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TUESDAY AFTERNOON SESSION

October 5, 1943

Presiding: PAUL VAN CLEEF, Van Cleef Bros., Chicago.

Safety Training and the War

By J. I. YELLOTT
Chairman, War Training Committee, Illinois Institute of Technology

World War II has brought a great number of developments to American industry. The spirit of unity which possessed the nation as soon as we were attacked has been manifested in an unbelievable increase in productivity. The victory which is now inevitable will be due to the actual fighting done by our men and by our Allies, but this victory will be made possible by the contribution of American industry. In a vast number of technical problems, the proverbial American ingenuity has found the solution, and in no phase of the current emergency has this ingenuity been displayed to better advantage than in the rubber crisis.

No one can fathom the workings of the Japanese mind, but it seems obvious that the Nipponese hope of victory was largely based upon their seizure of the natural rubber resources of the world. It must be a matter of extreme disappointment to their worthy emperor to learn, if his attention can be turned from poetry to such mundane matters, that American industry will soon be turning out synthetic rubber at a rate greater than the prewar output of natural rubber.

The technical phases of the rubber program reflect great credit upon the knowledge, skill and vision of the rubber industry. Another crisis confronts these men, along with all of American industry. At the beginning of the war program, our shortages were in machines and materials. The extraordinary efforts of the machine tool manufacturers have made up the first deficiency. The Controlled Materials Plan of the War Production Board appears to have gone far in the solution of the second problem. The third great shortage is becoming apparent now. America's manpower is now the most critical shortage of all.

The Manpower Situation

An elaborate statistical treatment of our manpower situation is not needed to convince any manufacturer that there is a shortage of men and women available for industrial work. In time of war, military requirements must come first, and accordingly, by the end of this year, some 11,000,000 of the best qualified young men and women in the nation will be serving in the Armed Forces. A large and well trained military force is apparently a prerequisite to a speedy victory, and certainly no civilian is competent to debate with our general staff the appropriate size of our Armed Forces.

Industrial employment has increased beyond any previous expectations. Again, without resorting to statistics, the classified advertising section of any metropolitan newspaper will show us the situation at a glance. Companies which formerly looked upon a help-wanted advertisement with disdain are now buying large display advertisements in the news section of metropolitan journals.

Part-time employees, formerly rejected as a nuisance, are now eagerly sought. Indeed, it is feared that the return to school of a million high school boys and girls will cause a serious situation in the service occupations.

It is obvious that we have come close to the end of our manpower resources. Unemployment has decreased until, at the present time, the United States Employment Service estimates that there are only one-half million men and women in the entire country who can be classed as unemployed. It is equally evident that industry must conserve its manpower, and in this conservation, two major problems arise.

Manpower must be used sparingly and intelligently. No longer can we afford to hire unnecessary labor, and every operation must be surveyed to learn whether it is being done in the most efficient manner. Of equal importance is the conservation of the services of the men and women who are employed. It is here that accident prevention enters the situation as one of the most important factors.

The prevention of industrial accidents can only be accomplished through the untiring efforts of management, and the most powerful tool with which management can fight the accident menace is training.

Need for Safety Training

No worker wants to hurt himself. In the present emergency, most industrial employees are working harder and more zealously than ever before. Only a small minority in most plants are interested in anything other than the maximum possible production. We know, however, that accidents happen, and so many of them happen that they constitute a very real menace to war production. Most accidents occur because of some human failure, and this human failure can in most cases be attributed to lack of knowledge, or lack of care.

Responsibility for accident prevention rests squarely upon management. This fact is no longer disputed, but management too often feels that it has absolved itself of this responsibility by putting up posters, and by urging every one to work safely.

Management exercises its responsibility, as far as the worker is concerned, through supervisors, and unless the supervisor has some knowledge of accident prevention and is safety-minded, his workers are likely to be involved in frequent accidents.

Training in safety should be directed primarily at those who have responsibility for the actions of workers, and training in safe work habits must also be brought directly to each individual worker.

These facts were recognized before the war by some far-seeing employers, but a full recognition of the necessity for safety training only now has reached the majority of employers. As long as accidents meant only a compensation problem, many employers were satisfied to let the insurance company handle them. Now, when the Army requires safe working conditions as a part of its contracts, employers must give thought to the other aspects of the safety situation.

Safety Training Possibilities

Training in accident prevention has increased tremendously as a result of the program established almost two years ago by the United States Department of Labor and the United States Office of Education, and operated by 120 colleges of engineering throughout the nation. This program is well known to thousands of supervisory employees in American industry, but a very brief resume is in order here.

When the National Committee for the Conservation of Manpower in War Industry undertook the task of protecting war production by conserving man hours, one of its first activities was the spreading of safety training throughout the nation. There was established in 1940 a unique experiment in engineering education, known as Engineering Defense Training. As the country began to move into war production, it was immediately seen that there would be a tremendous shortage in engineering and technical personnel. Accordingly, as a part of the Defense Training Program, the United States Office of Education was authorized to work with the accredited engineering colleges of the country in the establishment of short intensive courses in subjects essential to the national defense. All costs of these courses were met from Federal funds, and the colleges operated from the beginning on a non-profit basis.

Formal training in safety engineering had been virtually absent from the curriculum of the American engineering colleges until this program was established. A few colleges, cognizant of the great need for safety training, established evening courses in Industrial Safety Engineering as a part of the E.D.T. program.

96-Hour Course for Supervisors

The National Committee, with the wholehearted co-operation of the Office of Education, aroused the interest of the engineering colleges in this Safety Training Program, and as a result, a standard

96-hour course known throughout the country as "Industrial Safety Engineering" was organized on a large scale. This training program has done more to give to the supervisory personnel of American industry a systematic training in accident prevention than any other single project. Once again, statistics are tedious, but it is at least impressive to know that 40,000 men and women have been trained in accident prevention through this course.

The colleges have been responsible for the operation of this training program, although their financial support has been derived entirely from the United States Office of Education. In virtually all cases, instruction in this course has been carried on by experienced safety engineers, with the result that the trainees in the classes have received live and pertinent instruction, while the colleges have also started to become safety-minded.

Any company is privileged to send its supervisory personnel to one of these courses, and virtually every engineering college in the country is now operating such courses. They are tuition-free, and the only cost to the student is the price of his text material.

This 96-hour course does not pretend to make safety engineers. Rather, it is intended to give a basic training in accident prevention to men and women who have some responsibility in this field in their particular companies. Despite the fact that the training is brief, a surprising number of individuals have been upgraded by this course into responsible safety positions.

In order to give more training to the smaller number of individuals who have such responsible safety jobs, continuation courses have been organized by a number of colleges. Those colleges which are located in metropolitan areas, and are thus fortunate in having access to unusually competent safety personnel, are now operating such courses. Employers should consult their nearest engineering college to see whether such a course is available.

These 96-hour courses can do and have done several things. They have aroused the safety consciousness of a large number of responsible employees; they have given specific technical information to representatives of many companies which have never had any organized safety plan they have conveyed to many companies information on the best way of setting up Safety programs and of making them work; they have in many cases brought to the attention of management the necessity for a Safety program and the possibility of starting one immediately.

The tremendous improvement in worker instruction which has been brought about by training within industry has also contributed greatly to accident prevention. It is obvious that the best time to teach the safe way of doing a job is at the very beginning, and the ideal job instructor is therefore one who is both competent and safety conscious.

20-Hour Course for Workers

In order to bring safety training home to the lower level of supervision and to the great multitude of industrial workers, a new type of safety training is now becoming available. The 96-hour course is not suitable to all employees, since the great majority are responsible only for their own safe working and exercise no supervision over others. A 20-hour package course representing the essential parts of the longer course is now available, and is beginning to be used by an increasing number of industries. This 20-hour course is built around a series of sound-slide films which have been produced by the National Safety Council, using funds from the War Production Fund.

The 20-hour course is so designed that any competent graduate of the 96-hour course can put on a thorough version of the short course in his own plant. One of the difficulties in establishing the 20-hour course was the problem of compensation for the instructors. It now seems that this problem will be solved through the co-operation of the Vocational Training Program for War Production. These 20-hour courses are now available in many states, and concentrated efforts soon will begin to spread this type of instruction widely throughout America's war industry.

Probable Results

It has been frequently stated that no one

wants to hurt himself. It has been more frequently observed that each year millions of workers succeed in doing what neither they nor any one else wishes, namely, becoming a part of a lost-time accident. Unsafe working conditions undoubtedly cause many accidents, but unsafe conditions are rapidly corrected when management gives enthusiastic backing to supervisors who are trained in the detection of hazards.

It can be expected that supervisors who have taken the standard Safety course will be definitely safety conscious, and they can also be expected to insist upon safe working habits from their employees. Thus, the supervisor who has been trained in safety will create both a safe environment and safe working habits. Most of the acts which cause accidents are simply stupid and thoughtless, and virtually all can be prevented by safety-conscious supervision.

The spreading of the 20-hour Safety course throughout industry can also be expected to result in diminished accident frequencies. Workers are usually involved in accidents because they do not think, and the 20-hour course will definitely promote thoughtfulness in employees.

Post-War Prospects

One of the most valuable aspects of the present Safety Training Program lies in the fact that once safety consciousness has been established in a worker it is likely to remain a permanent part of his character. Thus, those men and women who have learned to be safe workers in war time will also be safe workers in peace time.

The engineering colleges of the nation have, by the War Safety Training Program, been made conscious of the accident-prevention problem, and steps are now being taken to insure adequate attention to Safety Engineering in all engineering curricula.

It is to be hoped that, in some manner, the Industrial Safety Engineering Program will be made a permanent part of engineering education. If the new generation of engineering students is made safety conscious, the post-war machine will automatically be made safe, because its designer will be conscious not only of the efficiency of the machine, but also of its safety.

If safety training can be continued for supervision, and can be carried continuously to the rank and file through such devices as the 20-hour course, it seems reasonable to believe that real strides can be made in he direction of eliminating accidents in industry.

The most effective way of eliminating accidents is through education, and tools are now available by which this education can be obtained. It is the responsibility of management in the rubber industry to see that these tools are used in their plants.

Highlights in the Placement of Women in Industry

By RUTH I. STONE

Chief, Women's Placement Section, Westinghouse Electric Co., Chicago

Women doing the work at home while their men fight is no novel sight. It is an old role for them—primitive society functioned much the same as we do today. The Indian squaw raised the maize while the braves waged war on other tribes or the encroaching whites. And since the beginning of the Industrial Revolution women have worked in factories and mills.

However, there has gradually developed a code in the public mind as to what women should do. It is the breaking down of this code in our new war emergency that has caused such confusion in the public mind. No longer is it a question, "What should the working woman do?" but "What can she do, and what should she be paid for it?"

What Can Women Do

The problem for us to consider is, "What can the woman worker do in the rubber industry?" What she can do is determined by training and by the working

conditions in your shops. She needs every safeguard that you have developed for the man in your factory, but also, she needs other considerations because of her physical and social relationships.

I assume that those present accept the premise that a woman is not just a "little man." There is not only a difference in height; there are also differences in strength, bone structure, muscle arrangement and the per cent of fat in the bodies of men and women. The difference in height may make it necessary to provide higher stools or to lower the height of the level of work, whether it be a machine she is tending or the bench at which she works. Her arms are shorter than a man's, a fact that must be taken into consideration when arranging the work on the bench.

Even if a woman is selected whose height equals that of a man, she can lift only about half of what he can lift. That presents to you a problem of developing devices such as elevators, trucks, or conveyors to reduce the amount of weight to be lifted and the frequency of lifting.

Some states have already passed laws regulating the maximum weight that women may be permitted to handle. The United States Department of Labor recommended in a recent bulletin that the optimum single load should not exceed 25 pounds in compact form, and where the work is heavy and continuous there should be a break by limiting the time spent on it and by devoting the rest of the day on some lighter work.

These suggestions take into consideration the fact that any woman may lift an exceptional load once in a while, but if the lifting is repeated, the strain resulting may produce undue fatigue—the parent of many accidents—or even harm the body structure to the point of eventually affecting the development of pregnancy.

Factors to Be Considered

In determining whether the job is suitable for women, it would be well to keep these eight factors in mind, a list against which to check each job:

1. The period of sustained lifting effort.
2. The height of lifting.
3. The degree of rotation of the body.
4. The weight of load in relation to the operator's weight (35 per cent).
5. The size and shape of the load.
6. The distance it is to be carried.
7. Change of level during lifting or carrying.
8. The methods of lifting.

These are found in the paper presented by Miss Carol G. Olson at the Midwestern Safety Council on May 6, 1943.

Noise does not seem to be a serious problem in the rubber industry, but it is one of the conditions of work that does affect women more acutely than men. If you are putting a woman in or near a noisy department, then you might try the ear stoppers that have proved advantageous in ship yards and airplane factories.

Anemia is a physiological fact not recognized often enough by the foreman, safety engineer or the woman herself. Women have fewer red corpuscles than men. Therefore, less oxygen is taken to the tissues with the result that they tire more quickly, and that begins a vicious cycle, for fatigue reduces the power of the blood to destroy bacteria. In other words, fatigue increases susceptibility to infection.

This leads to that perplexing problem of industrial poisons which I believe may well be the chief concern of those in the rubber industry where solvents are used in the product. It has been established beyond doubt that women are susceptible to certain industrial poisons such as lead, mercury, arsenic and benzene. These have much the same effect on women as on men, but in addition, they may produce miscarriage in a pregnant woman, or cause sterility.

Dermatitis has increased in many companies. It is well to remember that solvents used to cut grease may injure the skin of the woman because she has a layer of fat beneath her skin that men do not have. Consequently, new solutions are being used and new substances introduced in our products. They present the challenge of continual study as to their effect on all workers, especially the female worker.

Social Limitations

Under social limitations, it seems fair to list the fashions of the hour as well as home responsibilities. The hair is being worn longer, and if the woman with flowing locks is near machinery, some sort of cap or hair net must be worn to keep it out of danger and safe. Perhaps you have already learned that there will be resistance, but you who know the hazards better than she will have to be firm.

The other extreme is foot wear. The high heels which aggravate the woman's natural tendency to fall because of the wide pelvic base have largely disappeared. But because of shoe rationing the woman is apt to try to save her good leather shoe by wishing to work in any old thing. If the floor of the work room is likely to become littered with clippings from the work bench, or if she is handling fairly heavy material, then you have the right and the duty to insist that your workers, both men and women, wear safe shoes. They are one of the essentials of protective clothing.

Women will accept, however reluctantly, your requirements that they wear protective clothing such as caps, gloves, overalls and shoes.

The social responsibilities of the woman —the care of her home and her family— are large factors in her poor attendance. If a night shift is necessary, then it is best to have employees rotate, not more frequently than every four weeks nor longer than twelve. A change every six weeks is the most popular among our people who have voted on the length of the shift.

Also, the work period should be interrupted with rest pauses to avoid fatigue with its attendant loss in production and loss in resistance to sickness.

Every safety engineer has a dual responsibility not only to reduce the accident rate but also to increase production. For more than thirty years the accident rate has been steadily lowered, but now with the advent of new, inexperienced workers in our factories, increased vigilance is required to keep the rate down to the prewar level. In addition, every job must be considered not only for its inherent hazards but also for that extra something needed to increase production, and I am convinced that both depend on the same problem, "How to prevent and reduce fatigue." If you can find the answers to that, you have the key.

Health Service in War Plants

C. O. SAPPINGTON, M. D., DR. P. H.
Industrial Health Consultant, Chicago, Ill.

The peak of industrial employment has been reached and there can now be no doubt that the health of the working population is of the utmost significance in the conservation of manpower and in the production of war materiel.

It is possible to classify the war and postwar problems of industrial health into those of medical administration, those of public health in industry and the community, and finally, those relating to industrial hygiene and sanitation in the plant. It is obvious, however, that these overlap somewhat.

Venereal Disease Control

It should be understood that this is a problem primarily affecting the community and is, therefore, one of public health interest, not one of industrial responsibility. The diagnostic procedures should consist of a thorough physical examination supplemented by laboratory tests, including serology, and treatment by a family physician or a clinic. In a survey of 77 plants recently, it was the practice of one-third to reject all applicants who were positive reacters, while two-thirds of the plants accepted such persons when there were no contra-indications, these being communicability and central nervous system or cardiovascular involvement.

Preplacement and Periodic Examinations

The tendency at the present time is to streamline these services to the best utili-

zation of the physician's time by the use of nurses as physicians' aides to take all the history and also do certain of the examination procedures. Intelligent nurses can be trained to do a great deal of the work, leaving the entirely medical procedures and the interpretations of mechanical results to the physician. Examinations should be adjusted to use more men over 40, and should be based more on the requirements of the job.

There should be no relaxation with reference to periodic examinations and the industrial hygiene engineering data with which they should be associated, but these should also be streamlined to make the best use of the time of the professional groups.

Nutrition

The principle factors involved in industrial nutrition are the provision of an adequate diet for the worker, both at home and in the plant, and the education of the worker and his family—special care of underweights and overweights—and the use of nutrition advisers and dieticians by industry and public health groups.

The subject of vitamins has been met by an almost bizarre public reaction. It is admitted by the authorities that the wholesale purchase of vitamins at drug stores by the public is far beyond the control of those who are in a position to give advice, but in industry this is not the case—the choice lies with the officers and industrial physicians in each employment situation.

Immunization

Routine vaccination for smallpox should be done on all persons who have a vaccination scar five years or more old. The question of respiratory disease and cold vaccines is still an undecided one in scientific circles, although empirically such vaccines are used in many industries today. Clearly there should be a continuance of research work and also application to human needs with proper controls, so that more adequate procedures may be classified and standardized. It is quite possible that other types of immunization are not relatively important in industry.

Women in Industry

The types of work which women can do have now been standardized fairly well and can be referred to when anyone wishes information on this point. A list of these has been prepared by Dr. C. D. Selby for General Motors Corporation, and by various groups, including the Women's and Children's Bureau of the U. S. Department of Labor, which has published information on this subject.

Most of the authorities agree that all women should be examined thoroughly, but there is a disagreement regarding the making of pelvic examinations. A rational approach to this problem seems to be to make pelvic examinations only on married women and particularly if indicated by the history. X-ray films of the chest are decidedly important, particularly in young women because of the high tuberculosis rate among them.

A female counselor and health maintenance service has been found to be very successful in experiences of many years of dealing with women in industry by Dr. Max Burnell of the AC Spark Plug Division of the General Motors Corporation, Flint, Michigan. The special problems of the physiology of the female — menses, pregnancy and the menopause—of course come in for a great deal of consideration among women workers. Hours of work vary in different states, so that it would be necessary to be informed regarding the legislation in the state concerned. Clothing has been receiving a great deal of attention, but apparently women workers frequently go back to slacks and sweaters, even when uniforms are provided by the company. Proper restroom facilities and hygienic surroundings certainly go a long way toward making satisfactory working conditions. The use of women physicians is increasing, particularly for handling female employees. Health education is probably one of the most important phases of the subject of women in industry, in getting the cooperation of women in discussing their physiological problems.

The author has recently completed an extensive survey on women in war industries, by actual plant visits, inspections, and interviews sponsored by the Industrial Hygiene Foundation of America, the results of this study make available the

actual practices and policies of representative industrial groups.

Dermatoses

These are the most frequent occupational diseases in industry, and cutting oils are the most frequent cause, not because of the marked irritation of such cutting oils, but because of their wide usage. Soluble cutting oils rarely cause dermatitis, but the insoluble do, and they may contain sulphur and chlorine, the latter being particularly irritating at times. The oils are practically sterile however, containing bacteria on occasion but usually no pathogens. In the prevention program, personal cleanliness is of the utmost importance and outranks all other procedures, protective clothing of various types, particularly impervious aprons, sleevelets and gloves coming second, and ointments of protective nature low down on the list, according to Dr. Louis Schwartz, the eminent authority in this field.

Absenteeism

The greater part of absenteeism is caused by non-industrial illness. However, it is the short-time absences which are most in the public eye. As recently pointed out by Dr. Frank F. Tallman, a psychiatrist of Lansing, Michigan, the worker may be sick of many different kinds of things—he may be sick of love, whiskey, taxes, poor housing, transportation, etc.

Dr. Louis Selling, a psychiatrist of Detroit, says that individualization, and not mass methods, is the solution to the problem of short-time absenteeism—the total man is the concept and his reaction to all factors must be considered. The individual worker must be assured of his importance in the total scheme of things, according to Dr. Lydia Giberson, consulting psychiatrist to the U. S. Public Health Service, which means no matter whether he makes a set-screw or a tank, he must realize that his part should be well done in order to win eventual victory.

Fatigue

There are many factors involved in fatigue, those of industrial, non-industrial and mixed character. Apparently, the most important are hours of work, rest and sleep, adequate nutrition, proper recreation, and the will to work, the latter being especially important. We must not only provide safe and healthy places to work, but must realize that the physical and mental health of the individual is one of the most important factors in prevention of fatigue; what the employee does in the 16 hours outside of the plant can upset the best industrial health program inside the plant. By health educational methods, streamlined to meet modern needs, we should be able to make workers physically and mentally comfortable inside and outside the plant.

Tuberculosis

This disease always increases during wartime because of strain, anxiety, lack of adequate rest and food. If the last war was any criterion, there will be an increase in tuberculosis among industrial employees — the increase having already occurred in the general population. Fortunately, the cost of case-finding, which is industry's real avenue of usefulness in this problem, has now reached a new low. The only industrial exposure which has a specific relationship is severe exposures to dust of high free silica content.

Rehabilitation

Rehabilitation, physical, mental and vocational, forms an important field now and will be more important after the war. The Connecticut Clinic, under the guidance of Dr. E. P. Chester, of Hartford, has done outstanding work by securing the cooperation of labor, management, physicians and psychologists. Here, handicapped persons have been fitted to jobs and the cooperation of labor and industry with professional groups has been exceedingly interesting and successful.

Handicapped persons will be used in increasing numbers in spite of objections concerning liability. Waivers have been suggested in some states, and in Michigan at the present time there is such a bill pending. There have been some supreme court decisions to the effect that when an injury is due solely to the handicap, the employer is not liable. Concerning the subject of waivers, Connecticut has had a history of handling some 5,000 waivers annually without difficulty. Connecticut has a very carefully written statute, how-

ever, which provides for a thorough physical examination in connection with the waiver provisions.

A rehabilitation clinic has been quite successful at Rochester, New York, under the guiding influence of Dr. W. A. Sawyer. A manual on employment of women and the handicapped by the U. S. Civil Service has been stated to be a real contribution regarding etiology and disability, which have been correlated with job capacity.

Health Education

This is the only logical approach to the efficient cutting down of the tremendous losses due to non-industrial sickness. The employee should be taught what he or she can do to take care of themselves. The kind of health education which are available are varied, and there is considerable difference of opinion as to which are best, but it is generally acknowledged that an appeal to the eye and the ear by the use of sound and photographs is ideal for practical purposes, as exemplified in sound-slide films, the price of which is also within the means of most industrial establishments. Moreover, this kind of presentation is of particular advantage to physicians and nurses and safety directors who are usually so busy that they do not want to take the time to prepare material and present it.

Processes and Materials

During wartime, with the great rush of production and the difficulty in adapting to changed conditions, there will be new processes and materials, as well as new appearances of old hazards and it is because of the tremendous intensity and speed of production by labor and management that health may be lost in the shuffle, as Lt. Commander J. J. Bloomfield has so well expressed it.

Sandblasting, grinding and buffing, in which dust is a by-product, are not new processes and can be used safely, but safe provisions are not always made under war production conditions. Dust control at the source is important in all of these processes and can be so arranged as to control the hazard of silicosis.

The use of X-ray apparatus for testing purposes and the use of radium and fluorescent materials for dial painting may be injurious and, therefore, protective measures must be provided for these procedures.

In the welding of tanks, it has been found that fluorine and chromium compounds are given off, and that the protection of the eyes and the respiratory system is necessary. Thus far no manganese problem has been indicated in these processes.

The making of synthetic rubber has also indicated that a problem may exist if not properly supervised — exposures to the handling of, or creation of, vapors of acrylonitrile should be guarded against and the men properly protected by rubber footwear, gloves and the use of a lifeline when cleaning out tanks, as well as proper ventilation at various stages of the process.

The use of chlorinated naphthalenes and diphenyls on account of their insulating qualities and their water and flame resistance has found wide application. Already dermatitis has been experienced, and information is now being collected on systemic effects, there having been some instances of liver damage reported.

The use of various materials in the manufacture of explosives, such as toluene, TNT, tetryl, lead azide, mercury fulminate, and the various nitrates, also needs proper protection against the hazards of systemic effects and the more common dermatitis outbreaks.

Magnesium casting has presented a very definite difficulty, what with exposures to fluorides and sulphur dioxide caused by oxidation inhibitors, chromium compounds from pickling as an anticorrosive, and carbon tetrachloride in the spraying operation to chill the metal, as well as magnesium oxides. The most important of these are the fluoride gases.

Similarly, in the electric welding of armor plate, fluoride compounds and chromium are involved; the latter, however, does not figure as an important exposure because of its type.

Noise control has also presented a problem in certain types of industries, particularly in the testing of airplane motors where the noise goes up to 140 decibels. Reduction of noise has been largely accomplished by insulation and dampening

processes supplemented by special periodic examinations of the exposed workers.

A new lead hazard has apparently appeared in the use of a new silver solder which is higher in lead to the extent of 84 per cent in order to save tin. In using this solder, it requires 100 degrees higher temperature to melt than the old so-called 50-50 mix. Another metal, cadmium, also is being used considerably more extensively in electroplating, and may present the necessity for careful protection.

Among some of the older materials and processes which, under new conditions, may need to be well supervised, are the uses of plating solutions; the lead being specified in governmental formulae for paints; the use of menthanol, and the occurrence of carbon monoxide in steel metallizing processes where it has been stated to occur as high as 500 parts per million, which is five times the permissible standard.

Postwar Problems

In discussing the problems which will come after the war it is necessary to keep in mind that some of these may be anticipated by postwar planning. However, as Mr. Charles Kettering, the famous scientist, has remarked, one must look at these plans to see if they are really plans or whether they are merely wishes; moreover, Mr. Kettering asks the question, "Will human nature be any different after the war from what it was before?"

In health services in industry in the future there will be greater demands on the medical and health personnel, especially with reference to placing applicants in jobs for which they are best fitted; there will be greater developments no doubt for the measurement of mental capabilities, with proper adjustment to the job. There will be easier methods of placement and the evaluation of mental and physical standards, all of these to be worked out on a basis whereby they may be applied to individuals by mass methods.

Another group of problems will center around socio-economic-medical relationships and one of the most prominent of these will be the rehabilitation of the handicapped, including war casualties, and reintegration of these into industry. Already there are excellent programs of rehabilitation, but there will also be difficulties arising from the legal implications of these methods and the assumption of responsibility by industry in accepting handicapped persons. At present this is a medicolegal problem which has so far baffled any solution worthy of the name, and is bothering legislators, industrialists and labor no end.

The extensive use of women in industry will offer a problem which will probably reach its maximum proportions during postwar adjustment. It is reasonable to believe that medicolegal difficulties will present themselves in considerable volume during this period on account of the fact that in many instances it is impossible to justify a pelvic examination of all women employees, and therefore avail oneself of accurate information at the time of employment. There are all sorts and kinds of possibilities which may arise in this way, and it is, therefore, important that both labor and industry take measures to protect the rights of their respective groups.

Finally, it should be stated that whatever gains are made in the amount and quality of health service in industry should be preserved for the use of the millions of workers continuing in production during the postwar period. It is perhaps trite to twist an axiom, but one cannot help but paraphrase the old adage by saying "In time of war prepare for peace."

General Discussion

R. W. FICKES
Safety Director, Goodyear Aircraft Corp., Akron, O.

Rather than review these previous talks, I think that I will just add a few words to each of them and then turn the remainder of the time over to a general discussion.

Mr. Yellott's talk was of considerable interest to me because it is a subject that we are all interested in. Many of you present here have participated in one way or another in the 96-hour safety engineering course offered by our government. No doubt, many of you have instructed in these courses and others of you have been on the receiving line. Now we find the people who have completed these courses are organizing clubs so that they may continue getting together to discuss safety problems of mutual interest.

In addition to this safety course, the National Committee for Conservation of Manpower in War Industries is offering a 20 hour comprehensive foreman's training course. This course should be well received in our war industries today because there is definitely a place for it.

The subject discussed here today that I find myself most interested in is, of course, the one of "Women in Industry."

What Miss Stone has said about the placement of women in industry is true. Most of our plants were designed to accommodate men and now we have found it necessary to change the layout and equipment to conform to women's needs. It may mean lowering the height of work benches, providing chairs, improving toilet facilities, increasing the number of beds in the first-aid room, conveyorizing certain jobs so that lifting will not be necessary, redesigning heavy tools, converting hand operations into mechanical jobs and changing mechanical guards to conform to women's needs. In our old plants this has been a difficult job, but our engineers have not failed us. In our new plants, the job has been made easier by allotting more space for operations to be done by women. More thought and foresight has been given to making them happy and comfortable.

Some people maintain that women are more susceptible to injury than men, but this is again determined by the working conditions. Jobs for women should be selected carefully and then properly safeguarded so that the employee can work safely. In our plant we have broken down the number of injury calls to the plant hospital by male and female and find that the ratio is practically the same, which disproves the statement that women are more careless than men.

Dr. Sappington has told us about health service in war plants. When I think about some of the people that we are hiring in our plant, I am thankful that we have a good medical department. It is true that we are hiring many physically handicapped people and they have become the safety department's problem. However, there are many exceptions and in hiring these handicapped people many excellent workers are obtained.

In our plant we are using blind people for sorting materials and they are doing an excellent job. We have a man with one arm in our maintenance department who has done an outstanding job. He has proven to us that some physically handicapped people are capable of doing a better job than some of those in the best of health. Of course, there are exceptions to the rule and we get our share of those too.

In conclusion, I would like to say that this National Safety Congress has been more accurately timed than any other, because it comes when we are vitally interested in conserving our man power. The winning of this war depends on the plants engaged in war production. If our soldiers and sailors are not furnished with war materials as they require them, our work will have all been in vain.

WEDNESDAY MORNING SESSION

October 6, 1943

Presiding: PAUL VAN CLEEF, Van Cleef Bros., Chicago.

Mechanical Safety in Plants Manufacturing Synthetic Rubber

BY GLEN D. CROSS

Safety Director, Synthetic Rubber Division, Firestone Tire & Rubber Co., Akron, Ohio

I will attempt to give some of the safe operating conditions which are necessary safety measures in the operation of a synthetic rubber plant. In most plants at least one of the two main raw materials, styrene and butadiene, is brought into the plant by tank car. Some of the precautionary measures to be considered in unloading tank cars are as follows:

1. The track at the unloading rack should be grounded, rails bonded and an insulator placed in the track at the switch. These precautions (as well as those in item No. 2 of this list) are taken to prevent electric sparks from igniting the flammable materials while they are being unloaded.

2. There should be a bond between the track, the unloading line and the tank shell. The unloading rack itself should also be grounded.

3. The tank car, while being unloaded, should be blocked and a "Tank Car Connected" sign should be placed on each side of the tank car, one car length away. It is also advisable to use a derail.

4. To eliminate another source of ignition, tank cars should not be brought into the plant by coal-burning locomotives.

5. All electrical equipment at the unloading rack should be of the explosion-proof type.

6. It is advisable to use spark-proof tools at this location.

Tank Storage Area

Some of the safety measures which should be taken in the tank farm storage area are:

1. Maximum liquid levels should be stated on storage tanks to indicate the maximum amount of liquid material to be stored at the various temperatures. Enough vapor space should be allowed above the liquid material to permit expansion without raising the pressure to any great degree in the vessel.

2. It is advisable to plug drains on tanks to prevent possible escape of the material through faulty valves or valves that have not been closed completely.

3. Periodical inspection should be made of all relief valves on tanks to make sure that they will operate at the desired pressure. I plan to give a procedure for making these inspections in the latter part of this paper.

4. It is necessary to have drains with quick-opening remote-control valves in the diked areas to drain off the water below the burning liquid in case of a fire, if water is used as a control agent. Should drains not be provided, the diked area would fill with water and the flammable liquid, floating on top of the water, would spread over a large area and increase the damage caused by the fire. The size of the drains should be large enough to handle the greatest amount of water that ever would be deposited into the diked area involved.

5. Water sprays are used on styrene tanks to keep the temperature resulting from the sun's rays below 85° F. If the temperature is kept below this point, styrene will not form dimers which are harmful to the manufacturing process as well as a definite fire hazard. It is thought that the formation of such dimers may cause spontaneous ignition of the styrene. As the flash point of styrene is also 85° F., an explosive mixture of styrene vapors will not be obtained if the water sprays on the styrene tanks keep the temperature below this point.

6. Another precaution against the formation of explosive mixtures and dimers

includes the use of inert gas as a blanket over the styrene in the storage tanks. By doing this, air is excluded from the tank and the possibility of a flammable mixture inside the tank is eliminated.

7. In practically all plants, relief valves on the butadiene storage tanks are tied into a main vent line which goes to a burning stack. It has been found desirable to keep this line to the burning stack filled with inert gas under a slight pressure to prevent the possibility of butadiene and air forming an explosive mixture in the vent line and at the base of the burning stack. In the standard plants, relief lines from the styrene tanks are tied into a vent line which runs to a styrene burning pit located at some distance from the storage area. It is also a good precaution to use inert gas in this line.

8. We have found it to be good practice to place small wire seals on valves in lines that bypass the relief valves on storage tanks. This prevents the promiscuous opening of such valves without the authorization of a top supervisor.

Caustics and Acids

The storage of caustic and acid presents a definite hazard to employees if not handled correctly. The use of protective clothing of the proper type is a necessity in working with such materials. Additional safety is provided by emergency showers and eye fountains located at unloading racks, storage areas, pump houses and process areas.

It is also desirable to have available means of neutralizing and getting rid of the caustic or acid, should a large amount be spilled. Another precaution includes the placing of dikes around the storage tanks should such tanks be located near buildings or in areas where workmen are usually found.

As an added safety practice, shields may be placed around flanges or couplings in lines containing acid or caustic. Such shields prevent serious burns which may be caused by acid or caustic being released under pressure through a defective flange or coupling.

In addition to the main ingredients of butadiene and styrene, there are a number of chemicals used in smaller quantities in the manufacture of synthetic rubber. These are usually stored in drums, barrels or bags. Properties of these materials should be gone into thoroughly to determine their flammability, dermatitis-producing qualities, and their reactions with each other when any two or three of them are brought into contact. This latter point is very important inasmuch as the reaction may cause enough heat to produce a fire.

As a precaution against such fires, dry chemicals should be placed on raised platforms to prevent the possibility of their becoming damp or in contact with any spilled liquid chemicals. Liquid chemicals in drums should be segregated from other chemicals used. Any oxidizing materials should be stored between relatively noncombustible materials which will not react with the oxidizing chemicals. Good housekeeping is especially important in this storage area. Any material spilled on the floor should be immediately cleaned up and disposed of. Two places that are often neglected in housekeeping are the pits of elevator shaft-ways and weigh scales.

Transfer of Materials

Inasmuch as we have now covered the storage of the raw materials, we will consider the transfer of the materials into the process. The hydrocarbons in the tank farm go from the storage tanks through the transfer pump house before being purified and placed in the polymerizers. As large quantities of these hydrocarbons pass through this pump house, it is imperative that all safety precautions be taken.

The use of the color scheme recommended by the Rubber Reserve Company to identify various pipe lines is of great aid in this pump house as well as at other locations in the plant. Each employee should become acquainted with the identification scheme and especially with those colors which are used on pipes carrying flammable materials. We have found it desirable to post bulletins throughout the plant, showing the colors which identify each.

As the flammable liquids and gases which pass through the pump house are heavier than air, adequate ventilation at

the floor level should be furnished. Such ventilation is also necessary in other buildings or rooms where these materials are pumped or used.

All electrical equipment should be of explosion-proof type and should be maintained properly. As in other areas throughout the plant, housekeeping of the highest type is most essential in this transfer pump house. Oily rags should be placed in closed metal containers and should be picked up daily.

The pumps and compressors in this building are usually provided with relief valves on the discharge side to relieve excessive pressure to the suction side of the equipment. These should be checked periodically to insure their proper functioning, thus preventing an excessive pressure from being built up in the discharge line from such pumps or compressors.

As there are caustic circulation pumps in this pump house and as the caustic purification units are usually adjacent to the pump house, it is desirable to have at least one emergency shower and eye fountain in the building.

After the butadiene is pumped from the storage tank it goes to the caustic purification unit where the inhibitor in it is eliminated. Here again, it is advisable to have shields over flanges and couplings in lines carrying caustic.

The decanters in the unit are provided with relief valves which should be tested periodically to determine if they will operate at the proper pressure.

Polymerization

After the butadiene is purified, it and the other raw materials are pumped through meters to determine accurate amounts for the batches. The room housing these meters is a hazardous area and should be properly ventilated at the floor level to prevent an excessive amount of vapors from being present.

Next, the butadiene and the styrene are placed in the polymerizers together with an emulsifying agent, a catalyst and a modifying agent. These polymerizers are equipped with combination relief valves and safety discs. The safety disc prevents the relief valve from becoming gummed-up by the materials in the vessel. A pressure gauge should be used between the rupture disc and the relief valve to detect any leak in the disc. The vent line from these combination relief valves and discs runs into a "knock out" tank, in which liquids are trapped, letting the vapors continue on to the butadiene burning stack. It is necessary to make sure that the valve arrangement to this tank is properly set up to furnish the relief necessary. Wire seals on such valve controls may be desirable.

Under ordinary operating conditions, the highest pressures found in the entire process are present during the polymerization. Safe operation is exceedingly important here. After the reaction in the polymerizers is almost completed, the latex, as well as the unreacted butadiene and styrene, go through the recovery process. In this process, the unreacted butadiene is first recovered and then the unreacted styrene. It is essential that the vessels in the recovery process be provided with adequate relief valves. All enclosed sections of the recovery building should have good ventilation and all electrical equipment should be of explosion-proof type.

Once the latex has been stripped of its unreacted materials, it does not present any special fire hazard unless the recovery process be incomplete and a great amount of styrene be left in the latex. In this case, it is necessary to take special precautions in the rubber process building to prevent the accumulation of a high concentration of fumes in any one location.

The coagulation of the latex into solid chunks of rubber involves no safety problem other than that connected with the use of a dilute acid in one of the coagulating methods. It is necessary, of course, to properly guard transmission equipment and provide emergency stops on any rolls through which the rubber passes. Once the coagulation process is completed and the rubber is formed into small particles, the drying operation starts. In the dryers a considerable amount of fumes are driven off. This calls for good ventilation inside the dryers and the prevention of fumes from passing through openings in the dryer enclosures to the areas surrounding them.

Frequent cleaning of the dryers and adequate control of temperatures will aid greatly in the prevention of dryer fires. The ventilating ducts from the dryers themselves should be checked frequently to determine if there is any excess accumulation of materials in them.

Relief Devices

It can be said that the Rubber Reserve Company standard plants contain adequate safety features to make for safe operation. Nevertheless, the equipment will not function, as designed, if it is not properly maintained. This is especially true of relief valves and rupture discs which are vital to the safe operation of the plant. Defective relief devices and those that are of inadequate size are responsible for most cases of equipment failure. Some important points to be considered with regard to relief devices are as follows:

1. The discharge pipe on relief devices should be installed to prevent the accumulation of ice, water, dirt, etc., in it.

2. Relief devices should be installed at the highest point in the vapor space in the vessel.

3. Any shut-off valves installed before or after the relief devices, must be sealed open and inspected regularly to prevent them from being closed.

4. Back pressure on the discharge side of the relief devices should be low, if present at all.

Periodic inspections and maintenance of relief devices are essential to their proper functioning. It is necessary that a record be kept showing the date and conditions found at the time of the inspection of each relief valve. All maintenance work on such equipment should be performed by personnel who are skilled in this type of work.

A procedure that can be followed in testing relief valves is as follows:

1. The valves should be tested for the opening and reseating pressures.

2. There should be a test for leakage at a pressure slightly over the operating pressure.

If found to be satisfactory in both of these points, the valve may be returned to service.

Valves requiring maintenance should be cleaned and the face reground, using a water soluble valve-grinding compound. Following the cleaning, regrinding and assembling operation, the valve should be tested for leak-tight pressure at a pressure slightly below the opening pressure.

When the set pressure of a relief valve is changed, a new name plate should be attached showing the new pressure. The set pressure of the valve should never be increased more than 10% above the designed working pressure of the equipment. It is desirable to show, in addition to the set pressure, the actual free discharge area of the relief valve in square inches.

Safety relief devices should be so arranged that the possibility of tampering with them will be minimized. If pressure setting or adjustment is external, the relief valve should be provided with an approved means of sealing the adjustment.

No relief device should go for a period of more than a year without being inspected. One large chemical corporation has found that, even though frequent inspections are made, nearly 50 percent of their devices are in need of some attention when inspected. Another important point to be considered with relation to relief devices is that they should not be interchanged unless they are of the same type and size.

For the most part, I have attempted to cover only safe operating conditions, and have neglected to discuss the safety education of operating personnel. This has been due to the limited time at my disposal. Nevertheless, as you realize, safe practices are most essential and the safety program should be carried on without interruption to make sure that supervisors and workers do not become lax in taking necessary safety precautions.

Ventilating Problems

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The problem of ventilation arises in almost every phase of civil and industrial life. Not many years ago, ventilation was considered a luxury but today it has become a necessity in most industrial plants.

The rubber industry, in various parts of its processes, makes considerable use of heat, solvents and chemicals. Ventilating apparatus is required in many of these operations. Since the field is rather broad, I will review some of the more common conditions created by the processes that require ventilation.

Dust

There are two main reasons why dust should be confined and removed: One, it is a fire hazard; two, it affects the health of employees. In many dusting operations, static electricity is developed. This creates a hazardous condition, especially where flammable vapors may be present. In operations of this type, the machine should be hooded. The hood should be located so that the flow of air will be from the operator to the machine, then to the exhaust hood. Further, the hood should be designed so that air currents in the working area will not interfere with the proper flow of dust laden air to the exhaust openings.

In many cases, it is rather difficult to hood dusting operations. In such instances, it is advisable to confine the operation to an isolated area; or if necessary, to enclose the entire machine. Exhausting air from the enclosure, or the isolated area, will prevent the dust from spreading to other parts of the building.

Where solvent recovery is to be considered, the difference in performance between the two types of installations may easily be the deciding factor in the economics of the recovery system. While all machines cannot readily be designed to accommodate the desired changes, serious thought along this line might bring about sufficient improvement to materially simplify the problem of dust and solvent vapor removal.

Solvent Vapors

In many of the processes today, solvents are an integral part. New products of all descriptions are being developed, and many of these require large volumes of solvents in their processing. In some cases, solvents may be handled several times, thus adding to the ventilation problem.

In most of the processes, a certain amount of mixing prepares the solvent for further use. In many cases, these mixers have open tops and frequently are driven through line shafts and belting. In a layout of this type, it is important to maintain large volumes of exhaust air, because the solvents are not confined. It is necessary to place the exhaust ducts between the wall and the mixers, locating the openings near the floor as well as near the top of the mixers.

Wherever possible, the top of the mixer should be hooded and connected to the exhaust system. The exhaust system should be of sufficient capacity to give the mixing room an air change approximately every three to five minutes. Some rooms require more while others will take less, depending on the working space and the volume of vapors liberated. Where mixers are covered, the air condition will naturally be better; however, good exhaust should be maintained since losses will take place in the handling of the solvents.

It is further desirable to replace this exhaust air with fresh air, especially where rooms are separated by fire walls. The use of open windows is quite common, but through the winter season, window ventilation is not desirable. Further, any fresh air brought into the room should be distributed so as not to spread the solvent fumes throughout the area. Fresh air brought into the room should be discharged toward the working area, thus giving the employees the benefit of the fresh air before it is drawn toward the mixers to be exhausted.

From the mixers the solvents are conveyed, either manually or mechanically, to

various types of processing machines. These may be printing presses, coaters, impregnating tanks, spreaders, etc. With the above machines, drying apparatus is used to hasten the liberation of the solvent and the drying of the product. It is very important with practically all machines of this type, to provide sufficient ventilation and exhaust.

Where possible, the entire machine should be enclosed. If physical conditions make it impossible to enclose the entire machine, the more critical parts should be hooded. If satisfactory hoods cannot be provided to confine the solvent, a large volume of air should be exhausted near the machine to prevent the accumulation of high concentration solvent vapor pockets. If the machine can be effectively enclosed, certain operating economies will be experienced: One, by enclosing the machine heat is confined, thus reducing heat loss; two, where solvent vapor is trapped, large volume of exhaust air is not required for satisfactory ventilation; three, the trapping of solvent vapors makes it more economical where recovery systems might be considered.

Of course, in confining solvent laden air it is imperative that the concentration be kept well below the explosive limit. This is not such a difficult problem. With a knowledge of the solvent and the volumes liberated, safe working conditions can be maintained. By controlling the various operations, sufficient safeties can be provided to prevent the solvent concentration from reaching the explosive range.

Fire Hazard

Where solvent vapors are liberated and no ventilation is provided, a serious hazard exists. Often times, depending on the type of operation, concentrations will vary from below the explosive range, through the explosive range and even beyond. Frequently, processes are of such a nature, that it is difficult to avoid a high concentration in certain parts of the process. In operations of this type, areas where the solvents are handled should be confined as much as possible; and the entire surrounding area should be thoroughly ventilated so that under no condition will an explosive mixture exist near the machine. Under these conditions, should a fire develop in the highly concentrated area, it can be isolated, thus preventing a serious explosion and the propagation of a fire.

In many plants solvents are handled by mechanical means, such as electric pumps, etc. In these areas, exhaust should be provided because of losses in stuffing glands, loose pipe connections and occasional repairs to machinery. It is necessary to rid these machines of all solvent vapors before making repairs.

Static Electricity

Static has been the cause of many explosions and fires and therefore should receive the utmost consideration. All parts of the machinery should be thoroughly grounded. Brushes of a satisfactory design should contact all shafts and static bars of an approved design should be located near the processed material for desired leakage of the static charge, and near rope or belt drive, for these frequently develop rather high static charges.

In grounding machinery, heavy wire is recommended. Over caution is advised, since grounding of machinery is not expensive and requires practically no maintenance, once installed.

Humidification

Another very desirable means for removing static is the introduction of moisture into the air. It has been observed that where humidities are maintained above 50 per cent, static charges are very much reduced. In some cases it has been found necessary to maintain relative humidities of 60 to 65 per cent for satisfactory static reduction. Of course, humidification can only be considered if it is not detrimental to the materials being processed.

Frequently, due to plant construction, it is difficult to maintain high humidities during periods of low outside temperature; this is due to excessive condensation on walls and ceilings. Where it has been found necessary to carry high humidities, drain troughs have been provided to take care of condensation, thus preventing dripping from sash and monitors.

High Temperature Areas

The introduction of an air washer system will provide fresh air and recirculated

air at lower temperatures, thus maintaining reasonably favorable working conditions. The intimate contact between the air and water spray in the air washer will frequently reduce the temperature of the air as much as 10 to 20 degrees, depending on the moisture content of the air entering the apparatus. In the summer, when the outside humidity is high, the humidification system can be shut down and used as part of the ventilating system. Except for possibly ten to twenty days of the summer period, air washer apparatus is a very satisfactory and economical source of cool air for plant circulation. This type of apparatus is desirable where excessive heat loads exist. In addition, circulated washed air materially reduces the dust and solvent vapor content of a plant. To refrigerate air in plants of this type is rather expensive.

To provide for ventilating equipment involves expenditures and, in some cases, it is quite appreciable. However, by careful study, satisfactory ventilation can be provided at moderate cost. Improved working conditions will reduce absenteeism and labor turnover, will increase production of a uniform product and, further, will reduce insurance rates by eliminating the various health and fire hazards. These are important factors that should not be overlooked.

Dermatitis from the Manufacture of Synthetic Rubber

By W. E. OBETZ, M.D.
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A review of the literature on dermatitis and the manufacture of synthetic rubber fails to disclose very much information on this subject. Wherever dermatitis is mentioned, it is usually stated that its occurrence is either impossible or of little importance. It is generally a safe conclusion, however, to assume that wherever chemicals are handled, conveyed, or mixed there is a possibility of skin irritation among the persons so employed. The number of cases usually depends upon the number of employees and the extent of exposure.

Comparatively Few Cases

In the manufacture of synthetic rubber, a number of chemicals are employed and their use in the various processes does sometimes result in skin irritation. So far as is known, only a comparatively few cases have developed, considering the number of persons engaged in this occupation. This small exposure is probably due to the fact that much of the process, as far as the conveying and mixing of chemicals is concerned, is entirely enclosed in a network of tanks, pipe lines, and similar equipment. From the tank car until coagulation has been accomplished, the process is almost entirely enclosed and the chances of exposure occur only when there is a leak in some pipe line, a defective valve, or a disabled pump. After coagulation takes place, the washing, drying and pressing operations provide opportunities for exposure, especially to fumes and vapors thus liberated.

Butadiene and styrene are the chemicals most frequently mentioned in the manufacture of rubber. Various other solutions and dyes are required, but from the causes given in claims filed, styrene is most frequently mentioned and is considered more irritant to the skin and more apt to cause contact dermatitis.

Frequency and Distribution

The cases which have come to our attention by claims filed for the payment of compensation for disability and for medical expenses incurred, indicate that chemists, laboratory helpers, maintenance men, janitors, and laborers occasionally develop dermatitis from contact. Chemists and laboratory helpers are no doubt exposed during their experimental work. Maintenance and repair men are no doubt required to repair broken parts where leaks occur. Janitors are exposed to dust and liquids in the process of cleaning. Even

those who handle bales of the finished product occasionally develop contact dermatitis.

In order to best illustrate the frequency and distribution as well as the disability resulting from dermatitis, a study has been made of 27 claims from one of our larger plants manufacturing synthetic rubber. These claims were filed during the first eight months of 1943. The disability occurred between November, 1942 and July 1, 1943. The occurrence of these cases by months was as follows:

November	1
December	3
January	0
February	2
March	7
April	5
May	1
June	8

It is interesting to note this distribution of cases because, during March and April, an unusual number of cases of dermatitis developed among the employees working around a large dryer. Just what caused this dermatitis was difficult to determine; but all persons in any way subjected to the fumes or dust in the vicinity seemed to be affected. This even included the cleaning force, composed of both male and female janitors. It also included a painter working in the vicinity. It was concluded that exhaust hoods were necessary, and the installation of this equipment seemed to solve the problem. Later, however, the painter and one of the janitresses had recurrent attacks of a mild form of dermatitis.

From the standpoint of distribution the 27 cases were reported by the following persons:

Utility Men	7
Solution Mixers	3
Janitors	9
Mechanics	1
Reactor Helpers	2
Chemical Engineers	2
Painters	2
Chemists	1

Most of the cases reported were mild as indicated by the claims filed. In only three of the 27 claims was there a disability of more than seven days. In two claims the disability was nine days each and in the third, 12 days. It is evident, therefore, that the cost of compensation was negligible and the medical expense was very small, many of the cases being seen at the plant hospital only once or twice.

The distribution of cases, as far as part of body involved, shows that the dermatitis appeared chiefly on the exposed surfaces, that is, hands, forearms, face, and neck. In some instances several portions were involved at the same time. For example, hand, forearms, and face or face, neck, and arms. The classification of claims shows that the face was involved in seven claims, neck in four, arms in six, forearms in 14, hands in four, trunk in four, legs and ankles in four, thighs in one.

Symptoms and Treatment

The type of eruptions, as described in the medical reports, indicates that it appeared chiefly as a rash or erythema. In most instances the term "dermatitis" was used. In one claim, vesicles were described; in another, folliculitis was described; and in a third case, a maculopapular eruption was mentioned. From this it should probably be concluded that the skin irritation usually occurs in the form of a rash with redness and perhaps small pimples or may occasionally have water blisters or small pustules.

The period of disability was usually very short and, in many instances, no time was lost. The treatment prescribed by the attending physician consisted chiefly in simple lotions or ointments, to which the dermatitis yielded readily, apparently without any complications.

In conclusion, therefore, our experience indicates that the manufacture of synthetic rubber occasionally causes dermatitis among the employees, due largely to exposure to the various chemicals, especially styrene. The dermatitis occurs on the exposed surfaces of the body, in a mild form, causing little disability and responding to the usual treatment for mild dermatitis.