE.

_ Importance des statistiques de santé : fréquence des troubles cardiaques chez les opérateurs de téléphone.

_ Stress de l'apprentissage

_ Nouveaux risques physiques, nouvelles substances. Ne faut-il pas poser la question de l'exposition simultanée à plusieurs substances ? Ne faut-il pas limiter l'exposition à des combinaisons limitées de substances ?

_ Le mécanisme est celui des changements φ provoqués par des stimuli divers - Rôle des précurseurs du stress

_ Le schéma de SELYE (ostensible) : Rôle du complexe hypophyso-adrénalinique avec excrétion de catécholamines et de corticoïdes. augmentation de la pression artérielle, de la fréquence cardiaque, baisse du temps de [illegible], accroissement de la glycémie

_ Différences interindividuelles : les programmes psychobiologiques sont liés à des différences génétiques dans la production des hormones du stress

_ à l'apprentissage : rôle de la perception des stimuli comme tels

_ ~~à l'apprentissage~~ au conditionnement des réponses biologiques.

- le rendement et la sécurité des gens jouent sur l'apparition de maladies

- les structures de travail sont dangereuses si elles font apparaître le syndrome de SELYE

11.4.74 OSCARSON (avec dynamo)

Responsable administratif du ~~programme~~ fonds de recherches et d'action sur les conditions de travail de SUEDE

Bureaux dans l'immeuble nouveau (au 9ème angle droit) WERNER GREEN.

—

Un médecin PETERSEN (Nyman) est neuropsychiatre du travail à GÖTEBORG. Il a étudié le travail des soudeurs et en particulier leur charge statique par l'EMG aux GÖTAWERKE

Future visite des médecins en France pour le programme recherches sur les conditions de travail

---

Le Fonds de recherches a été créé en Suède en 1972

- Recherches
- Formation
- Information

OSCARSON est directeur depuis Janvier 1.973

Priorités

Recherches de caractère appliqué au Fonds. C'est au conseil de recherches médicales de financer les recherches fondamentales

- L'argent vient de cotisations patronales car il faut que l'amélioration des conditions de travail fasse partie des coûts de production.

- Les employeurs privés ont d'abord seul payé et maintenant les entreprises d'état paient aussi.

1973 ~~1er Janvier~~ 0,03 du total des salaires (privés) → 20-25.000.000 S.K.

1974 0,10 " " " "

0,075 → 75-80.000.000 SK pour le fonds

0,025 → 25.27.000.000 SK pour l'hospitalité que dirige LUNDGREN

Constitution de comités qui analysent les recherches existantes
étudient les besoins
les possibilités

—

25.000.000 de SKR déjà engagés

—

· Exemple des comité des besoins recherches.

9 personnes
- chirurgiens orthopédistes
- médecins praticiens
- ergonomistes préventeurs

dans le but de mélanger les gens (théoriciens et praticiens, médecins et ingénieurs)

Le groupe travaille d'Août 72 à Sept 73 pour écrire un rapport sur des recommandations de recherche.

Dans une nouvelle loi, les délégués à la sécurité auront le droit de voir les plans, mais aussi de recevoir la formation pour les comprendre

—

Non seulement il y a pénalité pour les recherches appliquées mais il y a mise du panage aux applications avec une contribution aux dépenses nécessaires aux améliorations.

—

Par exemple, pour le problème des poussières de plastique on a mis au point un nouveau système pneumatique d'élimination puis on a donné de l'argent à une entreprise de plastique : 50% des investissements des licences de vente pour 25 pièces soit : 100.000 SK.

11. 4. 74 OLF ÄBERG Métallurgie à dérivés des bois

Professeur à l'Université technique. Place marginale dans le monde universitaire nordique. Il est d'ailleurs seulement Docent ce qui lui demande de prendre beaucoup de contacts extérieurs pour la faire vivre lui-même et faire vivre son labo.

—

Le travail expérimental réalisé par Lennart LEVI sur le travail aux pièces est extraordinairement artificiel. La cadence est brève et très violente.

—

Il faut garder les relations avec l'industrie

Enseignement post-universitaire seulement: séminaires de doctorat

Pour avoir le doctorat (fin des études d'ingénieur) il faut 80 points.

12 séminaires d'ingénierie de 3 - 4 heures donnent 5 points

La thèse est un travail expérimental réalisé dans le domaine propre du candidat. Elle donne 40 points.

Une recherche importante réalisée par le laboratoire est liée à l'engineering d'une nouvelle aciérie avec d'abord reconstruction des postes de travail.

Construction d'une cabine hexagonale standard (60 exemplaires) qui résout beaucoup de problèmes: chaleur, fumées, bruit, effets physiques, isolement (elle a des vitres et elle est ouverte

Le conseil de rationalisation du travail est un groupe de coopération employeurs - syndicats. Il a publié une brochure: l'approche ergonomique

ABERG BOLINDER 2.13

Ergonomi och arbets~~[illegible]~~formning

Arbetsmiljöhäfte Skriften 1970

Joan WOODWARD

Human relations at work

McGRAW HILL

Industrial organization, Theory and practice

OXFORD

~~[illegible]~~

Une entreprise demande essentiellement au consultant d'exprimer ses besoins (par exemple la SERI

—

Necessité de permettre aux gens de parler. Pour cela il faut

- pas trop de bruit
- une disposition favorable des postes
- du temps

—

Il montre sa grille remarquable permettant l'analyse rapide du poste. Sa grille va plus loin que celle de P. TARRIERE puisqu'elle permet tout de suite de noter la catégorie de causes des erreurs constatées : technique, méthodes, machines, outillages locaux etc. Il présentera cela à PROMSTRA. Il me donnera un texte

13.4.74 Tom IVERGÅRD

~~[illegible]~~

Etudes d'ingénieur hygiéniste (chauffage ventilation)

" de sciences humaines (psychologie industrielle)

" d'Ergonomie à LOUGHBOROUGH (d'où ses liens avec KIRK et la défense du consommateur). sur les systèmes de contrôle des sorties dans les supermarchés.

- D'abord employé par l'Institut des Consommateurs suédois
- Puis jusqu'en juillet 74 directeur [illegible] d'ERGOLAB

— A partir de juillet 74 Création d'une fondation de recherches sur les conditions de travail comprenant ERGOLAB qui fait des bénéfices en prestant des services de conseil et un Institut d'Ergonomie Appliquée qui fera des recherches concernant le bénéfice d'ERGOLAB.

— Actuellement : chiffre d'affaires 1.500.000 SKr
74 10 personnes (enquête par conseil)

75 2.000.000 SKr
13.14 personnes.

— Bonne petite installation (rez de chaussée où j'ai déjà vu KRONLUND) propre et moderne avec quelques appareils, dessins et maquettes bien choisies - Ressemble un peu au labo de RENAULT.

— Usage du polystyrène expansé pour les maquettes

— Un excellent dessinateur (architecture intérieure)

Fait des plans en projection très vivants qui servent aux délégués pour comprendre et critiquer les futures installations (voir + haut) les droits des délégués dans la nouvelle loi suédoise)

— 3 activités principales pour ERGOLAB

- Ergonomie des produits de consommation (avec la participation de KIRK) - bureaux
- calculateurs
- Ergonomie industrielle
- industrie mécanique
- environnement (chaleur, poussière, bruit, éclairage)
- Charge physique et mentale

- Un gros contrat 500.000 k_2

- Ingénierie des manoeuvres des navires en pleine mer comparable à SOESTERBERG en DELFT mais dans ce cas approche du port

- En G.B., l'effort de recherche est 3.000.000 k_2 donné à E.M.I. et à CLARK (?)

Surprise 100 Salaire → 70% travailleurs
↘ 30% gouvernement charges sociales

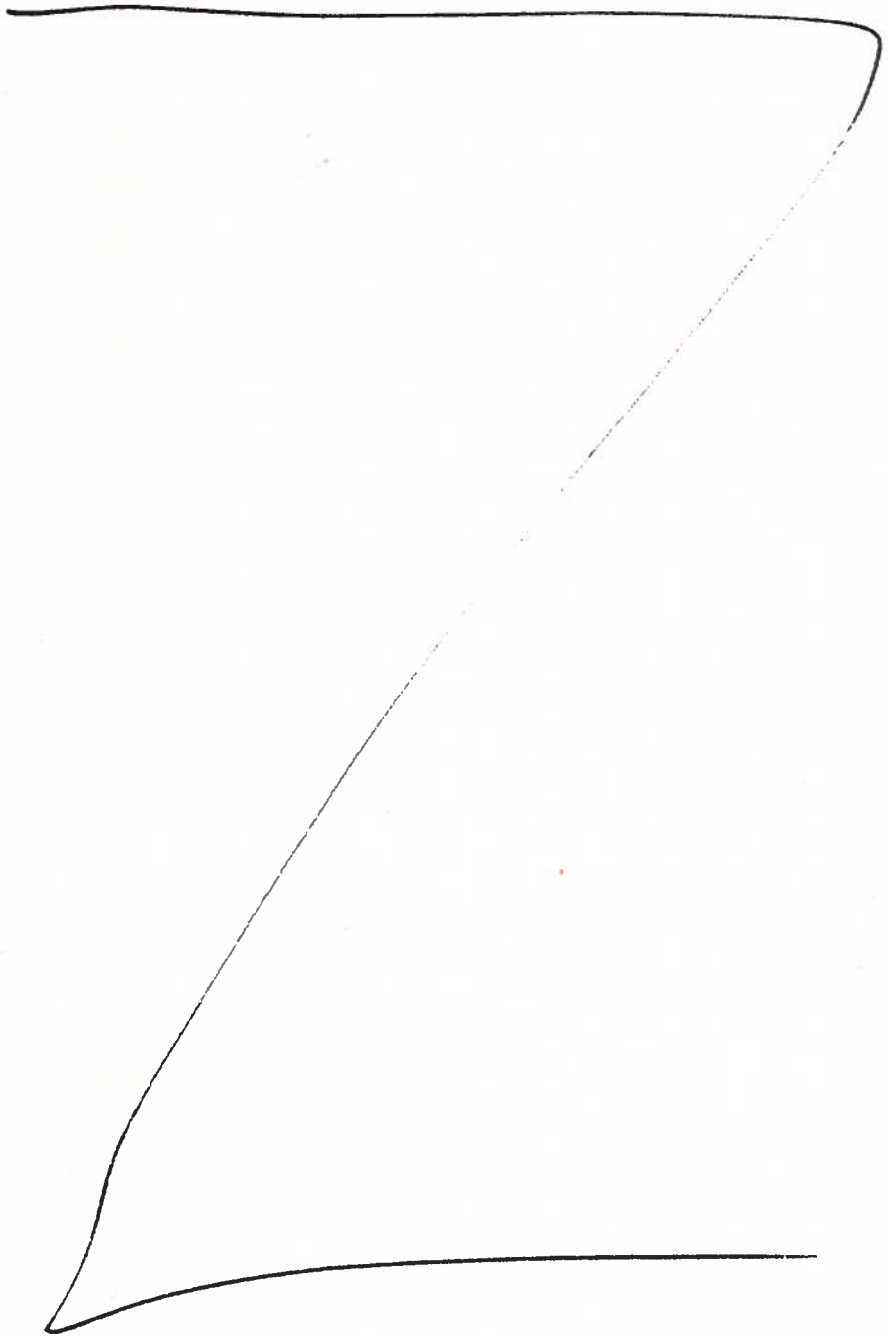
150-200 - frais généraux | impôts
loyers
appareils

- bénéfices

Il vendrait un contrat pour faire tourner à l'usine un des domaines industriels.

Voir l'assemblée plénière d'IVERGARD à RIMINI

17.4.74 - KAKKAÏNEN ~~sym~~ confédération syndicale finlandaise. Mon interlocuteur est un militant communiste très virulent. Il est arrivé récemment à la confédération et ne domine pas les problèmes. On ne peut discuter les socialistes dominent la confédération et la neutralité est un des domaines que l'on concède aux communistes.



3.2

- IPO Sensler ing
- 3 million in England

- EMI
- Clark

International coordination

100% of salary

→ 30% government

→ 70% private

150.200 50 - 100% is free Taxes space.

---

projection of design

---

book for designers.

TONI IVERGÅRD

→ RIMINI

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(5)

KARKKAÏNEN

Mesures d'incitation pour changer le travail

Législation

Lois de protection des travailleurs

La loi actuelle est l'ancienne (20 ans) il y a des points qui accédé à la sécurité.

L'inspection du travail loi de 40 ans. Mauvaise situation qui gênent l'application des lois nouvelles de sécurité

Contrat patron syndicats (4 ans) pour action de sécurité à l'atelier. Pouvoir pratique. Organe de discussion

la loi sur l'inspection du travail à changé (44 mars)
Nouvel organisme au ministère de Sécurité Sociale. Hôpitaux
Médecin de la profession.
Comité → Loi sur le système de gestion de la sécurité du travail
Les inspecteurs ont + de pouvoir : obligation de changement
Amendes importantes. Arrêt du travail dangereux. Travaux d'amélioration faites par d'autres et le patron paye
Santé des travailleurs → Prospérité des Entreprises.

2 : point de la loi
- organiser par contrat patrons - ouvriers déterminant les gains
- 1 délégué de sécurité pour minimum 10 personnes.
ne permet arrêter le travail mais l'utiliser en dernier
- Bonne protection des délégués de sécurité - longue discussion possible de la faire.
- Conflit très dangereux → inspection du travail
- Conflit + grave → système conventionnel commission mixte
- Contre entre le délégué l'inspecteur respecte l'anonymat des gens qui ont dénoncé les mauvaises conditions de travail.
- Les cadences seront traitées dans une nouvelle loi à la demande des syndicats
- Autre système important est le contrat annuel entre patron et syndicats. Sécurité point de sécurité et santé. Un dépasse pour le délégué de sécurité : heures de formation. 800 personnes
1 délégué à temps plein.
- Organisme de sécurité 50 % ouvriers
25% patrons
25% état
→ projets réalisés - Définition de ce qui sera fait l'an prochain

3.4
26

. Contrat patron syndicat : formation des délégués de sécurité payée sur le temps de travail et par les patrons.

La pour rassembler ce qui est dispersé dans la législation

Dans la loi sur l'inspection récente, obligation par entreprise nouvelle de + de 10 personnes ~~dans~~ pour + d' 1 mois. Rapport à l'inspection du travail

La loi ne permet pas l'inspection préventive - mais elle vient loi sur les systèmes techniques que l'[illegible] inspecte - Application aussi aux produits chimiques, aux méthodes de travail.

Nouvelle loi donne des cadres d'action. Ensuite meilleure définition des systèmes. Efficacité dans 20 ans. Le Ministère de l'inspection du travail est responsable des genres susceptibles d'être utilisés dans le système sécurité - soit

– les spécialistes

– la contribution à la formation universitaire dans le domaine de la sécurité et de la santé.

– Responsables des patrons doivent être des spécialistes (liste spéciale)

– Projets pour plusieurs années à l'avance dans la conception des ateliers ?

– Le comité pense que la loi sera présentée à l'automne prochain et en 74.75 au parlement.

– Bons rapports entre chercheurs et syndicalistes qui ont demandé beaucoup de projets. Regrette système total qui dirige sécurité et santé. Pas de planification. Nouvelle loi le fera ,

Possibilités de recherche de recherches limitées.

L'Institut a créé des annexes en Finlande. 3 actuellement

17.4.74 Reçu la visite à dîner par KARVONEN, qui a succédé récemment à la tête de l'Institut des Travail à la place du fondateur Leon NORO (maintenant Directeur Général de la Santé), quitte cet Institut pour devenir médecin-chef de l'armée finlandaise sur demande directe du Président de la République. Il faut dire que KARVONEN a été précédemment médecin chef de l'aviation finlandaise. On sait que celui qui succédera à KARVONEN, c'est une décision politique

- L'Institut est une énorme institution (500 pers) située à Helsinki. On y fait de la Médecine du Travail (pour 25.000 travailleurs), de l'enseignement, de l'enquête d'invalidité, de la ~~réadaptation~~ réadaptation et de la recherche.

- Juste après la 2. guerre mondiale
  - toxicologie du CO
  - étude des travailleurs de force employés dans la coupe des forêts destinée à payer les contributions de guerre
- C'est une organisation privée sans bénéfices
- Le ministère enquête les directions du ~~staff~~ développement
  - Santé publique
  - ~~Rehabilitation~~ Réadaptation
  - Environnement en général
  - Environnement du travail
- Maintenant l'Institut a sa propre politique
- son organisation est limitée ni par les ressources, ni par la demande mais par les personnes

l'Institut ne fait pas seulement des recherches
mais il donne des consultations médicales (pour employés)
publie des livres et des journaux
gère des services.
transfère ~~des~~ les malades au public

Départements 1° Médical. Clinique centrale de médecine
médicale (pour voir la page) : diagnostic, expertise,
liaison avec les médecins firmes qui emploient les 25.000
travailleurs suivis, ce qui donne de lieux de recherche et
d'expérimentation. Mais ce rôle de médecine du travail
devra être peu à peu progressivement.

- permet d'avoir des experts en médecine médicale - ophtalmologistes
- physiologique. - radiologie - dermatologues etc

2: Techniques de l'Hygiène (M. LEHTINEN)

de développement récent

3: Toxicologie et biochimie

- pollution de l'environnement qui doit être transférée à une autre institution.
- analyse d'échantillons.
- recherches de toxicologie médicale ayant commencé récemment en liaison avec le projet de LODZ (voir FORSSMAN p. 1.1)

2° Physiologie (KOSKELA)

- ergonomie
- sécurité ~~médicale~~ du travail
- physiologie clinique
- physiologie du travail physique
- ~~physiol~~ physiatrie

3: Psychologie (Mme HANNINEN)

- épreuves de relecture
- psychologie du comportement
- toxi psychologie

4° Epidémiologie et biostatistiques

5° Bibliothèque.

Il existe 5 antennes dans le pays permettant de faire des mesures techniques d'hygiène. Elles sont en liaison avec les Universités

Le conseil d'administration de l'Institut compte 18 personnes

10 gouvernement
8 partenaires sociaux (patrons, syndicats)

Le conseil se réunit 5 fois par an
Le bureau " " tous les 15 jours
La direction prend les décisions quotidiennes.

Budget 25.000.000 marks finlandais (M.F.)
dont 9.000.000 venant de l'Etat
16.000.000 ressources venant des activités

Mme KARJALAINEN fait partie de l'organisation centrale de l'inspection du travail et non pas de l'Institut. Elle était invitée à la réunion parce qu'elle venait d'établir un rapport sur la protection du travail, son état et son avenir.

Cela couvre : la sécurité du travail
l'hygiène du travail
actuellement les conditions de travail

Il s'agit d'un système très désorganisé, avec des ambitions très modérées et portant peu effet sur des cas concrets.

Elle a établi un registre des accidents (422) depuis 1.970 sur ordinateurs en y mettant même les petites accidents de fait d'où des statistiques pour les entreprises.

et les articles Chefs pour ~~...~~ revues de vulgarisation

Il faut que les reductions cessent d'être concentrées à l'Institut et qu'elles soient dispersées dans un grand nombre d'Universités.

~~Il faut definir ... les ...~~

Le ~~...~~ budget national est dans ce domaine de 120.000 NF et il va passer à 300.000 NF mais il faut qu'il cesse d'être orienté vers la production du travail pour aller vers la production du travailleur.

Pensée très faible - Tous les assistants le pensent

KOSKELA

- Très orienté vers la formation et l'information.
- le critère est le changement dans l'atelier. Tant que l'on n'a rien fait à l'atelier, on n'a rien fait du tout.
- Il faut aider pour cela le travailleur à porter lui-même un jugement correct sur son propre travail, developper ses activités intellectuelles, reduire le delai entre l'obtention des resultats sur le terrain et leur connaissance sur le terrain.
- Il faut ensuite ~~...~~ observer les conséquences
  → succès
  → par défaut → échec

et en decouvrir les raisons.

- Si l'on prend comme critères les suggestions pour obtenir des modifications du poste de travail, on voit les resultats varier de 1 à 100. C'est bien un critère discriminant.
- les principaux facteurs influençant sur ce critère sont 1°: La durée de l'enseignement
  - 1 semaine peu de resultats
  - 4 semaines (séparées les unes des autres) bons resultats

2°: le délai d'observation -> 1 an

3°: La qualité des relations sociales dans l'entreprise entre la structure technique et les travailleurs.

4°: L'attitude politique de la structure technique.

Les enseignements sont donnés par groupe de 12 à des personnes (médecins, ingénieurs, syndicalistes) appartenant à des entreprises diverses.

—

Il faut que les travailleurs puissent comprendre les informations On sait s'ils ont compris quand il y a eu des suggestions.

—

Le livre d'enseignement finlandais a été vendu à 3.000 exemplaires (pour 4.500.000 finlandais)

—

L'équipe d'enseignants de KOSTELA : 9 personnes de la région + 6 playwrights qui ne font pratiquement que cela

—

Contact continus avec les anciens élèves : 5 fois par an un fascicule d'information (contenant des textes à point pratique).

—

Aide dans les magasins des playwrights

—

Pour prendre des décisions dans l'entreprise on sollicite la participation des enseignants qui donnent leur avis surtout sur les critères

—

Remarquable "livre des marins" avec collaboration 170 dessins remis contre nourriture élèves (3.000 MF ?) aux anciens élèves qui deviennent enseignants dans

leur entreprise. Petits livres de l'élève (2e degré)
On m'a donné un exemplaire de chacun de ces outils pédagogiques.

—

M. LEHTINEN ingénieur dirigeant le département de la chronique de l'hygiène.

Pendant les 10 premières années de l'Institut, petit département (5 personnes) ne faisant que quelques mesures.

Depuis 10 ans, étude biochimique d'importance croissante : entre 65 et 70 14 personnes

- Après 1969, les assurances sociales financent ce département

- en 1974 43 personnes. On embauche chaque année 3.4 hygiénistes industriels

—

Chaque année, l'effort d'équipement porte sur un secteur différent : poussières, bruits et vibrations, chimie ....

—

Etablissement d'un guide pour l'évaluation des machines (1 exemple machines à fouir du papier)

—

Gros projet actuel relatif aux fonderies

- 20 sous-projets mais le prix du métal a fait trop critères aux demandeurs.

- On a provisoirement limité le nombre des projets donc le nombre des facteurs considérés, Par exemple on n'étudiera pas les poussières, les risques chimiques, les statistiques de mortalité

—

- Un autre projet concerne les caricières : on commence par l'étude des statistiques de morbidité.

—

Mentionner à conseils

Mme HANNINEN Département de Psychologie

- Etude des conditions et de la satisfaction
  - atmosphère physique et chimique
  - social
  - contenu du travail
- S'intéresser au bien-être et à la santé mentale sous tous leurs aspects.
- Suivant le type d'activité, on se demande ce qui est le + important, une étude globale ou l'évaluation particulière de certains aspects
- Etude comportementale et psychologique des effets de certains risques.
- le premier service rendu est celui du diagnostic en rapport avec les études cliniques. : étude des effets du CO_2 sur le comportement au travail
- Le travail par équipes : symptômes subjectifs effets sociaux, état mental

---

Communication de KARVONEN

Séminaire d'épidémiologie dans le domaine de l'hygiène industrielle

En Nov - Dec 1975, un séminaire destiné ~~aux~~ à 12 personnes appartenant aux pays de langues française a eu lieu à HELSINKI pendant 3 semaines pour enseigner l'épidémiologie de l'hygiène industrielle sous la direction de O. MIETTIENEN d'HARVARD

—

En janvier Février 1976 les participants donneront le

même enseignement dans leurs propres pays

le tout est organisé par KRISHAGUIN que j'ai eu au téléphone à Helsinki, que je rencontrerai à COPENHAGUE (WHO) cette fois ci mais que je verrai à PARIS en juillet prochain

---

- Mise au point d'une batterie de tests
  - psychométricité
  - vigilance (Bourdon
  - personnalité (RORSCHACH avec notation psychanalytique)

validés par 3 catégories de sujets
  - emprisonnement
  - expérimentation
  - par d'expérimentation.

Les batteries variant en peu selon les toxiques

—

Utilisation des entretiens avec ceux qui ont été exposés aux toxiques - Suivi à long terme par la clinique et les épreuves de comportement. On note souvent un accroissement de la sémiologie après expérimentation. Il y a souvent tendance à l'isolement social. ~~La victime~~ le malade ne redevient jamais le même qu'avant

—

Effet de l'intoxication de la mère sur l'enfant

—

Epidémiologie de l'utilisation des médicaments dans l'industrie

Danger du mélange des solvants et de l'alcool

Les conductions d'autocars prennent toutes sortes de drogues

Statistiques générales d'absentéisme et analyse

19.4.74

M. X et M. Y Directeur de la Recherche et de l'enseignement supérieur au Ministère de l'Education Nationale.

Aucun document de l'Institut M. X est très violent contre ce dernier, et la licence de fabrication. JO attaque vivement aussi KUORINKA qui est avec moi et dont j'explique le travail.

(cyclo DORST)

Son rôle est de faire un plan général de la recherche en particulier dans le domaine des conditions de travail et d'en établir aussi le détail, de choisir parmi les projets particuliers.

L'Académie de Finlande (analogue au CNRS) distribue des moyens aux établissements universitaires existants.

15 postes de professeurs de recherche (D.R.)

300 postes de chercheurs (4 degrés)

On donne des postes à plein temps ~~dans~~ aux chercheurs de plus haute priorité dans les départements des Universités pour une durée de 3 à 4 ans renouvelable.

Le chercheur peut avoir 1 ou 2 contrats de 5 ans mais en général il reste dans l'Université où il y a une grande augmentation du nombre des places disponibles; quitte à changer plusieurs fois.

Parmi les thèmes prioritaires :

- Epidémiologie et vieillissement de la vie
- La recherche avec les travailleurs.
- Psychopathologie du travail
- vieillissement
- Bruit
- Sommeil

—

Il pense que l'on ne peut financer en tant que telle la méthodologie de recherche ~~des~~ les conditions de travail

Il faut former les travailleurs (Université de JUVASKULA) publier des livrets destinés aux travailleurs.

19.4.74 A.M (à déjeuner à l'Hôtel)

Ingénieur des méthodes et médecin d'une ~~usine~~ usidérurgique finlandaise. Ils décident depuis un an d'avoir une action ergonomique avec le comité de KUORINKA

NORVEGE

18.4.74 Institut du travail

Mme RAMBERG physiothérapeute. Elle a organisé mon séjour de la part du D. SJÖFLOT qui a été mon correspondant comme secrétaire général de la Société d'Ergonomie des Pays Nordiques mais qui travaille à As à 40 Kms d'OSLO et que je n'ai pas vu.

Dans cet Institut (directeur TÖR NORSTED) 3 départements

- Physiologie du travail : Pr Kåre RODAHL
- Psychologie du travail
- Médecin du travail K. WULFERT

- Mme RAMBERG travaille dans ce dernier département.
- LANGE-ANDERSEN a quitté le département de physiologie du travail de l'Institut pour travailler au projet O.M.S I.B.P. (International Biological Project) et semble-t-il travailler aux USA. Son ancien collaborateur HELLSTRÖM en devenu l'adjoint du médecin inspecteur général du travail BRØSGAARD (voir + loin)
- THORSRUD dirigeait il y a 10 ans une équipe à TRONDHEIM Il a ~~abandonné depuis~~ mais il dirige le ~~laboratoire de~~ département de Psychologie de l'Institut, mais depuis 2 ans n'en est plus que le conseiller, pour se décharger de l'"administration" et s'occuper d'un nouveau projet dans la construction navale Il paraît avoir beaucoup d'activités aux U.S.A. avec EMERY et LOUIS DAVIS. Son adjoint GULOWSEN travaille

dans un institut voisin (voir + loin)

- le Professeur RODAHL a vécu 17 ans aux USA et est revenu depuis 2 ans dans l'institut malgré son âge avancé (# 70 ans ?) Il a ramené des Etats Unis Mme PRUETT

Mme RAMBERG est physiothérapeute dans le département de ~~Physiologie~~ de Physiologie du travail.

Il existe en Norvège 2 écoles de Physiothérapie

- Eiut
- MENSENAES

Les physiothérapeutes sont employés dans de petits groupes d'ergonomie dans l'industrie et les écoles.

On donne des cours dans les écoles de Physiothérapie pour ceux qui seront employés dans les Ecoles - dessin des mobiliers

- gymnastique de pause
- enseignement de

~~Con~~nes postures de travail pour lire et écrire

Enseignement aux professeurs de gymnastique.

Il y a des physiothérapeutes à plein temps dans les grandes entreprises (NORSK-HYDRO) ou à temps partiel dans les entreprises + petites. Ils inspectent les postures de travail

aménagement des bicyclettes

faut faire de la gymnastique

Mme RAMBERG parvient des recherches sur la consommation d'oxygène maximale dans des groupes particuliers.

- travailleurs "lourds"
- lapons
- > 50 ans

On note parfois des gens de + de 50 ans qui sont dans des conditions physiques remarquables à la suite d'un entraînement intensif. Certains ont les mêmes capacités que des jeunes gens de 20 ans

Elle étudie l'effet de l'entraînement sur la maîtrise des capacités physiques chez les gens vieillissants. Cela leur procure ~~[illegible]~~ un état mental meilleur mais cela ne fait que valoriser un peu la baisse des performances. L'entraînement est important (tapis roulant 3 fois par semaine). Tout cela a été étudié par LANGE ANDERSEN sur un an en patient.

Elle va aussi dans l'entreprise où elle a, en particulier, étudié les accidents dans les chantiers navals. Elle a fait l'analyse des fusées, l'analyse particulière avec EMG et montré que le bâton de rondeur qui se raccourcit conduit à une mauvaise posture ~~[illegible]~~ et à un risque lorsque l'ouvrier finit par avoir le nez sur la soudure) Elle recommande un nouveau type de visière à souder pour maintenir une bonne distance.

Elle enseigne beaucoup - maîtrise
- groupes de sécurité du travail
composés par les syndicats
- spécialiste de la sécurité

(ingénieur et technicien)

M^me PRUETT Américaine volubile qui explique ses effets des glucocorticoïdes sur la composition des fibres musculaires avec biopsie musculaire. La biopsie a l'air d'usage courant dans les labo nordiques de physiologie musculaire.

P^r RODAHL - Allocution sur de vieux mon projet. ~~[illegible]~~ le vieillissement par détérioration des conditions de travail mais seulement que l'on reconnaisse son droit à être plus payé.

Le travailleur prend de grands risques uniquement pour elle, les payé.

Toute discussion est impossible avec lui. Il paraît il tient compte de son pays où il ~~travaille~~ revient après 17 ans et où l'ouvrier est exploité.

18.4.74 Après midi (13H - 18H)

GULOWSEN

Homme d'une grande valeur, participant et critique vis à vis des fameux projets de démocratie industrielle et cofondateur actuel du nouveau parti ouvrier norvégien (P.C + autres éléments gauche type PSU)

- Le projet de démocratie industrielle repose à la fois sur les syndicats et le patronat.

- THORSRUD a essayé d'introduire les Sciences de l'Homme à l'Université technique de TRONDHEIM

- dans l'Institut d'économie industrielle et d'Organisation du travail —> Ergonomie

- dans l'Institut de sociologie industrielle

—> la dynamique de groupe

—> la théorie de l'organisation globale.

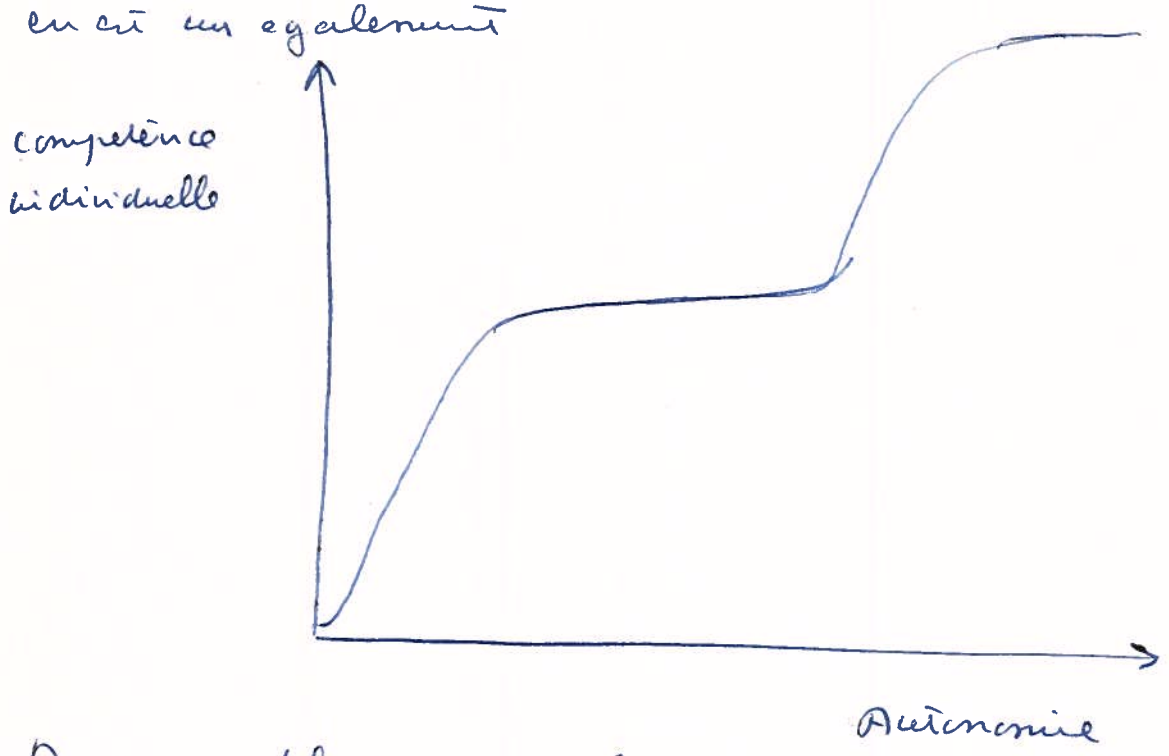
Tout cela s'est soldé par un échec et l'actuelle équipe qui est réunie au OSLO à l'Institut de Psychologie industrielle (par Psychologie il faut entendre le mot Sociologie que l'on n'a pas employé!)

Les Syndicats ont lancé le projet de démocratie industrielle pour donner aux travailleurs plus de pouvoir ~~dans l'Industrie~~ à l'usine. mais ils n'ont jamais renoncé à accroître simultanément leur pouvoir politique dans l'entreprise.

Du côté syndical, l'idée est de réduire l'aliénation des travailleurs.

Du côté patronal, mieux utiliser les capacités humaines (human ressources)

La création de groupes de travail autonomes est l'une des solutions possibles. L'autonomie est un moyen d'apprentissage de la démocratie mais la formation (growth) individuelle en est un également



Pour ce modèle on voit que les changements apportent d'abord un accroissement de la compétence individuelle et seulement ensuite l'autonomie correspondant à cette compétence. Une deuxième étape de croissance individuelle est nécessaire pour atteindre une autre zone d'autonomie. En général la pratique est d'accord pour l'accroissement de la compétence individuelle (formation continue) mais freine l'autonomie.

En revenant par exemple d'une des ateliers visités lors de la recherche à NORSK HYDRO on trouve un accroissement de la compétence des travailleurs mais pas de leur autonomie.

GULOWSON est en train d'écrire un livre critique sur la démocratie industrielle car il trouve que THORSRUD et encore plus EMERY et LOUIS DAVIS ont fait trop de réclame sur le succès et n'ont pas été assez critiques de peur de freiner le mouvement.

Il n'y a pas eu de changement dans le pouvoir au sein de la société industrielle norvegienne jusqu'ici malheureusement.

les améliorations sont : une plus grande satisfaction au travail
une charge de travail acceptable

le transfert des responsabilités des services du personnel (gens âgés, handicapés, parents) n'est possible qu'avec un conflit syndical de la compétition des groupes et des allocations de temps pour compenser les déficiences de certains membres.

La présence de syndicats forts est capitale pour réussir une expérience de démocratie industrielle. Par ce cas l'expérience elle-même renforce le syndicat (déjà fort)

Il a vérifié les résultats de 14 expériences réalisées à OSLO (C = central) en dans d'autres zones les peuplés, et en centrales dans des zones où les unités sont isolées (P = périphérique)

Il a distingué les entreprises

S.P.W Skilled primary choice workers ou l'on emploie des travailleurs qualifiés norvegiens mâles

U.P.W Unskilled primary choice workers où l'on emploie des travailleurs non qualifiés norvegiens mâles

U.S.W Unskilled secondary choice workers où l'on emploie des travailleurs non qualifiés de 2e choix (immigrés, handicapés, femmes.

	SPW	UPW	VSW
C	4 (0)	5 (4)	1 (0)
P	3 (0)	0	1 (0)

nombre d'expériences — nombre d'échecs

On voit que la localisation (C et P) ne joue pas

SPW est une bonne situation (en général les syndicats sont forts dans ce milieu)

UPW est une mauvaise situation : mauvaises conditions matérielles de travail, forte rotation du personnel, syndicats faibles.

Pour améliorer la situation, deux directions possibles

- changer la technologie (VOLVO-KALMAR) ~~Passer~~ c'est à dire passer de UPW à SPW avec des travaux qualifiés
- changer le lieu (décentralisation) on reste dans la même situation ; mauvaise : syndicats faibles, gens peu qualifiés ou conditions bonne : syndicats forts, gens qualifiés.
- recruter des femmes et des étrangers. Un a des syndicats faibles, sans tradition on ne peut rien faire.

Les projets de participation ne peuvent réussir que dans le cas où les conditions matérielles de travail sont bonnes

L'expansion des concepts d'autonomie ou d'~~extension~~ enrichissement des tâches nécessite une bonne situation dans l'entreprise (rôle des syndicats) mais aussi dans l'environnement (par exemple rôle de la municipalité)

Les travailleurs qui migrent de cinq semaines, travaillent à OSLO et passent le week-end chez eux à la campagne ont peu de relations entre eux en dehors du travail. Dans ce cas la démocratie industrielle est difficile

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Elle est dans une usine de radiateurs électriques

- Forte tradition ouvrière
- ~~Maison dans~~ Habitations dans le voisinage avec de fortes relations hors de l'usine
- Petite entreprise bien saine économiquement

Remplit excellemment la démocratie industrielle

Dans une petite agglomération, une grande société crée et gère la démocratie. 3 ou 4 petites sociétés permettent la démocratie.

Il y a une relation entre la démocratie industrielle et le reste de la société. Rien à faire si tout se décide à OSLO ou pire, à NEW-YORK

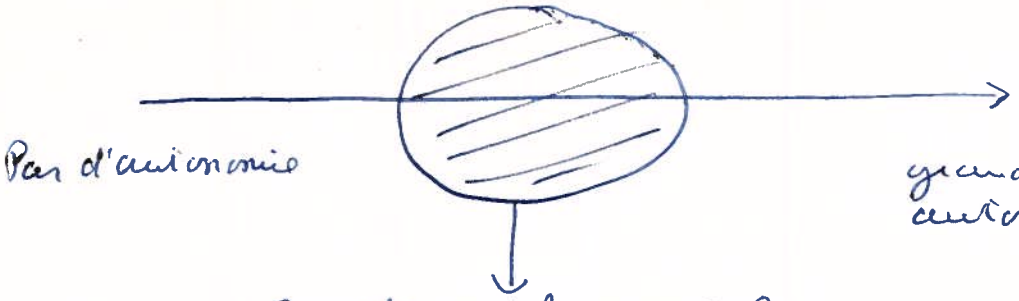
La direction par objectifs >> ont en commun la régulation en fonction ~~par~~ du but mais l'un dépend de la force syndicale.

Il n'y a pas de risque réel de voir réduire la force de discussion des syndicats voir p 387 de Design of jobs (DAVIS) voir + haut.

L'autonomie est unidimensionnelle

LICKERT qui ~~a~~ un point de vue national recherche une autonomie limitée qui permet de maintenir le conflit de la direction.

Zone de LICKERT



Zone de conflit maximal par la direction car les travailleurs ont devenu compétent sinobli, mais ne décident rien d'important

La démocratie industrielle, n'est pas seulement l'existence de grands autonomes

Dans quelles lois établissent les règles de choix des conseils d'administration

travailleurs 1/3

actionnaires 2/3

Il peut y avoir aussi mouvement circulatoire entre les travailleurs de base et ceux des sommets.

- G. s'intéresse par des recherches dans de petites entreprises dans des villes où il y a plusieurs entreprises.
- Il est très influencé par SCHUMACHER (Small is Beautiful 1973) et s'intéresse à la création d'unités de 20 à 100 personnes (en Finlande on pense dans une perspective voisine et différente qu'il ne faut pas dépasser 300 à 400 personnes)
- Il y a une relation à trouver entre les dimensions de l'entreprise et la société ambiante. Il y a peut-être une proportion qu'une norme absolue.

La rue sociotechnique tend à proposer d'installer une nouvelle grande unité de production d'aluminium près d'OSLO pour ne pas déséquilibrer l'équilibre entreprise-ville.

Il faut concevoir un effet technique à l'Homme (G. est ingénieur de formation) étudier le développement technologique intermédiaire en particulier pour les pays en développement.

EMERY Systèmes ouverts PINCHIN

G. sera à PARIS des 4-5 juillet. Puis venir au labo 1.2.3. juillet

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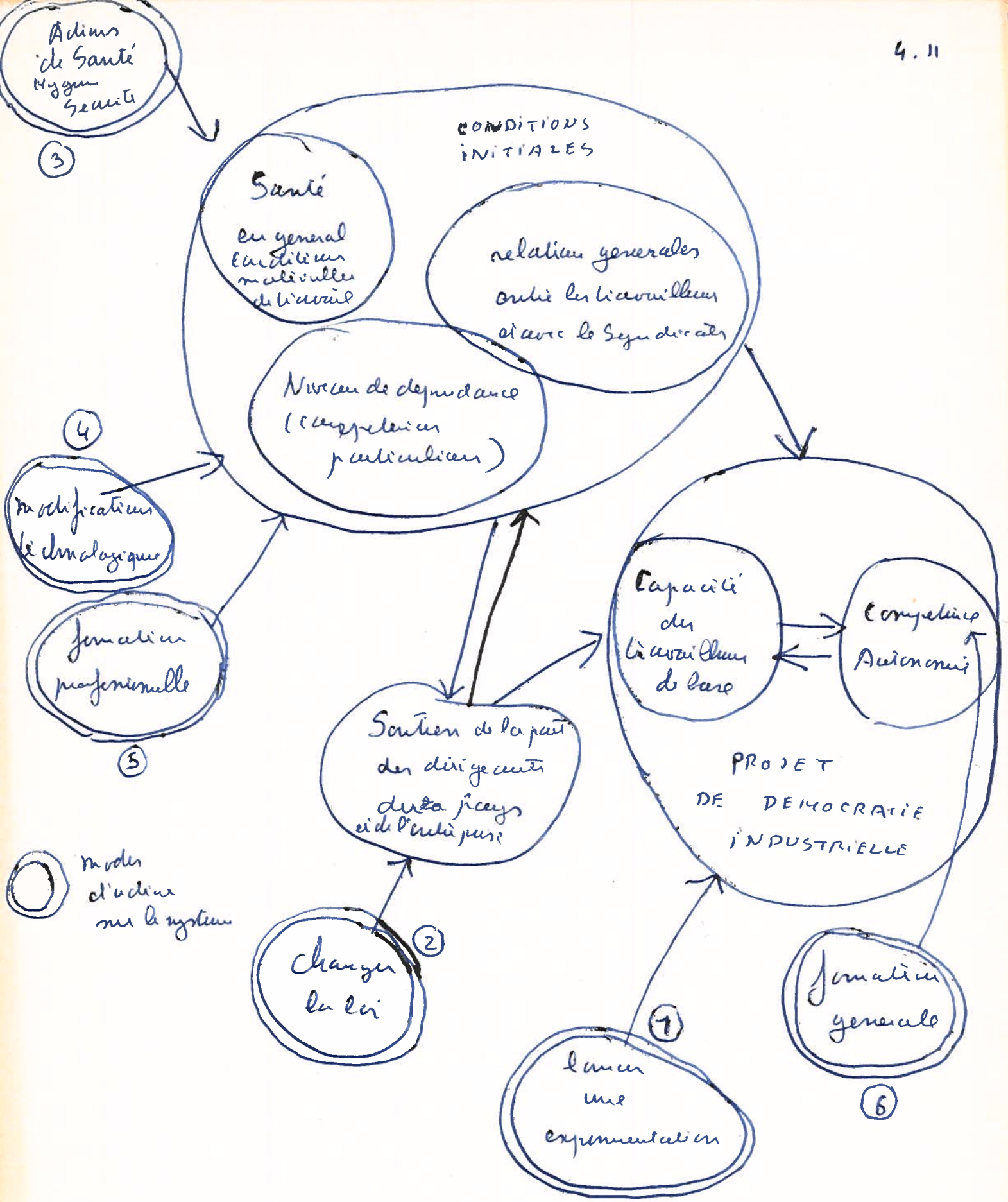
Envoyer à G. S. WEIL la cardia anorien

Faire inviter G. par OPESCALCHI à RIMINI

Lire WOODWARD pour la Sociotechnologie

Emery est en Australie


Actions de Santé Hygiène Sécurité
3
CONDITIONS INITIALES
Santé en général conditions matérielles de travail
relations générales entre les travailleurs et avec le Syndicats
Niveau de dépendance (compétences particulières)
4
Modifications technologiques
Formation professionnelle
5
Capacité des travailleurs de base
Compétence Autonomie
PROJET DE DEMOCRATIE INDUSTRIELLE
Soutien de la part des dirigeants de la firme et de l'entreprise
Modes d'action sur le système
Changer la loi
2
Lancer une expérimentation
1
Formation générale
6

19.4.74

- BRUUSGAARD - médecin inspecteur général du travail
- HELSTRÖM - on a déjà depuis 2 mois avant physiologiste militaire pour du travail (chez LANGE-ANDERSEN) vaut tant

- Il faut se méfier de la recherche participative (action research) où par définition les travailleurs ont raison
- Bien considérer tous les facteurs agissant sur les travailleurs.
- Une recherche récente a montré que les travailleurs "dans les coins" (parc de manutention, secrétariat etc) se préoccupent que ceux qui étaient à la production.
- Ce qui est important c'est la satisfaction : appartenir à un groupe. La lutte satisfaction est liée à la santé mentale
- Dans la nouvelle loi sur le travail et l'environnement l'inspection du travail pourra donner des avis sur des sujets + nombreux (mode de paiement, travail aux pièces)
- La grève au mois à KIRUNA
  a fait baisser de 95% des accidents graves.
  45% " " moyens
  augmenter 25% " " mineurs que l'on a pris le temps de soigner.
  Pour les travailleurs la production n'a pas baissé.
- Des gens qui auparavant étaient usés à 50 ans le sont à 40 parce que la charge de travail augmente.

Il y a plein de travail pour les gens vieillissants.

- Ils ne peuvent suivre, ils sont classés dans groupes de production et non par ~~date~~ attenté par le travail.

En quelques années, on va voir doubler le nombre des prestataires.

Il faut aider les handicapés à travailler en faisant l'inventaire de leurs capacités. Dans les groupes de readaptation, les travailleurs ne font que 50% de la production normale en comptant d'après le journal ou le semaine. Ils sont payés 50% et reçoivent le reste de la S.S., certaines personnes peuvent dans quelques années retourner au travail grâce aux nouvelles conditions.

Les changements entre patrons de travail pour les handicapés 50% est payé par la compagnie d'Assurances. c'est un accord officieux mais par la loi.

Les V. vieillissent doivent avoir des vacances + longues

L'âge officiel de la retraite est 67 ans ~~mais~~ pourquoi chasser les gens? on les laisse jusqu'à 70 ans s'ils le demandent par écrit. Ils gagnent 9% d'augmentation de la retraite par an entre 67 et 70 ans.

Ami de BRUUSGAARD ~~ou~~ THORSRUD - GULOWSEN

- Revue sur les groupes semi-indépendants. on a besoin d'un chef, cela renforce le groupe.

- Quand va dans des groupes semi-autonomes, on vous dit que la responsable varie selon les cas

- Il faut beaucoup de formation pour que les

- Travailleurs participant à des décisions qui ont toujours eu lieu par dessus leur tête.

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10 fondait que les travailleurs de sécurité (ingénieurs techniciens) des entreprises soient employés par l'inspection du travail

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CNAM

Technology to suit the worker

"This is no miracle plant," says Volvo's managing director Pehr Gyllenhammar, "and it's not the world's best and final answer, but it is a different approach." It is certainly a break from the conventional in-line assembly system that originated with Henry Ford's Model-T line in Detroit and that may have ended, some think, with Chevrolet's Vega assembly line at Lordstown, Ohio.

The Kalmar plant does not have a conventional assembly line that paces the workers. It is based, first, on the team approach and has about 25 teams of 15 workers each; each team is responsible for one complete system in the automobile. Second, the plant is also based on the use of powered wagons that carry the car bodies, under manual or computer control, to various team stations in sequence.

Although the team approach is not entirely new to Swedish industry or to Volvo, this is the first plant built from the ground up to suit the team concept. "We want the employees to work comfortably and not have to run after cars moving along the line," says Gyllenhammar.

The Kalmar plant cost about $20 million, about 10% more than a standard assembly plant of the same size. But, if its basic concepts are sound, this investment can be quickly recovered by reducing absenteeism and turnover (almost 20% at the main Volvo plant) and by improving product quality.

The assembly plant in Kalmar, a small city on the Swedish southeast coast, is much smaller than the main Volvo plant in Gothenburg, and it is designed for only about 60,000 car assemblies per year, on two shifts. Kalmar was picked because it has an available labor supply and because the Swedish Government allowed tax advantages. Originally, it was intended to supply cars for Sweden and Finland, but now the 164 Model, the Volvo luxury car, is being assembled there, primarily for the U. S. market.

At present there are about 300 workers (ultimately to be 600), about 25% of them women. Although about half the workers at the main plant in Gothenburg are foreign, the crew at Kalmar is almost entirely Swedish. Pay is about $4 per hour, plus 25% in fringe benefits. Since the plant started up, only one employee has left. Karl-Eric Nilsson, Volvo production chief, hopes that turnover will stay that low.

The goals of the planners, working in cooperation with the trade union, were the following:

1. Have people work in small groups.
2. Offer job rotation.
3. Allow for changes of production pace daily.
4. Help workers identify with the product.
5. Make workers responsible for quality.
6. Give workers a real opportunity to have some control of their own working environment. Nilsson says you could not do this if you were tied to a conventional assembly line. Gyllenhammar says they hope to bring back the concept of professionals and craftsmen working in small shops.

How it works

Painted Volvo car bodies arrive at the Kalmar plant by rail from Volvo's main Gothenburg plant. As they enter, they are

By Robert Skole, AM Stockholm correspondent

Volvo's plant with a difference is for more-civilized assembly work

Even though the plant consists of four hexagonal structures with a smaller additional hexagon for the plant offices, automobile production is still a linear process. The hex structure has a purpose, however, in that it breaks up the flow into segments, and each team has its own semi-isolated environment. In addition, almost everyone has an outside wall.

Numbers in the drawing refer to approximate locations of the various teams. Letters indicate major elements in the materials-handling or control systems: **A** indicates bodies coming in from the railroad siding, **B** is a major materials and components checkpoint, **C** is the central computer and control station.

In detail, the process works like this:

0 and **1** are incoming car bodies, produced elsewhere in Sweden.

2 is a body-storage area on the upper level, where bodies are organized in the required sequence.

3 is an area for a preassembly team (removing seals on welded fasteners, etc.).

4: control units assembled (steering wheel, etc.).

5: safety details—seat belts, padding.

6: window glass, inner roof.

7: comfort details—heater, fan, ducts.

8: inspection.

9: electrical components.

10: instruments.

11: interior details.

12: decorations, trim.

13: inspection.

14: body moves down to lower floor, and its wagon is lowered separately (**D**).

In the meantime, the engine, drive train, and suspension components are built up. This is not a real chassis, as the Volvo is a unit-body car, but the drive train must be laid out and connected, including the engine, transmission, drive shaft, front suspension and wheel spindles, rear axle, and exhaust system. Then:

15: body is mounted to upper corner supports (posts) on the chassis wagon.

16: wheels and brakes are added.

17: seats and carpets.

18: oil, gasoline, radiator fluid.

19: inspection.

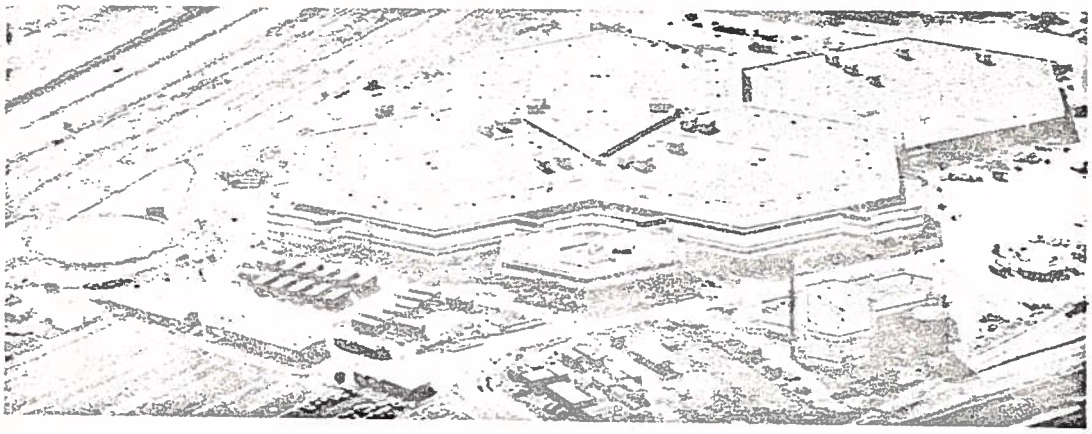
20: repair and adjustment.

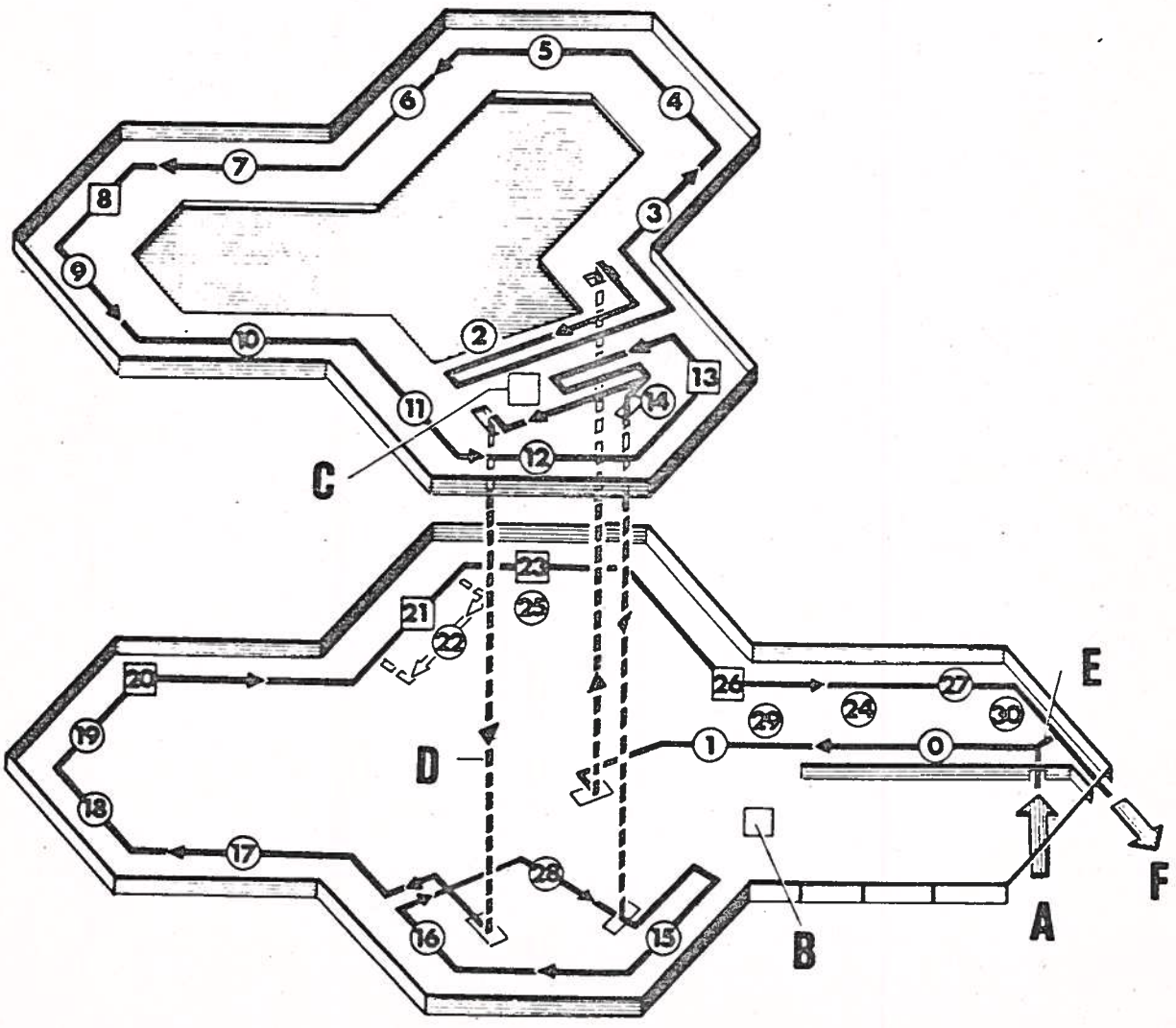
E is where cleared wagons return to starting point to get new bodies.

F is exit from plant.

Compared with many other auto-assembly plants, this tooling is both more complex and more expensive. But Volvo thinks that doing more with permanent equipment to help the worker will result in both better cars and better workers.

Volvo paid 10% more for its new assembly plant than it would have paid for a conventional plant, but the new one is different; it was built to suit the team approach





lifted to the upper level and assigned to a "wagon." Production details are entered in a central computer. Doors of the body are removed to enable workers to get inside the body more easily and also to ease the work of installing door details.

The wagon, which Volvo officials say is the real heart of the new plant, is made of aluminum and moves on rubber wheels at speeds up to about one mile an hour. The wagon carries the body automatically, controlled by impulses from the computer (relayed through electric cable buried in the concrete floor), from one work station to the next.

However, the wagons are not "tied" to the computer control system; they can be operated manually or semiautomatically. This means that workers or teams can move the wagons off the directional cable in the floor and bank the units. This, in turn, means that an entire team can take a coffee break together if it wants to, or it can move a car to the side to work on it separately. Workers can stand on the wagon and work on the car as it moves along the floor, or they can stop the wagon. The wagon is designed so that workers can easily reach into the door openings. Special safety devices halt the wagon if it runs into an object or a worker's leg.

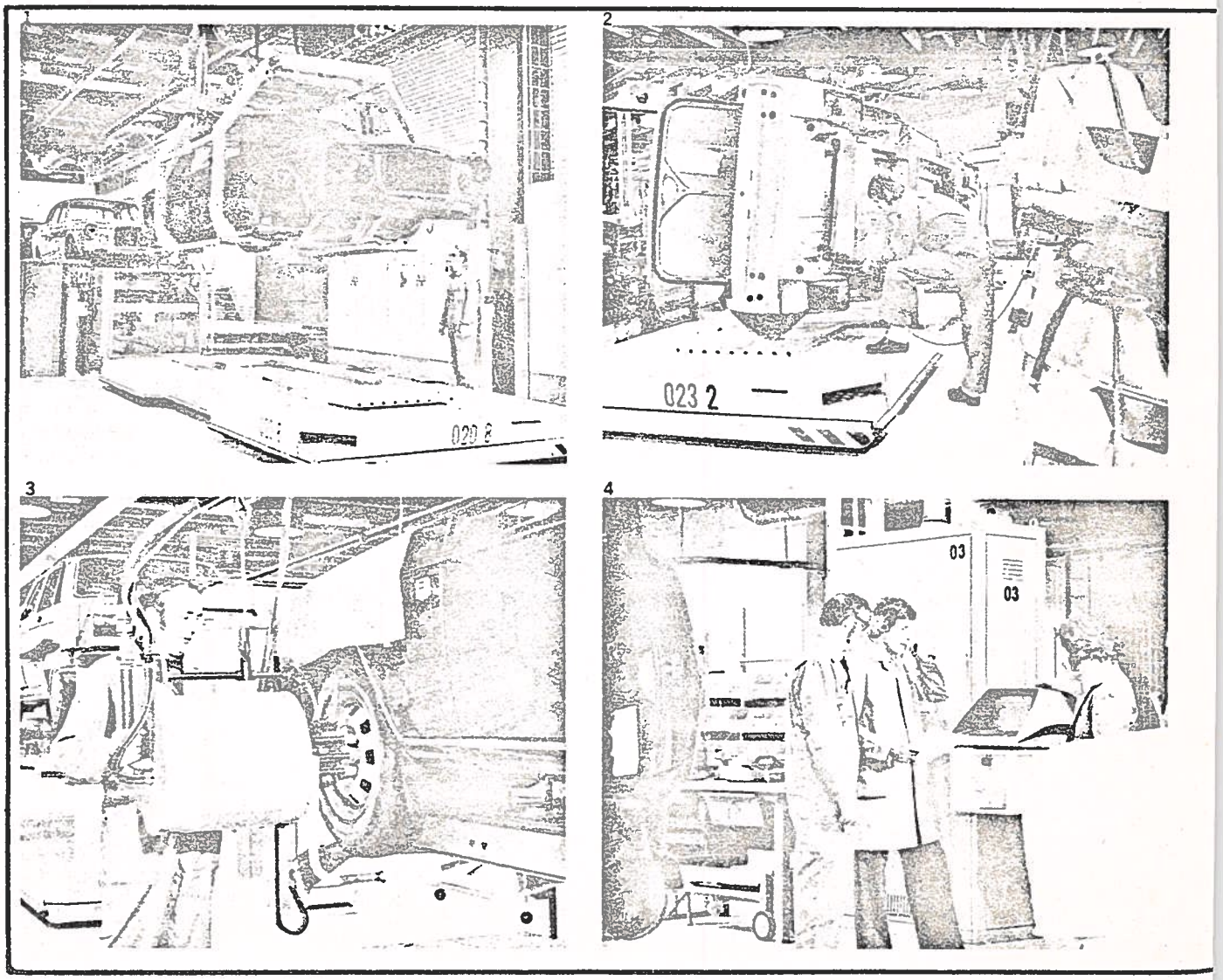
Each team is responsible for inspecting its own work, and the teams are self-directing. For example, two or three workers can work together to assemble a system, or one worker can assemble the entire system himself, or the team members can each perform one part of the assembly.

Assembly points are located along the outside walls of the building. The plant consists of four hexagonal buildings built together, with storage and supply rooms in the center. At the corners are located pause rooms, where workers can get a snack or have coffee. Here are also located toilets, change rooms, and sauna. There is one pause room and shower and sauna room for each team, and, of course, separate men's and women's saunas and showers.

Most of the work is done near relatively large windows, looking out onto green areas. Noise levels in the plant are kept at 65 decibels for most of the plant and not over 85 in machine areas.

When the body work is completed on the upper floor, with interior, steering wheel, electrical system, safety devices, etc. installed, the body moves to an elevator system.

While the body was completed on the upper level, the "chassis" was being assembled on the lower level. The frame is mounted on a special "high wagon," on which the frame can be adjusted for best working height. The rest of this wagon is similar to the other wagon, being electrically powered and computer or manually controlled. When the chassis is completed, the body is married to the chassis. Then the completed car rejoins its original "low wagon," which has



been lowered from the upper level separately. The completed car rides on this wagon to the final test station.

Functional separation

Assembly of the cars has been divided up by functions, such as interior, electrical, power, control system, and safety (interior padding and belts). Assembly teams are organized according to about 20 functions. In addition, there are teams for testing and touch-up painting.

At each team site, there is a CRT (cathode ray tube) computer terminal for production and quality control. The central computer knows where each car is in the plant, and it can provide immediate details for production planning or parts control or ordering. One feature of the system is its check of failures. At the end of each five teams, there is a special quality-control station where all completed work is checked and recorded in the computer. If a similar failure has occurred in several cars in a row, a warning signal is sent to the responsible team via the team CRT screen. The computer system includes four PDP-11 computers (one for programming and stand-by).

Cause for optimism

"Compared with the main Volvo plant, this is pure heaven," says one worker. But the main Volvo plant is one of the world's best, from the worker viewpoint, according to Leonard Woodcock of the UAW, who visited there last year. This is where Volvo installed a hydraulic car-tilting device that makes it much easier for the workers to work on the underbody. The tilt feature has been incorporated in the wagons at the Kalmar plant, too.

"We have attempted to create a plant that will give people meaning and satisfaction in their work," says Gyllenhammar, "and to make it possible for them to cooperate around a task in small, natural groups. A product made by people who find their work meaningful will be of high quality."

In regard to Volvo's planned assembly plant in Virginia, Gyllenhammar says it will not be a conventional line plant but will be built according to the same basic philosophy as the Kalmar plant. He says it won't be a copy, though. But, he adds, "The people are pretty much the same. They have high educational levels and want meaningful jobs—it doesn't matter if they are Virginians or Swedes."

Volvo is also now building a new engine plant at Skovde in Sweden, also to use assembly teams. Saab, the other Swedish car builder, has been operating such a plant for two years, and, though the company has never made a complete study of how the plant has succeeded, it has met its production goals, and one Saab official says the firm would never again build a conventional line-system assembly plant. ■

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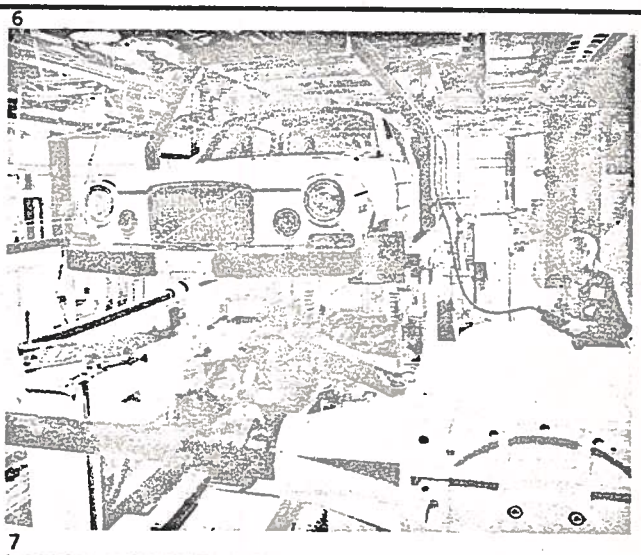

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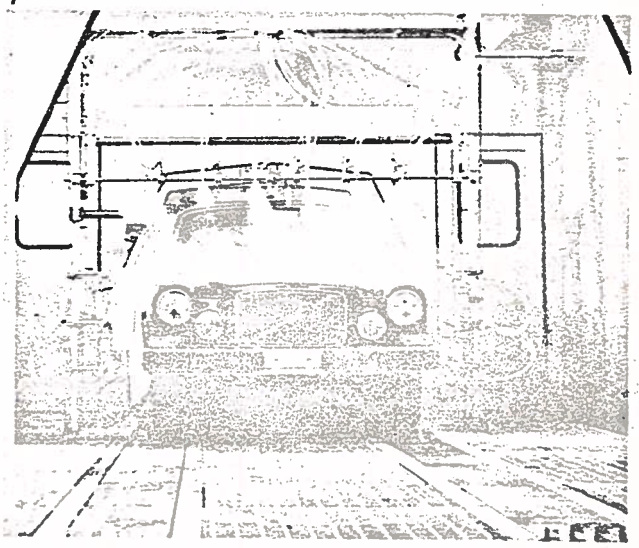

1. Volvo bodies arrive from other Swedish plants by rail, are conveyed to this unload station and lifted onto the special Kalmar wagons for the complete assembly sequence

2. Wagon has a built-in tilt device that presents underbody at a convenient position for the workers to bolt on gas tank, add front-suspension details, and do other such work

3. Multiple nutrunner for wheel-bolting is typical of low-noise tools that keep the noise at Kalmar down to a reasonable level. Note pipe guides for tool positioning

4. Computer terminal for each assembly team aids with production control and quality control. Errors are noted by inspectors farther along the line for team guidance

5. Working-level unit supports front-suspension subframe for engine mounting and addition of accessory hardware. The complete drive system will be built up on this unit

6. Body and chassis are joined by lifting body from its wagon and lowering it over the drive-train assembly on its own unit. Corner posts support body until it is connected

7. Assembled automobile is finally sprayed with waxy anticorrosion protective coating prior to shipment, which may be to an overseas destination

21 Février 1975

Monsieur Toni Ivergard
ERGOLAB
Mosebacke Torg 18
S 11620 STOCKHOLM
(Suède)

Cher ami,

C'est bien volontiers que nous accueillerons Madame Ivergard au laboratoire. Il serait préférable qu'elle vienne le jeudi 5 Juin, car j'ai une réunion prévue pour l'après-midi du vendredi 6.

Nous pourrons effectivement avoir une conversation intéressante, car nous nous intéressons beaucoup aux problème de vieillissement en relation avec les conditions de travail du point de vue physique et mental.

J'espère que vous trouverez le temps de l'accompagne afin que nous puissions reprendre nos discussions passionnée

Bien amicalement,

A. Wisner

18th February 1975

ergolab

Professor A Y Wisner
Conservatoire National des Arts et Métiers
41 Rue Gay-Lussac
PARIS 5
FRANKRIKE

Dear Alain,

It was very nice to meet you last autumn in Italy. The conference was very interesting from several points of view. It was also quite a shock to meet some quite reactionary people. However, my main impressions of the conference were very positive indeed.

I have heard that there is a conference in Paris about Social Gerontology from the 2nd to the 5th of June this year. My wife who is a work-psychologist and employed at Ergolab (she is mainly working with social psychological problems in the hotel and restaurant area), will be visiting that conference. She has for a long time been interested in gerontological problems and also been responsible for courses preparing elderly people for their old age pension.

It would be very interesting for her if she were able to come and visit your institute in the afternoon on the 5th and/or 6th of June. She has a general interest in ergonomics. It would therefore be valuable for her and also for other people at Ergolab if she could get a general review of and introduction to what you are doing at your institute. If there is time over it will of course be of special interest for her to hear more about projects with more social and psychological emphasis.

She will most likely be arriving on Saturday May 2nd and leaving late on Friday June 6th or early on June 7th.

With best wishes,
Yours sincerely,

Toni Ivergård

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cc.: Psykolog Gun M Pettersson-Ivergård, Ergolab

Ergonomilaboratoriet AB - Ergolab
För forskning och konsultation
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17 Janvier 1975

Monsieur Bo Oscarsson
ARBETARSKYDDSFONDEN
Wenner-Green Center
Sveavägen 166, 8 tr
113 46 STOCKHOLM

Monsieur le Directeur Général,

J'ai reçu avec beaucoup de retard, du fait de la grève des postes françaises, votre aimable invitation à participer au séminaire que vous organisez à Stockholm, du 17 au 20 Mars 1975, sur la recherche dans le domaine des accidents du travail.

Je ne vous cacherai pas que j'ai été très tenté de venir à cette réunion dont la nécessité est grande et où j'aurais rencontré des collègues particulièrement qualifiés.

Malheureusement, mon emploi du temps du mois de Mars est déjà décidé depuis longtemps. Je dois, en particulier, aller faire des conférences à Bruxelles et Louvain, et me rendre à des réunions à Luxembourg et à Amsterdam. Si je joins à cela la charge très lourde d'enseignement à cette période de l'année et les travaux que je réalise dans l'industrie, je me trouve dans l'obligation de ne pas accepter votre invitation, malgré un regret très sincère.

J'espère avoir d'autres occasions de participer au remarquable effort suédois dans le domaine de l'amélioration des conditions de travail.

Veuillez agréer, Monsieur le Directeur Général, l'expression de mes sentiments dévoués.

A. Wisner

ARBETARSKYDDSFONDEN
Swedish Work Environment Fund
/SEd

Stockholm, November 20, 1974

M. le Professeur A. Wisner
Laboratoire Physiologie du Travail-Ergonomie
Conservatoire National des Arts et Métiers
41 Rue Gay-Lussac
PARIS V^e^ France

- Leplat ?
- Wisner principe de vérité

Dear Sir,

The Swedish Work Environment Fund was established by act of the Swedish legislature on 28 April 1971. The Fund is financed by means of an increase in the compulsary fee paid by employers for occupational injuries and diseases insurance. It is estimated that these contributions will amount to over 70 million Swedish crowns (approx. $ 14 million) per year from 1974, which shall be used for research, development, education, and information in the field of working environments.

The Work Environment Fund shall, in accordance with its instructions, support such research, development, education and information as can counteract the occurence of occupational injuries and diseases and other adverse health conditions that can arise as a result of working environments, or can improve working environments and thereby on-the-job health and safety.

As a part of these activities the Swedish Work Environment Fund is arranging a seminar on industrial accident research. The purpose of the seminar will be to discuss theories and methods in this field.

The seminar will take place in Stockholm, 17-20th March, 1975, the programme including both lectures and working groups. About thirty persons are invited. The seminar will be held in English.

The Work Environment Fund has the honour to invite you to this seminar and would be obliged if you could give a thirty minutes´lecture on your industrial accident research work. Accomodation and travel expences (economy class) will be paid by the Fund. In compensation for your lecture a sum of 600 Sw.Cr. will be paid.

We do hope that it will be possible for you to accept this invitation. We would be obliged to get your answer as soon as possible and at the latest on the 15th of December 1974, together with a short summary of your paper.

In order to be able to distribute all papers before the seminar the deadline for your definitive manuscript will be the 15th of February 1975. Proceedings on the seminar will be published.

If you have any questions regarding your paper, please contact Mrs Elisabeth Lagerlöf, Secretary general of the seminar.

Yours sincerely

Bø Oscarsson
Managing Director

Elisabeth Lagerlöf
Secretary general

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Wenner-Gren Center
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Workhealthfund

ARBETARSKYDDSFONDEN
Swedish Work Environment Fund

Seminar on industrial accident research
17-20th March 1975
Preliminary invitation list

England

Professor W. T. Singleton, Birmingham

Finland

Engineer Stig Eriksson, Helsinki
Engineer Jorma Saari, Helsinki

France

Professor J. Leplat, Paris
Professor A. Wisner, Paris

USA

Doctor Joseph Bryk, Chicago
Doctor Alex Cohen, Cincinnati

Western Germany

Doctor Kroemer, Dortmund

Sweden

Doctor Kurt Baneryd, Stockholm
Mr Lennart Gustafsson, Garpenberg
M. Pol. Charlie Karlsson, Karlstad
Engineer Urban Kjellén, Sundbyberg
Doctor Hans Klette, Lund
Doctor Jan Kronlund, Bromma
Doctor Carl Lager, Stockholm
Mrs Elisabeth Lagerlöf, Stockholm
Professor Nils Lundgren, Stockholm
Miss Britt-Christine Nilsson, Skelleftehamn
Mr Bo Pettersson, Stockholm
Mrs Karin Sundström-Frisk, Stockholm
Doctor Leif Swanström, Skövde
Doctor Jan Thorson, Stockholm

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KUNGL ARBETARSKYDDSSTYRELSEN
ARBETSMEDICINSKA AVDELNINGEN

Handläggare

Datum 16.12.74

Vår beteckning

Edert datum

Eder beteckning

Monsieur le Directeur
Professeur A WISNER
41, rue Gay-Lussac
75005 PARIS Frankrike

remercié pour la dédicace

Cher Monsieur,

La rencontre avec Madame Teiger a Sofia m'a fait beaucoup de plaisir mais aussi m'a donnĕ une faute sur la conscience de ma paresse de vous ecrire surtout comme je n'ai pas eu le plaisir de vous voir pendant mon sejour court a Paris au mois de juillet.

Je pense que Madame Teiger vous avez informé sur la symposium. Pour moi c'etait tres etonnant qu'on n'a presque pas discuté les conditions de travail vue des travailleurs mais seulement des problemes d'augmenter la production et la qualité. L'exposé de Madame Teiger a eté, ensemble des rapports de Professeur Rohmert, le plus interessant et elle a fait un presentation excellent.

Les derniers nouvelles d'ergonomie suedois:

Le docteur B Knave (que vous avez rencontre pendant votre sejour de paques) est choisi au président dans la societe d'ergonomie nordique.

Les problemes a retrouver un professeur en ergonomie a l'ecole superieur technique a Luleå augmentent. Au lieu de Toni Ivergård on a proposé le directeur Ahlman comme le plus qualifie. (le

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A 5

directeur Ahlman est le patron d'un grand usine de caoutchuc.)
Mais comme il est involve' des rationalisation les travailleurs ne l'aime pas et ils ont protesté.
Vous trouvez ci-joint un copie d'une article sur les usine de Volvo et je pense qu'il peut peut-etre vous interesser.
Je vous souhaite un Joyeux Noel et une Bonne Année et vous prie d'agréer, cher Monsieur, l'expression de mes sentiments les meilleurs.

Nils F Petersson

New Scientist 10 October 1974

A tale of three factories

Volvo has just opened a startling new engine works at Skövda. The company's car assembly plant at Kalmar has already become a landmark in the use of technology to eliminate assembly lines and improve working conditions. But what about older car factories?

Nancy Foy
is a management journalist and author

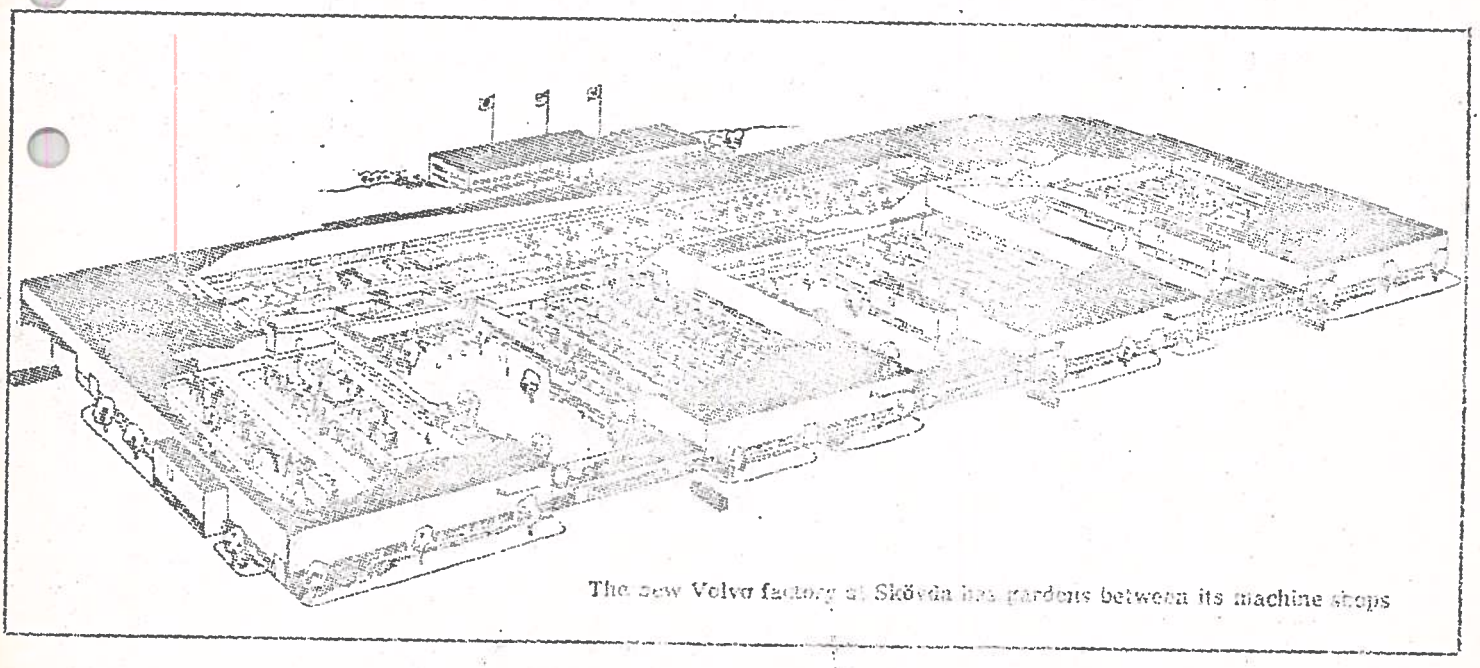
"When you can change the production technology, then you have a chance to get the flexibility that makes it possible to organise work differently." Volvo's 39-year-old president Pehr Gyllenhammar agrees that change is easier in a new car factory than an old one. He also grants that Volvo's higher quality, lower volume approach sets it apart from other manufacturers. On the other hand, the company's pre-tax profits were 8·2 per cent in the first half of 1974, at a time of rapid expansion in a very soft car market, so he believes Volvo's investment in better working conditions pays off in better cars.

On 24 September, Volvo officially opened its new engine factory at Skövda (pronounced Shove-da) in central Sweden. The Skövda works uses a number of different kinds of technology to achieve good working conditions, as does the other new Volvo plant at Kalmar on the Baltic coast, which opened early this year. The various aspects at Skövda which Volvo categorises as "technology" include plant design and layout, automatic handling devices, electronic control of machining and assembly procedures, the use of group instead of line assembly, and, allied to this, electrically powered carriers for individual engines going through the assembly process.

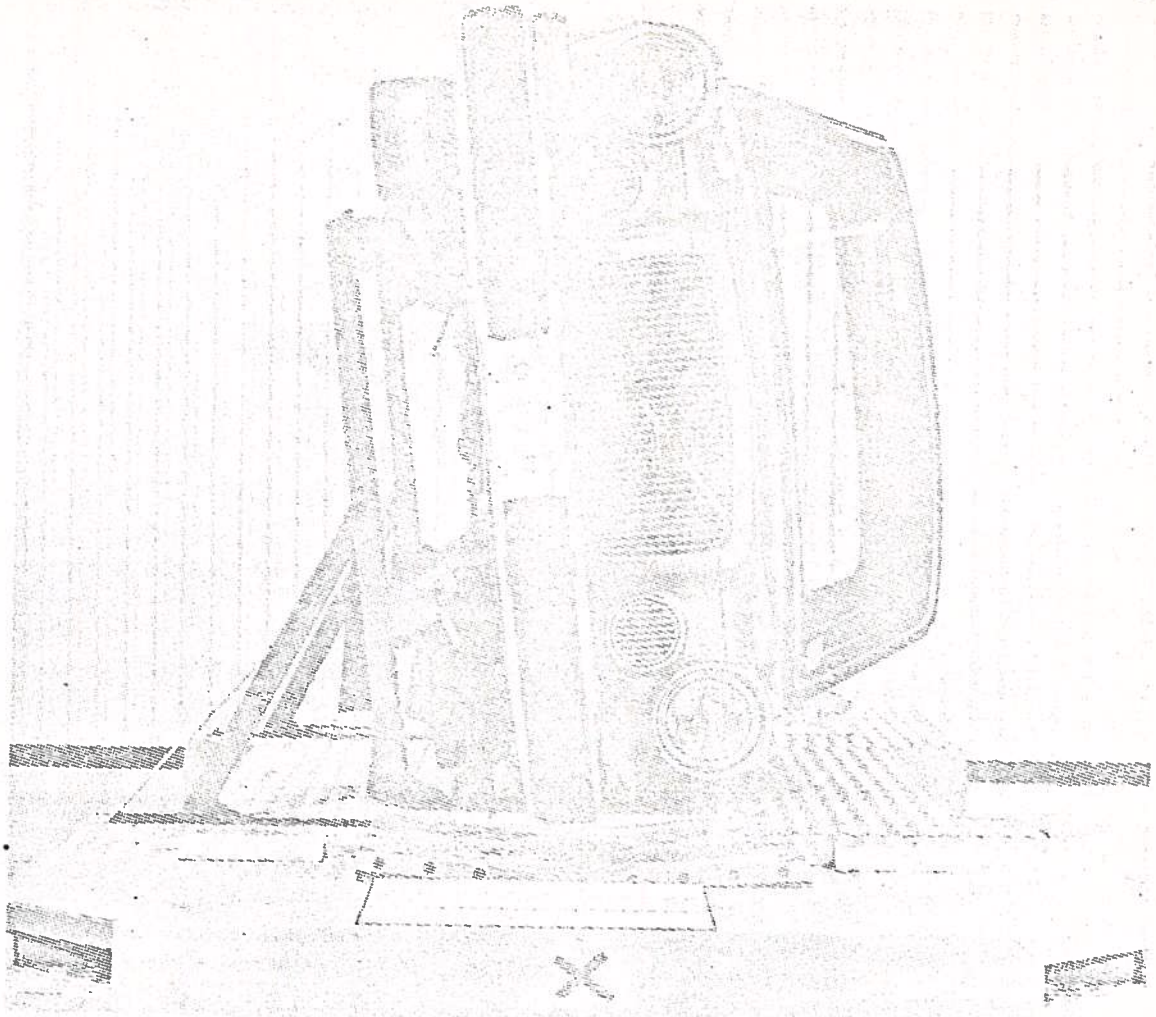
The plant design at Skövda, like that of Kalmar, is airy and pleasant, but there the direct resemblance stops. Gyllenhammar insists that each factory has its own set of problems and must therefore have its own solutions. Kalmar is in the form of three overlapping hexagons, with two floors of assembly areas organised with one 20-man group along each of the outer wall sections and a two storey storage and delivery area for parts at the centre. The Skövda building has one long leg and four short ones, each containing one of the four machining departments. Thus each short leg has three window walls, and between them are green garden areas. The long leg contains the assembly areas, soundproofed from the noisier machining areas. Thus the plant contains 40 000 square metres of floor space, yet it retains the feeling of small workshops. In addition to the soundproofing, the design itself keeps working noise from one department from invading another, and all the highly automated machines were manufactured to Volvo's extra-stringent noise specifications as well. Each working group has its own coffee area, and there are larger recreation rooms adjacent to each greenbelt. Air, noise and temperature control are the best and latest, and many machines have individual air circulation systems.

Women on the line

No matter how beautiful a factory is, the work itself may remain soulless. Volvo takes the sheer drudgery out of working life at Skövda with automatic handling devices to eliminate all heavy lifting. This means that physical factors no longer prevent women from working in most jobs, and the company's goal is to have women in about 40 per cent of the eventual 1000 jobs, when the factory is up to full production of 275 000 engines a year. (At present, there are about 400 people, and production is at 60 000 engines during the running-in period.)



The new Volvo factory at Skövda has gardens between its machine shops



The Kalmar carrier eliminates work underneath the car

This trend to bring women into the workforce is strong in Sweden generally, partly because labour shortages are growing. (About one-third of the workers in Volvo's other Skövda plants are foreigners, though a high proportion come from Finland, which is within the Scandinavian free-labour-exchange area. However, Finland is now experiencing its own industrial boom and advertising in Sweden "Finns, come home".) Volvo has for several years tried to broaden the number of jobs available to women, to the extent of encouraging two women to share one job; three to take one two-shift job; or groups to make other part-time arrangements among themselves. Although this complicates training and job rotation schemes, absenteeism among such part-time workers is demonstrably lower than average.

In addition to the lifting devices, the new Skövda factory has electronically controlled machining and assembly procedures, such as automatic positioning of shims to give the correct valve clearance; the machine chooses the correct thickness from a magazine holding 32 different shim sizes. Overhead camshafts are then assembled automatically and the valve clearance is also rechecked automatically. Other machining departments are similarly automated. The company says a new system of diagnostic equipment allows operators to check their own work. They also handle set-up and replacement of their tools and do their own material handling, so a "machine operator" rather than a mindless machine-minder is now a full-fledged member of a team in each machine shop, with a markedly enriched job.

Workers' control

The key to Volvo's team assembly at Skövda is little T-shaped carrier, about the size of chair, that collects and carries all the parts for engine assembly. The carriers follow magnetic loops in the floor, stopping automatically in positions the workers themselves have programmed into the guidance system. A worker can also run the carrier outside the programmed loops by using a manual override feature if he (or more likely she) desires. The carriers have special positioning devices to turn the engine block around two axes. Team members can work individually or together on a single engine, as they choose, changing the duration of a task anywhere from three to 20 minutes.

The Kalmar factory has already used (and patented) this carrier concept, and other car makers visit regularly with an eye to licensing it. The Kalmar carrier is on a much

grander scale—just as cars are larger and more complicated than engines. The Kalmar carriers are large, flat platforms—big enough to hold an assembler as well as a car—which have devices to turn the car on its side for work on the bottom. Another model for chassis work raises the work level to suit the worker or mate the chassis with the body. Both carrier types glide silently around the Kalmar floor and up and down its lifts like ghostly servants, under computer control. Information from all tests is fed back to the cluster of small computers (Digital Equipment PDP-11/40 systems), which schedule each car for its next destination according to the test results. Thus a paint scratch that occurred at the mating of the body and chassis is reported from a terminal on the spot, and that carrier quietly carries its car off to the paint shop at the optimum time in the production cycle.

Workers can override the central computer from their terminals in each area, and even the terminal can be overruled by using manual pushbuttons on the carrier itself, which is battery-powered for use off the electronic guidance system. If a carrier glides into an obtrusion (like a visiting journalist) it stops immediately (and painlessly). Kalmar has about 275 of these expensive but impressive devices. The carrier has been streamlined and simplified for use in Volvo's new assembly plant in the US, due to be opened next year.

Like Skövda, the Kalmar factory emphasises team assembly, with jobs organised functionally, so a worker is a "door expert" or an "electrical system worker" rather than a mere "auto assembler". Two teams of about 20 each share a single foreman, not to mention a sauna, a coffee room, several meeting rooms, and a production engineer. This approach flattens the traditional management structure considerably (and waters down the dominance of the technical experts) and replaces many supervisors with "instructors" working with, rather than above, each team.

Torslanda's task forces

Team work, although it gives the individuals obvious "benefits" of membership and a sense of identification with the product, is not so easy to achieve in an older factory that is already tied to the almighty assembly line. Volvo's huge Torslanda works at the company's headquarters in Goteborg is 10 years old. It is pleasant and new by car industry standards, but vastly bigger and inherently less flexible than the sparkling new little factories at Kalmar or Skövda. Even so, the company has managed to improve jobs at Torslanda for its 8000 workers (average age 29; about 20 per cent of them women). Training beginners now takes 10 days to learn at least three different assembly tasks, rather than the three-days/one-task initiation that existed before. About 2500 people involved in project groups or task forces of various kinds, usually five or six man groups that initiate changes in the work or the environment through the union/works council structure.

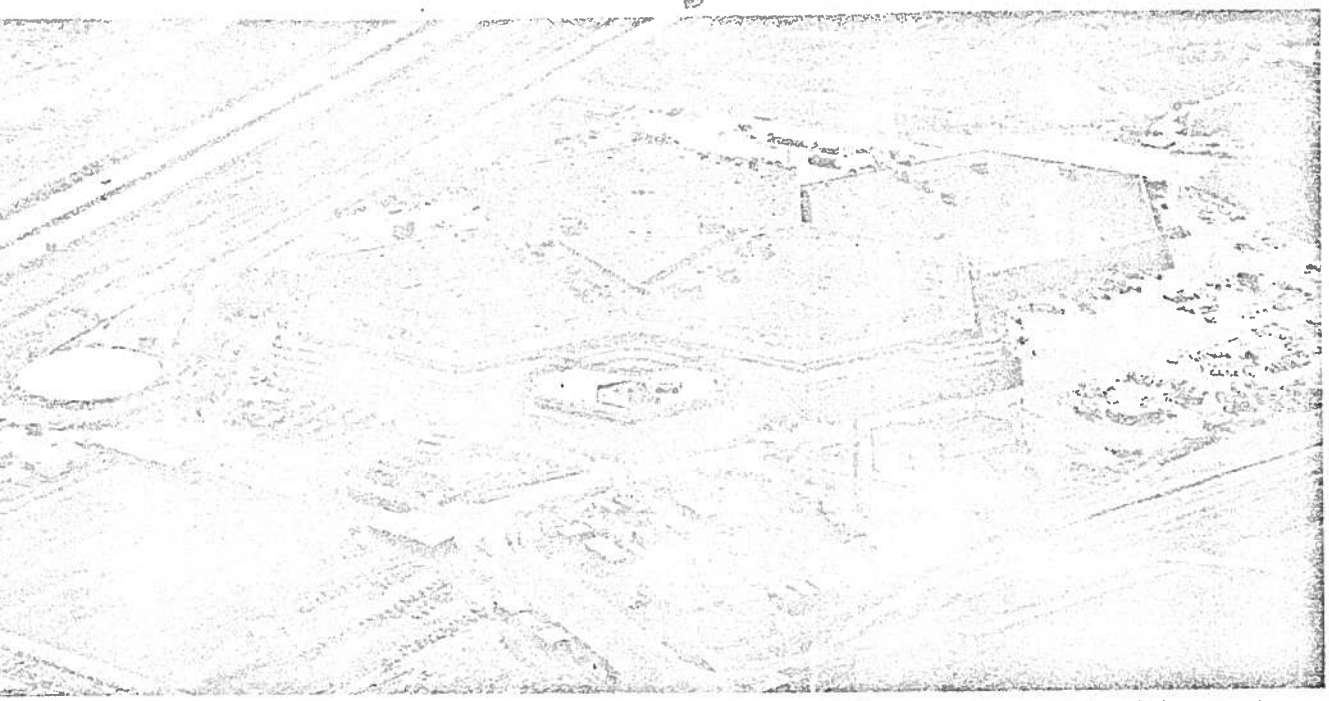
Over 1200 Torslanda employees have chosen to learn new tasks so they can enjoy job rotation. In the body shop, for example, the adjustment area has changed from a 16 man line with two inspectors at the top and two at the bottom, to groups of five each with its own inspector (usually a woman). Each group does all the necessary repairs and checks to a single body. "The paint shop told me we were doing much better," says one adjuster proudly. Competition between the four major departments at Torslanda (pressing, body work, paint, and assembly) seems to be tacitly encouraged, since it increases the sense of membership and the pride in quality that the company wants in all its plants. Torslanda has also imported several ideas from the new factories—for example, the carrier mechanism that turns the car body on its side during assembly, eliminating work underneath.

Proud of independence

Volvo is a very independent outfit, proud of its ability to do most of its expansion through self-financing. (Softening of the car market, if it continues, may cause some stretch-out, diminution, or outside financing—or all three—for the company's announced plans to spend about £500 million over the next five years on new or improved facilities.) Shareholdings are widely spread, and in a country whose industry has traditionally been dominated by few families, Gyllenhammar asserts that Volvo has been free from dominance by any one group since its formation in 1927. Today, the basic premise of the company seems to be: "We like to be independent and make decisions for ourselves, so we assume our employees do, too." In a country noteworthy today for its emphasis on industrial democracy, the question of whether Sweden's largest employer and taxpayer has influenced the national ethos, or vice versa, is an interesting one for academic contemplation. Fortunately, for Volvo's employees, Pehr Gyllenhammar seems to prefer to keep his contemplation focused on how to make it work.

Looking at his collection of old, new and nascent factories, Gyllenhammar emphasises again that Virginia will be different, too. "We will not end up with the Skövda solution or the Kalmar solution; it will probably be a third alternative." I asked how he saw the role of management in this change; his model seemed to be that of a catalyst. "If you are a supervisor experiencing the situation where people don't turn up in the morning, you grow more willing to change. Numbers are important and the supervisor has to produce the numbers. You wonder every day if you have 15 or 20 per cent of your workforce to replace. Live through *that* situation for a year, and pressure builds up, with considerable force from the bottom. Then if you add pressure from the top you seem to get change more quickly than the normal culture would permit. In the mid-1960s there weren't many managers who would support what we are doing now. So we have moved a long way from the attitudes we had ten years ago."

Dr Wisner



uilt at a 10% cost premium, Volvo's Kalmar plant consists of four hexagon-shaped buildings and an office building. This concept roduces a small factory atmosphere for workers.

VOLVO: FLEXIBLE PRODUCTION

By Joseph M. Callahan
Editor

LTHOUGH IT'S GENERALLY cknowledged that the "blue-collar lues" is an exaggerated phenomnon in auto plants, there is a growng realization among many aumotive leaders that ultimately omething substantial must be done reduce the mind-smashing boreom and increase the personal satisaction for factory workers.

A number of efforts have been ade recently to improve the workg environment and "enlarge" the b of auto workers. Renault of rance, Saab of Sweden, GMC ruck and Coach and Rockwell Inernational have introduced such rograms.

But probably the most radical, stly and serious efforts to upgrade fe in an auto factory has occurred Kalmar, Sweden. This approach may or may not be used at the new Volvo assembly plant slated to begin operation at Chesapeake, MD, in 1976.

U.S. top auto executives are especially curious because there is a widespread feeling that serious job-jumping and absenteeism brought on in Sweden by affluence and a high level of education could have the same effect in American auto plants in the future.

Kalmar has attracted auto executives and labor authorities from around the world, and especially from the U.S. Among the recent American visitors were Henry Ford II, chairman of Ford Motor Co.; Joseph Godfrey, vice-president of GM's Body and Assembly Group, dent of the United Auto Workers.

Starting in 1972, Volvo built an entirely new and different $25-million auto plant in Kalmar. By this year, 400 workers had been hired and assembly of U.S.-destined cars had begun at the relatively slow rate of seven cars per hour. At year-end, it's expected that the work force will climb to 600, with output reaching 13 or 14 cars per hour.

The "Kalmar Experiment" is an effort to improve job satisfaction by bringing the small workshop back to modern auto-making. Its key feature is the elimination of the relentlessly moving production line introduced by the first Henry Ford. It also diminishes the role of the foreman considerably.

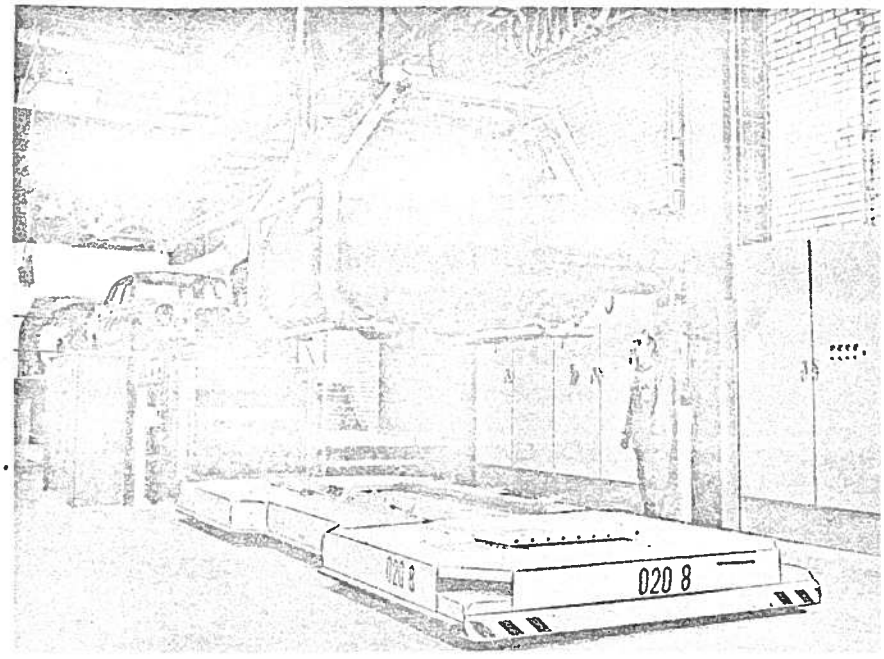
Pehr G. Gyllenhammar, manag-

ing force behind Kalmar, said, "We must create a factory which, without sacrificing efficiency and economic results, provides the possibility for the employes to work in groups, communicate freely, carry out job rotation, vary their rate of work, feel identification with the products, be aware of quality responsibility and also be in a position to influence their working environment."

To achieve these goals and to set up the small-factory atmosphere, assembly at Kalmar is divided between about 25 separate teams of 10-20 people. Each team has its own area, usually along an outer wall with large windows, plus "personal accommodations."

After a brief training, the men and women workers are expected to develop a sense of professional pride since they'll be able to install and become expert in one or more entire functions of the car. These functions are safety equipment, driver controls, glass and headlining, comfort features, electrical system, instrumentation, internal fittings, trim, assembly of chassis to body, brakes and wheels, engine hook-up, seat and cushions, testing of functions, sheet-metal adjusting, rust-proofing and surface finishing.

Workers can participate in the planning of their work and in the sub-division of jobs. They're also able to vary the rate of work. Gyllenhammar cooperated with the Volvo labor union in working out the concept.



When the assembly process starts, a body is placed on a low-level battery powered assembly carrier. The designation of the carrier is registered in a computer which follows the carrier throughout the entire assembly procedure.

CORE OF SYSTEM

At the core of the entire system are some 250 individual battery-powered carriers which transport bodies around the plant, transmit information about each car and also serve as working platforms. Since these carriers are not mechanically connected to any other transporter or directly with the movement of other units, a great deal of freedom from pressure is attained.

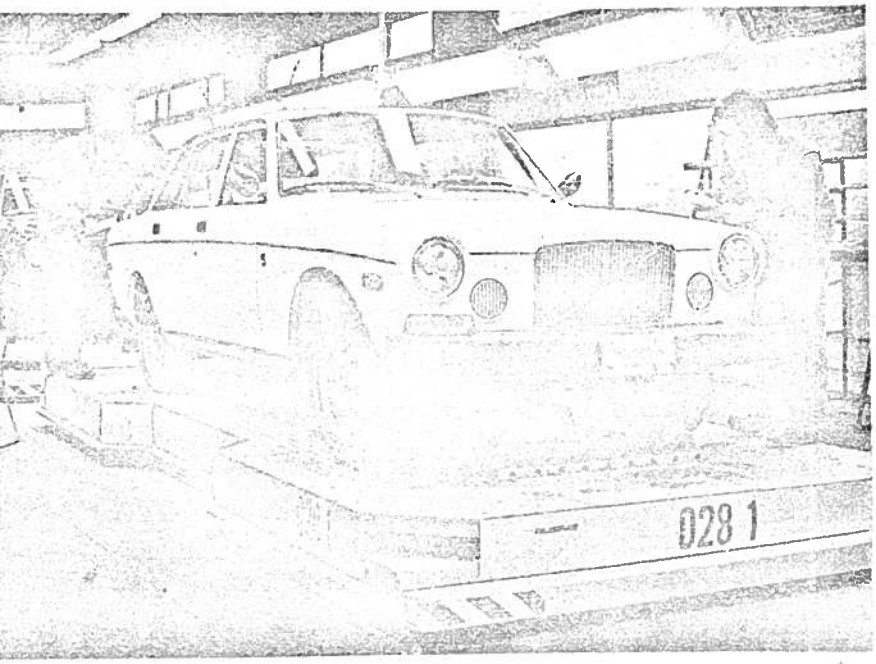
Two hundred of these carriers are low-level units which are used for final assembly of bodies. They have a patented device for turning the bodies 90 deg on their sides to make work easier on the underbody. The remaining 50 high-level carriers are used for assembling engines, drive trains, axles and exhaust systems.

Carriers are driven at a speed of up to one mph (1.6 kmh) by electric motors controlled either from a cabinet in each team's zone or from a central computer. Control of the carrier is transmitted through electrical impulses from cables in the factory floor. The carrier can also be controlled from a switch console normally on the front of the unit. It then operates independently of the floor cables.

To prevent collisions with people, the building and other carriers, each carrier has front and rear bumpers equipped with automatic anti-collision devices. They can stop the carriers before the energy-absorbing bumpers are fully compressed.

At the start of the assembly process, the body is placed on a low-level carrier whose number is registered in the production computer. The computer follows this carrier throughout the process, directing the supply of parts, assembly instructions and quality follow-up.

A separate high-level carrier is fitted with a chassis fixture for assembly of the engine, transmission, axles and exhaust system. Since this fixture can be raised and lowered, assembly



The low-level carrier which is operated from control cables in the plant floor, can also be operated manually from a control console mounted on the platform.

shaped buildings and an office building. Team work zones usually are along one of the many outside walls. Central areas are used largely for parts inventory. Near each team zone is a buffer area in which carriers with four-to-six bodies are stored until the next team is ready. All but one of the buildings has two floors.

Personal accommodations consist of "coffee corners," changing rooms with washing facilities, showers, saunas, drying cabinets, toilets, wardrobes and clothes cabinets. The coffee corners have a coffee-making machine, refrigerator, heater, pantry and wall-to-wall carpeting.

All work and personal areas are very bright, and a strong effort has been made to reduce noise levels. Volvo feels it's important for workers to be able to talk to each other. Noise is held to a 65 decibel level in much of the plant, although it may reach 85 decibels in some work zones.

In actual operation, Kalmar workers are responsible for assembling the cars, material handling and quality control.

Assembly teams can select one of two operating systems. The carriers, low a straight line through the team area. Or a team may decide to have its carriers "docked" until each function is installed. Generally, each team is divided into three-to-five-man sub-teams. Of course, the whole operation is a learning experience and changes are constantly being made.

The assembly process at Kalmar begins when painted bodies arrive from the Torslanda plants in Gothenburg by rail. Other parts are shipped from Volvo supplier plants and outside suppliers.

ASSEMBLY PROCEDURE

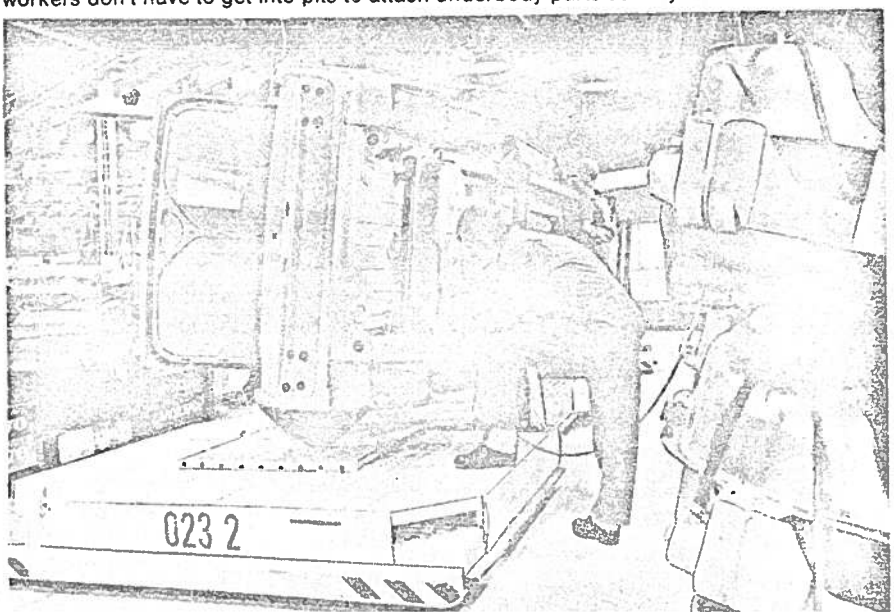
First the body is placed on a low-level carrier and lifted to the second floor where ten teams install systems. Doors are removed, completed separately and installed later.

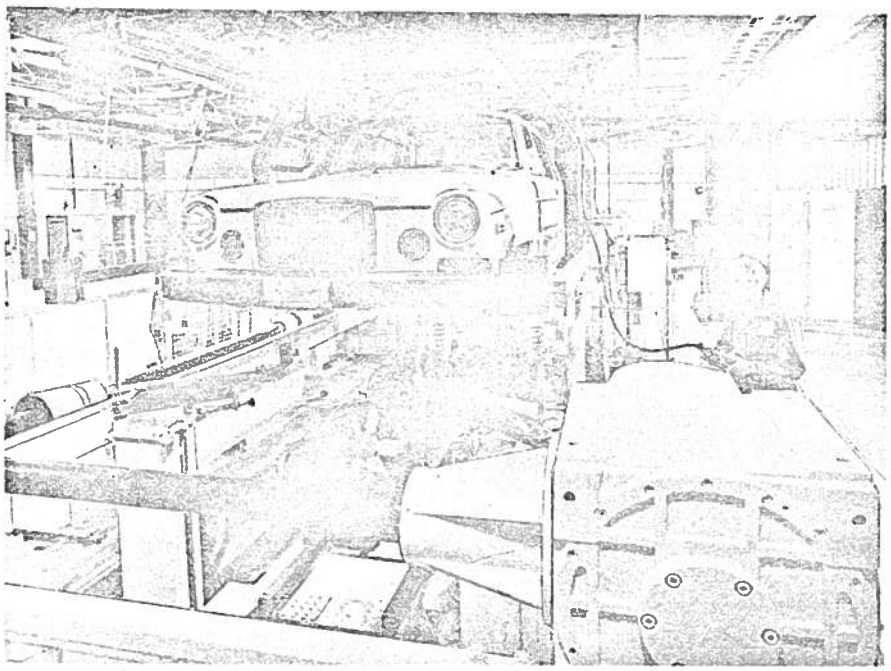
During this time the engine, transmission, driveshaft, axles and exhaust system are being assembled on a high-level carrier on the first floor. This carrier then moves to the second floor where the power train is "married" to the body. Then the complete high-level rig returns to the ground floor, where the car is ultimately transferred to a low-level carrier.

After the brake fluid is put in, wheels are installed and a final inspection is made. The assembly is concluded with underbody sealing and the application of a protective wax coating.

Thus far, the results have reportedly been satisfactory. However,

Among the innovations at the Kalmar plant is the body placed on its side so that workers don't have to get into pits to attach underbody parts as they must in the U.S.





After assembly of the chassis components on the high-level carrier, the carrier is then moved to the second floor where the power train is married to the body.

Volvo feels that the program is still very much in the experimental stage, with much to be learned before conclusions can be drawn.

Said a spokesman, "Frankly, we think the response of our workers has been too positive so far. We still don't know what this system will give us. We recently decided to add 100 people at Kalmar and 600 applied."

As to the efficiency of the Kalmar system, U.S. auto assembly officials say that a force of 400 workers would produce about 35 cars per hour in this country, compared to the seven per hour now being built at Kalmar. Although it's difficult to find plants actually doing the same amount of work on cars, it's important also to remember that U.S. cars, with all their accessories, require considerably more labor to assemble than European cars.

Regardless of how much workers are bored by factory work and how they dislike it, they'll not have jobs unless plants are efficient enough to produce automobiles at a competitive price and at a profit to stockholders.

No one yet knows how the Kalmar operation will work-out or what direction the program may take. Yet, Volvo's sincere gamble in seeking solutions to the "factory syndrome" must be respected.

As Gyllenhammar said recently, "We find that people are not only after money . . . money is no longer the single incentive. If it had been, people would stay on their jobs." ■

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FORD ON KALMAR: "TERRIFIC, BUT . . ."

Henry Ford II, chairman of Ford Motor Co., found the new Volvo plant at Kalmar, Sweden, to be "really terrific," although he admitted he didn't know if that approach could be duplicated in a typical American high-volume plant for a reasonable expenditure.

Ford visited Kalmar late last spring as the guest of Pehr G. Gyllenhammar, managing director of Volvo. When asked for his evaluation of the plant, he replied, "I can't give you an evaluation, but I can tell you what I think of it. You'd never think it was an automotive assembly plant. They've done some things there that I've never seen anywhere, or even contemplated.

"It's really an electronically-controlled plant. It's low volume, with 30,000 units a year on one shift and 60,000 on two shifts, compared to our plant in Spain with a capacity of 260,000 units."

Besides this low-volume characteristic, Ford said you have to take into consideration Volvo's belief that they can save money by reducing their turnover and quit rates.

country. We've never had the rates they've had.

"It's quite a plant. I was really surprised and I've asked our people (including President Lee Iacocca) to go in the fall and have a look at it. I think you've got to see the Gothenburg plant and then go to Kalmar to sort of get a comparison between the two because even in Gothenburg, they've done some things we've never done at Ford Motor Co."

Among the innovations at Volvo that particularly impressed and interested Ford was a tremendous air-circulation system, and the system in which the cars go down the assembly lines on their sides, so that workers don't have to get into pits to attach parts to the underbodies.

Ford concluded, "From a layman's standpoint, both plants are extremely interesting, and Kalmar is really terrific. I don't know if this can be done in a high-volume plant for a reasonable expenditure. I hope we can try to figure that out.

"There's another thing I should say. There's no point in considerin

2 Mai 1974

Monsieur Ivergörd
Ergonomilaboratoriet
Mosebacke Torg 18
11620 STOCKHOM

Cher ami,

Je vous prie de me pardonner de vous écrire en français. J'espère que vous trouverez quelqu'un pour vous aider à lire cette lettre.

J'ai été très heureux de vous rencontrer et je vous remercie des précieux documents que vous m'avez adressés.

J'ai déjà écrit au Professeur Odescalchi pour lui demander de vous inviter, ainsi que Monsieur Kronlund. J'espère donc vous voir à Rimini.

Vous savez que vous êtes invité en permanence à Paris.

Veuillez agréer, cher ami, l'expression de mes sentiments très cordiaux.

A. Wisner

PETERSON

chemise

Suède

3 Mai 1974

Monsieur N. Petersson
AMAT
Arbetarskyddsstyrelsen
FACK
S 100 26 STOCKHOLM 34

Cher ami,

Je repense avec le même plaisir et le même intérêt à mon séjour à Stockholm que vous avez su préparer avec intelligence et amitié.

En revenant à Paris, j'ai retrouvé mes soucis habituels d'administration et une lettre de la C.C.E. à Luxembourg qui me demande le rapport de synthèse sur les vibrations.

Je crois qu'il faut que vous nous l'adressiez dans l'état où il se trouve, et s'il y a quelques modifications à apporter sur la forme nous le ferons ici. Il ne faut pas être perfectionniste et il vaut mieux remettre quelque chose qui ne vous satisfait pas pleinement plutôt que de prendre un retard trop considérable.

Je vous adresse toutes mes amitiés ainsi qu'à votre compagne et espère vous revoir bientôt à Paris.

A. Wisner

7 Janvier 1974

Monsieur Nils F. Peterson
Fogdevâgen 96I
12158 JOHANNESHOV
(Suède)

Cher ami,

Je suis vraiment confus de répondre seulement maintenant à vos lettres du 10 Octobre et du 12 Décembre, et aux envois de documents qui les accompagnaient.

Nous avons pourtant été tous très sensibles à la part que vous avez réservée aux membres du laboratoire dans le compte rendu de vos recherches et de votre séjour en France.

J'aurais dû aussi vous remercier des documents que vous m'avez adressés sur la politique sociale suédoise et, en particulier, pour le remarquable fascicule de Geijer sur la démocratie industrielle. Ce document m'a été très utile pour un article que je viens d'écrire sur le contenu des tâches et la charge de travail.

J'espère que vous reviendrez bientôt en France. La Scandinavie ne paraît pas si loin, puisque Monsieur Kuorinka a pu déjà revenir pour trois mois.

Il est question que j'aie à préparer un rapport sur la prospective des recherches dans le domaine des conditions de travail. Si cela se confirme, j'ai l'intention de visiter les pays scandinaves, car je crois que c'est une des régions du monde où la réflexion est la plus sérieuse. J'espère que j'aurai, à ce moment-là, l'occasion de vous revoir, peut-être même devrais-je vous demander de participer à l'organisation de ce séjour.

Recevez, cher Peterson, avec mes amitiés, mes meilleurs voeux pour la nouvelle année.

A. Wisner

KUNGL ARBETARSKYDDSSTYRELSEN
ARBETSMEDICINSKA AVDELNINGEN

Handläggare

Datum 12.12.73

Vår beteckning

Edert datum

Eder beteckning

Monsieur le Directeur
Professeur A WISNER
Laboratoire d'Ergonomie
41, rue Gay-Lussac
75005 Paris Frankrike

Cher Monsieur,

Tout d'abord je vous souhaite un Joyeux Noel et une Bonne Année, aussi comme à votre famille. Je vous remercie egalement pour l'année -73 qui de ma part a été rempli des experiences si utiles et merveilleux grace á mon sejour dans votre laboratoire.
Je reviens d'une semaine des vacances en Pologne ou j'ai aussi visité le laboratoire ou travaille Docteur Koradecka qui j'ai rencontré a votre laboratoire.
L'autre jour Monsieur Åberg est devenu le premier professeur d'ergonomie en Suede a l'ecole polytechnique a Stockholm.
Vous trouvez ci-joint le magazine avec l'article de rapport de Denain qui vient de paraitre. Si vous en voulez encore des exemplaires je vous les envoie avec plaisir.
Je vous prie d'agréer, cher Monsieur, l'expression de

mes sentiments les meilleurs.

Nils F Pétersson

KUNGL ARBETARSKYDDSSTYRELSEN

Stockholm, le 10 octobre 1973

Monsieur le Directeur
Professeur A. WISNER
Laboratoire de Physiologie
du Travail - Ergonomie
41, rue Gay-Lussac
75005 PARIS

Cher Monsieur,

Je vous remercie cordialement de votre lettre si gentil du 3 septembre.

Je viens de finir le rapport de mon temps en France et vous trouvez ci-joints deux exemplaires que je vous envoie malgré qu'il est en suedois.

Je vais envoyer le rapport corrigé de CECA à Monsieur BERTHOZ dans quelques jours.

Pour le moment j'ai quitté les études des vibrations et je fais un rapport sur le travail dans des imprimeries. Mais j'espère de continuer à étudier les vibrations que je trouve plus intéressants et sur les quelles j'ai si beaucoup appris chez vous.

Ce serait avec un très grand plaisir que je vous reverrais ici à Stockholm.

Je pense que Monsieur Åberg connait des études à Volvo très bien. Son groupe travail pour le moment sur des questions ergonomique de l'usine à Lindesberg et on va profiter les resultats pour l'usine à Kalmar. Parmi d'autre chose l'usine sera construite en forme d'etoile pour donner tout les operateurs contact avec le lumière de jour. Le groupe d'Åberg a aussi construit une cabine pour des ébarbeurs chez Volvo qui réduit le bruit et les poussiers.

Dans un mois le congrès annuel des ergonomistes scandinavies aura lieu à Luleå où le premier enseignement superieur d'ergonomie a commencé cette année.

Pour l'année prochaine la direction nationale de la securité de travail à laquelle notre laboratoire est située on demande encore 150 postes et un augmentation du budget de 55 million franc à 75 million franc. Mais la securité ne fonctionne toujours pas très bien. Et pour la première fois de l'histoire de droit suedois un ergonomist (le Professeur Carlsöö) est demandé comme expert dans un procès.

Je vous envoie quelques brochures sur le milieu du travail redigé par la Confederation Generale du Travail. Je pense que c'est surtout Monsiur Bouny et Monsieur Guérin qui s'en intéressent. Dès que l'article de Denain apparait je vous en envoie quelques exemplaires.

Veuillez agréer, Cher Monsieur, l'expression de mes sentiments très cordiaux.

Nils F. Pètersson

Suppl.

JOURNAL OF APPLIED PHYSIOLOGY
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Circulatory responses to arm exercise with different arm positions

IRMA ÅSTRAND, ASIT GUHARAY, AND JOHN WAHREN
National Institute of Occupational Health, and the Department of Clinical Physiology, Karolinska Institutet at Serafimerlasarettet, Stockholm, Sweden

ÅSTRAND, IRMA, ASIT GUHARAY, AND JOHN WAHREN. *Circulatory responses to arm exercise with different arm positions.* J. Appl. Physiol. 25(5): 528–532. 1968.—The circulatory response to arm exercise by nailing at bench level, into wall at head level, and into ceiling 10 cm above the head was studied in 11 subjects and compared to leg exercise. Oxygen uptake was approximately 1 liter/min for all three types of arm exercise and for 300 kpm/min on a bicycle ergometer. Heart rate, blood pressure, and lactate concentrations during arm exercise were higher for nailing into ceiling than for nailing into wall and bench. In comparison with nailing into bench, bicycle exercise at 300 kpm/min resulted in lower heart rate, blood pressure, and ventilation in relation to oxygen uptake. The diastolic blood pressure during nailing into ceiling was higher than during maximal leg exercise. The observed differences between the hemodynamic responses to arm exercise in different positions indicate an increased sympathetic vasoconstrictor tone for exercise with elevated arms.

exercise with small and large muscle groups; blood pressure during arm exercise; lactate production; oxygen uptake during exercise

EXERCISE with small and with large muscle groups has been found to elicit different hemodynamic responses. Arm exercise in comparison with leg exercise is accompanied by a larger rise in heart rate, blood pressure, pulmonary ventilation, and arterial lactate concentration (1–3, 5, 10, 18). This difference has mainly been ascribed to a more dominating sympathetic vasoconstrictor tone during arm exercise. These findings may be of considerable importance, since arm exercise occurs frequently in many activities and occupations. Moreover, the observations may be of clinical consequence in elderly patients because of the inevitable gradual decrease in circulatory capacity with increasing age and in patients with coronary artery disease (9) or hypertension. It is, in fact, a frequent clinical experience that angina pectoris in patients with coronary artery disease often is elicited when the patients work with their arms elevated. Since quantitative data on the effect of exercise with the arms at different levels appear to be lacking, it was thought worthwhile to undertake a study of the circulatory reactions to arm exercise by nailing at bench level, into the wall at head level, and into the ceiling. This type of work was chosen since it can be standardized and made reproducible (11)

SUBJECTS

Eleven healthy skilled carpenters, 20–36 years of age, were studied. Their anthropometric data are given in Table 1. They arrived at the laboratory at noon and each brought his own hammer. The length of the handle of the hammer and the weight of the hammer varied slightly from case to case (Table 1). Rifled wire nails 3 inches in length were used.

PROCEDURE AND METHODS

Catheterization. Teflon catheters were inserted percutaneously into the median cubital vein of the working arm and into the brachial artery of the other arm so that the tips reached about 10 cm proximally. The tip of the venous catheter usually passed into the basilic vein.

Exercise. The subjects performed nailing in standing position *1*) into a bench 75 cm high, *2*) into the wall, and *3*) into the ceiling 10 cm above the top of the head (see Fig. 1). Each period lasted for about 7 min. The subjects were asked to try to maintain a constant rate of nailing, and the strokes were recorded on a tape recorder. After each nailing procedure the subject rested in the sitting position for about 20 min. After the final rest period the subjects exercised on a bicycle ergometer (Monark, Sweden) for about 7 min at 300 and 450 kpm/min (50 and 75 watts, respectively) and at a work load which was predicted to exhaust the subject in about 5 min (4).

Sampling. Arterial and venous blood samples were drawn simultaneously from the catheters at rest and at the 3rd and 6th min of each arm exercise period (cf. Table 3). The blood lactate concentration was determined by the colorimetric method of Baker and Summerson as modified by Ström (19).

TABLE 1. *Age, height, and weight for the 11 subjects and measures of their hammers*

	Age, years	Height, cm	Weight, kg	Hammer	
				Length, cm	Weight, kg
Mean	27	178.0	76.0	33.5	0.75
Range	20–36	167–189	61–104	32.5–35.5	0.68–0.81

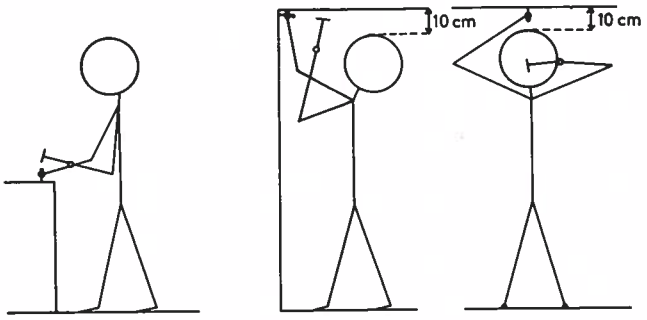

FIG. 1. The subjects performed nailing into bench (*left*), into wall (*middle*), and into ceiling (*right*).

Measurements. Arterial blood pressure was measured at rest in the sitting position with halfway bent elbow and at the 4th min during nailing and bicycle exercise with a blood pressure transducer (EMT 200, Elema-Schönander, Sweden). Mean pressures were obtained by electrical integration. The third intercostal space at the sternum was used as reference level in the standing and the sitting positions.

During the last minutes of the exercise periods the expired air was collected in a Douglas bag. The volume was measured in a well-balanced spirometer; the gas was analyzed according to the Haldane technique, and the oxygen uptake was calculated.

The heart rate was determined from an electrocardiogram at rest and during each minute of the submaximal work experiments. A mean value for the 5th, 6th, and 7th min is given. During the maximal exercise period the heart rate was recorded continuously, and the highest value attained is presented.

Effects of arm elevation. In eight of the subjects oxygen uptake, heart rate, and blood pressure were measured after 8 min of standing with elevated arms and after standing for 8 min with the arms along the sides.

RESULTS

Work production (*Table 2*). The number of hammer strokes during nailing did not differ significantly between exercise periods with the arms in different positions. However, the number of nails driven in per minute was lower for nailing into the wall than into bench and still lower for nailing into the ceiling, indicating that the strokes became less powerful or were less well aimed when nailing into the wall and ceiling as compared to bench nailing.

TABLE 2. *Comparison of exercise performance during nailing with different arm positions*

	Nailing		
	Bench	Wall	Ceiling
Strokes per minute	75.3±8.4	75.2±7.6	73.1±8.9
Nails per minute	14.6±1.7	10.6±1.3	4.5±1.1

Oxygen uptake (*Tables 3 and 4*). Nailing into bench, wall, and ceiling and bicycle exercise at 300 kpm/min all resulted in oxygen uptakes of approximately 1 liter/min. This indicates that these four work periods can be considered as equivalent with regard to the demands on the total energy supply. Exercise at 450 kpm/min gave an oxygen uptake of 1.4 liters/min and the maximum oxygen uptake attained was 3.3 liters/min in the average case.

Heart rate (*Tables 3 and 4*). Nailing into wall and ceiling resulted in a greater elevation of the heart rate than nailing with the arms at bench level. The heart rate during bicycle exercise at a comparable oxygen uptake was lower ($P < 0.01$) than for all types of nailing. Leg exercise with an oxygen uptake of 1.4 liters/min gave approximately the same rise in heart rate as nailing into bench with an oxygen uptake of only 1 liter/min.

Arterial blood pressure (*Tables 3 and 4*). The arterial blood pressures during nailing were with only one exception higher than during leg exercise at approximately the same oxygen uptake, the difference being most pronounced between nailing into ceiling and bicycle work ($P < 0.01$). Systolic and diastolic pressures were higher during nailing into ceiling than those recorded during bicycle exercise at both 300 and 450 kpm/min ($P < 0.01$). During maximal exercise when the oxygen uptake was approximately three times higher than during nailing, the systolic pressure was higher ($P < 0.01$), but the diastolic pressure was lower ($P < 0.05$) than those measured during nailing into ceiling.

Lactate (*Tables 3 and 4*). Lactate concentrations in arterial blood samples obtained at 3 and 6 min during nailing agreed closely. The largest increase from the resting level was noted for nailing into ceiling ($P < 0.01$). Lactate concentration in blood samples from the basilic vein obtained during nailing showed more marked elevations than the arterial concentrations. Both arterial and venous concentrations were recorded as higher during nailing into the ceiling than during nailing in other positions, and the differences became progressively greater during the course of the exercise period.

Pulmonary ventilation (*Tables 3 and 4*). The pulmonary ventilation was higher for nailing into ceiling and wall ($P < 0.001$) than for bench nailing. Leg exercise at 450 kpm/min resulted in approximately the same ventilation as nailing into wall and ceiling.

The ventilation per liter of oxygen uptake was larger ($P < 0.05$) during nailing into the ceiling than into the bench and wall. It was also higher than the specific ventilation measured during exercise at 300 and 450

During physical exercise an increase in sympathetic adrenergic vasomotor tone occurs in most parts of the body, resulting in constriction of resistance vessels (7, 8). This increased sympathetic discharge is, however, overcome by local vasodilatation in contracting muscle; details of this local mechanism are, as yet, not known. The net effect of these two events is to distribute the cardiac output to the exercising muscles, where the increased blood flow is most needed. The increase in sympathetic vasoconstrictor tone during leg exercise is directly related to the intensity of the work performed (6). Exercise with small muscle groups appears to elicit a similar and sometimes even more pronounced rise in sympathetic tone. Thus, even moderately strong isometric forearm muscle contractions have been found to result in a marked increase in arterial blood pressure (14). When healthy subjects exercised by cranking a bicycle with the arms the arterial blood pressure, heart rate, and pulmonary ventilation were higher than during leg exercise of approximately the same oxygen uptake (5, 18). The higher arterial blood pressure during exercise with small muscle groups as compared to extensive muscle involvement may partly be explained by the fact that the local vasodilatation will then overcome only a small fraction of the increased total peripheral resistance set up by the rise in vasoconstrictor tone. Moreover, when arm and leg exercise periods are compared on the basis of equal oxygen uptakes, the work per unit section area of muscle will be higher for arm exercise, which may be a contributing factor to the remarkably high sympathetic tone which may be elicited.

The present findings of a higher heart rate and higher blood pressures during nailing at bench level than during bicycle exercise at approximately the same oxygen uptake thus confirm previous observations for other types of arm exercise. Nailing at bench level is mostly a rhythmic dynamic exercise with very little static work included. However, when the subjects performed nailing at head level into a wall, an intermittent isometric component was added for holding up the arms with the hands at face level and for supporting the trunk. The work of nailing into the ceiling becomes even more strenuous since the subjects then have to both hit the nails upwards and hold the arms at a higher level. The added components of intermittent static work during the nailing into wall and ceiling are probably contributing factors to the higher heart rates and blood pressures recorded during these forms of arm exercise as compared to during bench nailing. The assumption that the static work component is of importance for the cardiovascular response during exercise with elevated arms is further borne out by the finding of a remarkably large rise in both heart rate and arterial blood pressure in subjects standing with their arms elevated but not doing exercise. It should be mentioned that the marked circulatory response during nailing into ceiling occurred in spite of the fact that the number of nails driven in per minute was reduced by more than 60%.

The present results do not allow conclusions as to whether the high blood pressure is associated with a high cardiac output, high peripheral resistance, or both. The findings of high lactate concentrations in venous blood draining the exercising muscles during wall nailing and still higher during nailing into ceiling indicate that in spite of the large rise in heart rate the blood flow to the muscles involved in the exercise was less than the metabolic demand. This is in agreement with observations during forearm exercise with the arm in different positions. During exercise with vertically elevated forearm blood flow and deep venous oxygen saturation were lower and lactate production larger than at exercise with the arm horizontal (20). It is probable that the increased lactate concentration is a result of both increased production and decreased dilution because of lowered blood flow.

The present results make it likely that the myocardial oxygen consumption is increased during arm exercise with elevated arms. This assumption is based on the finding of increased heart rate and systolic pressure, which will result in an increase of the time integral of systolic force. Moreover, the cardiovascular response is largely attributable to an increase in sympathetic tone which, in turn, is known to be associated with an increased contractility and rate of fiber shortening in the myocardium (16, 17). The time integral of systolic force and the state of contractility are known to be two major determinants directly related to myocardial oxygen uptake and coronary blood flow (15–17). It seems possible that this may be the background to the clinical observation that patients with impaired coronary circulation frequently elicit angina pectoris during physical exercise which involves static or both static and dynamic work with small-muscle groups, such as working with elevated arms.

This study was supported by the National Swedish Council for Building Research.

Asit Guharay's present address is Health Division, Central Mining Research Station, Barwa Road, P.O. Box 50, Dhanbad, Bihar, India.

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Skogsarbeten (Logging Research Foundation)

Drottninggatan 97
S-113 60 Stockholm
Sweden
Telephone: 08/24 88 40

Dr. A. Wisner
Département des Sc. de l´Homme au Travail
Conservatoire National des Arts et Métiers
Paris
Frankrike

Your ref. Our ref. OÖ Stockholm, 9/3 1973

Dear Dr. Wisner,

I have had the great pleasure reading your paper DIAGNOSIS IN ERGONOMICS which appeared in Ergonomics, 15, 601-620, 1972.

Especially these lines caught my attention: "During research in the electronic industri (Wisner et al, 1967) it was stated ..... the extremely high psycho-physiological cost of their training and of the need to develop rhythm in their work .....".

I have met exaxtly the same type of problem in re-training forest workers towards a more safe work-technique. I would be very grateful to you if you had the possibillities to send me a copy of the paper you refered to, i.e. to:

Wisner, A., Lavaille, A., et Richard, E., 1967, Les conditions de travaille des femme O.S. de la construction électronique. Laboratoire de Physiologie du Travaille et d´Ergonomie du C.N.A.M., Rapport No 2.

Yours sincerely
Olov Östberg
Olov Östberg

Address: Dr. Olov Östberg
Logging Research Foundation
Drottninggatan 97
S-11360 STOCKHOLM
Sweden

P.T.O.

22 Janvier 1973

Monsieur le Professeur Sven Forssman

The Swedish Work Environment Fund
Wenner-Gren Center

Sveavägen 166 8th Floor

113 46 STOCKHOLM

(Suède)

Cher ami,

J'ai reçu avec un grand plaisir votre lettre circulaire, chaque année si intéressante, et je suis heureux des remarquables progrès de l'ergonomie et des sciences voisines en Suède.

J'ai été très frappé de la liste des priorités retenues pour la recherche. Ce sont les mêmes que les nôtres, toutefois nous nous intéressons également au repérage spatial et aux contradictions qui existent à l'origine de certains accidents entre les informations visuelles et proprioceptives.

Nous nous intéressons également à la charge musculaire locale posturale qui me paraît importante dans l'industrie légère et beaucoup de travaux de bureau.

Enfin, comme vous le savez, nous nous intéressons aux vibrations et nous avons le plaisir, cette année, d'avoir au laboratoire Monsieur Nils Petersson, jeune chercheur de votre Institut, qui s'intéresse plus particulièrement à l'EMG au cours de l'usage des marteaux piqueurs. C'est un garçon intelligent et d'un contact très agréable.

Je n'ai pas non plus trouvé dans votre liste l'étude de l'adaptation du travail aux handicapés, alors que les réalisations suédoises dans ce domaine font, à juste titre, l'admiration du monde entier.

J'ai passé deux jours à Göteborg, pour une réunion extra ergonomique en Décembre, et j'ai été passionné par ce que j'ai appris au Service médical de Volvo et au Centre d'Etude des Handicapés.

.../...

Je serais extrêmement heureux de pouvoir avoir des renseignements sur les développements de votre remarquable projet, d'autant plus que je souhaiterais vivement que les travaux réalisés en Suède, dans le domaine de l'ergonomie en sidérurgie, soient en relation avec ceux qui sont poursuivis par la Recherche Communautaire Ergonomique, où j'ai un rôle de Conseil. Je sais bien que la Suède n'a pas adhéré au Marché Commun, mais je pense que la science n'a pas à connaître ce genre de problème.

Nous devons suggérer au Gouvernement danois le nom d'un ergonomiste pour suivre nos travaux. Pourriez-vous me conseiller pour que nous donnions le nom d'une personne bien orientée scientifiquement et également active dans le domaine industriel.

Veuillez agréer, je vous prie, l'expression de mes sentiments très amicaux ainsi que mes voeux, bien tardifs mais une difficulté de santé m'a retenu depuis cinq semaines hors de toute activité.

A. Wisner

ARBETARSKYDDSFONDEN
THE SWEDISH WORK ENVIRONMENT FUND

Handläggare | Datum | Beteckning

Stockholm in December 1972

Dear Friends,

There has been many activities within occupational health in Sweden during 1972. The 1st of July the National Institute of Occupational Health was integrated within the National Board of Occupational Safety and Health and I left my job as director in order to take up duties as a member of the Board of the Swedish Work Environment Fund. Professor Nils Lundgren, well-known expert on work physiology and my deputy for many years, has been nominated as my successor.

During the last year I have been busy upon request of the Minister of Social Affairs to carry out a survey on research in occupational health, what is going on and what are the needs for the next few years in Sweden? It has been very interesting, especially to study the needs considering the development of industry, labor market, organization, technology etc. Together with a few experts I delivered a report in April 1972 establishing eleven fields of priority for research: Industrial toxicology; industrial hygiene engineering eliminating air contamination at work; noise, effects and prevention; climate, especially low temperature and air movement; organization and motivation of work; back diseases; occupational injuries; interdisciplinary health surveys of industrial groups; working time, length and distribution during day and week, especially shift work; sickness absence and labor turnover; the aging worker. It is interesting to notice that many experts from other countries are of similar opinion concerning priorities.

The Swedish Work Environment Fund started its activities the 1st of January 1972 and is now gradually being established. It is a fund of 4 million dollars for research, education and information concerning work environment. My report on research planning should be the back-

Adress
Wenner-Gren Center

Telefon
08 -30 65 00

Telegramadress
Workhealthfund

ground for the fund concerning its research activities. The Board of the Fund elected four fields out of the eleven prioritied, proposed and established four working groups to study accidents, shift work, industrial toxicology and interdisciplinary studies of different occupations. A working group was also established concerning the education and training especially of workers and foremen in occupational health and safety.

In Sweden the interest in occupational health and safety has increased considerably during the last few years. At the United Nation Conference on Human Environment in Stockholm I was chairman of a small group who presented upon request from the Government a report on occupational health in Sweden. The Technical University in Stockholm created last year a centre on human technology in order to influence the technological development considering not only productivity but also human aspects. The Technical University in Copenhagen, Denmark established a course in ergonomics for productivity engineers and others interested. I was asked to give the closing lecture to the course in November this year which was a most stimulating experience.

The Scandinavian co-operation has always been very active in the field of occupational health and safety. The Nordic Council has 1971 started a committee on occupational health with two members from each country. The report will now be finished within the next few months and will describe the present co-operation and propose new ways especially of co-ordinating research between the institutes.

Also outside Scandinavia the international contacts have been developed. I was asked to participate in a WHO conference in Milano on teaching occupational health at the end of June 1972. Experts in occupational health met here together with experts in modern educational methods. An interesting and to some extent confusing discussion took place. I spent two weeks in the WHO Office in Copenhagen writing the report of the conference.

I took the opportunity before the conference to spend one week of holiday in Assisi, Italy, the town of San Francis. It was a wonderful experience to feel the atmosphere of the living middle-age in this beautiful town, and a few days holiday in the Swedish archipelago in Blekinge with a friend enjoying sailing and canoeing was a great pleasure.

It was a very interesting experience for me for the first time to visit South America on the occasion of the Buenos Ayres Congress, which was a great success. I had also the opportunity to visit and meet colleagues in Brazil, Chile and Peru.

Please note my change of address as I have moved from the villa in Djursholm to a flat near the Work Environment Fund. Only two of the children, the eldest and youngest daughters, are now living in Stockholm. Peter, the eldest son, is attending the famous High Military School in Paris for one and a half years. Christer, who started his studies of medicine in Vienna, is now completing them in Umeå in Northern Sweden and is now doing surgery. Jon is teacher of painting and history of arts at a people's high school in the Western part of Sweden near the border to Norway in the beautiful lake and forest district.

Best wishes to you all for Christmas and the New Year.

Yours sincerely

Sven Forssman

Sven Forssman

<u>Addresses:</u>

The Swedish Work Environment Fund
Wenner-Gren Center
Sveavägen 166, 8th floor
113 46 Stockholm, Sweden

or

Hagalundsgatan 35, 6th floor
171 51 Solna, Sweden

ARBETARSKYDDSFONDEN

The Swedish Work Environment Fund

Members of the board of the Swedish Work Environment Fund

Åke Nilsson, Chairman
The Swedish Work Environment Fund

Gunnar Danielson, Director General
The Swedish National Board of Occupational Safety and Health

Sven Forssman, Professor, scientific adviser
The Swedish Work Environment Fund

Erik Bolinder, Physician medical adviser
The Swedish Confederation of Trade Unions

Leif Kjellstrand, Secretary
The Swedish Confederation of Trade Unions

Sven Ahlgren, Chairman
Swedish Union of Local Government Officers

Gunnar Lindström, Director
The Swedish Employers´Confederation

Nils Masreliez, Chief physician, medical adviser
The Swedish Employers´Confederation

Hans Forselius, Director
The Swedish Association of Local Authorities

Head office of the Swedish Work Environment Fund

Åke Nilsson, Chairman	tel:	08 - 30 06 40
Sven Forssman, Professor Scientific Adviser		08 - 30 06 50
Bo Oscarsson Director		08 - 30 65 00

Arbetarskyddsfonden
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Sveavägen 166, 8 tr
113 46 STOCKHOLM

08/30 65 00 08/30 06 50

ALLF 532 72 002 Kihlström & Söner 1972

THE SWEDISH WORK ENVIRONMENT FUND

a brief information

BACK GROUND

The Work Environment Fund was established by act of the Swedish legislature on 28 April 1971. The Fund is financed by means of an increase in the compulsary fee paid by employers for occupational injuries and diseases insurance. It is estimated that these contributions will amount to over 20 million Swedish crowns (approx. $ 4 million) per year, which shall be used for research, education, and information in the field of working environments.

ORGANI ZATION

The Fund is administered by a board that determines the use and distribution of the Fund's resources. The board includes representatives of the various parties on the labor market and the director general of the National Board of Industrial Safety. The board assumed office on 1 January 1972.

PURPOSE

The Work Environment Fund shall, in accordance with its instructions, support such research, education and information as can counteract the occurence of occupational injuries and diseases and other adverse health conditions that can arise as a result of working environments, or can improve working environments and thereby on-the-job health and safety.

- **Grants for research shall apply primarily to such research as can be expected to achieve practical on-the-job implementation. Grants may also be awarded for purpose of furthering contact with research underway abroad.**
- **Grants for education shall apply primarily to the training of plant industrial safety representatives as well as to the further training of other occupational and safety personnel.**
- **Grants for information shall apply primarily to broadly devised informational programs aimed at large groups of people in industry and other working places.**

PLANS

As a basis for the Fund's operation in the field of research, a special report was presented in April 1972. Partly on the basis of this, the board has drawn up certain guidelines for the activities of the Fund, in which the importance of concentrating the Fund's resources on larger projects was emphasized. Research, having a practical orientation, is to be accorded special priority. Further, the board emphasizes the importance of adapting research results already obtained elsewhere to practical implementation at the working place. The Fund will also be working for a coordination of research in the area of working environment. Money will be appointed in answer to requests as well as on the Fund's own initiative. Some of the research areas that will be accorded considerable attention by the Work Environment Fund are the following:

- **Research into the problems of working hours, including the length and distribution of working hours, shift and night work, etc.**
- **Research intended to reduce the frequency and severity of occupational accidents.**
- **Broad cross-discipline investigations of working environment conditions within various branches of industry.**
- **Research on deleterious chemical substances in working environments.**

The Fund's support of education and information shall apply to limited projects relevant in principle to health and safety conditions in various work-environments; however, it shall not apply to continuing activities within these areas.
The Work Environment Fund is also eager to collaborate with authorities and institutions in the field of work-environment in other countries for purpose of exchanging experiences. Concrete joint projects in the area of research are also conceivable.
If you are interested in receiving further information on the activities of the Fund, kindly contact the Head Office of the Swedish Work Environment Fund.

Saturday 2nd December

Professor B. Aldman
CHALMERS TEKNISKA HOGSKOLA
Dep. of Traffic Safety
Fack
S.402 20 Göteborg 5
(Suède)

Dear Bertil,

Thank you so much to have prepared the possibility of a meeting in Göteborg with Pr Brattgärd. This opportunity is so important that I change my travel schedule and will stay in your city Friday the 15th, but I am obliged to leave at 2.45 p.m. by the flight SAS 495. I hope that during the morning, I will be able to have enough contacts to organize future connection between swedish researchers and those of C.E.E. on the so important problem of ergonomics for the disabled.

I hope that I will not disturb too much Pr Brattgärd and his team.

Would you be so kind to let the hotel in Göteborg be informed that I will stay one night more.

I am happy to see you soon,

Truly yours,

A. Wisner

CHALMERS TEKNISKA HÖGSKOLA
Dept. of Traffic Safety
Fack
S-402 20 Göteborg 5
Sweden

1972-11-29

Professor Alain Wisner, M.D., Sc. D.
Conservatoire National des Arts et Metiers
41, rue Gay-Lussac
Paris (5)
Frankrike

Dear Alain,

Referring to your letter of November 21 conserning the ergonomical adaption of work to handicaped people I am glad to tell you that we have at the medical faculty of the university a department for Handicap research. Head of this department is professor Sven-Olof Brattgård M.D. whom I have arranged for you to meet. There are also in this area several activities such as protected work shops for handicaped which I think should be of interest for you to visit.

If it is at all possible for you to stay one more day in Göteborg I can arrange for you to see this and to meet the people involved. I have asked professor Brattgård to keep Friday December 15 open for this possibility but I have to have a quick answer from you because these people are very busy at this time.

Please send me a short notice, letter or telegram, if you can stay ~~November xx~~ December 15 and I will arrange the rest for you.

Looking forward to seeing you here in Göteborg.

Truly yours,

Bertil Aldman

P.S. Please have your secretary notice my new address.

23 Avril 1971

Monsieur le Professeur Forssman
NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH
Fack
STOCKHOLM 60
(Suède)

Dear Pr Forssman,

I am very happy to have an apportunity to visit Stockholm when coming back from a travel to America. I have to discuss with Bertil Aldman on some common interests in road safety and I will be free in Stockholm monday the 10th of May. It would be a great chance for me to be able to see you and meet some of your coworkers specially Nils Lundgren and his team.

When I will arrive at Stockholm air terminal, I will call your office to know if I can come.

I hope strongly to see you.

Truly yours,

A. Wisner

NATIONAL INSTITUTE
OF OCCUPATIONAL HEALTH
STOCKHOLM 60

Stockholm, December 1967

Dear Friends,

1967 has been a year of hard work. The Swedish National Institute of Occupational Health has developed according to plans. My first year of activity has been mainly devoted to co-ordination and long term planning, but there is still very much to do in this field.

The first interdisciplinary research project has been started and deals with occupational health problems of forestry. The first plans of the project were made in November 1966, detailed plans of examination were then worked out in the beginning of 1967, 500 workers in forestry in Lappland were examined in April and May by a team of 10-15 members of the staff of the institute. The results have then been coded for statistical evaluation and the preliminary report will be ready in January 1968. The organization of this study will serve as a model for a great part of our future research.

A study on silicosis in Sweden has now been completed after several years. Concerning occupational hazards the institute will be especially active in studying silicoses, noise and vibration.

Teaching has started and the first courses for industrial physicians and for industrial nurses have been organized by the institute. The teaching activity of the institute will greatly expand during the next few years and we have organized a special committee to study the needs of the country and to make a long term programme.

In my work at the institute it has been of great value to learn from experiences from other institutes, especially as several of my friends are directors of such institutes. I have had several discussions with professor Leo Noro in Helsinki, but also with others as professor Teisinger in Prague and professor Richard Schilling in London. Professor Letavet, the director of the institute of Moscow, spent a week in Stockholm as the guest of the Swedish institute, giving lectures. It was an excellent opportunity for me to discuss the administration and planning of an occupational health institute with him with his

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Mailing address | Street address | Tel. no. | Telegrams

great experience.

It will be of great value to the Swedish institute to have regular exchange of experiences with other institutes of the world. I have therefore spent some time of the year travelling, visiting Czecho-Slovakia, Greece, United Kingdom and United States. During the last visit to the U.S. I had the great honour to receive the William P. Yant Award, presented by the American Industrial Hygiene Association at their Annual Meeting in Chicago. The title of my lecture was "Occupational Health Institutes: An International Survey". The visit to the U.S. gave me also the opportunity to visit Arthur Vorwald and his institute in Detroit, Harold Magnusson and his institute in Ann Arbor and the Biochemical Research Laboratory of the Dow Chemical Company, Midland.

Within the Scandinavian countries there has been regular exchange of experiences every year during the last 15 years. The members of the staff of the occupational health institutes in the four Scandinavian countries meet, present research projects and discuss problems of mutual interest. This year the meeting was in Stockholm which was a great stimulus to us as it was the first time since the institute started that we had the Scandinavian meeting in Stockholm.

The next International Congress on Occupational Health will take place in Tokyo in September 1969. I have had the pleasure to receive professor Susumu Harashima in Stockholm to discuss the programme of the congress, and we have also had the pleasure to receive other Japanese colleagues. Professor Harashima and the other members of the Japanese Organizing Committee are working hard on the programme and the first publication with invitation and preliminary programme has recently been distributed.

Finally some news from the family. Our second son, Christer, who is studying medicine in Vienna, married a very nice Swedish girl and they are now back in Vienna. The two grandchildren, Susanne, 2 years, and Jonas, 1 1/2 years, live near our home and their visits are one of our greatest pleasures in life.

After a year of hard work I am now looking very much forward to go with my wife to Italy to spend Christmas and the New Year at Villa San Michele, Anacapri.

Best wishes for Christmas and for a successful and Happy New Year.

Yours

Sven Forssman

23 Avril 1971

Monsieur Kajsa Svahn
University of Umeå
901 87 UMEA
(Suède)

Cher Monsieur,

Je suis heureux d'apprendre que l'Université d'Umea envisage l'enseignement des relations entre la technologie et les données physiologiques et psychologiques. C'est effectivement un problème qui nous préoccupe depuis longtemps et je vous fais parvenir ci-jointe une communication que j'ai eu l'occasion de faire au congrès du 50ème anniversaire du B.I.T. (I.L.O.) à Genève. J'y joins le programme détaillé de quelques enseignements. J'ai l'intention de publier d'ici quelque temps une brochure décrivant plus en détail l'ensemble de ces activités.

Je me tiens à votre disposition au cas où des précisions vous paraîtraient souhaitables.

Je serai à Stockholm les 10 et 11 Mai prochain et je visiterai l'Institut du Travail que dirige le Professeur Forssman. Vous pourrez éventuellement m'y joindre.

Veuillez agréer, Cher Monsieur, l'expression de mes sentiments dévoués.

A. Wisner

UNIVERSITY OF UMEÅ
Head of education in psychology
Kajsa Svahn

Umeå, 16th April, 1961

Professor A Wisner
Laboratoire de Physiologie du Travail et
d'Ergonomie du Conservatiore National des
Art et Mètiers
75-PARIS FRANCE

Dear Sirs,

At the University of Umeå we are now planning higher education in technology. Most subjects at the university are involved in this planning.

I have been recommended to address myself to your department to obtain information regarding courses in technology including psychological items - and possibly physiological ones - as well as regarding courses in psychology including technological items. We are quite conscious of the fact that the courses given in this subject at your department are both advanced and differentiated.

We should be most grateful if you would send us any prints you may have dealing with this subject, and especially teaching schedules and manuals, and if you would give us information about the professional lines that the courses are aimed at.

Thanking you in advance and looking forward to hearing from you by return, I remain,

Yours sincerely

Kajsa Svahn

Kajsa Svahn
Head of education in psychology

Address: Kajsa Svahn
University of Umeå
901 87 UMEÅ
SWEDEN

Svenska Arbetsgivareföreningen
TELEFON 225600 · RIKSSAMTAL 225620
POSTBOX 16120 · STOCKHOLM 16

Some notes on occupational health in Sweden

FACTORY INSPECTION, founded 1890. Headquarter in Stockholm, 11 districts in the country.

Chief: Director General Otto Westling

Part time physicians:

Senior medical inspector: Professor Axel Ahlmark

Medical inspector of factories:

Stockholm: Doctor Åke Nyström
Doctor Karl-David Lundgren
Doctor Åke Swensson
Göteborg: Doctor Gunnar Ahlborg
Malmö: Doctor Stig Tejning
Örebro: Doctor Wilhelm Ohlsson
Umeå: Doctor Tore Dalhamn

Address: Kungl. Arbetarskyddsstyrelsen, Wennerbergsgatan 10, Stockholm 12.

Telephone: 54 02 60.

NATIONAL INSTITUTE OF PUBLIC HEALTH, Department of occupational health, carries out research and studies on request from industry.

Chief: Professor Axel Ahlmark

Assistants, among others:

Medical examinations, toxicological studies: Doctor Bengt Axelsson
Doctor Bengt Kylin
Doctor Sven Yllner

Chemical analysis: Head of division: Doctor Ragnar Vesterberg
Mr Adrian Frank

Industrial hygiene, technical investigations:

Chief Engineer: Vacant

Engineers: Mr Per Ödelycke
Mr Harry Öhman
Mrs Harriet Ehrner-Samuel

Department of public health
Acting chief: Professor Lars Friberg
Assistant professor: Doctor Hans Dahlström
Doctor Bengt Kylin
Address: Statens institut för folkhälsan, Stockholm 60.
Telephone: 23 69 00.

UNIVERSITY HOSPITAL, Department of occupational medicine.
Chief: Doctor Åke Swensson
Assistant: Doctor Åke Lindgren.
Address: Karolinska Sjukhuset, Yrkesmedicinska avdelningen, Norrbacka.
Telephone: 34 05 00.

STATE REHABILITATION CLINIC

Chief: Doctor Karl-David Lundgren
Psychiatrist: Doctor Börje Cronholm
Address: Statens Arbetsklinik, Karolinska vägen (Close to the University Hospital), Norrbacka.
Telephone: 33 84 49.

STOCKHOLM CITY HOSPITAL, Department of occupational medicine.

Chief: Doctor Åke Nyström
Assistant: Doctor Anna Andersson
Address: Södersjukhuset, Ringvägen 52, Stockholm
Telephone: 23 70 00.

INSTITUTE OF WORK PHYSIOLOGY
Chief: Doctor Nils Lundgren
Miss Astrid Lindholm S.M.
Mr Bruno Utbult
Mr Ulf Åberg

Research and studies on request from industry and forestry on work physiology etc.
Address: Kungl. Gymnastiska Centralinstitutet, Arbetsfysiologiska avdelningen, Lidingövägen 1, Stockholm.
Telephone: 20 42 57, 10 96 50.

SWEDISH EMPLOYERS' CONFEDERATION (SAF), Division for occupational health.
Chief of division: Professor Sven Forssman
Medical expert: Doctor Nils Masreliez
Industrial hygiene expert: Engineer Gideon Gerhardsson
Secretary: Mrs Siri Ernblad
Mrs Marie-Louise Hamilton
Address: Svenska Arbetsgivareföreningen, S. Blasieholmshamnen 4 A, III, Stockholm.
Telephone: 22 56 00.

COUNCIL ON PERSONNEL ADMINISTRATION
Consulting and research on human problems in industry.
Chief: Director Rolf Lahnhagen
Chairman of research group: Professor Sven Forssman
Address: Personaladministrativa Rådet, Warfvinges väg 26, Stockholm.
Telephone: 54 13 10.

ASSOCIATION OF SWEDISH INDUSTRIAL PHYSICIANS
Chairman: Doctor Carl-Axel Heijbel, Volvo-Skövde-Verken, Skövde
Secretary: Doctor Eric Bolinder, Svenska Metallverken, Västerås.

MEDICAL DEPARTMENT IN INDUSTRIES
Stockholm
L M Ericsson Telephone Company.
Chief medical officer: Doctor Nils Masreliez
Address: Telefon AB L M Ericsson, Midsommarkransen.
Telephone: 19 00 00

AB Elektrohelios, mechanical industry
Medical officer: Doctor Carl-Einar Håkansson
Address: AB Elektrohelios, Heliosvägen 12, Stockholm
Telephone: 44 93 20.

Outside Stockholm

ASEA, Factory for electrical equipment
Chief medical officer: Doctor Allan Hedfeldt
Address: ASEA, Västerås.
Telephone: 021/37020

Domnarfvets Jernverk, Iron and Steel industry
Chief medical officer: Doctor Johan Pontén
Address: Domnarfvets Jernverk, Domnarvet (near Borlänge)
Telephone: Borlänge 0243/11830

Sandvikens Jernverk, Iron and Steel Factory
Chief Medical Officer: Doctor Erland Lindus
Address: Sandvikens Jernverk, Sandviken.
Telephone: 026/54100.

For litterature see: S. Forssman, Industrial medicine in Sweden. Arch.Ind.Hyg.Occup.Med. 1952,6,407. (Nr 3)
S. Forssman, Functions of an industrial medical service. (Nr 16)
S. Forssman & Masreliez, N. Företagshälsovård. (Nr 60)

15.8.1961
SF/Hton

Paris, le 2 Juin 1967

Dr Erik BOLINDER

Medical Adviser to the Swedish
Confederation of Trade Unions

Landsorganisationen i Sverige

Barnhusgatan 18

STOCKHOLM C

(Suède)

Dear Colleague,

I thank you for your interesting letter and I am sure that your efforts are very useful.

I will not be able to attend the Tokyo Congress so I would like very much to participate to a special meeting in 1968. If Paris appears as a convenient place, we can meet in my laboratory.

Truly yours,

Professeur A. WISNER

LANDSORGANISATIONEN I SVERIGE
BARNHUSGATAN 18, STOCKHOLM

Telefon: 22 89 80
Telegramadress: "Landsorganisationen"
Postgiro: 850

Stockholm, May 2, 1967.

Docteur Alain Wisner
Laborat. de Physiologie du Travail
Conservatoire National des Arts et Metiers
41, rue Gay Lussac

PARIS V / Frankrike

Eder referens

Vår referens

Dear Colleague,

At the meeting for medical advisers within the trade-union movement held in Vienna in September 1966 it was decided that I should send a questionnaire to the participants in the meeting asking for information about their functions. This information was to be prepared by me and forwarded to the medical advisers showing an interest in future contacts.

At the Vienna meeting ten colleagues were present, seven of whom have contacted me afterwards. Below I give you a summary of their answers to the questionnaire.

Professor Herbert K. Abrams, M.D. The Chicago Medical School, 2755 West 15th Street, Chicago, Illinois 60608, USA.

The principle aim of the trade-union movement in the U.S. concerning health and sick care is to guarantee the members support in case of illness and disablement by establishing so-called health centers. Professor Abrams has been Medical Director of such a center serving a trade union and offering its members sick and accident care. The health center also deals with questions of occupational medicine but not with preventive programmes in the various companies.

According to new information Professor Abrams has now changed over

*

to teaching. He is also Director of Ambulatory Services (clinics, emergency department, home care service) for the Mount Sinai Hospital, and is Project Director for a Neighborhood Health Center sponsored by Mount Sinai Hospital and financed by federal grants from the Office of Economic Opportunity (Anti-poverty Program).

Dr. Erik Bolinder Medical Adviser, The Swedish Confederation of Trade Unions, Barnhusgatan 18, Stockholm C, Sweden.

The 38 trade unions in Sweden are united in a confederation. In questions about industrial safety and hygiene there is a close collaboration between the Swedish Confederation of Trade Unions and the Swedish Employers' Confedration via a joint committee called the Swedish Joint Industrial Council on Safety and Health. The parties on the labour market act quite independently in relation to the government.

The Swedish Confederation of Trade Unions as well as the Swedish Employers' Confederation have a medical adviser and they work with tasks of a similar kind, often in a close co-operation.

The medical adviser to the Swedish Confederation of Trade Unions has a full-time employment and his main task is to handle all questions of medical character. His duties are for example to make investigations in the field of industrial medicine, to plan and run education concerning industrial safety and medicine, to represent the Confederation in the boards of state institutes and other institutions, to develop and supervise the organization for industrial health services within the companies and to assist the trade unions with advice and aspects on occupational medicine.

Dr. Klaus Dror Department of Occupational Health, Health Insurance Institution, Kupat Holim, P.O.Box 11112, Tel-Aviv, Israel.

Dr Dror is full-time engaged administrative head of the Workers' Health Insurance Institution Kupat Holim, a voluntary sickness fund, founded and maintained by the General Federation of Labour in Israel. In this position he has the function as adviser to the confederation and to trade unions on occupational health policy and also handles questions of social insurance and preventive aspects of labour legislation. He

takes part in state investigations and is called in as an expert in questions regarding the development of preventive aspects of labour legislation, problems of development of occupational disease compensation and of rehabilitation of work accident victims. The position is quite administrative and does not comprise either medical care or questions of workmen's compensation.

Dr. Rudolf Hauf 78 Freiburg, Bernhardstrasse 7, Germany (BRD).

Dr. Hauf is not employed by a trade union organization but has nevertheless a certain influence within this sector, being a member of the trade union ÖTV and an elected member of the executive board of the "Bezirksfachabteilung Gesundheitswesen" of the land Baden-Württemberg. He also acts as an adviser to the federal directorate's department "Social Policy" of the "Deutsche Gewerkschaftsbund".

OMR Dr. H.-G. Häublein Zentrale Poliklinik der Bauarbeiter, 102 Berlin, Magazinstrasse 6-7, Germany (DDR).

Dr. Häublein is the head of a central research institute connected with a top organization for industrial safety which co-ordinates aspects and advice from the Ministry of Labour, the center of industrial hygiene and the trade unions.

There is a common scientific council for industrial safety with representatives from the Ministry of Labour, the research institute and the building trade union, taking up all questions concerning workers' protection and occupational medicine. Further, they attack problems from the working life, such as ergonomic and industrial hygiene questions, how to reach industrial safety and so on. They run education at different levels and they have a certain co-ordinating activity concerning the occupational health services at the various work places.

Dr. Robert Murray Medical Adviser, Trades Union Congress, Great Russell Street, London, W.C.1., Great Britain.

Dr. Murray has a full-time employment and his duties are as follows:

a) to advise the General Secretary on all aspects of occupational health;
b) to assist the secretaries of the various departments by advice, investigations and reports on occupational health problems arising within their sphere of influence;
c) to assist in promoting the development of occupational health services along sound lines;
d) to advise trade unions on general or specific occupational health problems;
e) to make preliminary investigations at the request of trade unions and with their support of cases or situations in which damage to workers' health has occurred or is considered likely to occur;
f) to advise on the need for more extensive investigation in particular cases and to assist in obtaining the necessary technical help;
g) to represent the TUC at committees, meetings, etc. concerned with occupational health;
h) to keep in touch with ministries, nationalised industries, universities and research laboratories;
i) to maintain active membership in professional societies;
j) to keep in touch with current literature;
k) to assist in teaching and research;
l) to maintain contact as far as possible with international industrial medicine.

Docteur Alain Wisner Laborat. de Physiologie du Travail, Conservatoire National des Arts et Metiers, 41, rue Gay Lussac, Paris V, France.

Docteur Wisner is director of a scientific institute and in this capacity he has contacts with employers' organizations as well as trade unions and social organizations. He does not want to be called medical adviser specially to trade unions.

Summing up I want to say that this list of doctors engaged in trade union problems within industrial safety and health confirms that there is every reason to establish closer contacts between the colleagues in question.

All of us work with the same object in mind. Differences in our programmes are mostly referred to the different types of trade union organizations and to different types of social community systems.

What we have to know is: a/ Is there an interest in arranging a special meeting for trade union doctors when we meet in Tokyo in 1969?

b/ Is there an interest in arranging a special meeting for trade union doctors in the meantime, for instance next year?

Please, send me a few lines telling your opinion.

Address: Landsorganisationen i Sverige
Barnhusgatan 18
STOCKHOLM C / Sweden

Yours sincerely,

Erik Bolinder
Medical Adviser to the Swedish
Confederation of Trade Unions

Pr. S. FORSMAN
Medical Adviser
Swedish Employer's Confederation
Industrihuset
Artillerigatan 34
STOCKHOLM
(Suède)

Dear Pr. FORSMAN,

I intend to visit SWEDEN and DENMARK in the first half of September. I am specially interested by the ergonomical progress done in Steel Works fore I am in charge of the coordination of a research programme on this field at the European Coal and Steel Community. I hope to visit some factory with Pr. LUNDGREN to which I have written.

I hope to be able to visit you if you are at STOCKHOLM at this time. But I would ask you also to tell me before to which swedish or dane ergonomists I can write to prepare contacts. I am interested in industrial application of ergonomics. My fields of research are noise, vehicle vibrations, work posture in monotonous tasks. As you see the areas are both physiological and psychological. I send you in this letter a list of my published papers to give you more precision.

I would like also very much to discuss with you some problems of the IEA. I am now a member of the Commitee as a representative of the French Speaking Society and I would like to help the definition of an agreement between my friend Pr. GRANDJEAN and my british friends. I am sure that you are also anxious to solve these problems.

I hope not to disturb you too much

Truly yours

A. WISNER

21th September 1965

Miss LINDHOLM
ARBETSFYSIOLOGISKA INSTITUTET
LIDINGOVAGEN 1
STOCKHOLM
(Suède)

Dear Miss LINDHOLM,

I am now back in my laboratory and have found all the work and difficulties that are our every day bread. But I remember with most pleasure my stay in Sweden and specially the travel I had the opportunity to have with you. All was very pleasant but in my memory, some stories about the childhood of your father and the life of the people in the North keep a real life in my mind.

I have not found the books I heped to find but I hope that you will acdeptesome of the "cats" of SINE

Truly yours

A. WISNER

21 th September 1965

Professor LUNDGREN
Arbetsfysiologiska Institutet
LIDINGOVAGEN 1
STOCKHOLM
(Suède)

Dear Pr. LUNDGREN,

It has been really very difficult for me to come back to my usual way of living. I have so deeply appreciate my stay in STOCKHOLM and in SWEDEN, yo your friendly hospitality, the effective organisation of your work.

It is really marvellous to see how much the Swedish people has unterstood that it was no more possible to let the workers suffer in the mines and plants when we know how to avoid it. I have seen how you establish this knowledge and how you teach it and let it exist in practice. I hope to use all this both in an usual work and in our new project at the European Coal and Steel Community.

I must say that among my souvenirs, the science of Ergonomics is not alone. I have described to many of my friends this marvellous daysyou offered me in your island. I think that the man who has not lived such a day cannot imagine the the dimensious of the Swedish soul.

Would you transmit to Mrs. LUNDGREN my dupest thanks and to you, son my best regards.

I must also ask you to be my interpret among the members of your stoff in the famous green house of LIDINGOVAGEN.

I hope to see you soon in France

Truly yours

21 th September 1965

Professor LUNDGREN
Arbetsfysiologiska Institutet
LIDINGOVAGEN 1
STOCKHOLM
(Suède)

A. WISNER

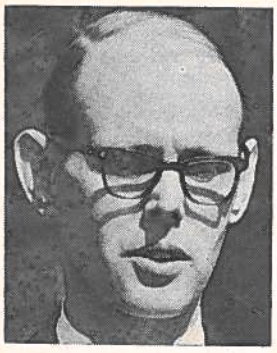
Albert Behnke

J. Appl. Physiol.

after 1960.

Manes Copaneller

Särtryck ur Läkartidningen nummer 3, 1965.



Wilhelm von Döbeln

Med dr Wilhelm von Döbeln är laborator i flygmedicin vid Statens medicinska forskningsråds försvarsmedicinska sektion.

FYSISK PROFIL

□ *Begreppet fysisk profil definieras. Den centrala betydelsen av den antropometriskt bestämda skelettvikten för bestämningen av fysisk profil framhålls. Synpunkter på användningen av skelettvikten vid bedömningen av kroppsvikten diskuteras. En ny metod att mäta fysisk kondition från pulsreaktionen på cykelergometertest beskrives. I denna ingår bestämningen av ett konditionstal i procent, som möjliggör jämförelse mellan individer av olika kroppsstorlek och ålder. En redogörelse lämnas för den med dessa metoder bestämda fysiska profilen hos 56 fältflygaraspiranter.*

Fysisk profil är en ordsammanställning, som hittills ej varit gängse varken i vardagssvenskan eller i det på språkliga nybildningar så rika medicinska fackspråket. Den har emellertid dykt upp i olika sammanhang, kanske framför allt i militärmedicinen. Den har då fått utgöra en samlingsbeteckning på sådana fysiska och fysiologiska variabler hos en individ, som visserligen icke behöver vara skiljemärken mellan den friske och den sjuke men som dock har betydelse för individens sociala eller militära anpassning. Kroppslängd är ett exempel på en i den fysiska profilen ingående variabel, man kan vara för lång eller för kort för att vara militärt användbar utan att man för den skull behöver vara sjuk. Andra i den fysiska profilen ingående egenskaper är t ex fysisk arbetsförmåga, kroppsvikt och eventuell övervikt.

Flygvapnets flygande personal utgör en grupp individer som är synnerligen väl övervakad i hälsoavseende. Vid antagningen av flygaspiranterna utföres en noggrann medicinsk undersökning vid flygvapnets medicinska undersökningscentral och kontrollundersökningar göres sedan årligen vid flygvapnets förband. Det ingår i undersökningarna att mäta vissa sådana egenskaper, som faller under rubriken fysisk profil. Nyligen har en del av dessa undersökningar detacherats till flygmedicinska laboratoriet vid GCI. Då härvid en del icke konventionella metoder används skall här en redogörelse lämnas för sådant som kan ha ett mera allmänt intresse.

Den del av undersökningen, som avser fysisk profil, tar en tid av sammanlagt cirka 10 minuter. Den omfattar kroppsmåtten vikt och längd samt skelettdiametrarna radioulnarbredd och femurkondylbredd på höger och vänster extremitet. Vidare utförs ett arbetsprov på cykelergometer i 6 minuter med en bromsad effekt av 147 Watt (900 kpm/min).

Ett i den fysiska profilen fundamentalt mått utgörs av *skelettvikten* (S). Denna beräknas från skelettmåtten med hjälp av en tabell, som tidigare publicerats i denna tidskrift (v Döbeln, Saltin & Stenberg, 1963). Skelettvikten utgör genomsntt-

ligt 20 % av den fettfria kroppsvikten och 40 % av den fett- och muskelfria kroppsvikten. Då den fettfria kroppens sammansättning varierar relativt obetydligt utgör skelettvikten ett användbart referensvärde för beräkningen av eventuell övervikt. Genom division av kroppsvikten (V) med den beräknade skelettvikten erhålls ett tal, som normalt varierar mellan 5 och 6.

I det enskilda fallet blir givetvis storleken av V/S kvoten delvis beroende på hur hög grad individens kroppssammansättning avviker från genomsnittet, där muskelvikten utgör 2,5 gånger skelettvikten. Hos magra personer kan en muskulär underutveckling resultera i att V/S kvoten understiger 5. Om en muskulärt underutvecklad individ har väl utvecklade fettdepåer kan V/S kvoten ändå ha normalt värde. Detta gäller framför allt äldre personer. Hos muskulärt väl utvecklade individer kan V/S kvoten vara något över 6 utan att fettdepåerna behöver vara särskilt betydande. I de flesta fall betyder dock en V/S kvot över 6 förekomsten av onödiga fettdepåer.

Det har tidigare visats, att den fettfria kroppsvikten utgör en lämplig parameter vid beräkningen av standardmetabolismen, »basalomsättningen» (v Döbeln 1956). På grund av sambandet mellan skelettvikt och fettfri kroppsvikt kan även skelettvikten användas vid beräkningen av normal basalomsättning. Uttryckt i Watt är den basala effekten $17{,}5 \cdot S^{2/3}$. (Om man vill ha värdet i ml 0_2/min gäller att 1 W = 2,93 ml 0_2/min vid ett kaloriskt värde av syret på 20,5 Joule/ml). Då maximal aerob effekt hos fysiskt vältränade unga män är känd (Åstrand 1952) och den genomsnittligt utgör 15 · standardmetabolismen, kan man för varje skelettvikt även beräkna den »ideala» aeroba max-effekten. Detta är sålunda den max-effekt en ung frisk man når genom lämplig träning. De standardvärden beträffande kroppens energiomsättning, som sålunda kan refereras till skelettvikten återfinns i Tabell I.

Den maximala aeroba effekten är emellertid beroende av åldern. Skall man beräkna ideal max-

TABELL I

Standardvärden för energiomsättning vid olika skelettvikter.

Skelettvikt Kg	»Basal» effekt, Watt	»Ideal» Watt	aerob max-effekt l 0_2/min
7	64,0	960	2,81
8	70,0	1050	3,08
9	75,7	1136	3,33
10	81,2	1219	3,57
11	86,6	1298	3,80
12	91,7	1376	4,03
13	96,8	1451	4,25
14	101,7	1525	4,47
15	106,4	1597	4,68
16	111,1	1667	4,88

effekt från skelettvikten hos personer på 30 år och däröver bör man därför använda de korrektionsfaktorer för åldern, som angivits av Irma Åstrand (1960).

I bestämningen av fysisk profil ingår även ett submaximalt arbetsprov på cykelergometer. Det har tidigare visats, att säkerheten i beräkningen av en försökspersons aeroba max-effekt från submaximal pulsreaktion blir större om skelettvikten ingår i beräkningen än om max-effekt beräknas på basis av pulsreaktionen enbart (v Döbeln et al. 1963).

Bästa sättet att från mätvärdena bestämma individens aktuella fysiska arbetsförmåga blir att använda ekvationen

Max aerob effekt (kW) =

$$0{,}11 \cdot K \cdot \left(S \frac{900}{\text{puls/min} - 60} \right)^{1/2}$$

där K är den ovan omnämnda ålderskorrektionsfaktorn.

Det är ibland värdefullt att känna den aktuella fysiska arbetsförmågan. Då den emellertid varierar med kroppsstorlek, ålder och träningstillstånd, utgör den icke ett idealiskt mått vid jämförelse mellan individer och grupper. Samma talvärde på fysisk arbetsförmåga har olika betydelse om det är uttryck för arbetsförmågan hos en liten fysiskt

vältränad individ eller en stor individ i dålig fysisk kondition. För att få ett vid sådana jämförelser mera användbart mått kan man beräkna kvoten mellan aktuell max-effekt och ideal max-effekt. Detta tal, som får enheten procent, uttrycker vad som i dagligt tal går under benämningen fysisk kondition och kan benämnas *konditionstal*.

Det så beräknade procenttalet för fysisk kondition uttrycker den testade försökspersonens fysiska arbetsförmåga i procent av vad en fysiskt vältränad man i försökspersonens ålder och av hans kroppsstorlek normalt skall ha. Då procenten är framräknad genom en division av två tal, som var för sig bör multipliceras med samma korrektionsfaktor för ålder, kommer denna faktor att vid uträkningen förkortas bort ur bråket. Därigenom blir olika åldersgrupper jämförbara.

För att förenkla beräkningen av konditionstalet från den vid arbestprovet räknade pulsen används Tabell II, där konditionstalet i procent direkt angivs. Om man även önskar beräkna den aktuella fysiska arbetsförmågan multipliceras den i Tabell I angivna ideala max-effekten med ålderskorrektionsfaktorn enligt Irma Åstrand (1960), varefter denna produkt multipliceras med konditionstalet.

Som framgår av Tabell II kan konditionstalet överstiga 100 %. Detta är fallet hos vältränade idrottsmän där max-effekt är större än 15 · basalomsättningen. Vill man bestämma konditionstalet hos dessa, måste testning ske med högre belastning än 147 Watt.

Den här beskrivna beräkningsmetoden gäller även för kvinnor. Dock kommer för kvinnor konditionstalen att ligga något lägre än för män med jämförbar sysselsättning. Denna skillnad är troligen biologiskt betingad och kan sammanhänga med det normalt lägre hämoglobininnehållet i blodet hos kvinnor. Vid testningen av kvinnor bör som regel en arbetsbelastning på cykeln av 98 Watt (600 kpm/min) eller lägre användas.

De här angivna metoderna har hittills använts

TABELL II. KONDITIONSTAL %

beräknat från skelettvikt och puls/min efter 5—6 min cykelarbete med bromsad effekt 147 watt (900 kpm/min).

	Skelettvikt									
Puls	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
120	117	115.	113.	111.	109.	107	106.	105.	103	102
2	115	113.	111.	109.	107	106.	104	103.	102.	101.
4	114.	111	109.	107	105	104.	102	101	100	99
6	112.	109	107	105	104.	102	101.	100.	99.	97
8	110	108.	106.	104.	102	101.	99	98	97	96
130	108	106	104	102	101.	99	98	97.	96.	95.
2	107	105.	103.	101.	99	98.	97.	95	94	93
4	106.	103	101	100.	98	97.	95	94	93	92
6	104	102.	100.	98	97.	95	94	93.	92.	91.
8	103.	101.	99.	97.	95	94	93.	92.	91.	90.
140	102.	100	97	96.	94	93.	92.	91.	90.	89.
2	100	98	96	95.	93	92.	91.	89	88	87
4	99	97.	95	93	92.	91.	89	88	87	86
6	98	96.	94	92	91.	90.	88	87	86	85
8	97.	95.	93.	91	90.	89.	87	86	85	84
150	96.	94.	92.	90	89.	88.	86	85	84	83
2	95.	93.	91.	89	88.	87.	85	84	83	83.
4	94.	92.	90.	88	87.	86.	85.	84.	83.	82.
6	93.	91.	89.	87	86	85.	84.	83.	82.	81.
8	92.	90.	88	86	85	84.	83.	82.	81.	80.
160	91.	89.	87	86.	84	83	82.	81.	80	79
2	90	88.	86	85.	83	82	81	80	79	78
4	89	87	85	84.	83.	81	80	79	78	78.
6	88	86	85.	83	82.	81.	80.	79.	78.	77.
8	87	85	84.	82	81	80.	79.	78.	77	76
170	87.	85.	83	82.	80	79	78	77	76	76.
2	86.	84.	82	81.	80.	79.	77	77.	76.	75.
4	85	83	82.	80	79.	78.	77.	76.	75.	74
6	84	83.	81.	80.	78	77	76	75	74	74
8	84.	82.	80	79.	78.	76	75	75.	74.	73.
180	83	81	80.	78	77.	76	75.	74.	73	72

Anm 1 Punkt efter siffra anger att denna är höjd genom decimalutjämning.

2 Tabellen gäller för belastning 450 | 600 | 1200 kpm/min
efter division av konditionstalet med 1,41 | 1,22 | 0,866

på 56 fältflygaraspiranter i åldern 17–24 år. De viktigaste vid undersökningen framkomna data angivs i Tabell III.

I fråga om längd och vikt överensstämmer medelvärden och standarddeviationer anmärkningsvärt väl med de av Broman et al. (1942) angivna normalvärdena för 20-åringar. Skelettvikten avviker icke nämnvärt från motsvarande värde hos GCI-elever. Detta gäller även V/S kvoten, som tyder på att den genomsnittliga fettmängden är densamma som hos GCI-elever, d v s omkring 10 %.

Pulsvärdet vid cykelergometerprovet är påfallande högt och konditionstalet i överensstämmelse

TABELL III

Medeltal ($\bar{M}$) och standarddeviationer (S.D.) av värden i fysisk profil hos 56 fältflygaraspiranter 17—24 år

	$\bar{M}$	S.D.
Längd cm	178,0	5,52
Vikt (V) kg	67,5	6,92
Skelettvikt (S) kg	12,13	1,01
V/S	5,56	0,40
Puls/min vid cykeltest 900 kpm/min	158,4	17,3
Konditionstal %	84,5	6,95

därmed lågt. En fråga av praktisk betydelse är om konditionstalet ger en bättre information än det obearbetade pulsvärdet. För att belysa denna fråga har materialet indelats i två lika stora grupper, den ena med skelettvikt $\geqq 12$ kg och den andra med skelttvikt < 12 kg. Medelvärden och medelfel på puls och konditionstal i de båda grupperna framgår av Tabell IV.

TABELL IV

	Skelettvikt		Diff.	Differensens signifikans
	$\geqq$ 12 kg	$<$ 12 kg		
Puls vid 900 kpm/min	152,7 ± 3,15	164,1 ± 3,11	11,4 ± 4,40	*
Konditionstal	86,2 ± 1,40	82,8 ± 1,16	3,4 ± 1,82	ej S

Av värdena framgår, att vid jämförelse mellan grupper med olika kroppsstorlek skillnader i pulstal icke alltid är uttryck för skillnader i kondition. Konditionstalet ger då en bättre information än det obearbetade pulstalet.

De hittills gjorda erfarenheterna tyder på att vid bestämning av fysisk profil minst följande värden bör ingå:

1) Ålder, år.
2) Kroppslängd, cm.
3) Skelettvikt, kg.
4) Kroppsvikt, kg.
5) V/S kvot eller vikt över 6 · S.
6) Konditionstal, %.

Litteratur

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SVENSKA TRYCKERI BOLAGEN STB AB STOCKHOLM 1965

LUNDGREN 7.9

- Fondation remplaçant - licenciellement
- Appel : relation personnelle entre de Lundgren / Clergy
  remplaçant au licenciement
- 1. visite de Lundgren
  - quel est le problème
  - accord de Tann sur publication
  intérieure renouvelée
- durée 3 ou 4 jours
  4 - 5 personnes
  tout un atelier (par de moyen)
  1 durée du travail et dépenses -
  2 équipes prise de contacts manuelle 30 fois
  dans le journal (10 types par examen)
- examen systématique
  Table
  voids déduit fin janvier / peser liquides aliments

– A l'arrêt du travail, le sujet s'assure

– prise de température rectale

10 fois par jour (rare)

– mesure – poids

– drainage

– décalage (globe) → cela

montre une sudation et la thermique stable.

– mesure de force – poigne

– flexion de l'avant-bras

– lever du tronc (assis)

– Profils mesure O^2 partiel

– Beckman

– Haldane.

~~retard~~ – rapide – descente rapide

du résultat ~~retard~~ avant rapide

– relevé 1 an après

MAX AEROB EFFEKT (KILOWATT)

beräknad från skelettvikt och puls/min. efter 5-6 min. cykelarbete med bromsad effekt 147 watt (900 kpm/min.).

	Skelettvikt									
Puls	7	8	9	10	11	12	13	14	15	16
120	1,13	1,20	1,28	1,35	1,41	1,48	1,54	1,59	1,65	1,70
1	1,12	1,19	1,27	1,34	1,40	1,46	1,52	1,58	1,64	1,69
2	1,11	1,19	1,26	1,33	1,39	1,45	1,51	1,57	1,62	1,68
3	1,10	1,18	1,25	1,32	1,38	1,44	1,50	1,56	1,61	1,66
4	1,09	1,17	1,24	1,30	1,37	1,43	1,49	1,54	1,60	1,65
5	1,08	1,16	1,23	1,29	1,36	1,42	1,48	1,53	1,59	1,64
6	1,08	1,15	1,22	1,28	1,35	1,41	1,47	1,52	1,57	1,62
7	1,07	1,14	1,21	1,27	1,34	1,40	1,45	1,51	1,56	1,61
8	1,06	1,13	1,20	1,27	1,33	1,39	1,44	1,50	1,55	1,60
9	1,05	1,12	1,19	1,26	1,32	1,38	1,43	1,49	1,54	1,59
130	1,04	1,12	1,18	1,25	1,31	1,37	1,42	1,48	1,53	1,58
1	1,04	1,11	1,18	1,24	1,30	1,36	1,41	1,47	1,52	1,57
2	1,03	1,10	1,17	1,23	1,29	1,35	1,40	1,46	1,51	1,56
3	1,02	1,09	1,16	1,22	1,28	1,34	1,39	1,45	1,50	1,54
4	1,02	1,08	1,15	1,21	1,27	1,33	1,38	1,44	1,49	1,53
5	1,01	1,08	1,14	1,20	1,26	1,32	1,37	1,43	1,48	1,52
6	1,00	1,07	1,14	1,20	1,26	1,31	1,37	1,42	1,47	1,51
7	1,00	1,06	1,13	1,19	1,25	1,30	1,36	1,41	1,46	1,50
8	0,99	1,06	1,12	1,18	1,24	1,29	1,35	1,40	1,45	1,49
9	0,98	1,05	1,11	1,17	1,23	1,29	1,34	1,39	1,44	1,49
140	0,98	1,04	1,11	1,17	1,22	1,28	1,33	1,38	1,43	1,48
2	0,96	1,03	1,09	1,15	1,21	1,26	1,31	1,36	1,41	1,46
4	0,95	1,02	1,08	1,14	1,19	1,25	1,30	1,35	1,39	1,44
6	0,94	1,01	1,07	1,13	1,18	1,23	1,28	1,33	1,38	1,42
8	0,93	0,99	1,06	1,11	1,17	1,22	1,27	1,32	1,36	1,41
150	0,92	0,98	1,04	1,10	1,15	1,20	1,25	1,30	1,35	1,39
2	0,91	0,97	1,03	1,09	1,14	1,19	1,24	1,29	1,33	1,38
4	0,90	0,96	1,02	1,08	1,13	1,18	1,23	1,27	1,32	1,36
6	0,89	0,95	1,01	1,07	1,12	1,17	1,22	1,26	1,30	1,35
8	0,88	0,94	1,00	1,05	1,11	1,15	1,20	1,25	1,29	1,33
160	0,87	0,93	0,99	1,04	1,09	1,14	1,19	1,23	1,28	1,32
2	0,86	0,92	0,98	1,03	1,08	1,13	1,18	1,22	1,27	1,31
4	0,86	0,91	0,97	1,02	1,07	1,12	1,17	1,21	1,25	1,29
6	0,85	0,91	0,96	1,01	1,06	1,11	1,16	1,20	1,24	1,28
8	0,84	0,90	0,95	1,00	1,05	1,10	1,14	1,19	1,23	1,27
170	0,83	0,89	0,94	0,99	1,04	1,09	1,13	1,18	1,22	1,26

W.v.Döbeln, Flygmed.lab., G C I, Lidingövägen 1, Stockholm Ö

S K E L E T T V I K T

beräknad från kroppslängd och skelettdiametrar (cm)

Längd	(hö + vä radioulnarbredd).(hö + vä femurkondylbredd)												
	150	160	170	180	190	200	210	220	230	240	250	260	270
150	7,2	7,5	7,8	8,2	8,5	8,8	9,1	9,4	9,7	10,0	10,3	10,6	10,9
1	7,2	7,6	7,9	8,3	8,6	8,9	9,2	9,5	9,8	10,1	10,4	10,7	11,0
2	7,3	7,7	8,0	8,3	8,7	9,0	9,3	9,6	9,9	10,2	10,5	10,8	11,1
3	7,4	7,7	8,1	8,4	8,7	9,1	9,4	9,7	10,0	10,3	10,6	10,9	11,2
4	7,5	7,8	8,1	8,5	8,8	9,1	9,5	9,8	10,1	10,4	10,7	11,0	11,3
5	7,5	7,9	8,2	8,6	8,9	9,2	9,6	9,9	10,2	10,5	10,8	11,1	11,4
6	7,6	7,9	8,3	8,6	9,0	9,3	9,6	10,0	10,3	10,6	10,9	11,2	11,5
7	7,7	8,0	8,4	8,7	9,1	9,4	9,7	10,1	10,4	10,7	11,0	11,3	11,6
8	7,7	8,1	8,5	8,8	9,1	9,5	9,8	10,2	10,5	10,8	11,1	11,4	11,7
9	7,8	8,2	8,5	8,9	9,2	9,6	9,9	10,2	10,6	10,9	11,2	11,5	11,9
160	7,9	8,2	8,6	9,0	9,3	9,7	10,0	10,3	10,7	11,0	11,3	11,6	12,0
1	7,9	8,3	8,7	9,0	9,4	9,7	10,1	10,4	10,8	11,1	11,4	11,7	12,1
2	8,0	8,4	8,8	9,1	9,5	9,8	10,2	10,5	10,9	11,2	11,5	11,9	12,2
3	8,1	8,5	8,8	9,2	9,6	9,9	10,3	10,6	11,0	11,3	11,6	12,0	12,3
4	8,2	8,5	8,9	9,3	9,6	10,0	10,4	10,7	11,1	11,4	11,7	12,1	12,4
5	8,2	8,6	9,0	9,4	9,7	10,1	10,4	10,8	11,2	11,5	11,8	12,2	12,5
6	8,3	8,7	9,1	9,4	9,8	10,2	10,5	10,9	11,2	11,6	11,9	12,3	12,6
7	8,4	8,8	9,1	9,5	9,9	10,3	10,6	11,0	11,3	11,7	12,0	12,4	12,7
8	8,4	8,8	9,2	9,6	10,0	10,4	10,7	11,1	11,4	11,8	12,1	12,5	12,8
9	8,5	8,9	9,3	9,7	10,1	10,4	10,8	11,2	11,5	11,9	12,2	12,6	13,0
170	8,6	9,0	9,4	9,8	10,2	10,5	10,9	11,3	11,6	12,0	12,3	12,7	13,1
1	8,7	9,1	9,5	9,9	10,2	10,6	11,0	11,4	11,7	12,1	12,4	12,8	13,2
2	8,7	9,1	9,5	9,9	10,3	10,7	11,1	11,5	11,8	12,2	12,6	12,9	13,3
3	8,8	9,2	9,6	10,0	10,4	10,8	11,2	11,6	11,9	12,3	12,7	13,0	13,4
4	8,9	9,3	9,7	10,1	10,5	10,9	11,3	11,7	12,0	12,4	12,8	13,1	13,5
5	8,9	9,4	9,8	10,2	10,6	11,0	11,4	11,7	12,1	12,5	12,9	13,2	13,6
6	9,0	9,4	9,9	10,3	10,7	11,1	11,5	11,8	12,2	12,6	13,0	13,3	13,7
7	9,1	9,5	9,9	10,3	10,8	11,2	11,5	11,9	12,3	12,7	13,1	13,4	13,8
8	9,2	9,6	10,0	10,4	10,8	11,2	11,6	12,0	12,4	12,8	13,2	13,6	13,9
9	9,2	9,7	10,1	10,5	10,9	11,3	11,7	12,1	12,5	12,9	13,3	13,7	14,0
180	9,3	9,7	10,2	10,6	11,0	11,4	11,8	12,2	12,6	13,0	13,4	13,8	14,1
1	9,4	9,8	10,3	10,7	11,1	11,5	11,9	12,3	12,7	13,1	13,5	13,9	14,3
2	9,5	9,9	10,3	10,8	11,2	11,6	12,0	12,4	12,8	13,2	13,6	14,0	14,4
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6	9,8	10,2	10,7	11,1	11,5	12,0	12,4	12,8	13,2	13,6	14,0	14,4	14,8
7	9,8	10,3	10,7	11,2	11,6	12,1	12,5	12,9	13,3	13,7	14,1	14,5	14,9
8	9,9	10,4	10,8	11,3	11,7	12,2	12,6	13,0	13,4	13,8	14,2	14,7	15,1
9	10,0	10,4	10,9	11,4	11,8	12,2	12,7	13,1	13,5	13,9	14,4	14,8	15,2
190	10,1	10,5	11,0	11,4	11,9	12,3	12,8	13,2	13,6	14,0	14,5	14,9	15,3
1	10,1	10,6	11,1	11,5	12,0	12,4	12,9	13,3	13,7	14,1	14,6	15,0	15,4
2	10,2	10,7	11,2	11,6	12,1	12,5	13,0	13,4	13,8	14,2	14,7	15,1	15,5
3	10,3	10,8	11,2	11,7	12,2	12,6	13,1	13,5	13,9	14,4	14,8	15,2	15,6
4	10,4	10,8	11,3	11,8	12,2	12,7	13,2	13,6	14,0	14,5	14,9	15,3	15,7
5	10,4	10,9	11,4	11,9	12,3	12,8	13,3	13,7	14,1	14,6	15,0	15,4	15,9

W.v.Döbeln, Flygmedicinska laboratoriet, G.C.I., Lidingövägen 1, Stockholm Ö

SVEN FORSSMAN
PROFESSOR, M.D.
MEDICAL ADVISOR TO THE
SWEDISH EMPLOYER'S CONFEDERATION

Genève
~~STOCKHOLM~~ 6 August 19 65

Professor A. Wisner
Conservatoire National des Arts & Métiers
41, Rue Gay-Lussac - V^e
PARIS

Dear Professor Wisner,

Thank you very much for your letter which has been forwarded to me in Geneva. I am there working with the World Health Organization as Chief of their Unit on Social and Occupational Health from the 1st of April until the end of the year.

I am sorry that I will not be able to see you in Stockholm in September but I have asked my colleagues Doctor Nils Masreliez and Mr Gideon Gerhardsson, Chief Industrial Hygiene Engineer, to arrange for your programme. I would suggest that you will visit Professor Nils Lundgren and his laboratory and also to see the office of me and my colleagues at the Swedish Employers Confederation.

On steel works and other industries I would suggest that you will visit the Volvo factories in Gothenburgh (Dr Adolf Yllö) and in Skövde (Dr C.A. Heijbel), the steelworks Domnarfvet (Dr Eric Dahlgren and Dr Åke Gessbo), and concerning mines, LKAB, Malmberget, Gällivare (Dr K.G. S:t Clair Renard) and LKAB, Kiruna (Dr Harold Jörgensen).

SVENSKA ARBETSGIVAREFÖRENINGEN

In case you would come to Geneva I will be very glad to see you and to discuss some problems of the IEA. I am glad to hear that you are now a member of the Committee as representative of the French speaking society.

I will be in Geneva except 12/8 - 3/9 and 10-24/10. Please let me know in advance if you are coming to Geneva.

Best wishes

Yours sincerely

Sven Forssman

/Sven Forssman/

My address in Geneva is:
9 Avenue de Budé
Apartement nr 923
GENEVA

/SEd

20 Septembre 1965

Monsieur le Directeur Général
de Problèmes du Travail
à l'attention de Mr. CARPENTIER
Haute Autorité de la CECA
29, rue Aldringer
LUXEMBOURG
(Grand-Duché de Luxembourg)

Monsieur le Directeur,

J'ai l'honneur de vous faire parvenir ci-joint en 3 exemplaires la demande de remboursement des frais de mon voyage et de mon séjour à STOCKHOLM et en SUEDE, ainsi que deux exemplaires de la demande de subvention revêtus de votre accord.

Ce voyage a eu l'utilité que j'espérai et ma permis de voir le grand effort réalisé en Suède pour l'amélioration des conditions de travail avec l'aide des ergonomistes et en particulier du Pr. LUNDGREN. J'espère qu'il nous sera possible de réaliser pour les 6 pays un effort comparable.

Veuillez agréer, Monsieur le Directeur, l'expression de ma parfaite considération.

A. WISNER

Haute Autorité de la CECA
29, rue Aldringer
LUXEMBOURG
(Grand-Duché de Luxembourg)

THE DANISH NATIONAL ASSOCIATION FOR INFANTILE PARALYSIS

5, Tuborgvej, Hellerup, Denmark

PATRONESS: HER MAJESTY THE QUEEN

Hellerup 5th August 1965.
EA/1

10 14

Dr. A. Wisner
Consevatoire National
des Arts & Metiers
41, Rue Gay-Lussac - V^E,
Paris.

Dear Dr. Wisner,

I shall be very pleased to see you here in København, preferably on Tuesday 14th as I may be on a holiday-trip on the 6th. However, even if you came the 6th you will be wellcome and my co-workers will show you our institute.

Hellerup is a suburb of København, within a short taxi-drive from the centre.

With best regards,
Sincerely yours,

Erling Asmussen.

UNIVERSITETETS GYMNASTIKTEORETISKE
LABORATORIUM
JULIANE MARIES VEJ 35
KBHVN. Ø

NOTE POUR LES VISITEURS

1. Sous peine de poursuites judiciaires, il est interdit à toute personne étrangère au service de photographier, prendre des notes ou décrire les terrains et installations visités.
   Il n'est pas non plus permis d'emporter d'appareil photographique au cours de la visite.

2. Les visiteurs sont priés de ne pas fumer à l'intérieur de l'enceinte des usines. Dans certains locaux, l'interdiction est formelle.

3. Durant la visite, les visiteurs sont priés de ne pas s'éloigner de leur guide et de ne pas gêner le travail en cours.

4. L'accès aux usines n'est accordé qu'à la condition que les visiteurs s'engagent:
   à **ne pas** révéler les renseignements pouvant leur être communiqués au sujet des installations, fabrications et autres, renseignements qui sont à considérer comme confidentiels, et
   à **ne pas** faire de publicité concernant la visite.

5. Il est entendu que toute personne qui visite les installations de la société après avoir pris connaissance de ce qui précède accepte les règlements et conditions mentionnés ci-dessus.

Bofors, mai 1963

Aktiebolaget Bofors
Sverre R:son Sohlman

1193 d
Juni 63
AB KARLSKOGA BOKTR.

ARBETSFYSIOLOGISKA INSTITUTET ÆI LIDINGÖVÄGEN 1 - STOCKHOLM Ö - TELEFON 20 42 57, 10 96 50, 21 91 47

Chrono

Philip ~~John~~ Jansson
Surbrunnsgatan 26
Stock NW

Dr. A. Wisner
Sous-Directeur
Centre National de la Recherche Scientifique
Laboratoire de Physiologie du Travail
41, rue Gay-Lussac
PARIS V:e
France

NL/GHC
4th May, 1965

Dear Dr. Wisner,

Thank you very much for your letter of April 9th. I am sorry that my reply is a little delayed.

It was really very nice to hear from you again and I am also very glad to hear that you are planning to visit us in Stockholm. For our part, September or October would be convenient; as far as I know the whole staff of our institute will be at home at that time and, thus, be available for discussions with you. It will be very valuable for us to be able, in this way, to profit from your great experience. I may mention in this connection that we have a Hungarian engineer with us at present, who is a specialist on machine ergonomics and who intends to take up some problems on forestry and agriculture machinery which he will be very glad to discuss with you.

We are sending some reprints by separate mail.

Looking forward to hearing from you again,

Kind regards,
Yours sincerely,

Nils Lundgren

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

LABORATOIRE DE PHYSIOLOGIE DU TRAVAIL

41, RUE GAY-LUSSAC, PARIS V°

TÉL. : ODÉON 18-27

Paris le I3 th May I965

N. LUNDGREN

Professor ~~Nilslundgren~~

Arbetsfysiologica Institutet

Lidingövägen I

STOCKHOLM Ö

Suède

Dear P. LUNDGREN,

I have been very happy to receive your kind answerof 4 th May and to learn that you were able to receive me in some monthes. I have also read the papers you send me and have much appreciate your simultaneous approahh, scientific and technical.

During this visit, I would like very much to see how you manage when you are called in a factory to give some advice and evaluate the work load. Do you think that at this time of the year you will be engaged in some field work of this sort .

As I have writen in my first letter, I can travel in September and October before the beginning of the academic year but, I would certainly prefer the earliest part of this period, the first two veeks of September.

I am certainly rude in telling you so roughly what I hope but what I want above all is to determine in your time schedule as little disturbance as possible.

I send you under separate cover four paper we have published in English.

With my best thanks,

Truly yours ,

A.WISNER

CONSERVATOIRE NATIONAL
DES
ARTS & MÉTIERS

CHAIRE DE PHYSIOLOGIE
DU TRAVAIL

41, RUE GAY-LUSSAC - Ve

PARIS, LE 26 th July 1965

Dr.ASMUSSEN
Danish National Association for Infantil
paralysis
TUBOREJ 5
HELLERUP Danemark.

Dear Dr.ASMUSSEN,

I have the pleasure to be able to visit P.LUNDGREN and P.FORSSMAN in Sweden. But, I would loss very much without visiting you in KØBENHAUN . I know how many interesting things you are doing and you may perhaps help me to visit another danish scientist interested in Ergonomics. I will be in KØBENHAUN Monday the 6 th September and, il necessary, tuesday the 14th, but this other stay problematic.

I hope not to disturb you too much.

Truly yours,

A. WISNER

Can you explain me what is the way to go from KØBENHAUN to HELLERUP

CONSERVATOIRE NATIONAL
DES
ARTS & MÉTIERS

CHAIRE DE PHYSIOLOGIE
DU TRAVAIL

41, RUE GAY-LUSSAC - Ve

PARIS, LE 26 th July.1965

Pr. S.FORSSMANN
Medical Adviser
Swedish Employer's Confederation
Industrihuset.
Artillerigatan 34
STOCKHOLM
(Suède)

Dear Pr.FORSSMAN

As I hoped, I will be in Sweden at the beginning of September. I will arrive at STOCKHOLM the 6th in the evening and will call you office the 7th.

If you can receive me and tell me which Swedish ergonomist, I can meet it will be a great pleasure formme.

As you know, I am specially interested in steel works and mining a physiological and psychological point of view.

I hope not to disturb you too much.

Truly yours,

A. WISNER

JAN EKSTEDT

Dept. de Pharmacologie
Université d'Uppsala
Suède
Tel: 14 10 57

(Privé:
TUVÄNGSVÄGEN 14.
Tel 29842.

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

LABORATOIRE DE PHYSIOLOGIE DU TRAVAIL

41, RUE GAY-LUSSAC, PARIS V^e^

TÉL. : ODÉON 18-27

9 April 1965

Professeur LUNDGREN

Institut of Work Physiology

Gymastika Central Institutet

STOCKHOLM

(Suède)

Dear P. LUNDGREN,

Since I had the pleasure to meet you at Stockholm and after at Dublin, I have admired your method of ergonomic action in Industry. I have dreamed to visit you and specially to accompany your group in a study in a plant.

I am now in charge of a project that aim to organise such ergonomic action and I have the time and money to pay this visit. But I am afraid to disturb you. If it is not too much the case do you think that September or October of this year would be convenient ?

If you have some new writings on Ergonomics would you be so kind to send them to me.

Truly yours,

Dr.A.WISNER

Sous- Directeur.

Voyage de Septembre

avion	Départ de PARIS	2	9 H 45	Accepté	
	Arrivée STRASBOURG	2	10 H 55		
Train	Départ STRASBOURG	2	17 H 33	APPENWEIER	18 H 06
	Arrivée FRANCFORT	2	21 H 47		18 H 15
				KARLSRUHE	19 H 03
Francfort	Hotel	2.3		HEIDELBERG	20 H 06
	Institut	3		FRANCFORT	21 H 47
				HAMBOURG	
Avion	Départ FRANCFORT	3	20 H		
	Arrivée COPENHAGUE	3	21 H 20		
Copenhague	Hotel	3.6			
Avion	Départ COPENHAGUE	6	19 H 45		
	Arrivée STOCKHOLM	6			
Stockholm		6.15			
	Départ STOCKHOLM	15	9 H 50		
	Arrivée PARIS	15	13 H 30		

Tarif

S K F

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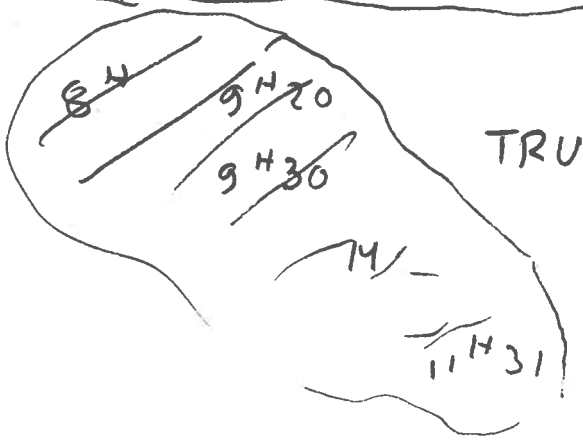

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SI ville FRANCFORT

VIERKEHRSAMT

HAUPTBAHNHOF

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12 H 30	13 H 40
15 H 10	16 H 15
18 H 55	20 H 5

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20 H	21 H 20

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7 H 30	
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16 H	19 H 40

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12 rue de Castiglione

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Paris Stockholm simple 1144 fr.

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L I S T O F A C T I V E M E M B E R S

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30	Anglais
28	Hollandais
19	Finlandais
14	Americains
11	Allemands
9	Francais
8	Danois
4	Suisse
3	Norvegiens
3	Sud Africains
2	Luxembourg
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1st INTERNATIONAL CONGRESS ON ERGONOMICS

1er CONGRES INTERNATIONAL DE BIOTECHNOLOGIE

1. INTERNATIONALER KONGRESS FÜR BIOTECHNOLOGIE

STOCKHOLM 1961

E P A

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DU TRAVAIL

DEMANDE DE SUBVENTION POUR VOYAGE D'ETUDE

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DATE: 29 Juillet 1965

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2) En cas de prolongation nécessaire de la mission, il y a lieu d'établir une demande supplémentaire pour faire régulariser cette prolongation.

REGLEMENT

RELATIF AUX FRAIS DE VOYAGE ET DE SEJOUR D'ETUDE

L'institut envoyant en mission (voyage d'étude) un de ses collaborateurs, en accord avec la Haute Autorité, a droit:

1. Au remboursement des frais de voyage du lieu de départ au lieu de destination et vice-versa:
   - en chemin de fer, 1ère classe, sur la base de l'itinéraire le plus court;
   - pour les voyages comportant un parcours nocturne de plus de six heures, au remboursement du prix du wagon-lit sur présentation du bulletin;
   - pour les voyages en avion, au remboursement du prix du billet sur présentation de ce dernier;
   - pour les voyages effectués en voiture personnelle, à un remboursement correspondant au coût du parcours en chemin de fer (1ère classe), sur la base de l'itinéraire le plus court, sans toutefois pouvoir y comprendre le coût du wagon-lit. Seul celui qui a la charge de la voiture peut réclamer le remboursement de ces frais, les autres experts en mission, dans les mêmes conditions de remboursement des frais de voyage, qui voyagent dans la même voiture n'y ont pas droit.
2. A une indemnité forfaitaire de frs.b. 950 par jour pour les experts allant à un lieu situé à 50 km ou plus, et de frs.b. 500 pour ceux allant à un lieu situé à une distance inférieure à 50 km.

   Mission d'une durée supérieure à 24 heures:
   - pour chaque période de 24 heures: indemnité journalière;
   - pour la période résiduelle inférieure à 6 heures: pas de remboursement;
   - pour la période résiduelle comprise entre 6 hrs et 12 hrs: moitié de l'indemnité journalière;
   - pour la période résiduelle supérieure à 12 heures: indemnité journalière.
3. Toutes demandes d'indemnité ou de remboursement des frais de voyage dépassant ceux prévus dans ce réglement, devront être soumises par l'Administration au Président de la Haute Autorité ou à son délégué pour approbation, après avoir été dûment justifiées.
4. Le paiement des indemnités et le remboursement des frais de voyage pourront s'effectuer en espèces en francs belges à Luxembourg, ou par virement, au cours officiel de la Haute Autorité, à une banque désignée par l'Institut, de la contrevaleur en monnaie nationale de son pays de résidence.