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an engine can be shut down entirely, all but major repairs effected, and placed back in operation again, with no appreciable difference in the airplane's flying ability. And engine failures account for 12.10 per cent of fatal airline accidents.

Large aircraft, too, are flown with a different technique. The flight deck on the trans-ocean clippers, for instance, is the same size as the passenger cabin on the largest of our present land transports. This flight deck is reserved for the flight crew. Instead of the usual pilot-copilot combination, these clippers are flown by a crew of five primary flight officers—with five reserve officers—under the direct command of a captain who graduated to this position of trust and of responsibility through a minimum of seven years of study and training. Under the captain, the primary flight functions normally handled by the pilot copilot are divided into separate flight stations—administration, piloting, navigation, radio communication, engineering. Each of these posts is manned by a specialist, trained for that particular task. These flight officers stand watch and are relieved at regular periods and return to their own living quarters aboard ship.

Through years of training, of study and actual experience, these multiple crews function as one man and make possible, for the first time in long distance transport aircraft, the achievement of scientific flight conduct, a system which, under the command of the Captain provides for a triple check on all primary factors, which lessens strain without lessening responsibility, which is designed to effect the highest attainable level of personal efficiency. And personnel errors account for nearly 40 per cent of fatal airline accidents.

These factors, many of which are intangible to those engineering applications for the first time on the trans-ocean clippers, where the facilities were built into the design of the original aircraft—are incorporated in the technique of international over-water flying. They are basic to a record of 171,871,000 over-water passenger miles, without a fatal accident in flight.

The safety record of transoceanic and transcontinental air transport did not just grow. It is the result of deliberate effort, of painstaking care, of endless research and test. Air travel, as we know it today, is purely a concept of this generation. It has had to make its way, from the start, in competition with the matured safety records of the older forms of transport. It has had to struggle with the principles of increased danger inherent in any type of high-speed travel—and we have the fastest ever known to man. But, because of these very reasons, more effort has been continuously and forcefully exerted to raise the standard of airline safety than that lavished in any similar period of development on any other means of transport.

This extraordinary effort has not come alone from within the industry itself. The encouraging results are, in a real measure, due to the tireless cooperation which the air transport industry has received from outside agencies such as the National Advisory Committee for Aeronautics, our Government's great research organization, and the Civil Aeronautics Authority, whose diligent efforts to effect greater airline safety stand out as a signal achievement of their first full year in office. In fact, all having to do with aviation have shared in the early recognition, by the air transport industry, of its responsibility toward the public in the matter of safety. These combined elements all continue as active as ever today in their common goal. Their support offers the promising possibility that aviation can eventually be made the safest form of travel known to man.

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Precautionary Measures

Workmen unloading bulk lime from cars should wear close fitting goggles and a double band, dust tight respirator. The clothing at the neck hands and feet should be close fitting.

Before handling the lime, all exposed parts of the body should first be treated with linseed oil or unguentine. (Unguentine is better than linseed oil as it contains disinfectants to prevent infection.)

Workmen engaged in slaking lime should wear goggles and tight fitting clothing at the neck hands and feet.

A drinking fountain should be located near where the material is to be handled.

Quick action is required when the eye is burned. It should be thoroughly flushed with plenty of water. If a drinking fountain is available hold the eye open and flush thoroughly. Then use a 2 per cent solution of ammonium chloride as a neutralizer, continuing at half hour intervals for the first twenty four hours.

The patient should be immediately placed in the care of an experienced physician.

The recent development of container cars for shipments of lime has made it possible to eliminate the hand unloading of the bulk product. Whenever the amount of lime consumed is of a large enough quantity, it is recommended that containers be used.

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quality of the negative produced with the proper choice of fine grained film, makes it possible to make enlargements of any desirable size. By the use of auxiliary lenses, copies can be made of photographs, drawings, manuscripts, or other flat material. The scope of the miniature camera is almost unlimited for those who desire to collect and prepare material for group presentation. Practically anything that can be photographed can be readily transformed into a slide or strip film for projection.

One other outstanding advantage of the miniature is the use of 35 mm color film which costs in that size an average of $2.50 per roll of 18 exposures including processing, an average of 14 cents per frame. There are two types of color film now available.

Both of these color films are available in larger sizes but the cost is prohibitive for non-commercial use nor are they so readily adaptable to inexpensive projection.

Over the past year or so, I have about come to the conclusion that two cameras offer the ideal outfit. The second camera should be of the type having ground glass focusing and adapted to the use of cut film and film pack. Outstanding examples of this type camera are easily procurable.

Let's take a look at the projector problem. As with the camera, the heart of the projector is its optical system. Here again it is necessary to rely upon the integrity and reputation of the manufacturer.

Projectors belong in one of four separate classes, depending upon design.

1. The opaque projector- designed to project pictures, pages of books, drawings, etc. by reflection. In general these are less efficient, watt for watt, than other types of projectors. Hence the illuminating system must be more powerful to offset light loss by reflection.

2. The standard slide projector for either 3¼ x 4 inch or 2 x 2 inch slides.

3. The strip or slide film projector for 35 mm film.

4. The sound strip film projector. Usually consisting of a sound unit operating in conjunction with a strip film projector. The projector may or may not be automatically synchronized to the sound record.

In some cases combinations of the foregoing are available. The opaque projector usually incorporates a slide unit and the strip film projector may be readily adapted for 2 x 2 inch glass slides.

In selecting a projector, the basic governing factors are:

1. The material to be presented. Pictures, slides or strip films.

2. The size of the audience or the size of the average room in which it is to be used.

3. Portability.

4. Ventilation of lamp housing and subject matter.

A combination of items 1 and 2 usually defines the size and type projector necessary. In most cases a combination unit is desirable in the interest of greater flexibility. It may also be necessary to procure two lenses of different focal length for the projector particularly if a variety of room sizes may be encountered. The shorter the distance between the projector and the screen, the shorter the focal length of the projection lens. For the average projector, a variety of projection lenses are usually available.

The question of portability is more or less self explanatory and is governed almost entirely by the local situation. Too much in the way of durability and projection power should not be sacrificed to portability. I believe that the power of a projector lamp should not be reduced below 200 watts.

Speaking of power, my preference is for a projector using a projector bulb of from 500 to 750 watts. A size larger than this requires a special power circuit which may not be available where needed. In projectors using projection bulbs larger than 300 watts some means of forced draft ventilation must be included. Otherwise damage to the slides or pictures being projected is almost inevitable. Then too, the bulb itself may be damaged by excessive heat.

Occupational Disease Control

THURSDAY MORNING SESSION

October 19, 1939

The session planned for the discussion of problems in industrial occupational disease control was called to order by A. S. Johnson, Assistant to the Manager, Engineering Department, American Mutual Liability Insurance Company, Boston, Mass., who presided. The problems were presented as a panel discussion, and Chairman Johnson introduced the members of the panel, as follows:

Roy S. Bonsib, Chief Safety Inspector, Standard Oil Company of New Jersey, New York City.

Warren A. Cook, Division of Industrial Hygiene and Engineering Research, Zurich General Accident & Liability Insurance Company, Chicago

Dr. A. G. Cranch, Industrial Toxicology Department, Union Carbide Company, New York City.

Dr. Leonard Greenburg, Executive Director, Division of Industrial Hygiene, New York State Department of Labor, New York City.

Willis G. Hazard, Personnel Division, Owens-Illinois Glass Company, Toledo, O.

Dr. E. G. Meiter, Director, Industrial Hygiene Laboratory, Employers Mutual Liability Insurance Company, Wausau, Wis.

Dr. O. A. Sander, Milwaukee, Wis.

The Discussion Plan

CHAIRMAN JOHNSON: We have agreed to have a working base from which we will talk. This working base from which we will try to develop our opinions is what I choose to call a triangle of responsibility, visualizing what may be called the three A, B, C's of an equilateral triangle.

At the top of this triangle is management of an industrial enterprise, the man who has to pay the bills, the man who hires the labor, the man who worries about their health. On the left base is the medical side. They are the group employed to carry out the medical part of industrial management's responsibility. And on the lower right is the third base of this triangle where we find the engineers or industrial hygienists, who have to develop and prepare for the operating group the controls of occupational disease, as far as engineering is concerned with controlling them.

Now, there is a strong tie between the medical and the engineering phases through that base line of the triangle. What we hope to do in discussing each topic is to develop that tie, which we will call the balance of opinion between the medical phases developed by the doctors on my left, and the engineering phases developed by the engineers on my right.

I would like to ask this panel a question. For a great many years occupational hazards have been studied in one industry or another. Would this panel feel, let us say, sanguine that any industrial enterprise is now ready, by employing proper personnel, by searching out the answers wherever they may be found, to solve an occupational disease problem if they have one, and by the proper solution maintain the safety and health of the employees? Put another way, are we still groping in the dark on some of these hazards by reason of conflict of opinion, conflict of experimental data and theoretical expression by folks who find the theoretical hazard in exposure because it is suggested in the book? Will Dr. E. G. Cranch talk briefly along this line of suggestion?

DR. CRANCH: This question is a broad one. Is any industry satisfied that it is in a position to solve an occupational disease on the basis of present information? I would say, absolutely yes, for the majority of occupational disease problems are sufficiently understood to adopt efficient measures for control.

CHAIRMAN JOHNSON: Frequently I hear it said, "Well, why should I do anything about this until you folks come to a decision on whether I might to have two parts per million or two thousand parts per million?" Let us develop this further and ask the opinion of Dr. E. C. Meiter, on the engineering side.

DR. METTER: I agree with Dr. Leonard that there is enough known to solve these occupational disease hazards. If some employers are not willing to do anything at all until all possible information is available, I would say that they are never going to start.

In solving these occupational disease problems, we have a progressive solution. In the same way that the 1940 automobile could not have been built in 1920, just so are we progressing in all the branches of engineering, ventilation, ventilation equipment, and respiratory protective devices, and so I think adequate information is available.

A Basis for Truth

CHAIRMAN JOHNSON: I think we have a balance of opinion there. If you have an occupational disease hazard, there is enough knowledge stored somewhere in the books and brains to tackle it or solve it in progressive fashion. But we are cluttered up, I think, by a lot of crack-brained notions. I have read any quantity of literature in which somebody has ventured the opinion that because such and such materials are used, we must have a hazard that is just about ready to kill off the population of the plant.

Do we know enough about the hazards and control of benzol, silicosis, arsenic, phosphorus, radium, x-ray, and so forth, to sort out the truth and build upon solid fact an effective safety program? Will Dr. Leonard Greenburg develop that for a couple of minutes?

DR. GREENBURG: It seems to me that there is a definite body of evidence which is available on the more important occupational poisons and for the more important occupational diseases that makes it possible to prevent and control these poisonings and these hazards with a great deal of certainty.

That holds for substances such as carbon monoxide and lead and chromium and arsenic and benzol. The chief reason, it seems to me, why we still continue to have poisonings in industry is because the employer and the worker do not realize the gravity of these hazards and do not take the problem seriously enough to institute the necessary and proper means of prevention.

CHAIRMAN JOHNSON: Now I am going to switch to the engineering side and ask the same question. Let us visualize an industrial enterprise that is fearful that has a notion that some exposure is a serious one, and wants to know if there is anything from an industrial engineering standpoint that will make it impossible or difficult to devise the proper instruments to measure the quantity of exposure, whether it be dust, gas or fume.

I am going to turn that over to Warren Cook.

MR. COOK: Today we have more methods available for finding out how much of the injurious materials a man is being exposed to than we have ever had in the past. Formerly it was a very laborious procedure in most cases to analyze the atmosphere inhaled by the worker. Today in connection with more and more of the injurious materials, we are having placed in our hands and are having developed methods which will quickly tell us how much of the injurious material is in the atmosphere breathed by the worker.

We have devices which will determine the concentration of carbon monoxide merely by reading a gauge. Similar equipment is being developed for other injurious materials. For vapors, about the best device is the Interferometer, and we hope we will be able to get equipment of this kind manufactured in this country one of these days, but at the present time it is rather difficult to obtain.

Practically all of the injurious materials in industrial atmospheres can be determined. Some of the methods are more simple than others, but methods are being simplified all of the time so the safety engineer in the plant can avail himself of these methods.

CHAIRMAN JOHNSON: Now I am going to ask Roy Bonsib a rather critical question. In cases of doubt, where fear has to be balanced with knowledge, would he think it advisable to attempt to define a hazard in a plant without technical

measurement? That is, by visual observation Or does he feel that it is beyond all question desirable to have the survey made technically by industrial hygienists or by men trained to sample properly with proper instruments?

MR. BONSIB. I think the greatest trouble in industry today is that there has been too much guess work In dealing with insidious problems such as the new substances and some of the old substances which have been introduced, it is pretty hard to hang your hat on everything, and the average executive today wants to know exactly what is what, and you cannot know that without concrete evidence. You have got to get definite information and data.

When once you know the facts, which can only be obtained through technical means and by experienced people, you can give them something definite on which they can base definite conclusions and on which you can base your preventive measures

CHAIRMAN JOHNSON: Now I feel assured that we can discuss some detailed problems. We have our base We are in agreement that there is no ordinary occupational disease hazard that cannot be coped with, that there is sufficient evidence to sort fact from fancy, that there are instruments sufficient in quantity and kind for proper engineering analysis, and that there is no need of guessing

Let us start now an occupational disease control program. We have Plant X. The management at the top says, "Find any hazard, if any. Control it, if need be I am setting up a medical department; I am setting up engineering occupational hygienists I want you fellows to work out a program so that my operating department can install the necessary safeguards, wherever they may be, and assure me that there will be no emergence of disability by reason of these exposures"

The Medical Program

Let us build first the medical half of that program. Of what does it generally consist, Dr. O. A. Sander?

DR. SANDER: I am glad you emphasized the need of a medical program in an occupational disease control program, along with the engineering control An initial examination of all workers exposed to a particular occupational hazard is as necessary as is the exact determination of a hazard by engineering methods.

The appearance or the findings in any group of workers exposed to a particular dust, or what have you, gives an accurate picture of the hazard which has existed over a period of years That picture is one which the engineers cannot give you, because their dust counts or other determinations may be only temporary or may vary from day to day. It may have changed considerably in the past few years, the hazard may have been for example, ten times as great two years before as it was on the day the dust counts were made. So no occupational disease control is adequate without initial examination of all employees.

CHAIRMAN JOHNSON Dr. Sander has developed the need for the medical examination as a survey question to determine whether conditions as they have existed have produced any pathology in the men. Let us assume that, and install our program of control Dr. Greenburg, what do you feel about the need for periodicity in the examination program?

DR. GREENBURG: That would largely depend on what particular hazards were present in the plant itself. In certain cases it would be desirable to examine workers very frequently, perhaps even as often as once a month; and in other instances it might be very satisfactory to examine them once a year, depending on just what particular substances the workers were exposed to in their daily occupation and how satisfactory the technical means of control were.

For example, in the case of benzol, it might be satisfactory to examine workers every three months. I believe in the case of tetraethyl lead, the du Pont Company examines its employees about once a month, though I am not quite sure about that In the case of sand blasters, it might be desirable to examine them and x-ray them every six months, whereas in the case of foundrymen it might be perfectly satisfactory if the men are engaged in ordinary foundry work to examine them once a year and x-ray them once a year or once every year and a half

It would be largely a question of judgment, depending on the particular occu-

portion and the particular substances employed

CHAIRMAN JOHNSON: I would like to ask Dr. Greenburg to amplify just one point. If the survey about which Dr. Sandler spoke discloses no specific occupational disease hazard as having caused any pathology—and that is the situation that obtains in most plants—but still there may be some moderate exposures to this or to that, and the management wants to be perfectly sure, how often as a general thing should those men come up for re examination?

Understand, this survey has disclosed no pathology, no damage, nothing you can put your teeth in or hang your hat on as indicating a great need for engineering changes in current methods of control

Re-examination Periods

DR. GREENBURG: That would largely depend on whether there were any hazardous materials being used in the plant. If the condition of the men at the time of the initial examination was quite negative and no hazardous material is being used in the plant, I should say the decision as to whether or not you are going to have physical examinations is largely an open one, and a matter of wide judgment.

For example, in the case of a department store's employees, where young women act as saleladies, under ordinary conditions, it might not be necessary or desirable to give them physical examinations more than once in five years, perhaps not even then.

If, on the other hand, the physical examinations were quite negative, and yet toxic materials are being employed, the decision would depend on how toxic those materials are and what the analysis of the plant atmosphere shows.

It seems to me that the answer to the question is a matter of judgment which must be based on a comparison of the relative hazards of the exposure as compared with the cost and desirability of continuing intensive physical examination, and only by knowing the detailed facts can one arrive at a sound decision in a particular given instance.

CHAIRMAN JOHNSON: I think that it is very important for you all to consider carefully the opinion expressed there. You will observe that he has placed the burden upon his own profession, by careful discussion, of course, with the management that is to pay the bill, but the decision must rest with the doctor upon the evidence as presented by the conditions of the plant and the employees themselves.

There is no cook book formula which says you must put employees through the mill at standard intervals. But the making of medical examinations is another thing. It always presents problems, because men frequently are frightened when they know they are being examined to see if there is anything the matter with them, not just being examined to see if they are all right. They are always fearful that some dire calamity may overtake them soon. It is a real personnel problem, one that has to be handled with judgment.

I am going to ask Dr. Cranch if, in his long experience of examining a great many employees for operating exposures that might not be hazardous, he has always been able to keep those employees calm and collected and quiet and quite content with what things were found.

DR. CRANCH: Physical examination programs for occupational disease control can hardly be divorced from a physical examination program aimed at general health conservation. Where it is possible to have a medical service, where the physician is in daily contact with the man, physical examination presents far fewer difficulties than where it is done only for the sake of occupational disease control.

If an outside physican comes in to examine certain groups of men at intervals of from one month to two years, men logically have a right to expect that there may be something going wrong with those who are called in frequently, and that leads to considerable nervousness on their part as to what will be found.

There is a matter of psychology and practice in carrying out such a program of examinations. It is much simpler, where it is possible to arrange it, to have reasonably frequent examinations for general health conservation, and these examinations, then, will be included in the regular procedure and help to determine the effects of an occupational disease exposure.

As Dr. Greenburg said, we do not attempt as a rule a routine examination at a fixed interval of a year, we will say. The periodicity of our re-examination is determined largely by several factors: first, the possible exposure to occupational disease hazards; second, what we notice in connection with that man's health as the days go by.

Our supervisory force is usually instructed to send in any man who seems a little under the weather, who does not seem to be doing well, who seems to be slipping a little. From their recommendations often we pick up cases that certainly require examination which otherwise would easily have been overlooked.

Another thing which we have to remember is that many symptoms are common not only to occupational disease exposures incident to life in general; and the medical program for the control of occupational disease is therefore extremely important in that the contact must be established with the men to determine what changes are going on and what is their origin.

CHAIRMAN JOHNSON: The important point to me is that you cannot drag in a physician from the outside who is a total stranger to your problem, merely because he is an expert toxicologist or expert something else, and ask him to set up a medical examination or control program for about a week, and then depart.

Hire him to consult with your own physician, but let your own physician so fold the occupational disease program into the general health conservation program, that the findings of the one serve to augment and support the findings of the other.

Now I am going to talk to the engineers, and assume that a survey has been made in which we have discovered a hazard sufficiently dangerous so that, in the doctor's opinion, something ought to be done about it. I am not assuming that it has gone so far as to kill men, but it has manifested itself either in moderate early symptoms or some actual demonstrable pathology in a few.

I want to ask this group of engineers what they want the medical men to tell them which they may use to utmost advantage in their own work in connection with surveying to locate and find the hazard that they want to control.

Will Willis Hazard discuss that one?

MR. HAZARD: It seems to me that the most important thing that the doctor can tell the engineer is what his findings are from the physical examination. That more or less determines how serious the hazard is; it often isolates it to certain individuals in the plant, and that points the way to places that should come under engineering control in that regard.

CHAIRMAN JOHNSON: Perhaps you have already visualized what I am leading to. I want Mr. Bonsib to develop that a little farther. Here we have the medical examination installed to disclose what is wrong, if anything. I want him to develop the engineering control method. What fact and what data does he need to go about his business?

Engineering Control

MR. BONSIB: Since the amount of damage to the human mechanism depends upon the exposure and the concentration, the engineer should know the maximum allowable concentration to which he would have to maintain the working atmosphere or the working condition, and as an engineer that is something that the medical profession must give so that the engineer will have something to which to work.

I think the answer to the question, then, is that it is very essential that the threshold or maximum allowable concentration permissible be known.

CHAIRMAN JOHNSON: I do not think we will quarrel about that. I am certain no engineering group will stick out its neck far enough to define for the medical profession what constitutes the safe threshold limit. It is not quite the answer to the question I had in mind, however.

For a great many years, you know, the medical profession has been conducting its work successfully in industry, maintaining the greatest degree of confidence between the employees and the doctor through the fact that the doctor never revealed what was the matter with the man if there was anything wrong. He grades the men in a general way—employable, or employable subject to medical

acetone as employable in limited exposures

I think I have blown open a question here Can the doctor inform the engineer of a sufficient number of facts about the hazard to which these men have been exposed without weakening that professional confidence which he has established in the workmen whom he is examining?

What I want this group of engineers to develop is Can they use adequately mass information, or information about the group, without having to know that Mike Hambrowski is about one month from emerging with a disability? Will you develop that Mr Hazard?

MR HAZARD It seems to me it is entirely possible for the engineer to use the medical results in a purely statistical manner He does not have to know who is sick or whether it is Mike Dambrowski or somebody else It is extremely important that he know the number of people who are showing the same ailment and the number of people who are working in the department or the plant as a whole

MR BONSIB I do not see how you can protect against something unless you know what it is going to do, and I do not see how you can provide necessary protective measures without knowing to what extent you have to go on them You must know the threshold limit to which the substance or the material, whether it is gas, fume or dust is causing the trouble If you do not know what the toxic limit is that is the amount it takes to make people sick or how much the human mechanism can stand making due allowance for the idiosyncrasies of the susceptible, I do not see how the engineer can provide the necessary measures

[illegible] he must reduce that concentration to the point below which it will not make anyone sick and the length of exposure necessary to which that person must be exposed

MR COOK An instance might be cited where other factors than threshold limits have been utilized For example, in the gypsum industry, in certain plants there is what is known as a sanded plaster manufacturing operation where there is much dust It had been shown that gypsum dust itself does not cause silicosis or injury to the lungs. Where there is silica sand, we look for that injury to the lungs and the development of fibrosis and silicosis where the exposure is high and continued over a long period of time.

Consequently, where about half of the material used in this operation was silica sand, it was the guess of the engineer that here was a condition which had to be controlled effectively to keep the dust concentration down to very low levels.

To everyone's surprise, the x-ray examinations of workers who had been exposed to these operations for a number of years, showed that there was no development of fibrosis

Further engineering data was collected and it was found that two things happened. In the first place, the grain size of the sand was rather uniformly large and well washed There was no abrasive action to produce a great number of fine particles. In the air itself, the concentration of free silica was not 50 per cent, or what it was in the main material, but only one or two per cent Finally, laboratory examination showed that where you get quartz dust falling, or where you would get gypsum dust settling out of the air fairly rapidly, the quartz dust settled out more rapidly; and the combination of quartz and gypsum settled out even more rapidly, than either one alone, due to the fact that the gypsum dust caused agglomerations with the silica dust, and you had large groups of particles which caused this more rapid settling

Now, the data obtained through the medical examination and the x-ray was what gave the hint that the cost and the completeness of the control at that operation was not as great as it would normally [illegible]

CHAIRMAN JOHNSON I think that illustration binds together these various points

I have watched that particular study developed with a great deal of interest, and for a fact, the engineers did not know, or did not have to know, anything about the men as individuals, the doctor kept that in his files completely

Now let us summarize for just a moment to see where we have arrived We have the doctors and the engineers as the two bases of our triangle. Our panel feels sanguine that hazards can be controlled We know enough, there is enough knowledge in the aggregate to control them We say that the need for a medical program is as vital as the need for an engineering program, that the doctor ought to be the plant doctor, augmented by such specialists as he needs to employ to counsel with him; that they have a certain amount of factual information that they must turn over to the hygienist or engineer for his use as a check for his performances, and that the medical crowd should tell the engineering crowd how low the hazard must be taken to consider it reasonably safe; that the engineers are perfectly willing and able to tackle the hazard in some fashion if they know those things; and the periodicity of the examination to find out whether the engineers did a job or not depends upon the conditions as the doctor finds the record written in the men themselves.

Of course, the engineers are going to continue to use the instruments of surveys to check their own results.

Now I am going down to our printed program and explore some of the questions suggested there. The panel will discuss phases of engineering systems. Are there in the engineering catalogues, data describing machinery of one kind or another to make it possible for the engineer to design an exhaust system if he wants it or thinks he needs it? Are there enough high grade, glorified vacuum cleaners on the market to pick one out of the catalogue and install it in the plant, and expect it to produce results?

Dr. Meiter, will you develop your thoughts on present market conditions of tailor-made exhaust systems as against engineering design of exhaust systems to fit the individual plant circumstances?

Exhaust Systems

DR. MEITER: In my opinion, there is not available ready-made exhaust ventilation equipment The assumption that you can select from a catalogue and ventilate your problems has been a great drawback to the progress of this work.

By that I mean this: Oftentimes a contractor will have, say, a local tin worker they call him in and he, without knowing what the requirements are of the State Code, without knowing the limits to which the gas, dust or fume has to be exhausted, immediately sets about and designs a hood

Then, without even knowing how much air can be handled by that hood, he looks into the classified section of the telephone book and calls up the fan company. The fan company has a salesman, but he is not in, so the office girl looks up the technical data, and the company ships the fan.

When this ventilating system is finally installed, the sheet metal worker says, "Well, the sheet metal work portion of it is all right, and that is all I guarantee."

Then the fan company, on the other hand, says that the fan delivers a certain volume of air at the speed shown in their catalogue, so they wash their hands of it And finally, when the whole thing is in, it does not work and a job has been poorly done. So the point I wish to make is that ventilation, no matter how simple, requires technical knowledge and technical instruments to determine when the system is really working

CHAIRMAN JOHNSON I think Dr. Meiter has put his finger on a very critical point. When I speak about engineering control, I mean engineering control, and I do not mean tinsmith control. Let me illustrate.

Sander talked about the metal fume fever, zinc shakes Visualize if you will, the problem of a shipyard building destroyers for the United States Navy of galvanized sheet plate, with a great deal of electrical welding work to be done in confined spaces, in the little tanks and cells of which the ship is constructed.

There is a plant set up in the field, you might say, lying for nearly a year at its fitting-out basin, a little plant about 325 feet long and 30 feet wide, 25 to 30 feet molded depth and heaven only knows how many tanks in it (they get down to pretty small sizes) with welding to be done in most. In those confined spaces welding, steam-fitting and electrical work must be done. Can you imagine a tailor-made ventilating system being used there?

Now let us go to the next question, protective creams and lotions Let us have clearly in mind that a cream or a lotion is smeared on the skin for a purpose, and

usually the purpose is to prevent the moderate amounts of something or other from coming into contact with the skin.

These creams and lotions are of two kinds: those that are water soluble for use in oily exposures, and those which are oil soluble for use in aqueous exposures. This use of cream I declare arbitrarily, as Chairman of this party, is not in lieu of any other control. These creams are used because controls cannot be made absolute and because there are sensitive skins to be taken care of.

Dr. Cranch, would you like to discuss the effectiveness and the use of creams, from the viewpoint of the doctor who has a cock-eyed purchasing agent who buys an oil soluble when he wants a water soluble and vice versa?

Protective Creams and Lotions

DR. CRANCH: I think you have stated something. Protective creams certainly have a field in the protection of skin from various irritant substances. I would put far ahead of the use of protective creams, however, good personal hygiene and thorough cleanliness on the part of the worker. Where that is obtained the question of protective creams is of lesser importance, sometimes negative importance.

There are certain exposures, however, where no amount of personal hygiene or cleanliness is enough to protect from possible harm. [illegible] we do have a place [illegible] protective creams of the two classes Mr. [illegible] has mentioned.

Primary in the consideration and selection of any cream of course is the nature of the exposure. If it is an oily substance, we must use a water soluble cream which will form a coating over the skin and resist the penetration of the oily material.

And on the other hand, if it is a water soluble substance from which we must have protection, we must have an oily base in the protective cream.

The first consideration, then, is that the cream itself shall not contain an irritant that incidentally opens up the whole field of allergy. There are many people sensitive to certain of the common ingredients used in many of these protective coatings. They can probably only be discovered by means of a patch test or by actual experience in the use of the cream. In that case, some other means of protection must be adopted, or the man assigned to other work.

The great proportion of creams now on the market appear to be reasonably free from any irritants or substances that are particularly *likely to bring* about an allergic reaction. The main thing is to select the one *designed* for the type of protection required.

These creams, we have found, are often considerably abused. Men seem to think, in many places, that the cream has to be applied in a coating that by its mechanical thickness to the naked eye will protect the skin. I have seen a man put on a quarter of a pound where half an inch squeezed out of a tube would probably have answered the purpose.

In that case they often run into other difficulties. Many of these creams which protect *from oil* substances, are creams which have a soap base; the men are simply running around in a soap poultice, and they work up an irritation which is as great or in some cases greater than that which would have resulted from the exposure they sought to prevent.

In the oily cream preparations which protect from water soluble substances, they offer us very queer mixtures. Lanoline as a base, I think, is the thing of choice for that type of protection, rather than a petrolatum. It works a little further into the skin, I believe, and will protect in a more thorough manner than the petrolatum base preparations which just smear over the surface and are more easily rubbed off and fail in their protection.

Another thing to consider is that the last word *has certainly not* been said on protective creams; they are in the process of rather rapid development. I believe there are commercially available many suitable types of protective creams, and, on the other hand, they can be made up for a specific purpose very satisfactorily on the advice of your physician. You can get a very satisfactory cream that can be produced in bulk for your own use.

Respiratory Protection

CHAIRMAN JOHNSON: We will continue with the discussion of respira-

tory protection. In connection with the examination of thousands of foundrymen, Dr Sander has explored the operations which they conduct so that he knows what they all mean. He of course has found that some of the men are protected by exhaust systems, and some of the men are protected by personal body protection, either filters or the airline type of respiration.

I interpret respiratory protection to mean the kind of respiratory protection that you stick onto the man. Of course, it is all respiratory protection, but I wonder if Dr. Sander would like to discuss whether or not he has found by the actual examination of men that the satisfactory type of respirator has been found which will actually protect the men.

DR. SANDER Beginning with sand blasters, undoubtedly the modern air helmet affords almost 100 per cent protection for the prevention of silicosis, provided the helmet is kept in good working condition and provided the air pressure coming into the helmet is satisfactory.

In the observation of about 300 sand blasters in a seven-year period I have yet to see the first one develop silicosis who had worked only with the modern helmet. Also, I have seen no so-called first stage cases develop a second stage silicosis during that interval. A first-stage case has been kept at work, he has not been shifted

We feel that a sand blaster with a modern helmet is breathing less dust than anyone else in the foundry as a matter of fact, and there is certainly no point in shifting him out onto the floor, removing his piece of respiratory protection and giving him more dust than he is getting at his sand blasting job.

As far as the other foundry operations are concerned, of course it is always advisable to exhaust when possible There are a few occupations that cannot be exhausted satisfactorily. One of these is sand chipping, and where sand chipping must be done, it is advisable for the chippers to wear the filter respirators. However, even there it is advisable to try some other method of cleaning the casting if that is all that is feasible—for instance, cleaning with high pressure combined water and sand, and so forth

With ordinary stand grinding, there is no need of respiratory protection, provided an exhaust system is used and is in proper working condition

The exhaust ventilation for swing grinders is a little more difficult, but it has been accomplished There are very few swing grinders in Wisconsin that are exhausted, however. It has been our experience that swing grinders have not developed as much silicosis as was at first believed, and the reason probably is that by the time they get the castings there is no more molding sand on them. It has all been removed first in the grinding wheels with all the artificial abrasive, so the only silica the swing grinder is breathing is generally plant dust.

Molders and core makers need no special respiratory protection, in my opinion A molder just could not do the job very well if he were required to wear a respirator from morning until night

I do not think I would depend on a respirator for the protection of the man with the tuberculous scar. I would rather move him to some other job, or move his job somewhere else, or localize his job in a separate room and ventilate it.

I see no reason why we should worry about a sand blaster today, even with a tuberculous scar We feel they are not going to develop silicosis, and therefore we think that what little dust there may be will have no effect on such a tuberculous scar We have not permitted sand blasters with tuberculous scars to continue working on that job, but I think we should permit them to do so today, knowing that the hazard of sand blasting is controlled provided, of course, the equipment is kept in working condition.

CHAIRMAN JOHNSON That dissertation answers beautifully the question of respiratory protection as far as it applies to the foundry, and I think direct makes will carry that opinion over into almost any other exposure that you choose to carry it into.

In order to play absolutely fair with everyone in the audience, I am going to start on the questions that have come to me, and there are quite a number

Here is the first question: Assuming that the development of adequate engin-

ering and medical departments is essential to properly control dust hazards how can the smaller plants, those having 100 or 200 employees cope with this problem and determine whether or not they have a hazardous dust condition or any other occupational disease condition? It would be impossible in many cases for these small plants to set up elaborate and expensive control departments.

To find the answer in a definite direction I am going to suggest that perhaps the answer lies in the recent development in almost every industrial state, divisions of occupational disease hygiene, either in the Department of Labor or the Department of Health. I am sure Dr. Leonard Greenburg would like to answer that question.

The Small Plant Problem

DR. GREENBURG: There are two things that the smaller plant may do: one is to make use of its insurance company to the fullest extent; and the second is to make use of such facilities as the state has at its disposal, either the Department of Labor or the Department of Health.

In approximately 30 states in the Union, there are divisions of industrial hygiene in either the Department of Labor or the Department of Health, and in a few cases in both and they are always prepared and eager to help the smaller plant, particularly with such problems as this.

Many of the insurance companies have developed divisions of hygiene and have experts on their staff who are also prepared and able to render service along these lines. It seems to me that the biggest problem is to get the small plant management to recognize that the stumbling block is management itself. Once that recognition has been achieved, it is a relatively simple thing to obtain practically free service from either of these two organizations in an effort to really start constructive preventive work.

CHAIRMAN JOHNSON: Let me add one thought to that answer. I am familiar with most of those divisions. In none of them is there anybody carrying a big stick to browbeat or to hammer into shape the small plants that want help. They are already giving help in an advisory fashion.

There has been fear at times, that one could not let a state man into the plant without expecting him to change a recommendation into an order overnight. I have not seen that in this treatment of the occupational disease problem. I am not telling you that it does not exist, I say I have not seen it.

I have here a question for our engineers. Yesterday they were talking about welding metal and fume fever, and so forth. Here is the question. Does an exhaust system from electrical welding affect the type of weld?

As I view this question, it means this: When you weld with an electric welding process using a coated electrode, the fluxing of the coating produces an umbrella or tent over the weld arc itself and thereby excludes the air from the arc and prevents oxidation of the steel which is being cast into the hole being filled up, and prevents oxidation of any of the material or metal that is in the fused state.

Now the question is, if you stick a heavy exhaust there and pull away that vapor which provides the protection, do you ruin your weld? Is the control for health at the expense of the weld, or would it be better to forget that and limit the time of the welding?

Does anybody here want to answer that?

MR. BONSIB: I think that if you have general ventilation there would be very little danger of destroying that umbrella that Mr. Johnson has mentioned. Of course, it is advisable to remove those fumes as near the source of origin as possible. You have to get within eight inches, and not more than that, to really get efficient results, and being that close you do not require more than 100 or 200 lineal feet per million.

I do not think there is enough cooling action to do damage. As a matter of fact, some tests we were interested in making seemed to indicate that there was no damage done. However, you come where the damage would be done if you exceed that, but I do not think you need to exceed 100 or 200 lineal feet per million. If you have general ample ventilation, then you do not have any danger, in my opinion.

CHAIRMAN JOHNSON: That seems to be a logical conclusion. It is certainly an opinion based upon observation of that

sort of problem. The next question is:

"Is there enough silica in the average fire brick to affect workers seriously?"

In other words, if we explore clay for its refractory property on the one hand, and its plasticity on the other, is there a descending order of silicosis hazard from the fire brick on the one side, down through plastic china clay or paper clay on the other?

Mr. Hazard, the questioner wants you to talk about the amount of hazard in the fire clay, and for want of a better definition let us leave out the Ganister brick which is a brick the sand of which we know to be pretty close to 100 per cent silica.

MR. HAZARD: I think this is really a medical question. But there are certain fire bricks which are very high in silica, and certain others which have practically none or a negligible amount in them. You have a range there from what might be called a dangerous condition, down to one where you are practically sure no danger exists.

It seems to me that if you had a fire brick with very high silica content, with the chipping and knocking of the bricklayer against the brick, it might stir up considerable dust and might be a silicosis hazard, but I would like to hear the medical side on that question.

CHAIRMAN JOHNSON: Will either of the doctors discuss the inherent toxicity of the fire clays as they are normally handled in the manufacture of brick?

DR. GREENBURG: It seems to me the Chairman ought to tell us what the percentage of free silica is in the fire clay. He has talked around the question, but he has not told us the crux of the whole problem.

CHAIRMAN JOHNSON: The problem seems to me to be related to the notion that maybe these mixtures are so mixed that other things beside the silica produce an alleviating or an ameliorating effect to prevent what silica there is from causing silicosis.

Clays do not seem to produce silicosis. It is the dry-pan grinding of all kinds of things that produces enormous quantities of dust some of which contain silica, and I cannot remember at this moment just what the amount of silica is in the ordinary run of fire clays, but I am not giving the medical answer. It is my thought, that the hazard produced in the clay products is not an inherent one, but one thrown in by violent agitation due to dry grinding operations.

Let us go on to another interesting question: "To what extent are the industries with which this panel are familiar providing washing facilities, and what are the advantages of washing in showers, and so forth, accruing to the employees on the one hand, and the employer on the other, and how is the thing paid for?"

Well, we know that in some states, washing facilities are *required by law* in certain types of industries, and in others they are put in.

I can visualize the need to develop this question in two ways: one for the control of a serious occupational disease exposure such as lead; and the other, the general industrial hygiene, to get folks to wash on the developed fact that by careful washing a great many of the dermatitis problems solve themselves.

Will Dr. Cranch talk about the provision of washing facilities?

DR. CRANCH: Washing facilities are most desirable things in any plant, large or small. As the Chairman has said, it is the most important factor in the prevention of occupational dermatitis, to say nothing of general hygiene to the workmen.

The vicissitudes of trying to establish any adequate washing facilities in industry are great. My first experience occurred over forty years ago as a workman. In that plant there was no water available, although it was a large plant, and unless you sneaked from the job and went around to a faucet which was used for sprinkling the front lawn, you had no water available. It was not expected that hands should be washed. A man worked at his job, ate his lunch, worked all day and went home so black as a rule you could not tell his race.

Later I became much interested in the development of washing facilities. I remember in one very large plant we put in excellent washing facilities, and it was surprising to see how they were abused even to the point where in some cases we had to discontinue service. In other or-

sanitations, an attempt on the part of the management to furnish good washing facilities met with consistent refusal on the part of the workmen to cooperate with them in the use of these things, even when the workmen were given time out at full pay on company time to wash. They would not do it.

Fortunately these conditions have changed and the men themselves now appreciate those facilities where they are put in, and they generally demand them where they are not put in.

I think washing facilities are a most important feature in the control of occupational diseases, and a number of occupational conditions aside from dermatitis. There are a number of occupations where complete showers are furnished and those facilities are very largely a measure of prevention of occupational disease, and at the beginning of the day's work the men change to working clothes where previously that was not done.

Oil Dermatitis

CHAIRMAN JOHNSON: Here is another question:

"Is it not an accepted fact that oil dermatitis is more of a mechanical breakdown of the skin than it is a toxic problem? How would you overcome the desire of the employees to use abrasive cleansers on the hands?"

Cutting oils and other oils produce dermatitis and represent three hazards. One produces a plucking of the hair follicles, which is largely a mechanical thing of rubbing oil and dirt or what have you, into the skin.

Then we have what I think the doctors call heterolysis, which is probably a chemical burn, an irritation of the skin which is another type of dermatitis. Then there is a third one, which produces blood poisoning or boils where the oil has been supporting an infective medium bacteria of some sort.

Can we solve that oil contact problem by handling the washing of men in a satisfactory manner through washing facilities and the discouragement of the use of harsh abrasive soaps or doesn't it make any difference?

May we have a development of that question from Dr Greenburg?

DR GREENBURG: In dealing with the whole problem of dermatitis due to the use of cutting oil, you are dealing with several different factors which may produce different types of skin lesions. The cure for all of these, it seems to me, lies in the use of proper protective ointment before the men start work in the morning, and the washing up at the end of each shift with the proper type of non-irritating soap.

The easiest way to get the men to use a non-irritating soap is to supply one so they will not purchase an irritating soap themselves. If you leave it to them, they may purchase one which seems to work rapidly, but which may have irritating properties.

On the other hand, if the management supplies it, they can purchase one of suitable quality which in general may be of a more satisfactory type.

The whole problem of oil folliculitis and oil dermatitis can be handled and is handled in many plants on a very satisfactory basis, by these simple means, and so far as I can see does not present any insurmountable difficulties whatsoever. The usual defect in the system seems to be that the plant does not pay any attention to the problem until many of the men become infected and many of them have skins which are more or less ruined by an accumulation of oil and foreign matter in the pores of the skin.

At that time, preventive measures are no longer sufficient. It then becomes necessary really to cleanse the skin thoroughly and repeatedly so as to once again bring it back to its normal clean condition.

CHAIRMAN JOHNSON: Let us go over to the engineering side and talk on the industrialist who manufactures oils to provide himself a meal ticket and tries to prevent just this hazard from causing trouble.

MR BONSIB: I agree with much that the doctor has said about getting good oil in the first place.

I think that one of the big causes (and I have studied this problem a lot for the reason that you hear many stories of injuries due to cutting oils) is that the oil

is not kept clean In the cases we have checked the trouble has been due to the use of dirty oil, or using oil over and over again that is filled with small particles of metal These cause small injuries to the skin, and that in turn brings about further damage. So if you keep the oil clean I do not think you will have much trouble

I think the practice of men spitting in the oil and using the oil over and over again has caused much more damage than the so-called paraffin acne

CHAIRMAN JOHNSON: The next question is this: "Should employees working in departments subject to occupational disease hazard be acquainted with and informed of these hazards, or kept in ignorance of them?"

DR. SANDER: Undoubtedly, employees should be informed of every hazard to which they are exposed, and they should be informed also of the findings on examination Anyone going to his doctor, for any reason whatsoever, wants to know what was found In the same way, an employee going to a plant doctor wants to know what was found. He is not paying for the examination, but that makes no difference, he is still a human being who *is interested in his own health and his* future years of gainful employment.

The practice in Wisconsin with physical examinations has been to give employees a duplicate copy of the report which the employer receives. The Wisconsin Industrial Commission recently published a declaration of principles on physical examinations in industry which everyone interested in this problem should see. In that it is specifically requested that employees be given a copy of the report which the employer receives

That is not a complete record or report it is merely a statement or listing of the important defects. I believe that it is as wrong to give employees complete reports as it is to give them nothing at all. A worker is not interested in what his blood pressure reading was yesterday or is today: he is merely interested in knowing whether or not it is significantly high, and that is all he cares about

CHAIRMAN JOHNSON: Is there anybody else on the panel who would like to discuss the question?

MR BONSIB: I think you can cause more unrest through fear, by failure to tell the truth, than in any other way If man imagines he has something, and b worries and worries, and finally becomes victim of what is known as autohypnosi whatever that is

I think by relieving his mind and tellin him exactly what is what, you lift th worry from him and you ease his min all of which makes a better man of hin

CHAIRMAN JOHNSON: Now let tackle another question. "Processing a certain cellulose product involves ove night soaking in a solution of .5 per ce formaldehyde, and subsequently conside able formaldehyde odor is given off durin the drying of which those in the vicinit often complain. How much *formalde* hyde would represent toxic proportions And how could the quantity present in th air best be determined?"

Dr Meiter, would you like to tack that problem?

DR MEITER. In my own experience formaldehyde is irritating enough so th. you *would not require refined technic* instruments to make determinations, b cause it is very easily noticeable in lo concentrations. I think proper enginee ing methods could be devised for elim nating the fumes without using technic instruments, because it is necessary to kee the fumes down to very low concentratio otherwise a dermatitis may develop ar also sore eyes

CHAIRMAN JOHNSON: Does th medical side of our panel wish to devel that any further?

DR CRANCH I think that questio illustrates one of the phases where it not necessary to have engineering help order to determine whether or not w have reached a point of safety.

Formaldehyde vapors are not likely be toxic, since in a concentrated form is so irritating that just for comfort son relief would be demanded, so that we nee not be particularly concerned about wh concentration is obtained.

There are a number of chemicals that start where the immediate effects a so irritating that toxic exposure wou usually be avoided in the course of ord nary good practice in handling the m terial

CHAIRMAN JOHNSON: Warn Cook says he has another idea

MR. COOK: The literature does contain some information concerning the development of irritative actions, and we are wondering in Connecticut whether the concentrations which were listed in the literature and the irritative action was associated with a tolerable amount of irritation, or whether it was in the higher degrees of irritation.

We ran some analyses on some formaldehyde gas in an operation where formaldehyde was being used in the manufacture of synthetic resin. The method we used was the bubbling of the air of the plant through water, with two bubblings in a series, and tested with Shaft's reagent, the regular method for the determination of formaldehyde, and we got results that were in the area of the breathing zone of less than 20 parts per million, which is usually suggested as a satisfactory concentration.

At one point we ran it up to 90 or 100 parts per million, and at that point I found I could keep my nose there for thirty seconds before I decided to back away from it.

But I do agree with Dr. Cranch and Dr. Meiter that where the irritation does get excessive, then the irritative gas can be taken as the determining factor even though with most of the materials the irritation is not the safe way to determine whether a gas condition is or is not safe.

CHAIRMAN JOHNSON: Here is another question:

"Is sulphur dioxide gas in concentrations as low as 10 parts per million for prolonged exposure considered hazardous to the health?"

Going to the medical side, will either Dr. Greenburg or Dr. Cranch tell us if sulphur dioxide in such low concentration represents a hazard for continuous exposure?

DR. GREENBURG: I cannot say offhand. It is just about on the borderline, I think.

CHAIRMAN JOHNSON: Now, if an employee upon examination shows a very slight increase of lead content above normal after sixteen years of exposure, would you change his occupation?

I do not know what a "very slight" amount of lead is. I think presumably this means a few stipple cells, or something like that. If an employee upon examination shows a very slight increase of lead content above normal after sixteen years exposure, would you change his occupation?

DR. GREENBURG: I would want to know where he showed it, and how.

CHAIRMAN JOHNSON: If I may answer the question, it seems logical that if there is lead showing up, it came from somewhere, and having explored that you can determine the engineering phase of the control, and perhaps he can stay on the job after you have controlled the lead fumes.

Mr. Cook, won't you answer the following question? "What instruments are there on the market which are reasonable in cost for small shops to purchase which can be used to check atmospheres in metal spray work for zinc, iron and other harmful fumes? Must several instruments be used where many types of metals are sprayed during a working day?"

Metal Spraying Equipment

MR. COOK: On metal spraying, there are several angles. No. 1, a booth, a ventilated booth should be used where possible. Secondly, the man should in most cases be given a positive pressure air supply.

Now, assuming that the particular operation is one in which the man may be spraying brass, there are various methods using the ventilated booth. Let us assume for the moment that he is provided with no respiratory protection. If a man is spraying zinc and the booth is providing adequate exhaust so there is not much of a cloud of zinc and he does not get metal fume fever, it is probable that it is not necessary to make any determination for zinc. If during the course of the day the man is spraying some lead and some cadmium, I would feel very definitely that it would be well to run an electrical precipitator sample, analyze the sample, and obtain the electric precipitation for lead and also for cadmium which would be a routine chemical procedure, and the concentration of both of those should be kept below the suggested-toxic limit in order to assure that you are on the safe side.

I would feel that it would not be necessary to analyze for zinc under those con-

ditions, or for either of the metals unless there is some additional one that is particularly toxic. But particularly where you do have lead or cadmium, the determination should be made for those, and based upon those determinations you can get an idea on the basis of the relative duration of spraying of those particular metals what the exposure is.

DR. MEITER: I agree with Mr. Cook, and I believe the solution of this problem is first, the use of a properly ventilated booth so as to eliminate the exposure to the other workmen in the vicinity.

The second item is the use of a positive pressure airline respirator to protect the operator. I think that conducting metallizing operations all over the shop and without adequate equipment, especially where such metals as lead are sprayed, are going to produce occupational diseases. I believe the proper thing to do is to start right with the proper type of equipment, by providing the booth and protecting the man, and you will then not need the sampling devices.

CHAIRMAN JOHNSON: Then the specific answer to the question seems to be the lead precipitator as the one gadget that will be most useful, and the sample should be analyzed quantitatively in the chemical laboratory.

I want to ask the doctor a question in connection with pre-employment medical examinations. The exposure is something that may cause dermatitis. I take it from the question that the problem of allergy arises. Do you recommend patch tests in connection with pre-employment examinations to determine an employee's possible allergy to the exposure?

DR. FRANCH: In general, I would say you would hardly be warranted in conducting patch tests on all applicants for employment. Where we have a known material to which the employee is being exposed that very commonly produces an allergy reaction, it might be advisable to use such a filter. Patch tests are not 100 per cent infallible, and they are not altogether simple. They have to be very carefully given and very carefully interpreted. For that reason, they are not an integral part of an average preliminary agreement upon examination. They might be quite misleading.

ADJOURNMENT