Rubber Section

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Past General Chairmen—

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C. F. Horan, Hood Rubber Co., Watertown, Mass.
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TUESDAY AFTERNOON SESSION

October 17, 1939

The opening session of the Rubber Section was called to order by General Chairman R. A. Bullock, Personnel Director, The Corduroy Rubber Company, Grand Rapids, Mich., who presided. Chairman Bullock first made a brief report of the activities of sectional committees during the past year, and then introduced the scheduled speakers.

Unfortunately the formal paper to be presented on the subject of "Carbon Tetrachloride in the Rubber Industry" was not available, and in the absence of the scheduled speaker a short discussion ensued. Led by C. W. Ufford, Personnel Manager, The Ohio Rubber Company, Willoughby, Ohio, this discussion has been summarized by Mr. Ufford for these Transactions as follows:

Carbon Tetrachloride Problems

It was pointed out that many of the small companies, in particular, have used carbon tetrachloride in washes and solvents in order to reduce the fire and explosion hazards to the people handling these materials. There is no question but that these same companies have experienced a wave of carbon tetrachloride sickness as a result and that there is room for considerable discussion as to a solution to the problem.

Ventilation on fixed installations can reduce the fume hazard materially, but the problem of local and oftentimes unauthorized use of carbon tetrachloride for isolated jobs still presents a real problem. The question is, can a suitable control or a suitable substitute be found for carbon tetrachloride?

The discussion showed that many companies have *definitely experienced ill effects* from the use of carbon tetrachloride; to such an extent that many of the companies represented have prohibited its use in any form and have substituted a standard cleaning solvent known as Stoddard's Solvent or Solvent No. 5, which is used commonly in large quantities with complete safety in the cleaning industry.

Substitutes Dry Slowly

This point brought up the fact that many of the substitutes for carbon tetrachloride are very slow in drying and that factor has kept their use out of many operations. Several representatives said, however, that the difference was so slight as to be negligible and the advantage so great as to warrant a change in the expected operation time.

No definite conclusion was reached, although the majority of representatives said that carbon tetrachloride had been eliminated from their use, and that by correct use of the various substitutes under conditions suitable to their peculiarities, very satisfactory results had been obtained. Another group of representatives said that they had not had satisfactory results from substitutes and that they were still faced with the hazard of carbon tetrachloride, particularly in washes, though not so much in solvents.

Progress of Safety in the Rubber Industry

By ERNEST W. BECK

Supervisor of Safety, United States Rubber Company, New York City

The National Safety Council today shows the rubber industry as *third* in severity and *fifth* in frequency among thirty major industries.

At the time of the organization of the Rubber Section of the National Safety Council in 1919 the rubber industry was regarded as a most hazardous one. After strenuous work and close cooperation on the part of everyone in the industry, in 1931 it stood *tenth* in frequency and *ninth* in severity among twenty-eight leading industries. In 1936 we took *fifth* place on the basis of frequency and *seventh* on the basis of severity in a list of thirty industries.

Our constructive work was really started twenty years ago when the Executive Committee of the Rubber Section, N. S. C., promoted the written standard practice for reporting accidents. As a result our industry can show accident figures for comparative purposes as far back as 1921.

Annual statistical reports show that the predominating number of serious accidents occurring in the rubber industry were due to machinery. Some of this machinery, such as mills, cannot be guarded at the point of operation. With this in mind, the Executive Committee of the Section devoted considerable attention to cooperating with machinery manufacturers, electrical equipment manufacturers, rubber manufacturers and State Departments of Labor, on the subject of drawing up a standard safety code covering safety factors on mills and calenders. The approved code was printed in March, 1927, and distributed as recommended American practice.

The adoption of this code has assisted materially in reducing the number of accidents on mills and calenders. During 1934 and 1935, not one person was injured in the bites of calender rolls among the employees of a large number of companies which I contacted. The survey covered a spread of 45,000 employees and an exposure of more than 81,000,000 manhours worked each year, or a total of 165,000,000 manhours worked. These same rubber companies reported but one accident at the bite of mill rolls in 1935 with a cost of $850.

Under the joint sponsorship of the Rubber Section and the Chemical Section, N. S. C., a complete report on "Benzol" was drawn up and received national recognition. The Rubber Section, through its annual meetings, has given publicity to outstanding authorities on such subjects as "Compounding Materials Used in the Rubber Industry," "Static Electricity," "Vulcanizing," "Fire and Dust Hazards in the Rubber Industry," "Digesters," "Hazards of Reclaiming," "Occupational Skin Diseases," etc.

During the past year our Rubber Section recognized the importance of revising Safe Practices Pamphlets RU-1 and RU-3—"Compounding Materials Used in the Rubber Industry." The work is in charge of a committee of which Dr. W. A. Gibbons, United States Rubber Company, Passaic, N. J., is chairman. Inasmuch as many rubber manufacturers are hesitant to use compounds which are not listed in the Safe Practices Pamphlets, it becomes a matter of concern to both the manufacturer and user that correct information regarding the later chemicals now in use in rubber compounding be classified and listed. A large number of questionnaires have been sent out to both manufacturers and users of rubber chemicals, and the work of this committee will assist materially in the safe handling of certain chemicals and compounds.

In the development of the Rubber Section safety program an excellent spirit of cooperation was created among the safety engineers of the industry. Rubber companies, while competitors in the marketing of their finished products, are certainly not competitors in the safety field and our motto has been "There are no secrets in safety."

Today we can safely say that health hazards in the industry are not a major problem as the accident cost in large rubber companies over a period of 15 years shows that much less than 1 per cent of the total expense was paid for occupational disease, including chemical hazards. We seldom hear of a case of lead, benzol or aniline poisoning in our industry. The fact that many large rubber companies carry their own compensation insurance has tended to accentuate attention upon preventive measures.

During the last twenty years our industry has seen many changes take place through the installation of modern machinery, such as plasticators, banbury mixers and tubing machines, displacing to a great extent the more hazardous types of washing equipment and open mills and calenders. The installation of conveyor systems, unit vulcanizers and hoisting equipment has eliminated the dangerous man power handling of heavy equipment and material.

The reduction shown in the number of accidents in the rubber industry during the past twenty years was obtained in spite of the fact that compensation laws in practically every state where rubber workers are employed have increased the amount of compensation and reduced the waiting period, including occupational disease laws, all of which has had a tendency to increase the number of reported lost-time accidents and their cost.

The large majority of rubber workers are employed in the states of New York, New Jersey, Ohio, Massachusetts, Connecticut, Pennsylvania, California, Michigan and Wisconsin. These states have been the leaders for years in advancing and increasing labor laws as they apply to both industry and the workers. However, the accident records during all these years have shown steady improvement.

The frequency rate for our industry, according to the National Safety Council's most recent figures, shows that we have reduced our frequency 72 per cent since 1926 and during this same period we have reduced our severity rate 58 per cent.

The National Safety Council has conducted for about six years a safety contest among our Rubber Section members. This contest, based on frequency rates, has stimulated accident prevention and has contributed to bring about a greater interest in safety within the industry. The 1938-39 Rubber Section Safety Contest had an enrollment of thirty-six plants which worked 98,000,000 manhours during the year. Two contestants established no-injury records for the contest year.

Quoting from the 1938 rubber industry accident rate report as published by the National Safety Council: "The 1938 injury experience of the Rubber Industry is based on reports covering thirty-eight plants, 51,023 employees and an exposure of 85,388,000 manhours. The frequency rate of 6.92 is 43 per cent below the average of all industries and the severity rate of 0.58 is 62 per cent below the general average. Rubber plants have more than kept pace with other industries in reducing injury rates. The improvement in frequency of 72 per cent since 1926 slightly exceeds the 68 per cent reduction by all industries; in severity a reduction of 58 per cent compares with an average of 44 per cent for all industries.

The company which I represent has about twenty factories with 30,000 employees. Sixteen years ago our company realized the advantage of competition among plants and organized and conducted a safety contest, giving prizes of various kinds to the factories showing the greatest percentage of improvement in their accident experience over the average of the previous three years.

We have many different kinds of Safety Committees at our plants such as Safety Advisory Committee, Employees' Safety Committees and Departmental Safety Committees. In addition, we have organized suggestion systems and all employees are encouraged to hand in suggestions for the good of the organization.

The reduction of accidents has been the result of united effort on the part of the entire organization. Conditions regarding health, safety, sanitation and fire protection are under the constant surveillance of each local organization and periodic inspections are made by the Supervisor of Safety and field inspectors.

The liberal use of National Safety Council service material is employed throughout all plants and safety lectures and demonstrations are given before safety committees and foremen's meetings to develop an ever increasing safety perception on the part of all employees.

Accurate statistics covering the number of accidents, compensation paid, medical and legal expense, are recorded for each factory as well as for the company as a whole. The proof of good safety work can be shown by proper statistics. Always have your statistics ready to show. The boss is interested in the end figure. He is used to dealing in figures and can readily visualize the trend.

Some time ago all of our plants operated for thirty-four consecutive months, or a total of 114,000,000 manhours without an industrial fatality. At one of our factories employing 1,600, the entire personnel worked 2,286,000 manhours during an entire year without a lost-time accident. Our largest tire cord mill with 1,450 employees, operated 391 days, approximately 3,500,000 manhours, without a lost-time accident. The United States Rubber Company, Providence Plant, Providence, R. I., holds the best all-time record for the rubber industry by working 5,688,369 manhours without a disabling injury, between February 19, 1935, and October 7, 1936.

The success in safety work that the rubber industry has had during the past twenty years did not just happen nor was it the work of any one man. It came about through everlastingly plugging away every day and the wholehearted support of the entire organization.

The most recent reports show that in 1938, 30 per cent of the lost-time accidents in the rubber industry were classified as "Machinery Accidents," and 31 per cent were classified under "Handling Objects." Therefore, my suggestion is that during the next twelve months we give special attention to eliminating accidents in these two groups. Let us feel at liberty to write to our competitors and ask them how they handle certain accident problems within their plants. Let us all work together in order to retain, and, if possible, improve our present position of being the safest large industry on record.

Handling of Materials

By D. G. WELCH

Safety Engineer, Hewitt Rubber Corporation, Buffalo, N. Y.

This type of accident leads in all industrial injuries with more than one-fourth of all lost-time accidents. In our own industry, this type is responsible for an even larger proportion of occupational injuries, the figure being nearly one-third of the total.

A careful analysis leads to the conclusion that most accidents of the "handling materials" type are most easily prevented by planning the job ahead so that each phase of the operation is fully understood, and the employee knows in advance just what he is to do. It is felt that this goal is best attained by job analysis whereby each phase of the operation is broken down into its component parts, and the superfluous and unsafe factors eliminated.

President Fennell's article in the May issue of "Factory" is very helpful in this connection, where he mentions calling all workers on a particular operation together, discussing the best method of doing the job between them, obtaining their reasons for feeling so, and securing their agreement. Job methods determined by the workers themselves receive unqualified support and need little enforcing.

Since nearly every job requires the handling of materials, the less handled by hand, the less exposure to injury. In this connection, process layouts should be helpful in the elimination of much manual handling; and gravity flow of materials, as well as motion study to cut down the extent of handling, should be seriously considered as well as other substitute equipment.

A further examination of the statistics shows that the largest grouping of the injuries from handling materials comes under "strains and sprains." For this reason we should devote considerable time to the problem of proper lifting. Much has been written and said on this subject; some of the various theories and rules are accepted by all, and some are still subject to controversy.

The most important phase is lifting by keeping the back straight while bending at the knees, grasping the load, and then straightening the legs. This takes the load off the stomach and back muscles, and puts it on the stronger leg muscles. Some advise taking a deep breath prior to lifting, and holding it while raising the load into position as this tenses the muscles; this is practically a natural instinct while lifting.

For group lifting, it is suggested this be coordinated by some such means as all lifting upon signal of the immediate supervisor. It is suggested that heavy flat objects are better handled by truck because of the possibility of strains, incomplete control, falls, etc.

Some sources state a good rule of thumb for continual lifting is that the load should not exceed 40 per cent of the weight of the individual lifting. The method of determining this figure is unknown. Another source, of English origin, states that a load in excess of 130 pounds should not be lifted. It would seem that the first method is more applicable to continuous lifting, the latter for instantaneous, infrequent lifts.

Another rule of some merit is that stating that if more than two men are required to lift a load, mechanical equipment should be substituted. If the back starts to bend under the load, that is a warning the load is too heavy and help is needed; under *no* circumstances should one attempt to move the load by jerking it as this doubles the strain on oneself and may result disastrously. It is far better to get help than to attempt to show off.

In any case, the weight of an object to be lifted should be known first. Besides the weight, factors of considerable importance when lifting are the build of the individual, the size and shape of the load, and whether it is bulky or concentrated. These items should be taken into account whenever a lift is made; much judgment, based upon experience, is required.

In addition to getting a good grip on the load while lifting, one should be on the lookout for slivers, nails, sharp wire strap ends on packages, etc., and should have hand protection as required.

Other phases of this subject also demand our attention; it will be necessary to hit the high spots only.

Transportation is a very important subject. In transporting or carrying objects by hand, a few precautions are in order. Long material should be carried with the front high and the back low to prevent striking or tripping those approaching you unexpectedly. When more than one man is necessary, it is preferable for the more experienced man to be in the rear to watch conditions; men should be as near of a height as possible.

Hand-powered transportation equipment consists mostly of various types of trucks. Serious consideration should be given to the type of truck for the load, with specially designed trucks being used where advantageous, as the common types in general use may not be satisfactory for the particular combination of weight, size, shape and hazard.

The common wheelbarrow is best used for bulk loads; the two-wheeled truck for bagged loads and such applications as heavy crates around warehouses and freight cars. Knuckle-guards are recommended for both type trucks to prevent striking the hands against various obstructions. Running is especially out of place when trucking. The precautions given relative to lifting should be kept in mind with these type trucks especially. Care should be taken to balance the load over the wheels, also, in order to reduce the net load. It is generally preferable to push such trucks although there are exceptions, such as when going up a steep incline or ramp. For the two-wheel truck, brakes and wheel-guards should be provided. These trucks should be counterbalanced so that they will stand alone, also, otherwise such trucks must be kept stored out of the way.

Overloads should be guarded against with any type of vehicle; they make the truck top-heavy and subject to turning over, as well as blocking the view if piled too high. Projecting loads should be guarded against, also. For any truck, the condition of the wheels should be checked regularly, its center of gravity should be as low as possible, heavy objects should be piled at the bottom with the load centered and secured, and the truck should be unloaded from the top down. Wheel-guards should be provided for all exposed wheels, and truck handles should be counterbalanced so that they stay off the floor, or else be hooked up. "Heads up" should be the rule when moving trucks. In addition to guarding against high piling, trucks should be blocked, both for loading and unloading. Indiscriminate riding of trucks should be prohibited. Side stakes and tie chains are frequently necessary.

The same problems are encountered with power trucks. In addition, a few other hazards exist; one of which relates to enhanced traffic problems. It is well to provide mechanical and other aids such as warning signs, mirrors, special watchmen as traffic regulators, and even to consider formation of a Traffic Department. Strict speed control is necessary and each vehicle should be provided with a satisfactory warning device—bells, horns, etc. In using trailers, especial care is necessary; also attention should be given to the type couplings and their proper maintenance.

Proper piling is extremely important. The keynote of this problem is cross-piling, with pyramiding very important on bagged material especially; pyramiding should start at the five foot level. Bulk material can be stored in bins easily, and removal made from the bottom of the bin. It is preferable to pile barrels and kegs on end, stepping them back. Planks should be placed between them to stabilize them. If piled on their sides, special racks are required. If racks are not used, planks should be laid across the top of the barrels with the second tier directly over the barrels below, and bulkheads erected at each end of the stack. Boxes should be placed on their long sides with stackers being used to pile them, if they are bulky, as the use of too many men results in injury. Bars and pipes should be stored in racks, and the material should not project into aisles; the ends should be marked, also, to contrast with the surroundings. The racks should be inclined toward the center so material can not roll off, and they should not face a main aisle.

In handling chemicals, in addition to providing special trucks and clothing and using special equipment to remove the contents from containers, such materials should be stored in dry places away from weather and temperature changes, and away from aisles and elevators. Different types of gases should be stored separately. It should be assumed that carboy jackets are in poor condition and so handled. Special racks should be provided, and no tiering permitted. Quick application of water is the first treatment for injuries from all chemical contacts.

General precautions consist of keeping heavy materials away from floor centers and closer to the underlying supports with the loads as uniformly distributed over the area as possible. Materials should never be piled too high; there should be ample clearance for sprinkler heads, and ample room should be left for passageways and aisles with no projections left of any kind. It is well, when piling materials near passageways and aisles, to see that there is little likelihood of their falling or being knocked over. Fire fighting equipment should be kept accessible.

Unpiling should be done from the top down without altering the shape of the pile. In removing material, care should be taken to climb up to the level of the material, then to lift it (not pull it) off the overhead shelves.

"Hand-tools" is an especially important subject in connection with handling materials, as handling materials by various types of hand-tools accounts for 58 per cent of the permanent disabilities and 24 per cent of the temporary disabilities. In using shovels, the user should always stand at one side of the shovel, not have it in front of him. When not in use and laid down, it should be left with the scoop down and out of the way, not underfoot. Care should be taken to see that all other tools are not left underfoot, either. Hand-hooks should be kept sharp and their points guarded when not in use. The hazard from tongs and pliers is due more to faulty design than improper use. The handles should be altered so that the hands can not be pinched by the closing of the tool.

Spacing men properly and using the correct tool for the job are necessities to keep in mind, too. Many accidents have been caused by striking an adjacent worker, or using a crowbar for a car-mover.

While the substitution of hand and powered mechanical equipment for hand work eliminates many of the hazards we have covered, and usually makes the job safer, it introduces hazards of its own. And while the number of accidents are reduced, their severity is usually greater. For that reason, a thorough job of mechanical guarding should be done, not only for moving parts, but for other unsafe conditions which may be present. This subject is one requiring separate treatment because of the very many types of mechanical equipment and the special problems peculiar to each. It is impossible to deal with this subject here because of time limitations.

As to building conditions, the main consideration here is to check floor conditions for smoothness, lack of obstructions, and capacity. Rough floors shake loads, break parts of trucks, and cause loss of control of the steering apparatus. Aisles are important, too; they should be two trucks wide or at least eight feet, and should not interfere with machines.

The answer to clothing may be summed up into tight-fitting clothing plus proper protective equipment as required. Gloves and hand leathers are helpful wherever rough surfaces are encountered—sharp edges, burrs, unfinished lumber, etc.—except around moving machinery, where they are to be discouraged wherever possible. Personal clothing of great value in preventing injury is headlined by footwear. Safety shoes are of inestimable value. No unbuttoned coats, long aprons, aprons tied with strong string, torn or ragged clothing, loose neckties, jewelry, long unconfined hair, celluloid visored caps, dangling loose sleeves, long trouser cuffs, high heels, runover heels, thin-soled shoes, or sneakers, etc. should be worn on the job.

Besides provision of goggles, respirators, and gloves as required, special protective clothing should be provided for handling hazardous chemicals, welding, etc. Hard hats are required in some instances also.

Too often men are turned loose without adequate supervision, and this one factor is responsible for a great many injuries. In the press of business, they are put onto jobs without an adequate check of their manipulative skill as stated in their experience record on their employment applications. It is well worth the supervisor's time to tell the man how to do the job, show him how to do it, and then to keep an eye on him constantly. Otherwise, we are going to have accidents because the operator assigned a task is going to see that it is completed regardless of whether he knows the best approved method or whether he is left on his own. Let us see that he does the job the way we want it done—the safe way: let us follow up.

Falls and Their Prevention

By R. M. WEIMER

Personnel Director, Dayton Rubber Co., Inc., Dayton, O.

In reviewing the accidents in our own plant for the past three years, I found that we had only one lost time accident as the result of a fall. Checking with other safety men, I found that they too had enjoyed a good experience as far as falls were concerned. Going further into the matter, I consulted my copy of accident rates in the rubber industry, published by the National Safety Council; I was indeed pleased to learn that the rubber industry as a whole has had a good experience.

But, while we may show a low frequency, we should not overlook the severity factor involved which may, and often does, result in many lost days, permanent disability or even in a fatality. We should always keep in mind that falls are a universal type of accident from which no one is immune. To prevent them, even the most remote hazard must be foreseen and eliminated.

Falls are generally classified into those that happen on level surfaces and those that occur on elevated or different levels. Falls occurring on level surfaces are caused mostly by slipping, tripping, stumbling, pushing or leaning against some object.

Highly polished floors in our office buildings and entrance ways are common causes of falls. We can materially reduce their number by several means. Careful selection of floor materials and coverings, the use of non-slip polishes and preservative finishes will aid in the reduction. Flooring in factory buildings becomes defective and deteriorates rapidly, due to the heavy trucking and severe traffic service. Holes develop, boards pry loose, planking splinters and nails project above the floor surface. When these conditions are present, it is quite certain that a fall will result. A well defined maintenance program is necessary to remedy these causes. Inferior grades of crude oil create a dangerous falling hazard when used as dressing on wooden floors. Only the very best grade of penetrating oil should be applied and this sparingly.

Cement floors become dangerous where wet processes are carried on. To eliminate the slipping and falling hazards here, baffles should be installed wherever possible to catch water, drains should also be provided for the water to run off the floor. Puddles and drippings of oil, water, soapstone, etc. that accumulate on the floor near machines and presses, can be eliminated by installing drip pans. If this is not practical where workmen must carry on their jobs, then ribbed rubber mats, abrasive-surfaced metal plates, or non-slip tile flooring should be installed. All floors should be kept clean and free from slip substances such as rubber buffings, grindings, small pieces of rubber, talc and other foreign matter that might cause a fall.

To aid in this, approved containers should be placed at convenient locations for the deposit of accumulated wastes. Regular instructions should be given to the operator of a machine or the janitor for the removal and collection of waste that may accumulate on the floor.

Floors should be inspected at regular intervals and all defects in them, such as holes, loose and splintered boards, should be repaired immediately.

Employees should be cautioned to wear durable, well-fitted shoes of the type best suited for their work. Female employees wearing high heeled shoes are the victims of many falls. They should be instructed to wear low heeled shoes while working. Shoes should also be kept in good repair because worn or run over heels or loose soles are a falling hazard.

Tripping hazards are generally the result of bad housekeeping, some tool or working material lying on the floor. Racks and containers should be provided at the employee's machine or place of work for the storage of these items. This will eliminate in a large measure falls due to stumbling and tripping. A place for everything and everything in its place is always a good safety measure.

Aisles and passageways should be well lighted and kept clear at all times. Hand trucks, skids, pans and other equipment projecting into aisles create a stumbling and tripping hazard. When such implements are not in use, they should be put in a location away from aisles and passage ways.

Falls into floor openings include those into elevator and hoistway shafts, manholes and openings to conveyors, chutes, bins, etc. This type of fall can be definitely eliminated if suitable enclosures, railings and close fitting covers are placed about these openings.

We should not overlook the falling hazards created around our plant premises by ice, snow and sleet. Ice and snow should be removed from all walks and steps leading up to entrances. In severe freezing weather, when snow and ice are hard to remove, salt, sand and cinders can be sprinkled on the walks and steps as a preventive measure and non-slip floor mats should be placed at entrances.

Falls on different or elevated surfaces are those that happen on stairways, ladders, scaffolds, runways, platforms and makeshift devices. Every flight of stairs and steps should be protected with handrails or standard stair railings conforming with the State or Standard Safety Codes. Your plant and maintenance engineer should have a copy of these codes and should be familiar with the specifications they outline. Lights should be installed in stairways that are dark, due to insufficient or no natural illumination.

Lights should be so arranged that they will not create a glare in the eyes when one is ascending or descending the stairs. Workers should be warned not to carry excessive loads, or loads that interfere with their vision, when going up or down stairways. Employees should be instructed not to run up or down stairways or indulge in horseplay of any kind. Steps or stairways should be inspected regularly and all defects repaired immediately.

Falls from ladders are generally caused by the breaking of the ladder or parts of it. Slipping, twisting or falling of ladder, falls from the ladder while handling objects, being knocked off of a ladder, worker's foot slipping off a rung of the ladder or the loss of balance.

To correct these hazards, be sure all ladders are constructed of substantial material and regularly inspected for broken parts or defects. Never permit a ladder to be used when there is the slightest doubt that it is not in a safe condition or when it is not suitable for the purpose for which it is to be used.

Stationary ladders should be constructed of steel and fastened securely to a wall or some other strongly supported object. Permanent ladders more than 20 feet in height should be provided with a basket or cage guard as a protection against the user falling if he were to lose his balance or make a mis-step.

Temporary wooden stationary ladders as well as portable ladders should have the side rails made of red, white or sitka spruce or other material equal to these in strength. Cross grain materials should never be used. Portable ladders should be equipped with safety feet, and whereever possible, with safety hooks at the top. Even when a ladder is equipped with safety feet, it is advisable to have a man holding the bottom of it when it is used on slippery surfaces; this is particularly true of extension ladders. Care should always be taken in the placing of portable ladders.

On surfaces where the angle or decline makes it difficult or impossible for a man to hold a ladder in position at the bottom, the ladder should be tied in place. Portable ladders should not be placed at an angle less than 75 degrees; if placed at a greater angle than this, they may break or fall. When ladders are to be used in aisles or passage ways, a helper should be stationed at the foot of the ladder as a guard to prevent anyone from bumping into them.

When using step-ladders, it is important that the ladder is fully open and all four supports are on a solid footing before anyone steps on the ladder. Many serious falls have occurred because defective spreader ropes or chains have allowed the ladder legs to open to such an angle that the ladder collapsed. Workers should always face the ladder and have the full use of both hands when climbing or descending. When they are required to use tools or other materials while standing on a ladder, the ladder should be equipped with a safety platform, or the worker should be well secured by a safety belt. This should be enforced particularly when workers are using an extension ladder.

Falls from scaffolds, staging, runways, balconies, platforms and gang planks may be due to the breaking of one or more parts, tilting of the apparatus, defective or broken surfaces, lack of suitable supports or the placing of greater weight on the structure that it was designed to carry.

The use of a poor grade of lumber, and in many cases used lumber, often are the causes of falls in this category. Usually such falls are of a serious nature. Therefore, we should take every precautionary measure possible in preventing falls of this kind. I believe it well worth anyone's effort and time to draw up a standard practice for this type of work, designating the responsibility, specifications for the quality and strength of the lumber used, rigid inspection for knots, straightness and thickness, style and types of safe handrails, flooring of structure so laid that overlapping at unsupported points is avoided, and tools and other materials never permitted on the floor of the structure.

Many falls occur during the erection or inspection of boilers; these can be prevented by the use of safe scaffolds and stagings. Wherever possible, permanent balconies or platforms with handrails should be provided. Care should be taken that the loads of material to be used in erecting or repair work on boilers or buildings does not swing against workers on the structure, causing them to lose their balance and fall.

When piling tires or any other product in the warehouse, employees should not be permitted to stand on the first level of stacked tires; suitable ladders should be used for this purpose. Benches, tables, chairs and other makeshifts should not be used as ladders or temporary work platforms. Employees with poor eyesight, weak ankles, broken arches or any other physical defects, or those suffering from mental strain or worry, should not be permitted to work on elevated surfaces or high places.

Horseplay and carelessness are the cause of many falls; the first should be eliminated by enforcing rules against such action; the second may be greatly reduced through educational means.

A program that stresses good housekeeping and maintenance, periodic inspections of plant premises, and equipment that is directly related to falls, proper instruction and work methods to workers who are engaged in occupations that are subject to falls, the use of good materials and safe equipment will do much to prevent and reduce the falls in our plants.

Knife Cuts

By A. M. DIETZ

Secretary, Safety Division, Pennsylvania Rubber Company, Jeanette, Pa.

In the early history of our company the knife was a necessary tool and everybody carried one, the superintendent included, with the result that cuts were numerous and many severe.

To prevent knife cuts our developing engineers over a period of years have perfected trimming, buffing, mixing and continuous feed units that are as complete in operation as the candy wrapping and packing machines you see in the windows along the boardwalk. With the installation of these machines the use of knives and shears has gradually been eliminated and accidents from this source were lessened. This development will continue and in some future day we expect to slab our stocks from the mills mechanically, thereby again eliminating the knife.

The use of knives in our plants is now confined to four departments, tire, airbag, mill room and tread. We mention tread because of its tie-up with warm-up mills.

The builder's kits consist of various types of cutting tools, designed especially for trimming at different angles, but come under knife classification. Work stands were designed so that tools could be laid out properly and within easy reach, production was increased, lost motion eliminated and also the chance of being cut or jabbed with the tools. All that was left for the supervisors to do was to teach the proper method of using knives.

This kind of planning is a convincing argument that time study and Safety work go hand in hand. Sell the time study department on Safety and you will have an able ally.

The set-up for airbag building is similar to that of tires. Although the tools are different the same method of application is applied.

Employees on mill and calender use keen edge knives for cutting stock from the rolls and taking out samples on the calenders. Although experienced operators do these jobs with apparent ease, there is always the danger of being injured unless the cut is started and finished away from the operator, when using either the right or left hand.

Another important item in mill Safety is keeping the knife out of the operator's hands as much as possible. This can be done by having knife pans on each mill housing so that the knife can be deposited quickly after the cut is finished. Lastly, if the knife is to be carried, insist that it be in a sheath with the blade down. A number of years ago we adopted a policy of placing only the highest type of workmen on these jobs and the idea is paying dividends in decreased mill and knife accidents.

The use of knives in other departments is limited. The crude rubber handlers use a scraping knife for removing foreign material from the rubber; this operation is not dangerous as the knife is not flourished.

During the year 1938 we had 55 knife accidents; 9 were described as jabs, 11 as scratches, and 35 as cuts; none were disabling.

To prevent injury from the use of knives in the industry it is necessary that the employees be properly instructed in their use and that they be furnished proper safety equipment.

In examining our records we find that cuts from other causes constitute a hazard of major concern that is getting our immediate attention. Partial records of these accidents are as follows: Cut while taking tool out of kit. Cut finger on shaft putting in keyway. Cut with strap iron on bale of rubber. Cut on ball forming tray. Cut finger on glass while cleaning up. Cut finger on can lid. Cut with serial tin while cleaning tire. Cut finger on paper, etc.

These accidents far outnumber the knife cuts; they are a challenge to our Safety organization and a thought for our entire Section.

Outstanding Facts in the Rubber Section Safety Contest

By ROLAND KASTELL

Safety Division, United States Rubber Company, New York City

I would like to go back and review the results of our previous contests, conducted during the first six months periods of 1932 to 1937 inclusive. In the fall of 1937 it was decided that our contest should be conducted for twelve-month periods.

In 1932 only 25 units entered this first contest. The number of contestants increased to 36 for 1935 with practically no change in the number of contestants for 1936, 1937 and 1938.

The Rubber Section Contests were conducted during 48 months of the period January 1, 1932, to June 30, 1939. The figures at the close of each contest period show that our frequency rate varied from a minimum of 5.76 to a maximum of 10.079. However, the figures for the 48 months indicate that the various contestants reported a total of 2,720 reportable accidents with an exposure of approximately 371,414,000 manhours. With these figures we then arrive at an average frequency rate of 7.32 for the entire contest period.

The average frequency rate for the entire rubber industry reporting their figures to the National Safety Council over the years 1932 to 1938 inclusive is 8.76. This indicates that the experience of the Rubber Section contestants is a fair average for the entire Rubber Industry.

A review of the Rubber Section contests shows that 27 perfect scores have been made. In breaking down this figure, we find that one unit took first place six times, one unit took first place four times, one unit took first place three times, two units took first place two times, and 10 units took first place one time. This is an average of practically four perfect scores each contest period.

The Rubber Section Safety Contest for the period of July 1, 1938, to June 30, 1939, had an enrollment of 36 units with an exposure of more than 98 million manhours. This was the first Rubber Section Contest conducted over a period of 12 months. The average frequency rate for all contestants was 6.616 which is a marked reduction over the frequency rate of 10.079 for the first six months of 1937.

The experience of the 22 contestants in the group of larger plants resulted in an average frequency rate of 6.775. The frequency rate for this group was 42 per cent higher than the average of 4.769 for the group of 12 smaller plants. Only two plants came through with perfect scores and both of these plants were in the group of smaller plants. The results of this contest can be considered very good due to the fact that 11 of the 36 contestants came through with a frequency rate less than 2.

The outlook for our 1939-1940 Rubber Section Safety Contest indicates that the enrollment is the largest in the history of the industry. The final figures for August show that we have a total of 44 contestants. At the end of the first two months 22 of the 44 contestants completed this two months period with perfect scores. The 22 contestants with perfect scores reported a total of 4,635,476 manhours worked without a reportable accident.

The experience for all contestants at the end of the first two months' period resulted in an average frequency rate of 7.17 as compared to 6.16 for the final results of the 1938-39 contest. This is accounted for in the high average frequency rate of 21.40 for the group of smaller plants. The experience of the various contestants would indicate that we can look forward to a very good contest this year.

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

Presentation of the Trophies and Certificates of Merit in the Rubber Section Safety Contest, as awarded by the National Safety Council, was made by Mr. Robert S. Elberty, Manager of Engineering and Safety Division, Fireman's Fund Indemnity Company, New York City. In the following list all units shown as No. 1 received a Trophy, and all others received Certificates.

GROUP A & B.

1. Goodyear Tire & Rubber Company, Gadsden, Ala., 2,676,927 hours, 2 injuries.
2. Goodyear Tire & Rubber Company, New Toronto, Ont., Canada, 2,309,392 hours, 2 injuries.
3. Dominion Rubber Company, Ltd., Merchants Factory, Kitchener, Ont., Canada, 1,580,512 hours, 2 injuries.

GROUP C & D.

1. Lobl Manufacturing Company, Middleboro, Mass., 116,717 hours, no injuries.
2. Fabric Fire Hose Company, Sandy Hook, Conn., 85,406 hours, no injuries.
3. Dominion Rubber Company, Ltd., Papineau Factory, Montreal, Que., Canada, 1,259,806 hours, 1 injury.

WEDNESDAY AFTERNOON SESSION

October 18, 1939

Safety and Product Quality in a Chemical Industry

By DR. WILLIAM G. NELSON

Manager, Product Control Division, U. S. Rubber Co., Detroit, Mich.

Safe working conditions for employees among chemicals and other hazards, efficient unhindered work, and product quality control, assuring safety for the user of the finished article, all are compatible requirements in a chemical industry.

Working conditions of employees are correct only when properly selected workmen are trained in the safe way to work, in the way to do a quality job, and do it efficiently. Conditions for safe working with special reference to the chemicals used on each job must be established. Machinery and tools must be made safe, the lighting and air must also be correct.

In a chemical industry, added to the usual occupational hazards, are those of a more definite type, where, because of their chemical identity materials may be harmful to the workmen. The corrective measure in such exposures is to remove the possibility of contact. The methods used include ventilation, respirators or gas masks, rubber gloves or other articles of clothing, as well as designing equipment to do the job automatically where the workmen's contact with the chemical will be removed.

Some individuals are physically intolerant to certain chemical exposures; while others are entirely free from any effects under the same conditions. This is similar to allergy to certain proteins in nature, exhibited by some people and not others. On such operations it is necessary to remove workmen from the conditions they are sensitive to and replace them with others.

Solvents and thinners used in processes and finishing should be adopted only after investigation of possible ill effects on employees' health. It is necessary to secure such information by reference to published reports and also statements from the manufacturers of the solvents. The experience of health departments may be of aid.

Benzol, a poisonous solvent used very widely in the past by the rubber industry has been largely replaced by non-poisonous solvents which give equal results without the hazards.

To health hazards are also added those of fire and explosion due to chemical materials.

Fire hazards of solvents and thinners in a chemical industry receive careful attention, and fire and explosion prevention methods must be applied.

The factory technical department oversees the methods of using solvents and thinners having in mind the characteristics of the individual material used. This department reports to the safety supervisor on the requirements of each application, and equipment is recommended accordingly.

Rubber products manufacturing is representative of many industries where chemical materials are used and the manufacturing operations based on chemical reactions. In our plant the technical department, called the product control division, not only has the responsibility of product quality but technical safety supervision as well.

When a material has been adopted, a testing schedule is drawn up and necessary tests are devised to apply to each shipment for controlling the material for quality and safety. Samples from each shipment of a raw material are taken according to specification and sent to the laboratory for chemical and physical tests.

The results of the tests are passed upon by the product quality inspector by comparing them with complete specifications covering each raw material individually. Each specification is complete in four sections; first, there is an approved source of supply specification, listing the only approved suppliers of the material in question, and adopted only after thorough and sufficient test as to quality and safety. Second, there are the tests applied to each lot of the material received, with the permissible limits in test results. Third, there is a more complete list of tests which are applied at intervals in order to make the most complete check required. Fourth, there is the specification outlining the exact laboratory methods for each test applied.

One day, as I was walking through the factory departments, a workman called my attention to a skin irritation around his collar, on his shoulders and under his cuffs, asking me what might be causing this recently developed condition. Complaints were also made by other workmen as well as by the supervision in this same department.

As a result of a complete investigation of possible causes of this trouble, we found the particle shape of the talc used in the department was different from regular as shown by comparison under the microscope and in photomicrographs. The talc causing irritation contained a high percentage of long needle-like crystals and on comparison with former lots from the same source and with the original approval sample, this was proved to be a new type of talc supplied without obtaining approval.

The talc in question was replaced with talc from the previous supplier and immediately the skin irritation disappeared. The supplier of the talc which gave the difficulty was removed from the approved list of raw materials. This is an example of how important technical control of materials is to the employee's health.

Some twenty years ago organic accelerators were unknown except for one material, aniline oil. This took its place among inorganic accelerators such as lime, litharge and magnesia but was a serious health hazard in both the raw material and mixing departments. Here the very poisonous character of this chemical affected the workmen in cases where it touched them, or when they breathed the air around mixing mills; they would become very sick and sometimes faint, their skin turning a blue-gray color.

Today, as the result of scientific discoveries, rubber compounds are mixed from accelerators that not only give marvelously superior results in the finished rubber article but are not poisonous in their effect on the workmen. This is an example of immense improvement in working conditions resulting from technical advances.

The dangers of burns from hot molds, pipes and heaters, jets of hot water or steam, are ever present in the curing departments of a rubber goods factory where high temperatures and pressures are necessary. Precautions taken include covering permanent equipment with insulation, setting up guard rails and providing gloves and other articles of protective clothing as required for specific conditions.

One function of the product quality division has been discussed. An equally important function, that is perhaps less widely appreciated, is how controlled quality of merchandise during manufacture also guarantees its safe performance to the consumer.

Only a few years ago the average tire manufacturer had so many problems that tire safety failed to receive very serious consideration. As a matter of fact, any tire was a safe tire up to the time when 20 miles per hour ceased to be remarkable. Very soon, however, tire safety became a major problem both to the manufacturer and to the consumer.

The purchaser of a tire fortunately or unfortunately is not equipped with X-ray eyes; he cannot look inside, cannot see the hidden defects that it may contain, cannot know whether what he thinks is a safe, dependable piece of merchandise, may fail at some crucial moment and endanger his life or the lives of others. He necessarily must depend on the manufacturer of that article for this protection.

In every line of business there are some manufacturers who in effect raise their products above that of competition. Such manufacturers have their quality taken for granted in advance by the purchasing public; backing their products by faithful guarantee, making products that give safe and dependable service.

Motorists have learned from experience that they cannot get more safe service out of a tire than is built into it by the manufacturer. The manufacturer of today with modern equipment, great research laboratories, scientifically designed controlling instruments and a rigid system of quality control maintained under the supervision of a completely experienced technical staff whose responsibility is the quality of the article produced, guarantees to the consumer that the merchandise he buys is of uniformly high quality, and can be used with maximum safety.

The real basis of quality and safety is constant watchfulness, sharp surveillance and minute control over each processing operation. Without this alertness even the finest equipment and material cannot guarantee uniformly high quality and safety.

The safety of the consumer, therefore, we might say, depends to a great extent on how well quality is controlled during manufacture. This is especially true of automobile tires. When you consider that several scores of different processing steps are involved in their manufacture, each of which must be minutely controlled and that there are possibly 60 distinctly different defects possible in a finished tire, you realize the necessity for, and the amount of technical supervision involved in, an adequate control of quality.

For example, many defects and service troubles in tires can be traced directly or indirectly to inaccuracies in compounding. Accuracy in compounding is a matter of primary importance today, especially when the use of extremely fast organic accelerators tends to produce a vast difference in any relatively small variation in the compounding of a rubber mixture.

To safeguard safety and quality, maintaining complete accuracy in the weighing of chemicals for compounding cannot be overemphasized. Each batch of stock is made up in definite proportions as specified in adopted recipes, weighed carefully and checked carefully before mixing. A sample from every batch is taken by a product quality man and tested in the laboratory. For example, a tread mix sample is tested for specific gravity, hardness, state of cure and plasticity. These results must meet definite specifications. Only by this rigid degree of control can trouble be eliminated, quality maintained, and safety assured.

The cord fabric that forms the carcass of the tire which can be compared perhaps to the bone structure of the human body is of the utmost importance. Cords must be of specified strength and elasticity or ruptures and fatigue failures may occur and the resultant blow-outs are extremely hazardous. However, good cord in itself is not sufficient. These cords must be thoroughly insulated with rubber of definite characteristics to prevent chafing and the building up of internal heat. They must be fully bonded together with more rubber of entirely different characteristics to prevent separation in service. They must be incorporated in the tire at a predetermined angle to obtain the highest strength efficiency. They must be securely anchored to the steel bead wires and reinforced with additional fabric strips to prevent rim bruises, wire cutting and other bead failures.

Again, a tire may be correctly compounded, accurately built and yet become defective due to faulty vulcanizing. To safeguard this all presses are equipped with the latest automatic instruments for accurately controlling time, temperatures and pressures. Sufficient mercury thermometers as well as recording thermometers are correctly placed and constantly checked to assure the maintenance of correct temperatures.

Each of these processing operations requires unusual care, extreme accuracy combined with adequate supervision and inspection to assure quality and safety of the product.

In spite of the utmost care, defects in workmanship and materials do occur in any manufactured article. These defects must be found before the article leaves the factory, therefore, it is necessary to minutely inspect each article, diligently searching for and rejecting defective merchandise. These inspectors, well trained, are paid a bonus for finding defects; however, as an added precaution, their workmanship in turn is checked by product quality inspectors to assure accuracy and efficiency.

The modern tire is only one important accessory for the car of today. The same painstaking care in manufacture, the same high regard for quality, the same precautions to assure the consumers' safety is a major part of every piece of equipment that is manufactured into each car. Tires are safe and automobiles are safe—if the person behind the wheel and in control cooperates by thinking and driving safely.

Quality control work in any manufacturing industry involves two major safety functions. The first consideration is the safety of the employee, to see that the operator is performing his job with the maximum degree of safety to himself, that the materials he works with, his tools or machines have no apparent functional defects that may be hazardous to safety. The second consideration, safeguarding the safety of the consumer by seeing that each operation is being performed correctly, being constantly alert to insure the observance of specifications in order that uniformly high quality, safe merchandise is produced.

Dusts in the Rubber Industry

By P. A. DAVIS, M.D., F.A.P.H.A.

Goodyear Tire & Rubber Co., Akron, O.

Dusts may be classified in two main groups:

1. Harmful; 2. Not harmful or nuisance.

When we think of this classification, we undoubtedly think of some type of pneumonoconiosis. However, I believe we must not base our conception of dusts on this basis, but assume that all dusts are detrimental to the human system as a whole when the concentrations are high enough. Whether the disability is due to a toxic condition or to a mechanical one, of course, depends entirely upon the nature of the dust. The conditions usually referred to as being of mechanical origin fall under that condition known as pneumonoconiosis with its various sub-divisions of:

1. Silicosis.
2. Siderosis.
3. Anthracosis.
4. Asbestosis.
5. Chalcosis.
6. Chalicosis.

The method of contracting pneumonoconiosis is by inhalation of the dust; however, all dusts do not cause pneumonoconiosis. The higher the silica content of a dust the greater the possibility of developing a fibrosis and the higher the percentage of crystal content the greater the irritation. The diagnosis of the type of pneumonoconiosis is based upon the following:

1. Past history and occupation.
2. Physical examination.
3. Clinical examination of sputum.
4. X-rays of lungs.

Since we have been studying the lungs of industrial workers by x-rays, there has developed an entity which should be termed the "Industrial Lung." This condition, I believe, should not be termed a pneumonoconiosis because it reaches a certain stage, does not progress any further and after several months to a year improves. There are no symptoms nor decreased capacity of the lungs. It is discovered only by a series of x-rays taken over a period of years.

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The other conditions caused by inhalations of soluble dusts, insoluble, but free from silica, and metallic dusts have to be discussed under a specific condition; for example, lead poisoning is very frequently caused by the inhalation of lead dust; and many nose and throat irritations are caused by inhalation of insoluble dusts whose action is strictly mechanical. We therefore may also classify dusts as: 1. Pneumonoconiotic; 2. Non-pneumonoconiotic.

Some of the principal dusts or materials used in industry which fall under these classifications are as follows:

Pneumonoconiotic:

1. Silicosis (sandstone, slate flour, fuller's earth, Stoughton earth, infusional earth, rotten stone, any other clay with more than ½ of 1% silica, ground glass).
2. Siderosis—iron ores, iron oxides (nat.), iron sulphides (nat.).
3. Anthracosis—coal and carbon dusts.
4. Asbestosis—powdered asbestos, asbestos ore.
5. Chalcosis—copper ore and copper dusts.
6. Chalicosis—stone dusts.

Non-Pneumonoconiotic

Harmful:

1. Lead dusts.
2. Arsenic dusts.
3. Chromium dusts.
4. Cadmium dusts.
5. Antimony dusts.
6. Radium compounds.
7. Alkali dusts.
8. Sulphur dusts.
9. Tellurium compounds.
10. Various colored compounds such as ultra marine blue, Prussian blue, lead chromate, etc.

Non-harmful but nuisance dusts:

- Soapstone with ½% or less of free silica.
- Zinc oxide and sulphide.
- Barium sulphate.
- Plaster of Paris.
- Paris white—whiting.
- Talc.
- Mica—may cause a mechanical irritation.
- Oxide of magnesia.
- Titanium dioxide.

As we can see by this classification we necessarily must go back to our original classification of harmful, and not harmful; and I am convinced that while silicosis is one of our predominant conditions due to silica, there are many other conditions which are produced in the respiratory tract which are harmful to the individual.

The following are the most important materials used in the rubber industry which are in the form of a dust or powder and to which the individual is exposed. They are marked by the following letters—H, harmful; NH, not harmful; HT, harmful and toxic; HP, harmful and pneumonoconiotic; NHN, not harmful but a nuisance dust.

1. Talc soapstone with ½ of 1% or less SiO_2—NHN.
2. Starch and potato flour—NHN.
3. Zinc oxide—NHN—see chest x-ray.
4. Lead oxide, metallic lead dusts, lead chromate, and the various powdered lead compounds—HT.
5. Carbon black—NHN.
6. Rubber dust—finely divided dust from buffing process—NHN.
7. Sulphur—H, sometimes irritates nose and throat and occasionally produces a dermatitis.
8. Whiting—NH.
9. Barytes—NH.
10. Asbestine—HP.
11. MgO, and $MgCO_3$—NH.
12. Lithopone—NHN.
13. Red lead—HT.
14. High grade clay—HP if over ½ of 1% silica and dust count is over 5,000,000.
15. Corn starch—NHN.
16. English vermilion—HT.
17. Graphite—NHN.
18. Chromium oxide—HT.
19. Ultramarine blue—HT.
20. Titanox—NT.
21. Thermatonic blue—NTN.
22. Zinc stearate—NHN.
23. Aluminum—NHN, occasionally causes a mechanical dermatitis and irritation of mucous membranes of nose and throat.
24. Hard rubber dust—NHN.
25. Lime—H caustic. Produces dermatitis.
26. Various alkali dusts—H caustic.
27. Various chromium and cadmium dusts—HT.
28. Mica — NH — sometimes causes mechanical dermatitis.
29. Yellow oxide (Fe_2O_3), NHN.
30. Black oxide (Fe_3O_4), NHN.
31. Gypsum—NHN.
32. Casein—NH.
33. Wood flour—NH.
34. Prussian blue—HT.

35. Soap powder — irritant NH. Sometimes causes dermatitis.

36. Captax—NH.

37. Phenyl—Bela Napthylame—HT, causes a dermatitis.

38. Soap bark—NH, sometimes causes a little coryza and conjunctivitis.

39. Cotton lint dust—NHN.

40. Bronze powder—HT—ac to copper and lead content.

41. Zinc sulphide—NHN.

42. Sand—HP.

43. Various clays having more than ½ of 1% of free silica—HP.

44. Antimony oxide—HT.

45. Titanium oxide—NH.

46. Various inorganic and organic chemical compounds in powdered form often produce dusts during their use and manufacturing. These must be considered individually as to their industrial hazard and toxicity and are not in the scope of this paper.

47. Wheat and potato flour—NHN.

The following procedure will be helpful in solving your problem of dust.

1. Make repeated dust counts of the working area at various levels.

2. Obtain some of the dust and send it to the laboratory for complete analysis including the determination of free SiO_2.

3. Examine the workers, x-rays of the chest for those working in pneumonoconiotic dusts.

4. Check the ventilation and increase it to produce non-hazardous atmospheres.

5. Differentiate between conditions caused by volatile substances and solvents, and those caused by dusts.

6. Protect the workers with proper clothing and protective respirators and masks.

7. Study the particular dusts from the mechanical and chemical nature and if the effects are unknown, resort to animal experimentation.

8. If dusts are toxic and harmful consider the possibility of a substitution for a non-harmful substance.

9. Examine and x-ray all employees who are being placed on jobs where there is a dust hazard. They should be examined periodically.

10. Make each dust problem an individual one, and in case of silicotic dusts, keep the counts below 5 M. per cu. ft., if the free SiO_2 is more than 1%.

11. Select employees free from TB, chronic bronchitis, post influenzal infections, post pneumonic conditions, asthmatics, and persons with myocardial involvements for dusty operations.

I have found that there is x-ray evidence of tuberculosis in about 2 per cent of the cases but only ½ of 1 per cent active and of a permanent disability. Uncomplicated pneumonoconiosis of a moderate degree is not disabling to a point of permanent disability.

I want to present to you a case which I think is a rare one. This employee has never worked in any dust before his employment on his present job. He has worked for 12¾ years in zinc oxide dust and during our periodic examinations in 1938 the x-ray picture proved very interesting. He does not have a definite pneumonoconiosis but he shows evidence of glandular fibrosis. What will develop in a few more years will be shown by x-ray examination only. He has no symptoms. If this man had been working in lead or similar toxic dusts, symptoms of that particular substance would have been present.

The dust counts on toxic dusts must be kept at a *minimum*, and much lower than that for silicotic dusts. In silicotic dusts the particles of 10 micron size or larger are of very little concern, but with toxic dusts the size of the particles is not so important as is the number of particles. The smaller the particles of dust the less the rate of settling and the greater the time of exposure, and this is the important item in toxic dusts. For example, the permissible amount of lead dust is approximately 15 mgs. per day of eight hours. There would be very little chance of any one ever developing a pneumonoconiotic condition with this dust count, but if it is increased very little there is a chance for lead poisoning, and so it is with the various toxic dusts.

The question in most of your minds is, "What are yon going to do about these conditions?" The answer is simple. You are going to correct them. It has been proved many times that it pays big financial returns, creates better working conditions, and the employees have a more efficient and appreciative attitude for the employer.

It is unnecessary for me to consider the methods of correcting the dust problems for this is in the realm of the ventilation engineer, but you must insist that the ventilation be sufficient to reduce the dust count to a certain point and have it maintained at that point.

You should periodically examine your employees according to the type of dusts exposed to and as a suggestion the following is a schedule which I have used for a few years.

Silicosis or silicotic dusts—six months including x-rays.

Non-silicious and non-silicotic or non-toxic dusts—every year, with x-rays.

Toxic dusts—for example lead, chromium, arsenic, antimony, phosphorus, chemical dusts, and alkali and caustic dusts—every month.

Nuisance dusts—every 1 to 1½ years—x-rays only if indicated.

If you find any evidence of trouble it is better to correct the cause than to transfer the employee elsewhere, for this often causes dissatisfaction and suspicion. All such conditions can be controlled if there is cooperation between the medical, engineering and managing departments. In most states at present all conditions caused by dust are compensable, so it behooves the employer to correct his working conditions to a point at which there are no hazards.

Conclusion

It is impossible to give a detailed description of all the dusts used in the rubber industry, for the silicotic dusts alone would require a volume to do them justice, but I want you to remember that there are just as many serious conditions which may develop from the inhalation of various toxic dusts.

These conditions are often more serious than pneumonoconiosis and develop much faster and in a shorter period of time. For instance, a person may develop a lead poisoning in two months from inhalation of lead compounds and it might take five to ten years for a silicosis to develop in the same environment of silica dust.

There are on the market today many fine and efficient protective devices such as chemical protective masks, dust respirators, positive pressure masks, clothing and gloves which if used will give good results.

Instruction to the employees by the supervision in regard to their personal habits, their instruction concerning the type of dust they are exposed to, and why they have to use the protective appliances, will reduce the possibility of any trouble to a minimum.

All laboratory work must be done by a technician who has been trained in the various toxicological laboratory techniques and the interpretations must be made in conjunction with the past history of the individual. May I say in conclusion that it is much more profitable to correct a dusty operation than to declare it a hazard.

Training Supervision in Accident Prevention

By JOHN J. LOGE

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As we scan the history of the safety movement, we find that a great deal of emphasis has been placed on the foreman's responsibility in accident prevention work. Authorities seem to agree that foremen (and by foremen is meant direct supervision) are very largely responsible for the prevention of accidents in industry.

How do these authorities arrive at their conclusions? Why must the foremen assume the responsibility for injuries to persons under their supervision?

When we tell our supervisors that they must accept the responsibility for accidents occurring in their departments, we must be prepared to state a few reasons. We ask a foreman for a report following an accident, and he has a right to a clear understanding as to the reason why he is called upon to explain when one of his workers is injured. There is nothing mysterious about the placing of responsibility for accidents. It isn't the case of management imposing a burden upon supervision that should belong elsewhere.

As soon as a person is placed in a supervisory capacity, a position where he has charge of the work of others, he becomes directly responsible for their conduct and performance while on the job. This is a grave responsibility.

If I were to ask this group what are the duties and functions of the foreman, I would receive many different answers, probably all correct. I would be told that the foreman is a handler of men, a psychologist, a mechanic and a leader, a salesman, cost man, planner, production man, waste eliminator, a representative of management. There are many more. For practical reasons, this list can be boiled down to two general terms—teacher and observer.

All the duties of foremen can be grouped under these headings. As a teacher, a foreman must train all the employees under his charge. To make them effective, he must convey to them his own experience and knowledge about the job. As an observer, he is ever alert to check up on the performance of his charges to see that the results of his training efforts are being carried out. Here we have the answer why foremen are responsible for accidents and why their place in accident prevention work is of utmost importance.

We are told that the prevention of accidents is accomplished mainly by mechanical safeguards and by educating the workers; and the educational phase of prevention is considered the most important. Some authorities state that 85 per cent of all accidents can be prevented if workers are properly trained. Now we see why foremen must shoulder the responsibility of accidents in industry.

However, what part is played by management in the scheme of accident prevention work? It is the duty of management to provide supervision with the proper facilities to enable them to carry out a safety program. Accident prevention should receive the same continuous attention as is given to such other matters as costs, quality, production, waste elimination, etc. What can management do to equip the foreman and stimulate him, so as to make prevention of accidents a vital part of his activity? This is where the safety man comes into the picture.

The safety engineer's relationship to the foreman is the same as the foreman's-worker relationship, that is, he becomes the teacher and observer.

Now the real way to develop a man is to give him a broader vision and to place within his reach the means of obtaining that objective. The safety engineer must furnish all the factual material pertaining to the three "E's" of safety.

For instance, every foreman should have access to channels of information in the engineering field. They should be familiar with all code requirements affecting the machinery and equipment in their departments. Regular reports should be furnished the supervision of the accident records of their own departments, with the severity and frequency rates of other departments and other plants to enable them to make comparisons. All safety literature that is available to the safety department should be circulated among supervision.

By these means the foreman will learn the accident prevention ideas used by others and will keep informed as to how safety problems are solved in other plants.

Various other schemes can be used to disseminate safety information to supervisors. We are all familiar with the methods that have been used successfully to stimulate activity, such as meetings and conferences for the discussion of safety matters. Safety committees can be established whose personnel will consist of members of the supervisory force and whose function it will be to make regular inspections of individual departments or the entire plant. Safety contests have a definite value in stimulating foremen as well as workers to greater effort for better accident records. Application of all these suggested methods has proved successful in preventing accidents ever since the inception of the safety movement.

After supervision receives all possible assistance from management through the safety engineer, they become better qualified to assume responsibility for eliminating accidents.

Now we come back to the foreman, the trainer of men. It now becomes his duty to convey the knowledge and experience he possesses to the worker on the job. It is his job to train the worker to avoid the pitfalls which are the causes of accidents and result in bodily injuries. He must be constantly on the alert and supervise and inspect men, machines, materials, operations, tools and safety devices. As a leader and skilled handler of men, he must constantly observe their human weaknesses and lapses. The whole problem becomes one of maintaining discipline.

Like every problem involving human relationships, this one becomes extremely complicated. After the foreman has taught the individual how to perform an operation, the training period has merely begun. Training is never a completed task, but a continuous program. The average worker is a person who, because of his limitations and human weaknesses needs stimulation and inspiration from a stronger character. Foremen are chosen because they possess qualities which make them leaders.

Three fundamental qualifications of a successful foreman are:

1st—Technical and job knowledge.
2nd—Good judgment.
3rd—Skill in handling men.

Foremen are selected because they possess these qualities in a higher degree than ordinary workers. Foremen, I believe, possess the knowledge and experience to handle the many problems they are called upon to solve. I think it is safe to say that the average foreman knows what to do but he often fails to apply his knowledge, and he fails at the point where he meets his worker; in other words—the personal contact.

I attended a foremen's conference recently, at which the following statement was made: "The successful termination of the entire foreman's job revolves around the individual contact with his worker."

After considerable discussion, it was agreed by the group, all the members of which were foremen, that this statement was at least 80 per cent correct. This places foreman-workman contacts in the first rank of importance. Isn't it safe to say that the best results in training for safety can be obtained by personal contact between safety man and individual foremen, and then between the foreman and the individual worker? I think if we would check the accident records of various foremen in our plants, we would find that the most favorable results are obtained by foremen who make the most personal contacts with individual workers and make them effectively.

Isn't it possible then that a common procedure for foreman-workman contacts should be developed for the guidance of foremen? Recently there came to my attention a foreman-workman contact analysis which impressed me as filling a definite need. This analysis was broken down into twelve steps to be taken by the foreman when contacting individual employees, as follows:

Foreman-Workman Contact Analysis:

Supervisor

1. Greeting
2. Create atmosphere
3. Observe progress of job
4. Observe for job difficulties
5. Decide what action is necessary

Skilled Handler of Men

6. Take a definite step into the thinking and planning circle which belongs to this individual workman
7. Decide what ideas must be presented,
   (a) Whether new instruction
   (b) Whether repetitive instruction
   (c) Whether corrective instruction
8. Plan the presentation.
9. Execute the plan

Supervisor

10. Create atmosphere
11. Summarize contact
12. Plan next contact

It is my suggestion that if more consideration is given to personal contacts by supervision; and safety injected into these personal contacts at every opportunity; the results obtained would be surprising, not only in better accident records, but in better understanding between workers and supervisors, which is another way of saying employee and employer.

General Discussion

The scheduled discussion following Mr. Loge's paper was led by William Spanton, Safety Director, The American Hand Rubber Company, Akron, O. Owing to the short time available, Mr. Spanton limited his discussion to a few points only. He asked the assembled delegates if they thought the suggestion made by Mr. Loge regarding analysis should be generally approved, and received an affirmative answer. The showing of hands was practically unanimous. His own opinion was that it was a very good basis upon which to formulate discussion, and that it would be to the advantage of everyone to consider it from that point of view, not only in consideration of safety factors but in every condition with which the foreman has to deal.

ADJOURNMENT