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TUESDAY MORNING SESSION

October 27, 1942

Presiding:—Ralph S. Farnum, Safety Supvr., U. S. Rubber Co., Detroit

All Out for Safety

By PAUL VAN CLEEF

Van Cleef Bros., Chicago, Ill.

Safety is something which cannot be purchased like an ordinary commodity, nor can it be captured like material from an enemy. It can only be secured in the largest measure by education and enlightenment. Everyone must be made aware of its importance. Every effort must be made to secure it.

Not until the beginning of this century did any group of people band together to study the problems of accident prevention from the social standpoint. Practically no thought had previously been given to the effect of accidents occurring in the home, in public places and in industry. But as a result of the organized safety movement we are constantly gaining ground.

As we look back over the years it seems strange indeed that so little attention has been paid to accident prevention. No doubt, the first man to use a lever to pry rocks loose had his accidents. The charioteers of ancient Pompeii driving on its narrow streets created a serious traffic problem. Coming through the ages down to the present we still have so-called accidents in appalling numbers. There has certainly been enough time to learn how to prevent them. Are we doing our utmost to do so? The responsibility is not only the householder's, a worker's, a foreman's or management's. It is all combined. The state too, must bear its share. Safety should be placed above every other consideration. We should stress the needlessness of accidents, the elimination of the maimed, the improvement of morale, the prevention of economic distress, the betterment of society. Although we measure our success in terms of severity and frequency ratings, why not let the whole problem be approached more from the humanitarian standpoint?

It ought not to be too great a problem to solve if we go at the matter in a fundamental way. Until recently the world has not seen the relationship between the care of the individual and society as a whole. Now we are trying to remedy this by improving the individual's education, his comfort, his health and his safety. When these are perfected, we will have a strong and happy people.

The Rubber Section has steadily improved its conditions, because the personal welfare of the workers was its first thought. It has regarded severity and frequency rates merely as a barometer indicating how well it has succeeded. When other divisions of the Council take the same attitude as the rubber group there will be improvement everywhere. If we try earnestly to train our workers more thor-

oughly, make them better satisfied with their occupations, take an interest in their well being both on and off their jobs we can contribute greatly to making not alone their places safe to work in, but in making them safer workers. It will take the best that is in us as sponsors of safety to bring this about. We cannot be superficial about our intentions. We must try to make society as a whole a better place to live in. We cannot be half hearted about the matter. We must go all out for safety.

Shielding the Plant and Personnel Against War Hazards in the Rubber Industry

By ARTHUR B. GUISE

Central Safety Department, United States Rubber Co., New York City

Starting from behind in the race to exceed Axis production of war materials, the United States is just getting into its stride, and soon our productive capacity will be felt to an increasing degree. Building new plants, installing new machinery, and training new workers have all contributed to the increase in production. But that achievement must be matched by an equal effort to maintain the production rate at its peak. Workers that are injured, machines that are damaged, and plants that are smoldering ruins do not produce. The responsibility for maintenance of production falls on management and workers alike, but putting into effect the necessary protection program is up to the safety director.

Air raids and sabotage are obvious hazards and intensive protective measures have been taken to guard against them. Equally obvious to the safety engineer are the hazards that are with us now as in times of peace. In the first six months of this year there were 1,800 civilian deaths from air raids over Britain. In the same period there were 9,000 occupational deaths in the United States. Corresponding comparative data for fire damage are not readily available.

Our important war hazards are primarily in the class of everyday hazards—intensified by green labor, less experienced supervisors, and the sudden introduction of new methods and new materials, but still not extraordinary.

The increased use of plastics and synthetic rubbers has brought into our plants solvents new to us from the standpoint of general use. Ethylene dichloride and methylethyl ketone, for example, are used in quantity where thiokol and vinyl plastics are being used. Other solvents in the ketone, ester, chlorinated hydrocarbon and nitro-paraffin groups are used in smaller quantities. Although these solvents are relatively new to the rubber industry, they have been used in other industries, and for the majority of them there are some data on their hazards from both the safety and the fire hazard angles.

Some of the new solvents have a more distinctive odor than the solvents previously used in rubber plants. For example, acetone and methylethyl ketone have a strong odor and an irritating effect on the nose and throat at concentrations considerably below the lower explosive limits and well below the maximum advisable concentrations for exposure throughout the work period. It is about impossible to continue to work in hazardous concentrations. However, the vapors of all solvents are heavier than air and explosive concentrations can exist near the floor unless adequate ventilation is provided.

Ethylene dichloride has a not unpleasant odor and is less toxic than carbon tetrachloride. Apparently, some of the reported cases of nausea among workers may be from psychological rather than physiological causes because they occur in well-ventilated rooms with low vapor concentrations even at the working points. Although the fire hazard of ethylene dichloride cannot be neglected, it is not as bad as benzol or naphthas because of the relatively low burning rate.

A slight rash may result from the use of the new solvents, but probably the basic

cause is removal of the natural oils from the skin which can occur from the use of naphtha or other solvents. The remedies of creams, lotions, gloves and personal cleanliness are well known.

Ventilating equipment is difficult to obtain even with the highest of priorities. The plants with spare blowers already are using them. Metal ducts are almost as hard to obtain as the blowers. Suggesting plywood for emergency ducts only gains the safety engineer the information that plywood and sheet metal are in the same class of hard-to-get. Despite these difficulties, a generally excellent job has been done. If room ventilation does not adequately reduce the vapor concentration at the work point, air line respirators are obtainable. For working inside of large fuel cells the air line respirators are indispensable. Respirators and masks are always inconvenient and few people enjoy wearing them, but their use frequently cannot be avoided without danger to the workmen, and supervisors should see that they are used when necessary.

Because of the difficulty in obtaining motor driven blowers, some plants with excess compressed air have installed air aspirators to induce sufficient ventilation. Even steam operated aspirators have been installed. These emergency means of obtaining ventilation have their limitations, but they can be used where limited amounts of air must be moved.

Water spray nozzles throwing a cone-shaped spray will move a surprising amount of air if placed in a horizontal duct of 18 inches to 24 inches in diameter. Those plants having spare low capacity high pressure water pumps might use this method of obtaining positive ventilation, keeping the cost down by recirculating the water.

In many locations, the local removal of solvent vapors may be achieved by having the suction points at the level of the work table. This arrangement has worked out very well on a conveyor belt on which a large amount of cementing was being done and one of the newer solvents was a factor.

Stencils should be cleaned in sprinklered booths with suction to draw the vapors away from the worker. The container for the solvent should have a self-closing cover held up by a fusible link. An approved wash tank of this type is available in several sizes.

Static electricity is always with us and the most practical method of reducing it where brushing cements comprises an important portion of the work is to humidify the room to at least 50 per cent relative humidity. It is fully realized that in the winter this humidification will require a considerable amount of additional heating steam, but the alternative would be to provide conductive flooring and have the workers wear shoes with conductive soles. The difficulty of keeping the floor and the soles conductive where cement is used should not be overlooked.

Many plant machine shops are working on war orders and have enlarged their force of machinists. Safety standards in the use of grinding wheels and the wearing of goggles are needed now more than ever. The general use of goggles is advisable, as will be quickly shown by the number of "foreign body in eye" reports. A pair of goggles for use only at the grinder frequently collects a layer of dust, indicating non-use.

Maintaining electrical equipment in good condition is vital to continued production. Replacement of motors and transformers may require months. Fire extinguishers of the proper type—vaporizing liquid (carbon tetrachloride), carbon dioxide, and gas-pressure dry chemical—should be readily available for use on motor fires. Water spray nozzles approved for use on hose lines on electrical fires should be provided to fight fires in oil-filled electrical equipment. In cases where it would be difficult to fight such fires with portable spray nozzles, a piped water spray system is highly advisable. Frequently, a plant can be kept operating if one transformer is lost, but may be out of production for months if all the transformers in a substation are lost. This thought should be kept in mind when guarding against sabotage.

The fire and explosion hazards introduced into rubber plants are not new. They are only greater in number and in a somewhat different form. To be sure, some of the new solvents are highly water soluble or are miscible, and foam extinguishers are not as suitable on fire in these solvents. Acetone, alcohol, diacetone and methylethyl ketone are in this class and carbon dioxide or approved

gas-pressure dry chemical extinguishers should be used to fight such fires.

The amounts of flammable liquids being handled in rubber plants have generally increased. In many types of work, large numbers of cement cans and solvents cans are necessary. Special cement cans have been developed which reduce the evaporation of solvents to a minimum and still allow the brush to remain in the can. Safe bench cans for solvent swabbing should be provided, but sometimes the reason for the depressible screen is not apparent to workers and they remove it.

The extinguishers provided for areas where women are working should not be heavy. A large number of smaller extinguishers is preferable. Key personnel throughout the plant should be trained in the use of extinguishers.

Tampering with extinguishers in these times is dangerous, even if it is innocent tampering, and workers should be warned against giving the appearance of sabotage.

The majority of fire doors are automatic closing in case of a fire, but if blocked open by material piled against them they have lost their automatic functioning. A fire wall is no better than the fire doors that protect its openings, and frequent inspections are necessary to insure proper operation of the doors. In some locations a guard to prevent piling of material against the door may be advisable.

Many of the workers being hired have never worked in a factory before. They are new to safety methods and are unaccustomed to the discipline necessary in every plant. Safe practices are unknown to them. Despite the orientation course for new workers they frequently will not follow instructions, and as a result are injured. They sneak smokes and are not always careful in disposing of the butt.

The lack of choice in hiring has resulted in a somewhat lower grade of labor. Many workers come from plants where safety rules were unheard of and smoking was permitted generally. These workers also need to learn to work safely and obey fire prevention rules. To succeed in maintaining a low accident and fire loss rate, greater emphasis on safety in the orientation course followed by continued guidance by supervisors is a real necessity.

Many companies have branched into fields alien to the rubber industry. In doing so it has been necessary to transfer experienced supervisors from their plants and this has resulted in a dilution by supervisors of less experience. These less experienced supervisors frequently feel that production cannot be maintained if the safe practices of peacetime must be carried out. They do not realize that by enforcing simple rules they can reduce the number of minor incidents and prevent serious accidents. It is up to the safety director to impart to these key men his own faith in the very real value of safe procedures.

Some of the problems are being eliminated as conditions reach equilibrium. In many cases manufacturing operations were rapidly expanded beyond any early plans and extreme congestion was the result with its parallels of poor housekeeping, increased minor accidents and increased fire hazard. Engineering departments, which have been under an overload in rearranging equipment, planning new buildings, and making existing equipment do double duty, have been unable to keep maintenance work at a high standard. Although we are not yet out of the woods, we can look forward to the time when maintenance will again promptly eliminate physical hazards.

Some Industrial Hygiene Problems in the Synthetic-Rubber Industry

By FLOYD A. VAN ATTA and ALFRED M. NOYES

Illinois State Department of Labor, Division of Industrial Hygiene, Chicago

We have much to learn about the special health hazard involved in the production and use of synthetic rubber. In this discussion we will present some of the facts we have gathered and point out some of the unsolved problems which those engaged in the industry are best equipped to study in their own plants. Such studies should help to prevent industrial disease and are certain to yield economic as well as humanitarian benefits. The economic value of this program was recently emphasized by Mr. S. C. Sufrin of the Rubber Products Branch of the War Production Board: "As an economist, I would like to point out that if the laboring people discover that certain jobs, although paying fairly good wages, cause the workers to become ill, the job opportunities are so great that those people leave and go to other jobs, which means a long breaking-in period with attendant interruptions to production."

Without attempting to define either of the terms "synthetic rubber" and "rubber substitute" we shall use them interchangeably in this discussion to indicate any of the synthetic materials which have rubber-like properties.

We have been helped considerably in assembling our data by the two Industrial Safety Series pamphlets, Ru-1 and Ru-3, published by the National Safety Council from information supplied by Dr. L. J. D. Healy. The other day we received a copy of the "Condensed Proceedings of the Conference on Health Hazards in the Rubber Industry," which was called by the Division of Labor Standards of the U. S. Department of Labor in Akron on May 29th of this year.

Neoprene

Neoprene has been rather thoroughly worked out in this country and there has been more experience with it than with most of the other substitutes. The chief potentially hazardous materials in the synthesis are acetylene—the real starting material, vinyl acetylene, and chloroprene. Chloroprene is obtained from acetylene by catalytic condensation to monovinyl acetylene, followed by addition of hydrogen chloride. The processes are indicated in the following equations:

$$2\,HC{\equiv}CH \xrightarrow[NH_4Cl]{Cu\,Cl_2} CH_2{=}CH{-}C{\equiv}CH$$

Acetylene — Vinyl acetylene

$$+\ HCl \longrightarrow CH_2{=}CCl{-}CH{=}CH_2$$

Chloroprene

Acetylene may be classified with the asphyxiant gases. In fairly high concentrations it has a depressant effect on the circulation and respiration and is somewhat narcotic. In the few recorded cases of industrial poisoning there is a question as to whether the harm was done by the acetylene itself or by the hydrogen sulphide or phosphine which it commonly contains as impurities. Vinyl acetylene is probably somewhat more toxic than acetylene but still would be an asphyxiant. Like many of the other chlorinated compounds, chloroprene—a liquid boiling at 59°C. (138° F.), is considerably more toxic than its parent hydrocarbon. When it is inhaled in comparatively low concentrations it causes irritation of the respiratory tract. Continued exposure may produce a fall in blood pressure, reduction in the respiratory rate and cyanosis. The most serious effects are damage to the liver, kidneys, and testicles, and internal hemorrhage due to the hemolytic action. Von Oettingen suggests that concentrations of 0.3 milligrams per liter, corresponding to about 100 parts per million, may cause toxic effects on long exposure. The maximum safe concentration will, consequently, be something below this value. In addition to the danger from inhalation, chloroprene may be absorbed directly through the intact skin and produce about the same effects that it does by inhalation.

The processes involved in these syntheses will invariably be carried on in closed systems

and the materials handled through pumps and piping. The dangers to be considered, therefore, are due to leaks in the systems and to acute exposures from cleaning tanks and piping. One of the larger rubber companies suggests the following precautions in handling processes of this sort where toxic and highly explosive liquids and gases are used:

Escaping vapors must be removed at their source by exhaust ventilation. Coupled with this they recommend general ventilation at the rate of twenty air changes per hour.

Exhaust ducts should be located at points where vapors are likely to be released, such as valves, gauge glasses and similar locations and also in pits and other dead air spaces where vapors might collect.

Skin contact with the liquid should be prevented by proper protective clothing.

Cleaning Pressure Vessels

Safety rules for cleaning out pressure vessels cannot be too strict; the following precautions must be taken:

"1. All valves should be closed and sealed unless a safety man is stationed at such points to prevent their being opened.

2. Any agitators or other moving equipment must be locked out.

3. Before entering any such vessel it must be thoroughly purged. This can be done by a combination of several of the following: filling the vessel with water, steaming, applying vacuum, and exhausting. Before opening such a vessel we evacuate to as much vacuum as possible, bring to zero (gauge) pressure with nitrogen, and repeat this process a second time.

4. Workman entering such a vessel must be provided with suitable safety equipment such as goggles, rubber gloves, and forced air masks.

5. Any extension light used must be of the approved vapor-proof type.

6. The workman must wear a manhole harness with a strong lanyard attached, and another workman must remain on the outside and retain hold of the lanyard. In some cases where the manhole is near the bottom of the tank it may be practical to omit the manhole harness but there still must be another workman detailed to the specific duty of observing the workman who is inside.

7. The workman in the vessel must be instructed to come out at the first indication of dizziness or illness and must be removed to clean air.

8. It must be borne in mind that the vapors of many of the materials used in these processes when mixed with air are highly explosive and all receiving, storage, and processing must be handled accordingly."

Intelligent application of the precautions outlined above will permit the manufacture of chloroprene, or any similar synthesis, with little or no hazard to the health of the workers.

Except for the possible production of chloroprene vapors, no further hazards should be experienced in the polymerization of chloroprene. The phenyl beta naphthylamine added to the polymer to retard aging, or further polymerization, is not generally considered to be very toxic. We feel, however, that exposure to it should be avoided because of the possible long-range effects. Beta naphthylamine has been cited as a cause of bladder tumors in dye workers, and the addition of the phenyl group would probably not decrease its carcinogenic activity.

Buna Types

These are the polymers of butadiene and its copolymers with acrylonitrile and styrene. None of the simple polymers has been proposed for commercial production in this country, and the important one of the other two seems to be the Buna S type, the copolymer with styrene. Butadiene synthesis is more of a problem for the petroleum and alcohol industries than it is for the rubber industry, but the connection between these industries must be very close in the future, if it is not now. Therefore, some discussion of the synthesis is pertinent to this article. Butadiene may be prepared from acetylene by the same condensation which is the first step in

the production of chloroprene. If this condensation is followed by addition of hydrogen, rather than of hydrogen chloride, butadiene is the end product. This synthesis is the common one in Russia and Germany and has the advantage of producing a material of high purity, but it is said to be more expensive than the production by the cracking of petroleum products. A third method, or rather series of methods, is through fermentation. The most recent of these depends upon the direct fermentation of corn to butylene glycol and dehydration to butadiene.

$$\text{Corn} \xrightarrow{\text{Fermentation}} \underset{\text{1, 3—Butylene glycol}}{CH_3—CHOH—CH_2—CH_2OH} \xrightarrow{\text{dehyd.}} \underset{\text{Butadiene}}{CH_2=CH—CH=CH_2}$$

Styrene is ordinarily prepared from benzene and ethylene, with aluminum chloride as the catalyst, and dehydrogenation of the resulting ethyl benzene. It may also be produced from coal-tar.

$$\underset{\text{Benzene}}{C_6H_6} + \underset{\text{Ethylene}}{H_2C=CH_2} \xrightarrow{AlCl_3} \underset{\text{Ethylbenzene}}{C_6H_5—CH_2CH_3} \xrightarrow{-2H} \underset{\text{Styrene}}{C_6H_5—CH=CH_2}$$

Acrylonitrile may be prepared by any of the three processes shown in the following formulas. The method of choice in the future will probably be the third one involving ethylene oxide and hydrogen cyanide, as it does not involve any chlorine.

$$\underset{\text{Ethylene chlorohydrin}}{HOCH_2—CH_2Cl} + NaCN \longrightarrow \underset{\text{Ethylene cyanohydrin}}{HOCH_2—CH_2CN} \xrightarrow{KHSO_4} \underset{\text{Acrylonitrile}}{CH_2=CH—CN}$$

$$CH_3COOCH_2CH_2CN \xrightarrow{\text{heat}} CH_2=CH—CN + CH_3COOH$$

$$\underset{\text{Ethylene oxide}}{CH_2—CH_2 \text{ (O)}} + HCN \longrightarrow CH_2=CH—CN + H_2O$$

There is no doubt that most of the raw materials and intermediates in these syntheses are highly toxic by inhalation and a number of them also by skin contact. In a general way the remarks made on the synthesis of chloroprene will also apply here, especially as to the precautions required.

Butadiene and Styrene

What directly concerns the manufacturer of rubber substitutes is the materials he receives to polymerize. The material handled in greatest volume will undoubtedly be butadiene. This is a liquid boiling at —3° C. (26.6° F.). It may produce irritation of the eyes, nose and throat, but apparently has no cumulative effect. Below the lower explosive limit (2%) it is mildly narcotic and strongly so in higher concentrations. There is very little information in the literature on the physiological effects of butadiene. The recorded observations, which are mainly concerned with the effects of repeated heavy exposures, may have to be modified when there has been a more complete study of the effects of continued exposure to low concentrations. It should be obvious that skin contact with the liquid is dangerous, due to the low boiling point.

Styrene is a liquid boiling at 145° C. (293° F.). It is possessed of a powerful odor which will prevent prolonged contact with large concentrations if the man involved is a free agent. This cannot be relied on as a control measure, however, as the senses are dulled as a rule when the sense of smell is offended for long periods. Exposure to the vapors may cause skin irritation and conjunc-

tivitis. The vapor is also quite narcotic in comparatively small concentrations. Irritation of the lungs, and liver and kidney damage will follow heavy exposures. Concentrations of 200 parts per million are said to be about the safe maximum.

Acrylonitrile

Acrylonitrile is a liquid boiling at 78 to 79° C. (172-4° F). The toxic effects of this material are apparently due to the formation of hydrogen cyanide in the body after absorption. According to Dr. Neal of the U. S. Public Health Service a typical cyanide reaction follows absorption. The safe limit should be 20 parts per million or less. This is by far the most dangerous substance so far discussed and should be handled only with the most extreme precautions. The effects are apt to be acute and anyone who shows the slightest symptoms should certainly receive immediate medical attention. It is well known that cyanides are easily absorbed through the skin and it would be well to consider that this compound will be also, at least until there is evidence to the contrary.

Polymerization is usually carried out in a water emulsion, with the addition of soaps as emulsifying agents, catalysts (such as peroxides, persulfates or peracids), and modifying agents which may be halogenated hydrocarbons, nitriles or sulfur compounds. These modifying agents are generally materials of known high toxicity and should be handled with care. The point of maximum hazard would probably be the removal of the modifying agents from the latex resulting from the polymerization.

Isobutylene Polymers

The member of this group which will be commercially important is the copolymer of butadiene with isobutylene. This introduces the new hazard of butenes which are probably below butadiene in toxicity. The butenes are colorless gases with boiling points between —6° and 2° C. (21° and 36° F.). We have no reason to believe that the control measures should be other than those recommended for butadiene. In polymerizing butene with butadiene to form butyl rubber two highly volatile, inflammable gases are being handled at the same time, which would make the fire and explosion hazard greater than with other copolymers thus far discussed. When isobutylene itself is polymerized the product formed cannot be vulcanized by present methods and therefore finds limited commercial application.

Trade names for the polymer are Vistanex and Oppanol.

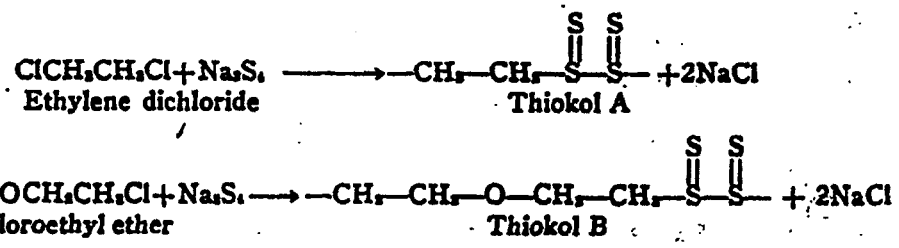
Thiokols

These are made by condensing sodium polysulfide with chlorinated hydrocarbons. Depending upon which chlorinated derivative is chosen, a variety of rubbery materials can be obtained. The two chlorinated derivatives most frequently used are ethylene dichloride and dichlorethyl ether, both highly toxic.*

Ethylene dichloride is a liquid boiling at 84° C. (183° F.), whose vapors are considered of the same degree of toxicity as those of carbon tetrachloride. The suggested maximum permissible concentration is 100 p.p.m. Irritation of the throat, coughing and vomiting have been reported as initial symptoms in man. The possibility of liver damage and other effects of prolonged exposure to moderate concentration indicates the need for keeping the vapors out of the breathing zone of workers. Dichlorethyl ether is a liquid boiling at 178° C (352° F.). Its close relation to the war gas, dichlormethyl ether, suggests that it too may cause irritation of the eyes and lungs. One state has set a maximum permissible concentration for the vapors at 15 p.p.m.

Because the reaction takes place in aqueous medium and the product is coagulated with acid, the hazard of hydrogen sulfide must be considered in both parts of the process. Past experience has shown that hydrogen sulfide may cause nausea, headache, and irritation of the eyes, as well as loss of appetite and loss of weight when workers are exposed even to moderate amounts day after day. Therefore, hydrogen sulfide should be removed at the source of generation so that the concentration in the workroom air does not exceed 20 p.p.m. At least one article has appeared in which the source of thiokol odors has been discussed. It is believed that ethylene mercaptan and other sulfur-containing compounds are formed. These may be highly toxic as well as disagreeable. Efforts to keep the

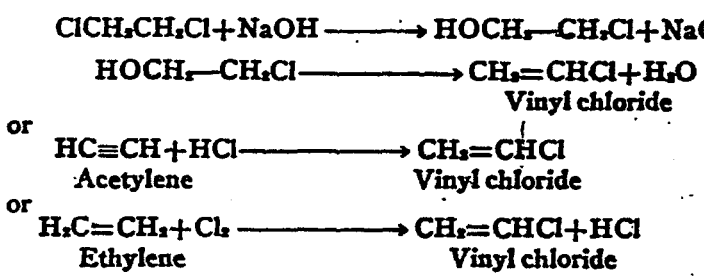
*Formula top of next page.



hydrogen sulfide out of the workroom air should be just as effective with these other compounds.

Vinyl Polymers

Two of the most important members of this group are polyvinyl butyral (Saflex) and polyvinylidene chloride (Saran). Common to all of these compounds is the hazard of acetylene, the basis for synthesis of the monomers. The monomer for polyvinylidene chloride is made by treating dichlorethane with alkali.



Among harmful materials involved in making other monomers and in effecting polymerization may be mentioned: hydrogen chloride, butyraldehyde, and several catalysts —mercuric sulfate, benzoyl chloride and uranyl acetate in methanol. The various processes are carried on in a closed system. Therefore, the precautions given previously for such handling—proper ventilation and avoidance of skin contact—should be observed.

Mixing, Vulcanizing, Extruding, Etc.

The synthetic rubbers which will be most important commercially will be compounded and handled in much the same manner as natural rubber. This is more than a coincidence, for otherwise the rubber fabrication machinery now available would be useless.

Most of us are familiar with the early history of the rubber industry with regard to hazards from accelerators and antioxidants. Aniline and some of its derivatives, "hexa" (hexamethylene tetramine), the toluidines and paraphenylenediamine caused so many cases of poisoning and dermatitis that there was a rush to develop harmless or less harmful substitutes. With some of the newcomers there have been no reports of harmful effects, but much of this information has come from direct questioning of manufacturers rather than from toxicological experiments.

The agents most frequently mentioned in the fabrication of synthetic rubber are diphenylguanidine (D.P.G.), phenyl-beta-naphthylamine (Agerite Powder), phenyl-alpha-naphthylamine (Neozone), mercaptobenzothiazole (Captax), tetramethylthiuramdisulfide (Tuads), the dihydroquinoline derivatives (Flectols, Agerite Syrup), hexamethyleneammonium dithiocarbamate (Latec), dinitrophenyldimethyldithiocarbamate (Safex). Because some of these materials may contain known toxic substances as impurities—Neozone D contains free aniline—and because of the possibility of harmful effects after long exposure, direct contact with these materials by inhalation or skin contact should be avoided.

Among the plasticizers commonly used with synthetic rubbers, those which have already

caused harmful effects are dibenzyl ether and tributyl phosphate, both of which have caused irritation to the respiratory tract, even nosebleeds. The chlorinated naphthalenes have a long history of serious dermatitis and of poisonings which may be fatal. They have been recommended as plasticizers, especially for the extrusion of neoprene, but should be used very cautiously, which means avoiding contact either by skin or by inhalation of condensed vapors. One of the more obvious means of preventing harm from these materials, which are poisonous by skin contact, is personal cleanliness. The need of sufficient, clean washing and bathing facilities cannot be urged too strongly, especially since compounding of rubber is a very dirty job at best.

Inorganic Accelerators

Although no dust should be promiscuously disseminated into the atmosphere, the toxic dusts are the ones to be especially avoided. The inorganic accelerators most frequently recommended are the oxides of zinc and magnesium; these may create a nuisance but have not been shown to have any definite harmful effects. However, lead oxide and mercuric oxide have been recommended and used for special properties, and these should be most carefully controlled both in weighing out and incorporating on the mill. Lead has also found use in the form of a soap during polymerization by emulsification. Of course, such use also calls for extreme caution in handling. The history of poisoning by both lead and mercury is too well known to require repetition here.

Solvents

A variety of solvents are used for the preparation of cements and extrusion mixtures, coating fabrics and other materials, and forming seams in some of these coated materials. The synthetic rubbers are a group of materials whose outstanding property is resistance to many solvents which cause swelling and disintegration in natural rubber. Therefore, we must use special solvents when cements and other soft products are made. Coal tar solvents are especially popular. Some have recommended coal tar naphtha (solvent naphtha), a mixture of benzol, toluol and xylol, having definite toxic properties.

Benzol itself is being used to a great extent, especially since the so-called safe substitute, toluol, has been restricted by other war needs. The controversy about toluol as a safe solvent seems to be unending. We do not feel that it has been conducted from an unbiased or scientific viewpoint. Our opinion is that boiling point alone does not determine relative toxicity; one must know the actual concentration of vapor in the air. We do know that toluol has an appreciable vapor pressure at room temperature and that severe poisoning and at least one death have resulted from its promiscuous use.

Nothing will be gained by seeing how much the worker can absorb before blood changes are observed. The fact that there have been cases of chronic poisoning from exposure to relatively low concentrations of toluol would indicate that safe practice requires keeping the concentration as far below the suggested safe limits of 100 to 200 p.p.m. as is practicable. Several years ago a limit of 75 p.p.m. was suggested for benzol. The A.S.A. has upped this to 100 p.p.m.; why we do not know. We do know of a recent death from the use of benzol in an extrusion compound.

Ethylene dichloride and monochlorbenzene are the most common of the chlorinated solvents. Both are highly toxic; suggested limits being 100 p.p.m. for ethylene dichloride and 75 p.p.m. for the monochlorbenzene.

Other solvents frequently used, especially for vinyl polymers, are methyl ethyl ketone and butanol. Methylethyl ketone is considered probably more toxic than acetone; therefore the safe limit would appear to be somewhere below 200 p.p.m. The suggested safe limit for butanol has been set at 100 p.p.m.

Buna S and the butyl rubbers appear to be the only common synthetic rubbers which are appreciably soluble in aliphatic hydrocarbons. If the petroleum naphthas used for dissolving these contain aromatics, as many have been found to do, the suggested safe limit of 1000 p.p.m. must be scaled downward. Before using solvents, or for that matter accelerators, anti-oxidants, etc., which are identified only by trade names, you will be using proper caution only if you learn what they really contain. If you have the facilities you can have it analyzed in your own laboratories. Often it is simpler to communicate

with the manufacturer or your Labor Department.

Because so many instances have been observed in industry where a window exhaust fan or wall fan is considered proper ventilation, we mention here that we do not generally approve such installations. Positive control of solvent vapors calls for removal of vapors as close to the point of generation as possible, and in such a way as to carry the exhausted air away from the worker. Nor is the current rage for down-draft exhaust entirely justified. The vapors of most of these solvents are heavier than air and should fall, certainly, but it should be obvious that a down-draft exhaust beneath it cannot possibly remove solvent vapor from the top of a broad table without the workers along the edge of the table getting it first. This does not mean that ventilation near the floor should not be used to reduce fire hazard, but it does mean that it is not necessarily effective in protecting the workmen from inhalation of vapors. There are a multitude of cases of illness from these operations on spreading tables, and numerous deaths.

Vulcanization

This admittedly complex process can give rise to a number of toxic gases, such as hydrogen sulfide, carbon disulfide, mercaptans, etc. When Neoprene was introduced into fabrication processes there were frequent complaints of a "tear gas" generated during vulcanization. Most processors claim that recent grades do not give off obnoxious gases. The Thiokols, however, still retain the reputation of being the smelliest members. These possibilities of poisonous and irritating gases during vulcanization show the need for adequate control by exhaust ventilation.

Dusting

For a long time it was thought that free silica and asbestos were the only hazardous dusts from the standpoint of pneumoconiosis. In recent years it has been shown that silicates—talc, mica, etc.—are capable of causing a lung disease called "silicatosis." For this reason, and the fact that it makes a great difference in plant housekeeping, dusting should be done on tables provided with enclosures and exhaust ventilation. Our own observations have shown that these dusting operations frequently produce excessive contamination when done in the open.

Summary

The data we have presented in this paper can best be summarized by a review of the most hazardous operations and the proper means for their control.

Synthesis and Polymerization—Highly volatile liquids and gases, most of them quite toxic and highly inflammable, are pumped from reservoirs into reaction vessels. Control measures include ventilation wherever leaks may occur, prevention of skin contact, and a strict set of safety regulations, as outlined above, for all operations requiring a worker to enter tanks or reaction vessels.

Fabrication—Avoid use of the known bad actors among accelerators, antioxidants, etc. if possible. In any case, wherever potentially toxic materials are handled, the resulting airborne dusts and vapors should be removed at source by exhaust ventilation. The processes which may be the source of these contaminants are: weighing, mixing on mill or Banbury, extrusion, vulcanization, dusting, spreading and cementing.

The greatest enemy of industrial health, as well as industrial safety, is ignorance. If we acquaint ourselves with the actual and potential hazards in our plants, install the proper control measures, and educate our workers to the potential harm in the materials they handle and how to use the protective devices provided, we will get better production and less turnover.

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TUESDAY AFTERNOON SESSION

October 27, 1942

Presiding:—GENERAL CHAIRMAN MR. RALPH S. FARNUM, Safety Supervisor, U. S. Rubber Company, Detroit.

Presentation of National Safety Council Awards in the Rubber Section Safety Contest

By J. I. BANASH

Consulting Engineer, Chicago, and Past President, National Safety Council

The Rubber Section Annual Safety Contest

July 1, 1941 through June 30, 1942

For reasons of national security, man-hour reports are omitted from the results given here. Outstanding facts about the Contest are:

Thirty-one plants competed in the 1941-1942 Rubber Section Safety Contest.

The average frequency rate for all contestants was 6.57.

Frequency rates averaged 12 per cent higher than for the 1940-1941 Contest.

Large plants had the lowest rates in the 1941-1942 competition. They averaged 6.49 for frequency in comparison with 8.13 for the small group.

Large plants had the best results in comparison with the previous contest—an increase of 11 per cent. Frequency rates averaged 30 per cent higher in the small plants.

Six plants went through the contest year without having a reportable injury. Van Cleef Bros., Chicago, Illinois, again worked the largest number of hours without a reportable injury.

Group	No. of Units	Freq. Rate	Change from 1940-1941
All Groups	31	6.57	+ 12%
Groups A & B	20	6.49	+ 11%
Groups C & D	11	8.13	+ 30%

All units shown as No. 1 received trophies, all units shown as No. 2 and No. 3 received certificates.

Final Rank	Unit	Frequency Rate
	Group A & B	
	Average Rate	6.49
1.	United States Rubber Co., Indianapolis Plant	.85
2.	Ball-Band Plant, Mishawaka, Ind.	.97
3.	United States Rubber Co., Naugatuck Footwear Plant Naugatuck, Conn.	1.13

Final Rank	Unit	Frequency Rate
	Group C & D	
	Average Rate	8.13
1.	Van Cleef Brothers, Chicago, Ill.	0
1.	United States Rubber Co., General Development Dept.	0
1.	Collyer Insulated Wire Co., Inc., Providence, R. I.	0
1.	Canadian Lastex, Ltd., Montreal, Que.	0
1.	The Lobl Mfg. Co., Middleboro, Mass.	0
1.	Fabric Fire Hose Co., Sandy Hook, Conn.	0

THE EFFECT OF LENGTHENED HOURS ON SAFETY PROBLEMS IN THE RUBBER INDUSTRY

A Symposium

Presiding:—General Chairman Mr. Ralph S. Farnum, Safety Supervisor, U. S. Rubber Company, Detroit.

CHAIRMAN FARNUM: On the very excellent paper this morning from Mr. Noyes of the Industrial Hygiene Division, Department of Labor, State of Illinois, there was no opportunity for questions to be asked. Therefore I have allotted twenty minutes, during which time we will have questions and answers on this topic, "Some Industrial Hygiene Problems in the Synthetic Rubber Industry." I will ask Mr. Noyes and his associate, Mr. Van Atta, to make themselves available for answering any of these questions.

MR. PAUL VAN CLEEF (Van Cleef Bros., Chicago, Ill.): When the manufacturer makes his applications of these synthetic rubber materials, there will be such annoyances as bad odors, acrid fumes, and so on. I wonder whether it would be possible for Mr. Noyes to indicate which of these synthetics are likely to be most harmful, in connection with the process of manufacturing. It is quite possible that traces or residues of some of the more hazardous chemicals used in producing the synthetics may still remain, and when the product is heated on mills or extruded from tubers, and so forth, these might get into the air and cause trouble.

MR. FLOYD A. VAN ATTA: I think there is a fair possibility of that. We haven't a great deal of information as to exactly how much unpolymerized material remains in these synthetics but, certainly, there is some. The pure Bunas will stink to high heaven of acrylic nitrate, and on milling you are bound to get some of that released, particularly on hot mills. The Buna-S loses some stearin. Of course, some of those will lose some butadiene on milling, too, but that is not important, because it is not awfully poisonous. The Buna-S will lose some stearin and the thiocols—I wouldn't want to say exactly what does come off those things on milling but, certainly mercaptans and probably hydrogen sulfide, and possibly some carbon disulfide.

It is with the things that are losing much stearin, that it will be necessary to get rid of the thing from the comfort point of view because it is irritating. The mercaptans that come off the thiocols are considerably more poisonous and probably considerably less irritating. Hot milling those might easily be dangerous; possibly also extruded.

CHAIRMAN FARNUM: Are there any further questions anyone would like to ask along this line? Evidently there are none.

We will proceed with the program as originally outlined. The next section of the program is in the form of a symposium, to be presided over by one of our former Rubber Section associates. Mr. Ufford, formerly connected with the Ohio Rubber Company of Willoughby, Ohio, was a member of the Rubber Section. Unfortunately, a few years ago, due to severe illness, Mr. Ufford was forced to give up his work and remain away from it for sometime. I was highly elated today to see Mr. Ufford able to come back. He has kindly consented to come down here from New York and preside at this symposium which is to follow on this program. He has a slate of people who will assist him in this, and he will make his own introductions.

Mr. Ufford is an old friend of all the Rubber Section men from way back . . . Mr. C. W. Ufford, Barrington Associates, New York City, assumes the chair . . .

CHAIRMAN UFFORD: Thank you very much, Ralph.

The meeting this afternoon is on the subject of "The Effect of Lengthened Hours on Safety Problems in the Rubber Industry." It is a real pleasure to introduce the first

speaker on this afternoon's program, a lady who is new on the programs of the Rubber Section and who comes to us with real authority, having been in training, personnel and safety work with Wellesley College, Mutual Life Insurance Company, New York, Syracuse University, R. H. Macy Company, Montgomery Ward, and now with General Electric, where her position is Assistant Supervisor of Personnel for the General Electric Company at Erie, Pennsylvania. Her subject is "The Effect of Lengthened Hours on Employees." I take great pleasure in introducing to you Miss Lucy O. Norton.

MISS LUCY O. NORTON: I can see you are not used to having a "Miss" on the program. This is really a wonderful opportunity because I am practically one, lone woman among a lot of men. A lot of women would give a lot for this opportunity, and I assure you it is appreciated.

The Effect of Lengthened Hours on Employees in War Production—Male and Female Employees

By LUCY OGDEN NORTON

Assistant Supervisor of Personnel—in Charge of Women, General Electric Company, Erie, Pa.

The General Electric's work week has in the past been a 40 hour, 5 day week. During this pre-war period, this work week started on the upward swing.

During the six months prior to Pearl Harbor, the number of hours worked by our men rose to an average of 47.7. In regard to women, the State of Pennsylvania has for some years set a limit of 44. However, the state has now relaxed its limitation in the interest of the war effort, and permits 48 hours per week. Wherever possible we held our women's hours to 44 until Pearl Harbor.

With our entry into the war, working hours of necessity increased. For the nine months following Pearl Harbor, our men in the shop have averaged between 50 and 56 hours per week and our men in the office 52 hours. Our women have worked a six-day, 48 hour week. We still cling to the belief that a 40-44 hour week is a desirable goal but present conditions make the increase imperative.

Therefore, it is obvious that our production efforts since Pearl Harbor have been intense. For the second successive year we have foregone vacations. The plant is operating on a straight six-day week and in some divisions on a seven-day basis. We operate 24 hours a day, around the clock. We have worked "as usual" on Memorial Day, July 4th, and on Labor Day.

Effect of Increased Hours

Naturally, after a period of sustained effort, certain effects are going to appear. Employees are human beings and can stand just so much pressure unless something is done to assist them to maintain their morale. The problem which results from lengthened hours, and which can cripple industry if not controlled, is absenteeism. At Erie, we have more than doubled the number of employees on the payroll at the same time that we have increased the hours. Increased hours, more employees, higher earnings, added together, can produce absentee problems which tear down any production program.

At Erie we are trying to approach this problem from two angles:

(1) To set up a program which, by creating certain working conditions, will tend to forestall fatigue and thereby eliminate an absence before it occurs.

(2) To set up a program for dealing with the absence *after* it has occurred in an effort to discover and eliminate the original cause.

Employee morale is influenced by two important factors; conditions in his working environment, and conditions in his home environment and the morale of his family.

Therefore our efforts to deal with absentee-

ism have been directed along these lines. We also have made a distinction between justifiable absences such as illness and inexcusable absences such as "payday richness" or "Monday morning blues." Both types are important but require different methods of handling.

Improving Conditions

Our answer to the problem of fatigue on the job has been to set up certain conditions in the plant.

For men, we have provided restrooms and smoking areas. For women, we have scheduled definite rest periods and provided restrooms where they may rest, smoke and prepare food. Definite standards of cleanliness and sanitation are maintained and are important in building morale.

A canteen service provides hot meals and milk to employees on all shifts.

We have organized several men's and women's bowling leagues for after working hour relaxation. We have about 33 women's bowling teams participating in various leagues.

We have a broadcasting system for use throughout the shops. This is employed during the lunch hours to broadcast local and national news, and to play recordings for relaxation.

The Personnel Department has worked out special programs for building morale and these have been held during the noon hour on each of the three holidays we have "worked as usual."

The celebration for Labor Day was turned over to the women, and an elaborate parade was held to show the part that women are now playing in war production. Each division produced a float to show the special contribution being made by them. This was an inexpensive but colorful way to indicate the importance of our participation in the war effort.

We have put up cleverly illustrated posters calling attention to the assistance rendered the Axis by absenteeism, in an effort to clarify the importance of good attendance to the individual worker.

Finally, we are particularly proud of our new Erie Works community center, an attractive building of colonial architecture which has been completed to house employee activities. It is set apart from the Works, with the factory in the background. The beautiful landscaping makes the Center one of the most attractive structures in the city.

It is not an athletic club—these facilities are provided elsewhere in the city. Rather, it is a homelike building, completely equipped, where employee groups may meet for parties or where individual employees and members of their families may come to enjoy its facilities.

Assembly and committee rooms are available along with completely equipped kitchenettes and kitchen. Lounge rooms are provided with pianos, radio, record player, cards, games, magazines, dance floor, etc. The Center is already booked weeks in advance for evening parties and is fast becoming a meeting place at the noon hour and shift change hours.

Our most recent use of the Center has been to hold wartime nutrition classes for employees and members of their families. Our Home Service Division conducts these programs with the approval of Washington, in an effort to provide proper nutrition for war workers.

When this Center was started, we were not at war. However, it is helping us tremendously in maintaining the war production pace. It represents an investment of about $40,000 but has already been well worth it.

At the time this report is made, the all-out-War Production Committee of our Works is making a survey on absenteeism in the plant in an effort to speed up war production and to determine any other steps which might be taken to improve general conditions. The information collected over the first few weeks indicates that about 10 per cent of the employees are absent during the week.

Absentee Check-Up

Our approach to the problem of absentee investigation has been from the welfare angle and is the outgrowth of a public relations program which was set up in September, 1941. For some time we realized that our employees were, of necessity, working under unusual pressure and tension, yet the company could not afford to have any employee away

from work any oftener than absolutely necessary. In an effort to deal with this situation, we set up a program of employee visitation, the purpose of which was two-fold:

1. To assist employee and family to adjust to conditions under which he was working.

2. To acquaint the employee and his family with Company benefits and policies.

Our philosophy was that an employee's morale depends as much on his home environment as it does on working conditions. We therefore set out to make the G. E. family aware of Company aims so that the vital part played by each employee was appreciated at home, as well as at work. The program was initiated by visiting the homes of employees who were ill or absent from work.

With our entry into the war and the subsequent upward swing of hours, the problem of absenteeism, as such, became acute. Divisions began requesting check-ups to learn reasons for absences and dates of expected returns, so that production could be adequately planned. The need for check-up in an effort to reduce absenteeism became more and more apparent.

Therefore, the visiting program has been altered somewhat and is now concerned with the two phases of absenteeism:

The visitation of G. E. employees who are away from work because of illness or some welfare problem. This involves visiting employees who are confined to the hospital or to the home, paycheck deliveries, taking employees receiving compensation to and from doctor, family visitation in case of death, etc.

The checking of absentees to determine the reason for absence and the date of return. An attempt is made to interpret to the family the part the employee is playing in the war effort and to impress them with the importance of his being on the job. For the duration, our emphasis will be on getting these employees back to work as quickly as possible.

The mechanics of absentee check-up are simple. A visitor is assigned to this phase of the program. Absences on which check-up is desired are reported daily by 10:00 a. m. Visits are made by personal call and reports returned to the departments by 5:00 p. m. First hand information is secured and we are able to advise departments of the reasons for absences and date of return. We can also act in an advisory capacity in special cases of discipline, etc.

About 15 to 25 such employee contacts can be made per day with continued application on the part of the visitor. The number of such absences reported for investigation has varied from 545 in February to 745 in April. Since that time, the number of requests for investigations has remained between 600 and 700 per month, which would indicate that our set-up is having some effect on controlling the inexcusable absence rate.

These figures do not represent the total number of absences in the plant. Such figures are not available. They do represent those absences concerning which we know little or nothing to start with and which the departments want checked.

In the few months of experience, we have found the general reasons for employee absence to be:

1. Personal illness or fatigue.

2. Illness or death in the family.

3. Domestic difficulties.

4. Dissatisfaction with some condition of work.

5. Appointments with draft boards, physical examinations, enlistment appointments, etc.

6. Personal business which the wife cannot attend to and which must be done on a week day.

7. Car and transportation trouble.

8. Too much money to spend—taking vacation on own hook without regard for war effort.

9. Trips to the home town (case of employees who are away from home).

10. Too much celebrating the night before, alcoholism, etc.

Personal illness cases vary with the seasons, being heavier in the spring and fall and light in summer. Fatigue due to "just too tired to work" is on the increase, particularly when earnings have been high. Our investigation, plus doctors' statements, determine payment of our sick insurance benefits.

Domestic difficulties are becoming more acute with wartime conditions and emotional stress and often lead to social problems with which we are not equipped to deal. Referrals are made to proper agencies.

Absences due to enlistments and draft board appointments and to transportation are on the increase and will probably continue for the duration.

Housing facilities in Erie are limited. Therefore, absences due to trips to the home town increase as we hire out-of-town labor, because they cannot bring the families with them.

Cases of alcoholism and self-appointed vacations increase with sustained high earnings. We play a definite role of disciplinarian in these cases and our evidence is often a determining factor of continued employment.

The reaction to the program has, for the most part, been good. Our foremen avail themselves of the service daily and feel it is a necessary part of planned production.

We are trying to avoid the role of "truant officer" and much of our success here has been due to the fine personality of our visitor as the contact person. Although there has been some resentment on the part of those employees who present the discipline problems, the program has been well accepted in general by employees as an added service.

We avoid the police idea except in cases where it is necessary and in those instances we do a good detective job. We do not want this angle but under present conditions it has been necessary to accept it temporarily.

Co-operation Between Purchasing, Engineering, and Safety Divisions in Obtaining Equipment

By HARRY A. WALKER

Safety Eng., Goodyear Engineering Corp., Charleston, Ind.

The place to start safety in any well-organized safety program is at the beginning or, in other words, the planning and purchasing of equipment. This will tend to prevent, if it does not eliminate, the need of revision of installations and equipment after they have been put into operation.

When engineering, purchasing and safety divisions are working hand in hand, there is an awareness of projected operations which enables all to plan for safety because each knows what is to be done and how it is to be done, since they are familiar with the layout of the project, the processes to be used, and the materials and chemicals which will be employed.

It is up to the safety director or safety engineer, whichever he may be called, to secure this co-operation between his own division and the other two divisions in order to attain the results that I have mentioned.

He can do this by selling the safety program to his management in such a way that they will desire that the program be effective. It is also necessary for the safety engineer to sell himself to the other two divisions by friendliness and cooperation and by making them aware of the fact that he is not infringing on any of their prerogatives, but is simply endeavoring to aid them to avoid making any errors which might result in loss of life or property after a project is completed. Of course, the safety director or engineer must have in his possession, or know where to get, the information which will enable him to intelligently work with the other divisions.

When the safety engineer has the backing of management and the co-operation of the other two divisions, the means of providing for safety in new installations is comparatively simple.

I want to outline to you a method by which the engineering, purchasing, and safety divisions can work together to provide safe working conditions in any manufacturing establishment. In the first place, production or management issues orders to proceed with any project. Usually these orders are issued after careful investigation as to feasibility

and relative costs have been made. There are no definite plans as to how the project shall be accomplished; only surveys have been made which will acquaint management or production divisions with the aims which are sought to be accomplished.

After such okays have been received from management or production, the engineering division issues the necessary orders to have the work done. In a great many instances, this will involve the erection of buildings and the installing of equipment. In other instances, it will mean the rearranging of a department within existing buildings. Whichever the case may be, plans must be made for the providing of housing, layout of equipment, and the actual equipment itself. The safety division should be empowered to scrutinize all such plans to acquaint them with what is going on and to enable them to point out safety features which should be incorporated into such plans.

One way of accomplishing this is to have all orders routed through the safety division for their okay, not from an engineering standpoint, but simply to make certain that no safety feature has been overlooked. For instance, plans for buildings should be checked to make certain that exits and fire escapes are properly placed and sufficient to handle the personnel which will occupy the buildings. The safety engineer should make certain that fire walls are provided for, that open stairways and elevator shafts are avoided, that there is an adequate sprinkler system and that such system is adapted to the service which it is to render; that is, it might be a wet or dry pipe system, depending on location and the use to which it is to be put. On the dry pipe system, we might advocate fused or unfused heads. The safety engineer will also be interested in knowing what sanitary arrangements in the washrooms and toilets have been provided for and he will certainly want to be sure that adequate provision has been made for proper lighting facilities, taking into account the nature of the work to be done. In addition, the wiring system throughout the building should be checked to see that it conforms to all safety requirements and electrical code, taking into account the nature of the product to be handled within the building.

Inasmuch as war industries are using an increasing number of women and in all probability the ratio of female employees will increase considerably in the near future, the safety engineer will be interested in knowing that all facilities are provided for handling this type of labor.

The safety engineer will also be interested in equipment, particularly as to location. He must analyze the uses to which the equipment is to be put and he must point out to the engineering division the necessity for providing proper handling space, adequate aisles, and clearances of every description.

When the location of equipment is mutually satisfactory to the engineering and safety divisions, there is the matter of the individual pieces of equipment: Are they properly guarded to prevent striking, shearing, and crushing accidents? Is all equipment properly grounded to insure against static sparks, especially when such equipment may come in contact with dust-laden air or with volatile vapors? Is the ventilation adequate and is it adapted to the particular installation? Does the ventilation provide the necessary change of air? Is it adequate to remove dust and fumes which may be generated in process and, in the cases of volatile vapors, does it take into account whether the vapors will rise or sink as they are given off by the liquids or materials from which they come?

The safety engineer must take into account, in scanning engineering orders, the materials and chemicals which enter into the manufacturing processes because it is often necessary to visualize the possible hazards which may be involved, due to splashing, contact with vapors, and also contact with the chemicals or materials themselves. Also, the safety engineer must visualize the possibilities of respiratory hazards. Where the safety engineer determines, in his own mind, that protective equipment or clothing are necessary in conjunction with other equipment to be used in the process, he must make certain that such equipment or clothing is going to be on hand at the time the process goes into operation. This may involve the ordering of gloves, aprons, leggings, goggles, or in some cases it may require respirators. However, well-designed equipment should eliminate the need for respirators insofar as possible.

In the purchasing of equipment, specifications should be drawn up, covering all ma-

chinery, tools, and accessories. You who are connected with war industries are aware that such specifications are necessary in order to enable the purchasing division to make inquiries for bids and it is my belief that industry in general can profit by adopting the same system in their everyday operations.

These specifications are particularly valuable to the safety man because they enable him to scrutinize them carefully, to see that all safety features are incorporated. Needless to say, the routine of any organization should be set up so that such specifications receive the approval of the Safety Division before being turned over to the purchasing division.

After all the preliminaries of the engineering order and specifications have been handled to the mutual satisfaction of the engineering and safety divisions, most plants write out a purchase requisition. This purchase requisition may be made by the stores division or by the engineering division itself. Such purchase requisition, of course, should require that the specifications, which have been agreed on, be adhered to by the vendor in submitting his bid.

This is where the co-operation of the purchasing division is very essential, for as you all know in this day and age of priorities and scarcity of materials, vendors are prone to suggest substitutions as an essential change in order that they may have an opportunity to bid on supplying something which might fill the bill but which does not conform to specifications, and this may be something that we are forced to do. However, in making such changes, it is certainly necessary that the purchasing division consult with the engineering and safety divisions to insure that the results anticipated are going to be achieved by the substitution. It may be even necessary to re-write the specifications.

In connection with war industries, we find that the low bidder on any particular piece of equipment is given preference, providing he has met specifications, but we are all aware that there are variations in standards set up by vendors of equipment and we know that, while it would be possible to get by with certain equipment, it is sometimes highly desirable to award the contract to a higher bidder, based on the quality of the materials he uses and the service which his product renders. It is not necessary to go into detail on this as you are all familiar with such instances, but it is necessary for the safety engineer to justify asking for the better product regardless of price when such instances as I have mentioned occur. This is just another problem confronting the safety man in war industry.

After we have set up the engineering order, written specifications, and purchased material, the safety man can not sit back and feel satisfied that everything has been handled. It is necessary for him to keep in constant touch with the purchasing division as to the progress of material ordered and to be aware when such material arrives at the plant. He must then co-operate with the engineering division to satisfy himself that the equipment or material received meets specifications and incorporates all the features which were anticipated when the equipment or material was ordered. Needless to say, this co-operation with the engineering division continues during installation and after the process has gone into operation.

The Effect of Lengthened Hours on Safety Problems in the Rubber Industry

By HOWARD L. LEAVITT

Liberty Mutual Insurance Co., Chicago

Overtime, two shifts, three shifts and swing shifts were just words to most of us until several months ago when orders came from the front to increase production. We felt the full impact of the real meaning of these words when the third shift was added.

Not until twenty-four hour operation is the order of the day does the safety engineer and the production supervisor face the full significance of the many problems that will arise that never existed before. They immediately must acknowledge that added hours

and changing shifts produce accidents of unexpected types and disappointing frequencies.

Safety and production men look to other plants expecting to profit from their experiences. Producers of rubber products turn to other rubber plants hoping to gain therefrom some indication of the logical steps to be taken to minimize production loss through accidents resulting from increased working hours. Unfortunately the results of retooling and substitutions are that plants, machines, materials and men are subject to adjustments, new formulae, uncertain hours, and numerous other changes. These produce so many new and unknown factors that very little about trends is available even in the larger plants.

If the accident frequency and severity rates in your plant are increasing to the point of alarm can you put your finger on one or two causes? Unlikely! Too many factors are involved! Who can say to what extent the simple factor of added hours of employment contribute to your increasing frequency? Our study is further complicated when an attempt is made to evaluate the contributing effect of experimental materials, illumination, swing shifts, rapidly up-graded supervisors, replacement of men by women, fatigue, etc., not overlooking outside influences over which we have no control.

Trends in the rubber industry are not yet available, but shift frequencies in one of our larger defense plants, recently published by the National Safety Council, indicates what we may expect.

Shift No. 1—8:00 A.M. to 4:00 P.M.—7.96 accident frequency rate

Shift No. 2—4:00 P.M. to 12:00 Midnight—6.82 accident frequency rate

Shift No. 3—12:00 Midnight to 8:00 A.M.—15.00 accident frequency rate

Many believe that the fatigue factor is the major, if not the only, cause of accidents due to lengthened hours of employment. Fatigue is a blanket excuse used to explain away injuries on the late shifts when in reality there are many other important reasons.

Supervisors

First, look to the caliber, training and ability of the supervisors that will handle the work beyond the normal day. With very few exceptions your industry has been unable to train a capable staff of reserve supervisors. Your management has been obliged to rapidly up-grade their more skillful and responsible workers to supervisory capacity. It does not follow that responsible workers become capable supervisors. Such up-graded men, and likely a few of the experienced supervisors, should study modern courses in the responsibilities of industrial supervision. These courses are available through correspondence, government authorized schools, private instructors, moving picture and sound slide distributors, insurance carriers, etc.

It is not necessary to employ scores of new workers each day to make practical some form of training for "green hands." At least an orientation period, and perhaps a short vestibule course, will pay dividends by reducing the adjustment period of the new worker. If daily instructional periods are impractical certainly meetings each week can be arranged.

Experience has dictated the advisability of having a representative of the safety department, perhaps a safety inspector, available on all shifts to make certain that standards required by the safety department are being maintained. This responsibility on the second and third shifts employ the newer men who will be, therefore, less skillful and experienced, as a group, than those on the daylight shift. The physical condition or the machine guard that was adequate and safe for the experienced worker may not be adequate for the less skillful. The adding of the additional shifts requires more than the average diligence by the safety department in making certain mechanical conditions are practically without hazard. Look to such machines as your calendars, circular knives, extruders, trimmers, beaders, etc., for substandard guarding when viewed toward protecting your new worker. Substandard protection is not adequate.

Ventilation

Presently installed and operating ventilating systems have been doing a splendid job for eight hour exposures. They will bear investigating for ten, twelve and fourteen hours of continuous exposure. The psychological effect of gases and fumes on the human is proportional to their toxicity, concentrations and, just as important, the length of time the worker is exposed to them. The exhaust sys-

tem in the batching room, over the mill or on the cementing table, may be satisfactory protection for eight hours a day yet grossly inadequate for twelve hours of continuous exposure.

Likewise, the respirator filtering medium may provide sufficient protection for eight hours of continuous use, but clogging, caused by more hours of use per day, may render it ineffective during the later hours. Filter replacement must be stepped up as the working hours are increased.

What has been said for ventilation and respirators applies equally to workers' personal cleanliness. Dusts, fumes and chemicals on the skin for eight hours a day have produced no symptoms, but lengthening the exposure without increasing the cleanliness factor could produce unnecessary dermatitis.

Consider your illumination for a major three-shift problem. Most plants have lighting designed for solving occasional dark-day illumination problems. Such lighting is far underdesigned for twenty-four hour operation. The average plant requires illumination intensities eight to ten times above its present capacity.

Lighting

Lighting is not a handyman's job. Proper light distribution, elimination of strong contrasts and standard intensities in the important work areas is the work of a lighting specialist. Foot candle intensities for general work and for specific machine operations have been scientifically determined. This information is available to you through your local electric utility, the American Institute of Lighting Engineers, fixture and lamp manufacturers and similar sources.

Recent accident experience has made it obvious that insufficient maintenance personnel have been provided on the second and third shifts. Most men imagine themselves capable electricians. Electrical apparatus breakdowns, in the absence of an electrician, invite tinkering which has produced more than its share of minor and serious electric shock cases. This applies equally to most of the maintenance trades.

Up until now I have avoided the subject of fatigue with the hope of emphasizing a few of the other controllable factors incident to the lengthening of employment hours. Industry is accepting the responsibility of attempting to control fatigue. It is doing many remarkable things to minimize its effect on production schedules, accidents, workers' health, etc. A few will be mentioned briefly.

An attempt is being made to reduce fatigue and increase the health level of workers by providing vitamin capsules, much the same as salt tablets have been dispensed. This, however, is properly the function of the medical department.

Relaxation

Rest periods have proven their worth in increased production alone. Rest periods held too frequently and too long defeat their purpose. It is generally accepted practice to provide two periods per shift of about ten minutes each.

Snack wagons, smoking rooms, even roped-off smoking areas, are gaining more accepted approval in helping to minimize the fatigue factor as it affects production and accidents.

Music at the production line is no longer an experiment, although it is far from popular acceptance. Such representative concerns as the Utica Drop Forge & Tool Corp., Westinghouse, Curtiss-Wright Aircraft and Bristol-Myers are no longer experimenting. They know the proper hours for playing music and know the exact type of music that produces the most favorable production results.

Noises, particularly those of higher pitches, produce fatigue and there is plenty of evidence that some noisy operations bring on "industrial deafness." In attempting to eliminate noise fatigue there is much that can be done in a physical way, including isolation and soundproofing. Some plants report favorable results from the use of small ear appliances which screen out the high pitch fatiguing noises, yet provide adequate hearing for ordinary conversation.

The practical application of reducing fatigue will more easily be solved when we realize that it is more a factor of psychological reaction rather than physical exhaustion.

Lengthening of production hours confronts

us with three important responsibilities.

1. Job and safety training of both supervisors and new workers are needed more than ever before.
2. Physical conditions, under which the work must be performed, requires a higher degree of perfection than was considered necessary for one eight hour daylight shift.
3. Fatigue is an operation problem which cannot economically be overlooked. It can be reduced to a surprising degree through a combination of several proven methods.

CHAIRMAN UFFORD: Mr. Leavitt, thank you very much for that clear and comprehensive analysis of a mighty complicated subject.

I wonder if, after the breadth and variety of material covered in the presentations by Miss Norton and Messrs. Walker and Leavitt, you would not like to ask some questions or make comments, or possibly give some brief experience in your own plant which might illustrate the use and success or failure of some of these methods which have been discussed here.

MR. LOUIS LYONS (Monsanto Chemical Company, Texas City, Texas): I want to ask Mr. Leavitt to give me some information on where I can get some data on music in industry.

MR. LEAVITT: That is available from several companies. You can get it from the companies I mentioned. I will give you this leaflet that was part of the information that I got hold of. If you want more, I will be able to get it for you.

MISS NORTON: I might mention that we get our music through our local music stores, what they have left. Some of them lend us their programs. We were going to have Lucy Monroe but it got too cold in Erie, and we could not do it. You have to be careful what you have, at certain times of the year.

We also happen to have a company band, a union band. During our War Bond Drive we used the band to go around and play at the different buildings that had the highest subscriptions for that week. We have had the band only a year. and we have found it had done us a lot of good.

CHAIRMAN UFFORD: Mr. Lyons, there are two or three companies that have simply plugged in the music from night clubs and hotels. They have had moderate success with that.

MR. LYONS: Do you give them the music during working hours, or during lunch hour?

MISS NORTON: Ours is being given during the lunch hour.

MR. JACK KIDNEY: I think it is a lot of bunk to use music. I was in a plant in Cleveland, and they were blasting news, music and everything. It is the only experience I ever had with it. As far as I am concerned, it is out.

MR. HOPKINS (U. S. Rubber Company): We tried the music out, records and music. We also have moving pictures. We try to give it between the incoming and outgoing shift, so it doesn't interfere.

MR. J. E. LOVAS (U. S. Rubber Company, Passaic, N. J.): On the question of restrooms and smoking areas, do you permit smoking during the working period?

MISS NORTON: We have exactly what was mentioned for our men. They have regular smoking areas that are roped off, right in the middle of the plant. If a fellow wants to smoke, he walks over there and sits down and smokes. Before that they were sneaking into the restroom and wasting time.

The girls have to go to the restrooms to smoke. That is why we have a scheduled rest period. I dont know why we don't, but we don't allow the girls to smoke. Probably in some of the offices they do. But they have to go to the restroom.

MR. LOVAS: Do you have a smoking area in each department?

MISS NORTON: Yes, in each division.

MR. VIZETTI (Corning Glass Works, Carlisle, Pa.): I would like to know if any of your plants have any first aid training of any kind and, if so, how you go about it.

CHAIRMAN UFFORD: Can somebody

give us some information on that now?

MR. McEWEN: We started our program with first aid training, to prevent accidents. When we first started our program, we had no instructors in our plant. It is not compulsory, but we request each of our men to take this Red Cross training. Of course, there are two different kinds. You can take either the Red Cross or the Bureau of Mines. It so happened it was easier for us to get the Red Cross than the Bureau of Mines.

Since we started that three years ago, practically all of our men have had first aid training. Of course, that lasts for three years. Just recently we have had three men complete the instructor's course. From now on we are going to teach our own men. We have found that it is very good.

MR. LYONS: I might state, with my twenty years' experience with the Arkansas Fuel Company at Shreveport, Louisiana, in '26 we started our first aid program. Confirming what you said, we have done more in safety work by teaching first aid than through any other medium.

I find with the new employee, if you can get him to take first aid work, you have solved a great thing with your safety program, because the man who teaches first aid work will get to know the new employee, and the new employee will get to know him and respect him if he teaches a good course in first aid.

We have gone in for contest work down there for years. In the petroleum industry as a whole, throughout the South, first aid work and first aid contest work is one of the principal forms of safety educational work that we have.

MR. LOVAS: Is first aid on their own time?

MR. LYONS: It depends on the company. In some it is on their own time, and some it is on company time.

MR. E. J. EFFING: We found we can bring back some of our men after working hours, mostly salaried help, who are usually too busy to take a first aid course during working hours, and train them, with our own men as instructors, who have passed instructor's courses. During the day we pick out people who wish to do first aid work. In that way we have several men on first aid work. We pay some of them. The supervisors and salaried help usually are willing to come back and take the course.

MR. A. L. SOMMERFELD (Van Cleef Bros., Chicago, Ill.): I think if there is any time when first aid should be taught, it is now. We have tried it for the first time in our plant. We started out with a group of about fifty, although we did not complete with them. But we were fortunate enough, for our size plant, about 230 people, to complete with nineteen, who will receive their certificates.

We were also fortunate to obtain one of the best instructors. I do not think it is a hard job getting instructors to teach first aid.

CHAIRMAN UFFORD: That is the favorable side of the subject. Has anyone had an unfortunate or, shall we say, unsuccessful experience with first aid in the plant?

MR. KIDNEY: Yes, we have had. I am trying to stir up a little fun here. I don't want you to take me too seriously. First aid is being overdone in this country. We take after the English. Our whole civilian defense program is built around first aid. Now we discover, as we did with the bombs, that first aid is not so important in England. In fact, in England today in an air raid if a fellow gets knocked over, they say, "Leave him lay there until the truck comes."

If you have a plant and you have a hospital in that plant, there is grave danger in promoting first aid too far. If it is possible to get the fellow to the hospital within twenty minutes or one hour, unless he is bleeding real bad, nobody should touch him.

In all of our plants in Akron we have about 46,000 people. In spite of the fact that we teach first aid in the civilian defense setup, we will not permit any man to bother with any man that is hurt. The only job is the transportation. We will teach them how to get the man to the hospital or a doctor.

When anybody is hurt, the No. 1 problem is to get a doctor. Then there is the other problem: if the man is bleeding, or something like that, or it is a matter of trans-

portation, then I think the first aid comes in.

MR. WALKER: The safety manual specifies that one out of every fifty employees in a plant shall be instructed in first aid. So, it was necessary for us to institute a first aid training set-up.

All of our men are versed in first aid. We started classes in our explosives area and have trained approximately 250 people. I won't say whether that is one in fifty or not. But our instructions to our first aiders are just what Jack has outlined, that it is only to make the patient comfortable. They are not to try to set any limbs; unless there is excessive bleeding, they are not to try to stop that.

However, we have had some very good experiences from people on outside cases, where they have been witnesses of automobile accidents, where they have rendered very valuable assistance to other persons.

We have never had occasion to use our first aid, except in very minor cases. But, of course, we are always on the brink of something big happening, probably involving burns and fractures and every category of injury, if anything did break loose. We do feel in that event we should have a certain number of people who will be able to make the patient comfortable until he can be transferred to the doctor's care.

M. VAN CLEEF: I just wanted to add, in passing, our organization, as referred to by Mr. Sommerfeld, although we developed a first aid group, they are reserved, to be used in case of necessity. Our rule also is that, in case of accident, get the patient to the doctor as quickly as possible. There is one angle I think we often overlook, and that is the fact that anyone who renders first aid becomes liable under the law for what might happen in an adverse way. In other words, if, through the wrong sort of measure, the first aider causes greater injury, or the injured can prove that he was influential in making the case worse, then the first aider is subject to claim.

MR. C. M. GARRETTSON (Electric Hose & Rubber Company): We started first aid approximately eighteen months ago. We set it up on each shift. We work three shifts, six days a week. Each shift had approximately fifty employees who finished up on first aid and qualified on the standard course of the Red Cross. But just as some other gentlemen said here we were afraid of the mob psychology that comes in when there is an accident.

To get around that, we set up in each department an individual first aid station with only the bare necessities, equipment to stop bleeding, or a splint that could be used to make the patient comfortable, and appointed two men in each department, on each shift.

Their function was to get that injured person comfortable, on a stretcher, to the hospital, stay with him until such time as the doctor or the nurse dismissed him, or they were turned over to the ambulance service, taking that patient to the hospital. We have found that that has worked very well in our place.

CHAIRMAN UFFORD: There are probably many other things that can be said on this particularly interesting subject, but there is both pro and con. We hope it will answer your question, sir.

Are there questions or comments on other subjects covered by this program?

MR. A. B. PETIT (Synthetic Rubber Division, Buta Gum Rubber): Miss Norton and Mr. Leavitt both mentioned increased working hours. Miss Norton mentioned per week and Mr. Leavitt per day. But the question in my mind was what they found in the combination of continued working.

According to the information I have, England and Russia both tried to work continuously seven days a week. They found that the thing did not work out, that they could probably work twelve hours a day as long as they had one day off in seven, but they could not work successfully eight hours a day and continue to work. I would like to know something of the experience you might have had in that.

MISS NORTON: We have found that out. I think, in general, a lot of companies, including General Electric, as soon as war was declared, just went to town, and felt that seven days a week was the thing, but we have cut out now, as much as possible, in almost all of our divisions, Sunday work. Of course, that is followed through by the women's laws in Pennsylvania. We cannot

work them seven days a week; we can only work them six days.

We found that very satisfactory. That was set up at Washington, through England's experience and with the various Department of Labor heads from the United States. They decided not to have a seven-day week but a six-day week. I think the trend is to bring the men's hours to the women's hours. Before long I am sure we won't have very much, if any, Sunday work.

MR. KIDNEY: I would like to hear from Jimmy Quirk in California. He used to be a safety man; he is now a "big shot" personnel man.

MR. QUIRK: I am listening. I would like to ask Miss Norton, though, the success you have had in investigations. Is that worked through your personnel office or through the foreman? Did the foreman make the request for the investigation?

MISS NORTON: Yes. We would have too big a job if we investigated every single absence. We try to cover as many as possible. The request comes through the individual department, and it is centralized in my particular office. We get all the requests every day, by ten o'clock. That is the difficult thing, because the foremen have plenty to do before ten o'clock. If we don't do that, we cannot investigate the same day.

We have not done an awful lot of investigating on the second and third tricks. That is an important phase, but we don't know how we are going to do that now, because, while we are not in the rationing area yet, we are going to be shortly. We have only one car available to use all the time, and there are a lot of other things.

We realize we should be investigating on the second and third tricks. We are also running into this now: A man who works on the second or third trick and is absent, is reported the next morning. He is very clever, because they have gotten some signs that say "Night worker sleeping during the day. Do not disturb." (Laughter) Then we cannot find out what went on the night before.

MR. QUIRK: Does your nurse do your investigating?

MISS NORTON: No, we have a woman who, while she is not a professionally trained social worker, has had practical training. She is about forty-five years of age and a very nice person. She does a good job.

That is a very important point because you can get the employees very annoyed at you if you start prying into their private lives. You really have to have a good reason and do it in a tactful way.

We also have a man doing the same thing. A lot of the alcoholics and so on, we know by name. The man does the investigating, and he often has to take them home.

MR. HARRY WALKER: What area do you have to cover?

MISS NORTON: We are in Erie, Pennsylvania, a rural district. We have quite a few small towns surrounding the city, and we did cover them. I don't think we are going to be able to do that when gas rationing comes in. We have a couple of little towns in New York State that go right by the border. We probably cover about fifteen or twenty miles now. That really does the trick.

MR. R. A. BULLOCK (Corduroy Rubber Company, Grand Rapids, Mich.): Geting back to this absentee business and willingness to work, I think it is a part of the production problem, in order to keep production going through, without interruption due to absenteeism. I don't think the production set-up is proper if that is not taken into consideration with the problems we have today. I think that reserve help should be available, that is, should be planned ahead of time to be available to maintain a certain production schedule.

For example, in a foundry in Muskegon not so long ago, this story is reported on management themselves. It happened on a key operation, a tank motor job. The key operator, through his own carelessness, was involved in an automobile accident and held that operation up entirely for the eight hours the day he was hurt, and severely curtailed production for the next three days before he returned.

The management criticized this employee for being careless, which was justified, but I criticize management because of the fact

that they had a key operation and only one man trained to do it. I think it is definitely management's responsibility to plan that in the production schedule.

On this willingness to work and absenteeism we run into, with these hangovers, and half-day fishing parties, too tired to work, it seems to me if it is possible for a man to fight twenty-four hours a day, it certainly ought to be possible, under our present industrial set-up for anyone to work two four-hour periods a day, six days a week.

When it comes to absenteeism, I think something has to be done in order to clean up the problem. We can only partially answer it through training and education. I don't know how many of you people have ever gone down to Union Station to see 200 draftees leave your city. If you haven't done it, you should do it. It does make me sick to play with these men who take time off without good reason, knowing that we are sending men away to fight against their best wishes.

I think the answer is it has to be a work-or-fight proposition. If they don't work, send them away to fight. I don't think we will solve the problem until we get something along that line. We have plenty of other rules and regulations. It seems to me that something like that is in order.

CHAIRMAN UFFORD: I imagine we could have 100 per cent assent to your spirit from this group.

In order to keep to our schedule, ladies and gentlemen, let us just have a minute here in which to try to pull two or three things together.

I just wonder if possibly we people who are very much concerned about safety aren't in much the same fix as everybody else right now. We have gone into an awful frenzy of production. We have to do it, there is no question about it, but sometimes when we are in a frenzy, we don't think; we don't plan. Quantity of thinking and quality of thinking don't go together nearly so well as we would like to think. How often we have told that to other people! I wonder if we might not all of us take that same thought to ourselves.

Practically every organization represented in this room is vastly bigger today, five times, ten times, twenty times bigger than it was two years ago. The safety supervisor is faced with not that many problems but possibly twice that many problems again, because they do multiply in greater proportion than the mere personnel involved.

The Planning Job

Do the safety supervisors in general take into consideration this point: that the bigger the organization gets to be, the less their job is one of doing, which is perfectly all right in a small organization, and vastly more a job of planning, training, coordinating, developing other people who in turn will do? That applies to all levels of supervision in industry, doesn't it? And yet how few of us have really changed our thinking that way.

So I think that not only safety men but everybody may be in a position of where a company is working miracles every day, by comparison with regular standards, and yet we let ourselves be balked by the little things. Mr. Bullock has hit a point here—the planning of a miraculous operation yet no planning for that little key spot there. We just take it for granted.

Maybe if we could take away the thought that has built up here, through all this discussion, it seems to me, put it together, can we do a job of planning, of thinking, of searching out these little things in principle and eliminating them, if we cannot get away from the problem that so many personnel men, safety men and other people concerned with the human aspects of industry are bothered with continually, and that is of continually having to beg for the little things.

We need to do the big things that must be done. Is it possible that we become enough concerned with those little details, which are endless, that we have not thought to go back of them and plan a program such as Harry Walker has talked about here in principle, and such as Miss Norton has gone into in detail, which links the problem once and for all with selling the idea to management and which gives you a policy and a road to travel?