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PULP & PAPER SESSIONS

A NEW CHALLENGE FOR SAFETY

By H. M. GRAY
Vice President, Sealright-Oswego Falls Corp., Fulton, N. Y.

A group of individuals whose working life is devoted to the protection of human life and limb performs a service the importance of which it is difficult or impossible to surpass. We of the Sealright-Oswego Falls Corporation are proud of our record in this important activity. Therefore, we want to support it in any reasonable way in which we find it possible to assist. There is another reason, and that is my own personal deep interest in industrial safety, as well as safety in all other activities of human endeavor.

Perhaps I was fortunate. The first day I worked in industry was during my student days in 1919. That day I was a member of a crew of men whose duty it was to unload manually rather large pieces of limestone from a freight car. These stones were so heavy that the only way I could get them out of the car was to first get them on top of the side of the gondola and then just push them off, which apparently was the practice of the entire group. Before getting one rock out of the car, I was successful in injuring one finger. There wasn't any one concerned as to whether or not I injured fingers, hands or any other thing. It was assumed that each workman would protect himself.

Before the first morning's work was over, one of the more reckless of the group was successful in dropping one of the large rocks on his finger, which at that moment was on the edge of the top of the gondola and he amputated the finger at the second joint. The only comment made by the foreman of the group was, "Get back to work fellows, there are lots of fingers in the world." That comment made a lasting impression on me.

From the beginning of the building of the American industrial empire, the importance of safety was not fully recognized. Management paid a day's wages for a day's work. There was usually an abundance of personnel available and if not, it was not difficult to recruit from the crowded areas of Europe. These things were not the result of a cruel, heartless and indifferent attitude; they were the result of not recognizing the expense of replacing the trained workmen who would become injured or ill, or the good production practice which resulted from insisting upon safe working rules and all that goes with it. That condition was the product of the time.

With the advent of the compensation laws, and state and government controls, and with the development of enlightened management, safety came into its own as an absolute, indispensable part of the modern day industrial activity.

During the Second World War production pressures were very great. Accident rates rose in some plants to alarming levels in a short period of a few years where industrial safety activity was allowed to slip back or was simply ignored.

In fact our own plants became so busy, and management became so occupied with the sheer pressure of producing things, that to our great horror and sadness, we discovered we had a frequency rate in the 30's, and then that was that. It was decided that never again would that be allowed to occur. If you work at something intelligently, you can influence it for good or bad. In the case of safety, the influence desired was for the good and the objective was a frequency of zero.

Zero frequency was not achieved, but a frequency below two was achieved and an average of about two has been maintained for many years.

Any problem which has a solution can be brought to a favorable decision if sufficient quantity and quality of the proper thought is brought to bear upon the situation. Thus it is with safety.

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It was inferred earlier in these comments that management was not as sincerely and deeply interested in safety in the past as it is at the present. Just a word of explanation about that.

I do not want to leave the impression, which I believe would be completely erroneous, that management was unconcerned with human suffering. On the contrary, it has been my experience that American industrial management, at least during my working life, has been deeply concerned about these problems; and the lack of an earlier and more aggressive safety program for plants may be laid at the door of the group foremen, or department heads, or mill managers who seem to have a tendency to read into management's policy things which are not there and were never intended to be tolerated.

Enlightened management has always recognized that no amount of remorse, however sincere, has ever restored life or limb, or healed an injury or alleviated pain.

Anything worth doing is worth doing in a safe manner. One of the most depressing things that management can hear is to learn of an accident and then be told "Well, we were in a hurry." Surely sometimes it is necessary to work faster than at other times. But at no time does management expect the worker to go at a rate which jeopardizes life and limb.

With the competition for labor in the boom periods following World War II, the greatest progress has been made in safety practices in American industries. A good, intelligent, American workman will simply refuse to sell his services to a business where the working conditions are so hazardous that he does not know whether or not he will return home to his family at the end of his working day free of injury.

What are the present challenges which industry must face in its safety program for the future?

1. It seems apparent that there will be growing competition for the service of the skilled worker. The result will be that the skilled worker will demand a safe place in which to work and safe working rules and practices.

2. Labor is going to cost more each year. This probably will eventually lead to serious conditions such as the pricing of a product out of profitable competition with other equally good or satisfactory products. Since labor will constantly increase in cost, the cost of having labor unable to work because of injury will also increase.

3. For some reason or another which I do not understand, it seems to be increasingly unpopular to want American industry to make a profit. Yet, it is only through the American profit system that we have worked ourselves up to the highest standard of living in the history of the world.

Let me give you a bit of advice. Never work for a company which does not make a profit. Do not plan to continue working for a company which does not make a profit. No employee of a company can for long be more successful than the company for which he works. Now it is certainly easy to understand that good safe working practices rigidly followed and enforced go a long way toward assisting a company in making a profit.

Therefore, if not for humane reasons—and they, of course, are the more important—then for selfish reasons, you in your chosen work in this great pulp and paper industry, which has served us so well, and of which we can be so proud, must plan to constantly work toward a lower number of man hours lost because of accidents.

4. You must, to justify your existence in a world which is constantly demanding more and more of all of us, develop an attitude of excellence toward this very important work, that there can be an assurance of continuing quality of product with safety.

5. You cannot as safety directors assume the responsibility of management in this important field, but your first duty is constantly to inform management of their responsibilities in seeing that the proper program is set up and enforced. This will require personal attention by the highest members of management, and it deserves the best attention.

You cannot assume the foreman's responsibility for enforcing safe practices in his group, but you can constantly educate him, to a point where he feels that it is a personal affront if workmen under his supervision get hurt.

6. Take an uncomprised stand. A practice is safe or it isn't safe. If it isn't safe, it should not be allowed to continue.

7. Have constantly before you as your objective in your working-day life a frequency rating of zero. It will not often be achieved, but that should not keep you from trying. What you will achieve as you persevere is the great goal of making the pulp and paper industry the safest industry in business.

Is the pulp and paper industry to be satisfied with a frequency rating of 6.93 and a position of 20th place when it is so easy to get the frequency below two (while we are shooting at zero), and then go from there to lower rates, approaching perfection?

Not only develop and maintain an attitude of excellence toward this important work but also indoctrinate management, the foremen, the rank and file of workmen, so that they display a vigorous attitude of righteous indignation when any injury occurs, however trivial.

You have a good industry in which to demonstrate your ability. You have a rather uniform rate of operation and employment, with a low turnover. You are just as well trained and just as capable as the safety directors in other industries.

All of these things being true, can you think of any reason, other than perhaps a lack of continuing vigor and perseverance, which keeps your industry at such a high level? You can do in life almost anything within reason that you think you can accomplish. In this your full time work you must recognize but three basic things.

1. Safety is everybody's business.

2. The objective in safety is a frequency of zero.

3. Perhaps this is the most important of all. You must recognize that you are responsible for the program which results in the education of all employees to the fact that safety is everybody's business; and that zero frequency is achieved and maintained at many places, but that it is never the result of a haphazard or undirected program. It is never an accident when such a record is achieved. It is the result of hard work and the everlasting drive of the crusader, of the man dedicated to his mission and willing to put forth the energy and courage to achieve the objective, and to refuse to accept defeat. This I know you can do.

I hope that you may dedicate yourself anew to go back to your place of work after learning more, and carry forth your work to success. You have already done much. Indeed, you have done even great things. Therefore, with that experience in back of you, you are capable of greater achievements.

INCREASED ON-THE-JOB FIRE TRAINING
(A must in the Pulp and Paper Industry)

By M. M. "SMOKEY" BATZER
On-the-job Industrial Fire Prevention and Damage Control Trainer, Philadelphia, Pa.

In probably few other industries is the dreaded cry—Fire!—feared as much as in the pulp and paper industry.

In the woodlands, a carelessly dropped match or cigarette butt may start a blaze that in a scant few days can wipe out tens of thousands of acres of prime timber and with it perhaps a mill's chances of expansion, if not survival.

In the mill itself, a collection of rags or oily waste may be the springboard for a fire that will burn the plant to the ground, taking with it millions of dollars in invested capital, years of hard work and the jobs of hundreds of workers.

The pulp and paper industry has recognized this grave danger and thus its fire record, so far, has been a good one.

But this is no reason for your industry to rest on its laurels. Vigilance and on the job training are "musts" if those "small" fires which do occur from time to time

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I'd like to tell you a true story to emphasize this point. It happened to me in a Canadian pulp and paper mill.

While we were doing some in-plant fire protection training, I went up to an employee standing on the uncomfortable backside of a large paper machine, rolling along at usual hoped-for breakneck speed.

"Suppose," I said, "you discovered a fire here on the floor, a fire that was big enough so that you couldn't positively stamp it out with your foot. What would you do?" Know what the reply was? "Well, I guess I'd get the hell out of here. I'm not paid for fighting fires."

That was the unfortunate attitude of this employee. Sure he might have saved his own bacon by getting out of there; but by running, instead of turning in the alarm and bringing portable fire fighting equipment into play, he would have given the fire a big head start and helping hand. That fire—undetected for even a few more minutes—could have endangered the lives of many other employees and burned the mill to the ground.

Now you may very well say: "Ah, Smokey, that happened in a practice run, but it wouldn't happen if a real fire were involved."

Want to bet? It happens every day, everywhere and in every industry.

Here's a case almost as bad. It's listed in a Fire Commissioner's Report under the heading: Typical Fires, 1957.

"April 25, Seminary and Classical College; loss $1,176,120. While welders were installing a new metal stairway fire broke out in an unsprinklered shallow roof space of the otherwise completely sprinklered 9,500 sq. ft. 5-story brick, wood-joisted building. Welding sparks were the probable cause.

"The welding crew attacked the fire with several fire extinguishers and the alarm was not transmitted until someone outdoors saw smoke pouring from the building. The fire spread through the unsprinklered parts of the roof space and although sprinklers operated in certain parts of the roof space and in the fifth story to protect these areas, they had no effect in the unsprinklered areas.

"Hose streams also were unable to reach the fire raging beneath the roof.

Eventually the roof collapsed breaking sprinkler piping in the fifth story and later the bell tower fell in and caused most of the building to collapse."

Don't misunderstand me. Let's give those welders full credit for doing their duty as they saw it. But the critical point is they attacked the fire with hand extinguishers and the alarm wasn't transmitted until someone outdoors saw the smoke. It's a matter of history and record now that by the time smoke was sighted, it was too late. If the alarm had been turned immediately, there's a chance the building might have been saved.

Think that's an isolated case?

Same Report, same year, and I quote:

"May 29, restaurant et al.: loss $514,530. Four buildings, housing stores and apartments. Originating within a nonfire stopped partition in the first floor restaurant, fire was first discovered when heat ignited papers on the floor adjacent to the partition. Employees attacked the fire with buckets of water but the fire persisted and when it started to spread along the wooden and combustible fireboard interior finish, they fled and notified the fire department.

"Flames were coming from the roof of the 215 foot by 70 foot three-story wooden building when firemen arrived. Fire spread to two wooden buildings on one side and one on the other before sufficient fire apparatus could be assembled to make an effective attack."

Get that? Fire spread to two buildings on one side and one on the other before sufficient fire apparatus could be assmbled. It may be a hard, blunt way to put it, but it boils down to fiddling while Rome burns.

I cannot stress too strongly that it is within the first thirty seconds of the life of a fire that the most effective headway can be made, against it—even by people of limited know-how.

Even in industries as fire conscious as yours, few people realize the full extent of the terrible toll that fires exact from the nation every year.

In 1960, fire claimed the lives of 11,350 men, women and children. That's one life every 47 minutes, 31 times a day. In addition to that number killed, countless thousands of others were seriously injured, many of them to spend months in hospital, many of them unable to work again.

In terms of property loss, last year's toll was $1.5 billion. That's a good deal more than it cost to build the entire St. Lawrence Seaway, the hydro electric power phases of that great project excepted.

Frightening, isn't it? Fire is a vicious, wanton thief and killer that respects no one.

It is one of the most serious problems that confronts the continued prosperity of the North American economy today. It is a problem that is growing more serious annually. It is one that we are all guilty of doing too little about.

What makes the terrific annual loss of life and property due to fire even more tragic is the fact that virtually all of it could have been prevented through proper care and proper training.

That's why I want to show you what a formidable and frightful enemy fire is. Fire losses are difficult to assess with any accuracy, and they are even harder to predict.

Nevertheless, as far as 1961 fire toll is concerned, I'll stick my neck way out and say this: if fatalities conform to the national ten-year average, more than 11,600 people will be killed by fire in the United States this year. If the pattern of property loss experience established in the last decade is true, then fire losses in 1961 will top the one $1.5 billion mark by a wide margin.

This will happen—and remember it could happen to you—unless all of us, starting right now, get out and do something about it.

Fire loss figures are apt to be misleading. Virtually every source you look at will give you a different dollar figure for losses sustained in any given year. Claims paid out by fire insurance companies are often taken as a useful yardstick, though bear in mind this presents far from the whole picture.

Some companies are self insurers; some insure only part of the risk. Frequently, the actual amount of the physical loss exceeds by far the amount of insurance carried. The sad fact is that according to figures compiled by the National Fire Protection Association, the dollar value of fire losses has been increasing more rapidly than the number of fires.

As I said a moment ago, figures are apt to be misleading and they seldom tell the whole story. Fire does not respect statistical averages, which are computed from hindsite information. If you have a fire in your mill, don't be lulled into the security of thinking that the loss is going to be confined to your just, proportional share of the industry average.

Nor can you forget about the intangible losses that result from major fires—losses that can't be or aren't measured in direct dollars and cents terms; ones that probably can't be covered by insurance are ones which, none the less, are very 'real' and which have a direct bearing on the well being of the enterprise.

There are many of them. Surveys in the U. S. have disclosed these sobering facts about severe business and industrial fires:

43 per cent of the concerns hit by bad fires were unable to resume operations.

17 per cent of those firms able to furnish financial statements before a fire were unable to do so afterwards.

14 per cent suffered a severe reduction (from 30 per cent to 66 per cent) of their credit rating.

26 per cent, unaffected as to credit rating, nevertheless suffered a severe loss in customer relations.

Just think about that for a moment. If you expose yourself to fire risk and loss, priceless records, plans, documents, and the like which took years to produce and assemble and which are the very life blood of your business may go up in smoke in a very few minutes.

I'm thinking, for example of production and test lab reports. You can't insure the true value of these reports, and you can't buy back the information contained in them for any amount of money. Believe me, if money could reproduce these records, your nearest competitor would have bought himself a set years ago.

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Then too consider what happens to your business if a disastrous fire puts you out of operation for an extended period. Have you thought about the good will of customers who depend on you for materials? If they can't get their requirements from you, they'll have to turn to alternative sources of supply—in all probability your competitors.

And once a competitor gets a foothold in your market, it may take you years to get him out again. In fact, you may never be able to regain all of your former markets.

In such a highly competitive industry as pulp and paper, I think you will all agree it is poor business indeed to let fire give your competitor the upper hand in your own markets.

There's another important consideration too—your labor force team. Quite apart from moral and social considerations, if you have to shut down for fire repairs, you'll probably have to lay off a considerable portion of your work force.

As you know, we all have to eat. Once laid off, your workers will probably try to find alternative employment. Will you be able to get them back again once you reopen? It's almost a certainty that part of the work force will be lost to you for good. When you re-open, therefore, you'll have to take on new men and will have the added expense and production set-back having to train them from scratch.

Bear in mind too that fire insurance companies aren't set up as charitable institutions.

And I'll tell you right now that the last time I made this suggestion, a manager came up to me and said: "Smokey, who are you trying to impress? You should see the premiums we have to pay each year."

Well, that's exactly the point. The insurance principle is very simple. Premiums are collected from the many to cover the losses of the few. If industry has a bad loss record this year, everyone's premiums go up to compensate for it next year. Thus fire costs *everybody* money. It's a vicious circle, and you can't beat it any other way than by cutting down the fire losses.

And there's much more to the insurance angle than just that. If your plant has a bad fire record, believe me, you are going to feel it in the size of the insurance premium *you* pay.

As I said a moment ago, insurance companies aren't charitable institutions. They, like you, are in business to make money. They come in, gauge the risk, and set premiums accordingly.

I'd like to turn for a moment to the moral and social implications of the fire problem. You, as members of the pulp and paper industry are the employers—the "job-givers" to a large number of Americans. As a result, the burden, as well as the responsibility, placed on your shoulders is a very heavy one.

In many smaller communities across the nation one pulp and paper mill is the sole industry—virtually the sole source of employment—and for all intents and purposes, the only reason for the community's economic existence.

On the management of such companies rests the responsibility for the well being of the entire community. If the mill burns down, shareholders are not the only ones to suffer. The death warrant for an entire community may have been signed.

The sad fact is that technology and markets do not stand still in today's fast changing world. If a manufacturing operation is burned down, economic conditions may dictate that it remain closed forever. If it is to be rebuilt, it may have to be rebuilt elsewhere. One need only look at the trend towards establishment of pulp and paper plants in the southern states to find proof of the validity of this argument.

There is also the human element to be considered. In North America, business and industry help look after the employee's welfare in many different ways. Employers contribute to unemployment insurance; many pay part of health, sickness, life insurance, and pension plans. They may even offer a stock purchase plan so that employees can participate to some extent in the profits of the business.

Surely the very life of the employee is no less important than the fringe benefits he received!

I think everyone in this room would do everything in his power to avoid having to call on the wife of an employee—the mother of five children—to tell her that

she has become a widow. Yet each year in the United States, there are dozens of businessmen on whom this sorrowful duty falls.

The real tragedy is that in almost every instance death could have been avoided by proper training, proper precautions, taken at the proper time. This will suffice, I think, to show how great and how far-reaching the economic and social implications of fire loss are.

Let me just add this: some authorities suggest that the indirect losses due to fire are more than five times greater than the actual damage to any property. To the best of my knowledge, no one has yet been able to contradict this statement.

The real problem in industrial fire prevention today is not one of equipment; it is one of training and attitude. Contrary to widespread opinion, there has been nothing radically new in methods of extinguishing fires for many years. Our basic tools have, for the most part, been in use for the past fifty years, or so.

The real deciding factors in whether there will be a fire loss or not are these:

Have fire hazards been recognized and effectively eliminated?

Do plant personnel know—instinctively—what to do if fire breaks out, how to do it, and when to do it?

Has the plant availed itself of all possible fire fighting and fire protections services and facilities that are available to it?

Few people realize the speed with which usually small fires get big and uncontrollable. For example, it is often pointed out that an average fire at the end of two minutes is three times as large as at the end of one minute. At the end of four minutes it can be twenty-five times as large as it was at the end of two minutes. And at the end of ten minutes it may be one hundred times as large or larger than it was at the end of four minutes.

These estimates are conservative. Where combustible vapours of petroleum and similar products are involved, the acceleration rate is much more rapid.

It follows, therefore, that more can be done with less know-how and less equipment in the first thirty seconds than the best trained and equipped fire department can often accomplish when it arrives on the scene ten or more minutes later. That is why management must accept the challenge of getting the man on the job-level to realize he must deal with a small blaze intelligently and immediately, whether or not this is part of his particular job. If management doesn't succeed in this mission—it is missing the boat.

When dealing with fire protection problems, we often hear the term fireproof. Unfortunately, fireproof is one of the most abused adjectives in the English language.

There are virtually few substances on earth that won't burn under certain conditions. If there were, scientists wouldn't have had to spend so much time and effort trying to devise methods to effect re-entry of space rockets into the earth's atmosphere.

Probably one of the materials that comes to mind most easily as one that supposedly won't burn is water. That's because water is widely used to extinguish fires. However, we need only recall that during World War II many incendiary or fire bombs were dropped by both sides. To fight the resulting fire with water was soon found to be suicidal. The reason: An incendiary bomb, being made out of a material called thermite, burns at about 8,400 degrees Fahrenheit. When water is exposed to a temperature of 8,400 degrees Fahrenheit, it decomposes into its component elements, oxygen and hydrogen. The former supports combustion, and the latter actually readily burns, given the right conditions.

Thus I leave the result of fighting thermite fires with water to your imagination. Like water, supposedly fireproof buildings have a nasty habit of burning when they are not supposed to. I'd like to quote again from a Fire Commissioner's Report; dealing with the destruction of a hardware Company Building at a loss of $700,000.00.

"Destruction of a noncombustible (steel framing, aluminum siding and roof) with noncombustible contents (hardware, plumbing supplies) probably seemed to be a remote possibility to the owners and may have accounted for their decision not to sprinkler the building. As it turned out, the combustible attic floor, stored papers in the attic, office furniture and combustible crates and cartons of stock provided adequate fuel to cause total destruction of the building.

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"The fire originated when sparks from welding torch being used on the roof fell on papers stored in the attic. The fire burned an estimated 30 minutes before employees in the first story discovered it. Public fire fighting was ineffective due to poor water supplies, the nearest hydrant being 2,000 feet away."

In the past few years the march of science has created two or three thousand new, combustible products that didn't even exist a decade ago. All are potential fire hazards, particularly if you don't know them, their properties and behaviour.

To sum up, recognition of fire hazards and in-plant fire prevention and fire fighting training are the keys to lower industrial fire losses.

At your respective companies or plants, if you do nothing else, I urge you to do this:

Make a careful, thorough inspection to see if you can spot any fire hazards.

Eliminate any that you find.

Find out whether you have sufficient fire fighting equipment and, above all whether what you have actually works.

Find out whether your employees on all levels have sufficient training and know-how to deal effectively and immediately with any fires that may occur.

Satisfy yourself that both your employees and your fellows in management are fire prevention "oriented."

If you haven't established a mutual-aid fire fighting agreement with neighbouring industries, work one out. This is particularly important in small communities with only limited municipal fire fighting resources.

Don't look on plant visits by fire inspectors as the coming of the seven-year plague. On the contrary, make a point of inviting your local fire fighting authorities into the plant before disaster strikes. If they know the layout and your particular problems, they will be much more effective in dealing with any blaze that may occur.

I cannot impress on you too strongly that you can't take too many precautions and that you can't give your employees too much training. Oceangoing vessels, by law, are required to hold a weekly fire and boat drill. Yet ships still burn!

This is in spite of the fact that they are floating in a sea of water and have much more fire giving equipment built right into them than the average industrial plant.

Recently, Ambrose B. Kelly, general counsel of the Associated Factory Mutual Fire Insurance Co., summed up the fire loss problem very neatly. He said, ". . . experience in loss prevention indicates that the attitude of management is just as important as good construction and physical protection against loss. A reinforced concrete building fully protected by automatic sprinklers by having a management indifferent to loss, an attitude which is reflected in the attitudes of the employees, is not a good risk.

"Fire starts because of carelessness of employees or because of faulty maintenance, and when it comes there is no plant organization trained and ready to extinguish it promptly and with a minimum loss.

"Automatic sprinklers have proved their worth, but a single shut valve can destroy the effectiveness of the entire system.

"For effective loss prevention, we must have both proper physical conditions and a proper management attitude. Given both . . . losses can be substantially reduced."

And that is expert opinion. It comes from an insurer who judges you as a fire risk in the dollars and cents you must pay.

As an industrial fire fighting and fire prevention trainer, I can only add one word: *"Amen."*

INFLUENCING BEHAVIOR FOR SAFETY

By GLENN F. GRIFFIN
Training and Safety Consultant, Park Ridge, Ill.

I believe we are not paying as much attention to influencing behavior as we ought to. Behavior is the most important factor in safety or in accidents. When I say that behavior is the most important factor I am not thinking of the outmoded concept that 85 per cent of all accidents result from unsafe acts and only 15 per cent from unsafe conditions. If we could take a few hours and examine a thousand or so accident reports I could convince you that unsafe conditions probably occur just about as often as unsafe acts.

When I say that behavior is the most important factor in accidents or in safety, I have in mind that unsafe conditions are the result of somebody's behavior and that any given unsafe condition is really an unsafe act just one step removed. When you look at it that way it is not a case of 85 per cent due to unsafe acts and 15 per cent due to unsafe conditions but rather 100 per cent due to unsafe acts although not necessarily unsafe acts of the injured persons.

But whether you follow me in all this reasoning or not, I think I could get an affirmative vote to the proposition that most accidents result from the way people act. The thing that worries me is that many of my friends in the safety business tell me that accidents result from unsafe acts of people and in the next breath tell me that after all you can't do much about the way people act.

Now when people say that I know they are just discouraged by some instance of unsafe conduct that seems quite inexplicable because, of course, we can do much to influence the way people act.

Human behavior and how to control it is such a broad subject that I have selected just three factors influencing behavior that seem to me to be very close to the actual point of contact in accident occurrence. They are:

Knowledge and skill
Attitudes
Temporary states, physical, mental and emotional

I can't say which of these is the most important factor; in fact, when we investigate an accident it is often difficult to tell which of the three is predominant. One leads to another. A very simple example is that of a man who is assigned to a job that he does not understand. (A lack of knowledge and skill). Because of this he becomes worried and frustrated. (A temporary state). The continual worry and frustration eventually leads to a feeling that he doesn't like this job and that the whole safety program is a lot of bunk. (An unsafe attitude).

If you really want to make a complicated case of it you can say that having arrived at such an attitude he then shuts his ears to further instruction and as a result gets in bad with the boss and as a result of this his attitude gets worse and worse. That can go on endlessly and sometimes it does.

But we have to start somewhere and it seems to me the logical place to start is with the matter of knowledge and skill. Certainly we can't expect that a man will work safely unless he has the required knowledge and skill and certainly we can say that the boss is responsible for seeing that he does have that knowledge and skill. I will have to illustrate the importance of this factor by a negative example.

A man was told to empty a tank of solvent. Having given the order the foreman walked away and the next he heard the man had suffered an injury trying to tip the tank over to empty it. The fact of the man's ignorance then came out when it was disclosed that there was a drain cock on the bottom of the tank.

The obvious remedy for lack of knowledge and skill is instruction, instruction about safety, yes, but mostly just plain simple thorough job instruction. People need to learn how to do the job as it is done in the place where they are working and this includes knowing the names of things, knowing the principles behind the actions, knowing the why as well as the how. It also includes not only knowing but

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If this kind of an instruction program is going to work it means that the people responsible for instruction know that the amount and kind of instruction varies with different people, that with some people it has to be repeated more often than with others but that with all people it is a never-ending process.

Job instruction has to be done on the job by the responsible man on the job who is the foreman, and here we safety men get our first and biggest alibi, which I am afraid we have used until it has worn pretty thin. That alibi—"the foreman is responsible."

Does this mean that we can leave instruction up to the foreman and that we can blame him for accidents that result from ignorance? Certainly not.

If our job as safety men amounts to anything at all, it is up to us to see that the foreman acquires the necessary knowledge and skill to transmit the necessary knowledge and skill to the people under his supervision.

And so I am giving away what is, perhaps, the most important point of my talk which is that while all the things we are talking about are part of the foreman's job, they are our job, too, and perhaps first.

A foreman has so many things to do! He is being crowded for production, for cost control, for quality control, for work simplification and methods improvement, and the management people who are pushing many of these other activities are not always alert to the important job of influencing the behavior of employees. And yet if we allow the job of influencing behavior to be neglected, the whole operation deteriorates. Controlling the behavior of people is still the most important function of the foreman; in fact, the very reason for his existence.

So it is up to us to see that foremen get training in job instruction. I won't insult your intelligence by telling you how it is done because I think you already know. Call it JIT or call it the Allen Method or call it by any new-fangled name that has been invented, foremen need it and most of them will not acquire it by absorption. We have to teach that over and above the knowledge and skill needed to *do* a job, it requires a very special skill to *teach* the job and we have got to teach people the old JIT maxim that if the student hasn't learned the teacher hasn't taught.

This job of learning and improving instructional methods has to be continuous. If the instruction dies out good practices become neglected, as many of us can attest from observation.

But how to keep teaching the same thing over and over? That is what so many training men and safety men ask me. Don't people get tired of the same thing and just stop listening?

No, people don't get tired of it if we use our imagination and skill in presenting it. Here are just two ideas for keeping instruction alive and keeping it new and interesting.

1. Start a program of getting foremen to work on safe work methods and job breakdowns for the jobs in their departments. Possibly tie this up with accident investigations. Hold some meetings, discuss with them the best methods and have them tell their experiences in teaching.
2. Let foremen learn by teaching others how to instruct. Practical training men know that job instruction is more often done by other people than by the foremen. And yet when job instruction is taught it is usually taught only to the foremen. If this job instruction by other workmen is to be done right, the people who do it have to be taught and the foreman is the one who should do it. This is the best possible instruction for the foreman who, even as you and I, learns best when he tries to teach others.

That's about enough to say about job instruction and I haven't said anything new but if I have started you thinking again about something that you long ago thought was good but that finally fell into disuse it will serve a useful purpose.

Now let's look at attitudes, the way people feel about things. I think when management people talk about attitudes for safety they really think about attitudes for

accidents. A few years ago President Dearborn of the National Safety Council made a speech called, "Seven Deadly Beliefs." In this speech he pointed out that all of us run into danger because we believe such things as these—that accidents are an act of God, that taking chances is necessary in order to get the job done, that safety is for weaklings, that too much safety takes all the fun out of life, that people will think we are afraid if we practice too much safety.

Now that kind of preaching is all right and we need some of it but if we are going to influence people for safety we have to concentrate also on some safe attitudes rather than on unsafe attitudes. I have asked many in groups of safety men to tell me some safe attitudes and I find that it is pretty hard to think them up quickly. This indicates to me that we do concentrate more on the unsafe attitudes than we do on the safe ones. Let me give you a few safe attitudes that I think all of us need to know and teach.

An accident can happen to me at any time when I take a chance.

Accidents can always be prevented.

It is a mark of good sense and skill to work safely.

We can always take time to work safely.

The men I work with will think well of me if I practice safety.

Many other safety attitudes could be added to this list and I would like to suggest to you that if you hold safety meetings you make this the subject of a meeting. Let each man tell you what he thinks is the most important safe attitude and then discuss them.

In order to build safe attitudes among employees, it is necessary for management people to know what they themselves believe about safety. We should have these safe attitudes straight in our own mind if we are going to impart them to somebody else. We have to make a conscious effort to get people to accept these very attitudes.

Now how do we get people to accept attitudes? Consider for a moment how attitudes develop.

Attitudes grow in an environment that is favorable to them. They grow as a result of example. They grow if the safety instruction is consistent. They grow if the instruction is backed up by firm supervision. They grow if people have a chance to talk about how accidents can be prevented. They grow if the men themselves have a part in the whole safety effort and if their part is recognized.

Creating the environment, setting the example, giving the instruction and discussing safety with the men is a job for the foreman to do but again who teaches the foreman? We are the specialists. If we don't do it it won't get done.

That is a pretty brief discussion of the development of safety attitudes but possibly just mentioning some of these things will cause you to think about them and if you think about them I'm sure you will know the answers.

Finally let me come to that very troublesome factor in accident occurrence, temporary states, physical, mental and emotional.

This is the toughest of all. In accidents I have observed, in unsafe and harmful conduct that pops up every day, in my own personal life, the bad temper, the forgetfulness, the abstraction due to worry about real and imaginary troubles, the anger at unfair treatment, the lassitude due to fatigue and boredom and ill health, these are the states that I know the least about curing, but we can't pass them up just because they are difficult to handle. We have to do something about them.

I used to tell foremen that the remedy for these temporary states is to be alert and to know when men are troubled and to give them help and advice. I was always pretty satisfied with this solution until I ran into a bunch of foremen who were not properly docile and respectful. In effect what they said to me was, "O yeah? How do we know when a man's got trouble? Maybe he doesn't want us to know. If we do know, what can we do about it? Can we say, "Don't worry now. It isn't as bad as you think." How can we say that? Maybe it's worse. And anyway, the man has to work. Pulling him off the job would only add to his troubles."

So I asked these foremen what they thought we should do about these men with troubles. And we talked about it for three or four sessions. Here are the best thoughts that we could come up with.

First, counselling and helping are OK if you get a chance and if it seems called for.

Beyond that, remember that many of the troubles and frustrations are job created. Let's try to keep from causing troubles. Let's always be available when men have gripes or a worry, not to soothe them, but to try to do something about the thing that is bothering them, before it gets to the point of a neurosis.

You know we talk a lot about men who bring troubles to work. Let's think about the fellows who take work troubles home with them. Psychiatrists tell us that much domestic trouble and illness and many off-the-job injuries result from worry about job troubles. We tell the foreman to say good morning when men come to work. Do we think enough about being around to say good night when they leave so that when they go home they won't have that gnawing feeling that maybe the boss is mad at them, or that he has forgotten some complaint or request made during the day.

So much for preventing the troubles, but there is more. We know that everybody has troubles of many sorts and we can't cure them all. But we can teach people well enough and supervise them well enough and develop good enough work habits so that even when a man is disturbed he won't get hurt. That is not too difficult and we can apply it to ourselves as well as to the men who work in the shops.

And we can create safe working conditions so that safeguards will protect the fellow who forgets. Actually, many of the most familiar safety devices and guards are not needed at all when we are fully alert but are there to protect us when we forget.

Again, I say that a very large number of the serious accidents result from temporary states, physical, mental and emotional, and that you and I and our friends and our families are subject to these states just the same as the man on the job. Together, we and all the other management people should give consideration as to how we can prevent these states from resulting in job injuries.

These are just a few of the things that we can do about the three factors we have been discussing:

1. Knowledge and skill.
2. Attitudes.
3. Temporary states.

I am aware that some of you are saying, "Well OK, but that's pretty elementary stuff. He hasn't told us anything new." But listen to this. I have been talking to people about their safety programs and I find that many of them are giving almost no time to activities consciously and specifically aimed at improving behavior. Why?

Here is what they tell me: "Oh, we had some job instruction training once quite a long time ago." I can't refrain, in that connection, from reminding you of the old gentleman in the club who was talking with a member whom he had just met. The member offered him a drink and the old gentleman replied, "No, I tried it once, didn't like it." "Then, how about a smoke?" "No, tried that once, didn't like it." "Like to play cards?" "No, tried it when I was young, didn't like it."

About this time a young man walked in and the old gentleman introduced him as his son. Whereupon the member who had been attempting to cultivate his acquaintance said, "Your only child, I am sure."

Let me assure you that training and job instruction tried once, a long time ago, is not enough. If it is not done continuously it dies, and you and I have seen it die. Another thing that safety men tell me is that they tried a program of having their foremen talk regularly to their men about safety. But the foremen got tired of it, couldn't think of anything new to say and so it just petered out. That is an excellent program.

Some companies with good safety records say that it is the most important part of their whole safety program, having a foreman talk to two or three men every day about safety. But it won't work unless it is kept alive and promoted by some management person, and that ought to be the safety man or the training man. The companies where it works best have occasional meetings with their foremen in which the foremen all exchange experiences and tell about the things that they have been talking about with their men. But it will die just like job instruction training will die if you don't keep pushing it.

The bottom recorder in the operator's station presents the profile of the basis weight as the gauge scans across the sheet. On the return scan the target weight is shown as a straight line. The scale on the recorder shows the position of the slice screws. This enables the machine tender to reference the weight variation to the appropriate slice screws and make the necessary adjustments. Because six to ten profiles per reel are obtained, more uniform profiles result.

The top recorder, on the Operator's Station, presents the averaged basis weight of each scan across the sheet. This is presented as a straight line on the scale that reads in absolute basis weight. The actual weight seen by the gauge is then compared to the target weight. If this weight varies from target more than is desired, a signal is fed to the automatic control, contained in a second electronic console. The control opens or closes the stock valve or stuff gate to make the appropriate correction to basis weight.

Presently, there are more than 150 Accu-Ray Basis Weight Systems on Fourdrinier and cylinder paper making machines. More recently, systems have also been installed on off-machine coaters. More than 177 systems are installed on coaters and gummers. Also, more than 140 systems have been installed on extruders and extruder laminators. Different types of source detector units are designed to do specific measurement jobs.

U-Frames are used in a number of applications, available for sheet widths up to 160 in. Source detector units are designed for the metals industry. One used on high speed steel tandem mills weighs in excess of 2500 pounds, to give you an idea of the ruggedness of design. There also are "O" type brackets.

Another application of the absorption principle of radiation is used in the measurement of fluid, slurry, and in some cases, solids streams. The signal can be fed to a recorder or recorder controller for manual or automatic control of the process.

These composition analyzer systems are being applied today in pulp and paper mills for black liquor, lime and slurry, white liquor, calcium hydroxide slurry, clay slurry and clay-starch slurry measurements. They are also being used to control evaporation, absorption, extraction, drying, mixing, classification, filtration, size reduction, materials handling, and filling operations in industry.

II. *Blocking of Radiation*

In this case we find level measuring devices in which the mass of liquid or solid material blocks the radiation between the source and detector. This principle can be used for detecting levels in vessels with solid walls, such as steel and concrete, without having any contact with the material within the vessel. By extending the detector, this principle can be used to measure continuously the level of material in a tank or bin.

These level measuring devices are of interest in pulp mills for level measurement in a number of areas. Digester level specifically has received considerable interest. Since this type of measurement system was introduced some three years ago, over 400 devices have been installed.

There are some other interesting applications of this device. Since it can "see" through solid walls, it can be looked at as a sort of gamma radiation photo cell. It can be made to disregard foam, froth, dust, and other gaseous materials. It will average out turbulence and occasional interrupting matter such as agitators and paddles and will be unaffected by them.

There is an installation on a clinker cooler in a cement plant. The source looks through the walls of the cooler and measures the height of the bed of hot cement clinker. This level is controlled to permit the most efficient operation of the cooler.

Another installation uses two level switches on a standpipe feeding powdered coal to a boiler in a power station. The radiation passes through the stream of powdered coal. If the coal bridges the pipe, the radiation is cut off and the switches initiate a shaking action to remove the coal build-up.

The blocking principle can be used to detect the height of fill in cans on a canning line and the signal is used to control the filling machine. Underfilled or overfilled cans can also be automatically rejected from a conveyor line using a similar system.

Of course, the one outstanding advantage of these systems is that level, density, weight, or thickness can be accurately measured without contacting or without affecting the measured material.

What is involved in the use of radioisotopes? We have discussed why and where radioisotopes should and can be used. Let us turn for a moment to see what radiation really is.

Over simplifying, there are two types of radiation. The first of these is Corpuscular radiation. This type of radiation exhibits the properties of particles such as size, weight and velocity. The flow or movement of electrons is an example of corpuscular radiation.

The second type of radiation is exhibited in wave form. Heat, light, and radio waves are examples. Wave radiation covers the spectrum from alternating current, radio and ultra high frequencies, infra-red, white and ultra-violet light, x-ray and gamma ray, and finally, through the cosmic ray region which possesses the highest frequency and energy level and shortest wave length of all energies in the spectrum.

There are approximately 50 radioactive elements found in nature. Radioactive means that the element is unstable and the atoms are disintegrating or emitting a charged particle from the nucleus. Eventually all radioactive elements reach a stable form. When a half life is mentioned for a radioisotope this means the time required for one half of its energy to be emitted. The half life will vary for every radioisotope from seconds to thousands of years.

Radiation can be found all about us in nature. For example, there is enough Potassium 40 found in the average human body to emit 150,000 beta particles per minute with energies up to 1.5 MEV. Carbon 14 is continuously being formed in the atmosphere by the action of cosmic rays on nitrogen in the air.

Radioactive isotopes are generally referred to today as being artificially created since they are produced from a chemical element not normally radioactive. Bombardment in a reactor rearranges the neutrons and protons in the nucleus of atoms of these elements.

There are various types of radiation being used in industry. These are:

(1) *Alpha radiation:* This is radiation of a helium atom nucleus (helium atom without two electrons). Alpha particles have a large mass and a slow speed. A few inches of air will stop alpha particles.

(2) *Beta radiation:* This radiation consists of high speed particles, electrons, with little mass. Approximately .030" of steel is required to stop these particles.

(3) *Gamma radiation:* This is high energy wave type radiation, and 0.65 inch of steel or 4 inches of water is required to cut this radiation in half. A fourth type is X-radiation and Bremstrahlung, both of which exhibit the same properties as gamma radiation. (a) X-radiation is generated by high voltage acceleration of electrons, generated by heating an electron emitter. These electrons are directed to strike a target, generally tungsten, and the X-ray is generated. (b) A similar technique using a beta radiation emitter (electron) and striking a target will produce higher energy radiation called Bremstrahlung. Except for energy levels and method of generation, these two types are identical.

Let us define terms used in radiation.

Curie: This refers to the quality or amount of radioactive material present. A curie is defined as the quantity of radioactive material in which 3.7×10^{10} atoms disintegrate in each second of time. This term is analogous to power in electricity.

MEV.: Million electron volts. Refers to the energy level of the isotope. This is analogous to voltage in electricity.

Roentgen: A roentgen is an energy measurement difficult to express, however, this can be done practically by defining energy in terms of the specific effect produced in a specific apparatus. The most convenient method is to collect and measure the number of ions, caused by radiation, produced in a given quantity of air. The roentgen is a unit of dose of total energy exchanged. The intensity of a radiation beam is expressed in terms of dose per unit time and the common terms is roentgens per hour, or more commonly, milliroentgens per hour, abbreviated mr/hr. The reading of an ionization survey meter can be in mr/hr and can be used to determine the radiation intensity level around an isotope system.

Dose: Is the quantity of radiation absorbed, per unit of mass, by the body or any portion of the body. Total dose will specify an amount over some period of time. Several units of a dose are in current use, however, the most common is the rem. A. E. C. Regulation 10CFR20 gives infor-

mation to compare this measurement to other units if necessary. A rem is defined as a measure of dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of one roentgen of X-rays.

Let's now consider the actual construction of the source itself and its housing in a source-detector unit used in an industrial measurement system. The size of this hermetically sealed unit is about as big around as a nickle and about ½ to ¾ inches high. The source is then placed in the source holder assembly with a shutter assembly. The shutter is power activated and spring closed so that in the event of a power failure the shutter will automatically close. It is mounted on a "U" frame, and the access panel contains a lock to prevent unauthorized entry.

An alarm window protecting the source is a printed circuit. Should any one attempt to get into the source from this side the circuit is broken. Once the circuit is broken an alarm horn sounds and the shutter automatically closes. The horn will continue to sound until the window is replaced or power is removed from the gauge.

In the density gauge, the source capsule is sealed in meehanite. The meehanite is welded onto the process pipe, allowing a small air space. This type of gauge has no shutter since it becomes an integral part of the pipe.

In a small radium source unit used for level once again we find the source sealed into the unit. Because of low radiation levels, no shutter is required on such a unit.

In a larger source unit used in level devices a center "cannon ball" rotates, focusing the radiation into the solid meehanite, reducing radiation to low levels. The unit can be locked in this position, thereby permitting handling or entry into the area of the measuring beam.

The largest of the source units will take up to 1 curie of Cobalt 60. The weight of this source assembly is approximately 850 pounds.

What must be done to get isotopes into the plant? Uses of radioactive isotopes fall under the jurisdiction of the Atomic Energy Commission. This agency has very actively promoted the use of isotopes and has been extremely helpful to potential users. In order that the safe use of isotopes is assured, certain restrictions and precautions govern the use of isotopes.

Regulations pertaining to radiation devices are contained in A.E.C. Regulations 10CFR20 "Standards for Protection Against Radiation" and 10CFR30 "Licensing of By-product Material." This type of equipment can be obtained under either specific or general license.

Specific licenses are granted by the A.E.C. to cover specific situations such as the distribution of isotope gauges and to cover their use in specific situations or applications.

The Commission has also attempted to encourage the broad use of isotope radiation equipment by setting manufacturer's standards compatible to safety requirements of other manufacturers of industrial equipment. If certain conditions are met by the manufacturer of isotope equipment and other requirements are met by the user, the user can acquire radioisotope systems under a general license covered by 10CFR30, Par. 30.21c. This exempts the user from the conditions of 10CFR20 except for those sections dealing with reporting of accidents.

I suspect that some of the above has been confusing. If it has, further studies of the A.E.C. regulations is recommended if you have or contemplate isotopes in your plant. I also suspect that once you are familiar with the subject it will be no more confusing than your electrical or building codes. Whether you are licensed generally or specifically, there are some reporting requirements involved:

1. Theft must be reported as explained in 10CFR20.

2. Telephone and telegraph reporting to the A.E.C. on any of the following:

   a. Exposure of any individual to 25 rems or more of radiation

   b. Release of radioactive material, averaged over a 24-hour period, that could exceed 5000 times the stated limits.

   c. Loss of one work week due to the operation of facilities

   d. Damage to property over $100,000.

3. 24-hour notification by telephone or telegraph.

   a. Individual exposure of 3 rems

b. Release of material, averaged over 24 hours, that could exceed 500 times the stated limits.

c. One day loss of facilities

d. Property damage over $1000.00.

4. 30-Day report

This report is generally necessary with accidents less serious than the above, where individuals have received some excess of permissable radiation levels. This report would contain notes to the above and precautions for the future.

Before leaving the subject, I must mention that most states also have regulations concerning isotopes. It would be well to be knowledgeable in this area also. Another good practice is to inform your plant fire control group of the locations of isotopes, or if you use town facilities, the town fire marshal should also be informed. The use of radioisotopes does present potential hazards from exposure to radiation fields and contamination by radioactive material. The Atomic Energy Commission governs both areas very closely. Additional safeguards are imposed by the manufacturer of the device, local authorities, and plant safety groups.

Exposure to radiation fields is minimized by the manufacturer of these devices through the construction and location of the source unit. For example, Industrial Nucleonics restricts the maximum radiation field to 5 mr/hr at 12 inches from any surface which is normally accessible to personnel. In most AccuRay equipment, external radiation is far below this figure. Contamination by radioactive material presents the greatest potential hazard with the possible exception of exposure to gaseous sources. Great care is taken to prevent any possible contamination.

If plant safety groups are not directly concerned with plant insurance, you are probably expected to know to what extent and degree the use of isotope equipment could affect your insurance coverage. In general, two distinct types of insurance are involved with the ground rules different for each. These are general liability and fire insurance.

General liability provides third party coverage to property and persons. Industrial Nucleonics Corporation General Liability would cover the claims of our customers. General liability policies have nuclear exclusion clauses but these clauses do not apply to our types of equipment.

The second form, fire insurance, covers loss of property and profits or the loss of the use and occupancy. The nuclear exclusion clause does apply in the case of fire insurance.

Having radiation devices does not void fire insurance, but if you want to be covered for loss caused by radioactive material you would have to pay a surcharge. This surcharge depends on the type of structure covered and other considerations. It would be determined in the same manner as standard fire insurance is determined. For example, the rate would be higher if the isotope was located in a frame building rather than in a brick or concrete structure.

These devices have been through fires, floods, and explosions and no additional loss has been incurred due to the presence of radioactive material. Because of our rugged construction, as you have seen, we have been able to maintain this record with more than 5,000 installations scattered throughout industry.

Examination of a density gauge after it had been through an explosion and fire in a rocket fuel plant revealed no contamination, even though the source detector unit was badly damaged.

Unfortunately, insurance companies do not yet recognize improved encapsulation techniques, or other safety techniques. In some instances, where a gaseous source is used, common in the paper industry, no contamination hazard is present.

Some of our customers pay the additional surcharge for the added protection in their fire insurance policies. Others do not feel the risk of loss caused by radioactive material contamination is worth the extra charge. In no case has a customer decided not to install the device for insurance reasons, as very little risk is involved.

Before, during and after installation it is extremely important that all personnel coming in contact with the unit be thoroughly instructed in the matter of radiation safety. The manufacturer of the equipment should be properly equipped to give assistance in this area.

What must be done on a continuing basis once isotopes are in the plant? With the radioactive material in the physical and

chemical state described above, the likelihood of failure of the encapsulation is extremely low. If a failure were to occur it is thought that it would be extremely gradual. The initial indication of such failure would be the presence of radioactive material on the external surface of the source carrier. The presence of such radioactive material would be detectable by wiping its surface with a test swab and inspecting the swab for the presence of radioactive material with high sensitivity radiation detection equipment. The sensitivity of these tests permits detection of the presence of radioactive material in quantities hundreds of times below the amount considered hazardous. Such tests are routinely carried out at six month intervals, either by the guage supplier or by the user when he has suitable facilities and personnel.

In closing let me compare the safety aspects of a radiation level device with that of conventional methods of tank level control. Suppose the radioactive level device was used to measure level in a 10 foot diameter tank 10 feet high. The device would be used to turn on and off a pump in order to maintain the desired level.

The presently used technique might be a float system. This system would inherently have more failures than a radiation level device. Therefore, someone would be required to climb into the tank periodically to check and repair the float system. Certainly climbing a ladder is not a great hazard but it is more of a hazard than standing on the ground.

Assume that operating procedures called for cleaning and painting the inside of the tank every three months. Warning signs mounted at the access to the tank would instruct personnel to close the source shutter before entry. With the shutter closed there is no possibility of entering a higher than tolerable radiation field.

There is, of course, always the possibility that a negligent person will ignore the warning. The danger of this is no greater than that of ignoring a warning sign on a 440 volt electrical line. The results of the negligence is a different matter. In the case of radiation received for a limited time, it is unlikely that any damage to the individual would occur. In the case of ignoring a power line warning it is likely the person would be injured, perhaps fatally.

Look upon radiation devices as an extremely useful form of energy offering many industrial benefits. Properly used, they are worth their weight in gold.

SAFETY IS BUILT INTO THE KAMYR CONTINUOUS DIGESTER

By O. A. LAAKSO
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There are in operation today a number of distinctly different types of continuous cooking systems, each one custom-designed to handle a particular raw material, utilizing a specific process, producing a particular grade of pulp. This paper deals with the subject of how safety is built into a continuous digester.

On the North American continent the greatest interest today is in kraft cooking, and so we shall in this paper deal with the continuous kraft digester. In order to discuss the safety aspects of the unit, it becomes necessary for us to go into a general technical explanation of the principles involved in a continuous digester of this type.

First, let us examine the basic difference between the familiar batch process and the continuous kraft process. In a batch operation a vertical stationary digester shell is filled with chips, along with the required amount of cooking liquor, and spent make-up liquor. The vessel is capped, and steam is applied to the system in order to raise the material to cooking temperature, and is held at temperature for the time required to complete the reaction. Non-condensable gases are

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released from the digesting vessel during the rise to temperature, and the pressure in the vessel is approximately equal to the corresponding vapor pressure of steam at the cooking temperature.

In this type of system there is a tendency for overcooking the outside of the chips, and undercooking the center of the chip, due to the fact that impregnation of the wood chip with chemical takes place during the rise to temperature. There is also lack of uniformity between the top and bottom of this vessel due to the fact that the chips at the bottom are getting a partial pressure impregnation, due to the static head of liquid, while the chips at the top of the vessel are barely being washed by the liquor.

This lack of uniformity in the batch digester was the initial basic reason for designing the equipment to conduct the process continuously.

Basically, the typical kraft continuous digesting system consists of the following steps:

1. Metering of the raw chips together with a light presteaming to prepare them for inpregnation.
2. Impregnation with cooking liquor at 220°F to 240°F for approximately ¾ of an hour.
3. Uniform rise to temperature.
4. Adequate time at temperature with no mechanical action.
5. Cooling and washing of the cooked chips prior to discharge.

Referring to the flow sheet, the foregoing steps are achieved as follows:

Item 1 is the surge hopper, which stores chips at the head of the system; the size of this bin varies from mill to mill, depending on what other storage facilities are available, but in general no less than 20 minutes storage is recommended.

Item 2 is the chip meter, which controls the rate of feed to the system. The meter has a five-pocket rotor, and each pocket delivers its entire contents to item 3, a low pressure feeder. This feeder is a steam valve which holds against the 15 psi chip pre-treatment or steaming vessel pressure.

To avoid damaging the chips, the low pressure feeder—which like the chip meter has a pocketed rotor—rotates at a faster speed and has larger pockets than the chip meter. The rotor, which is tapered, is equipped with an advancing mechanism to provide clearance adjustment in the casing which is necessary due to wear caused by sand and grit entering the system with the wood chips.

The steaming vessel, item 4, not only acts as the chip pretreatment vessel but also serves as the heat recovery system, since the low pressure steam used for pre-steaming comes from the flash tank located at the discharge end of the digester vessel. Release vapors from the steaming vessel can be piped to a condenser for the production of hot water for pulp mill use. The vessel itself is about 5 feet 6 inches in diameter and 24 feet long, and is equipped with a screw conveyor for moving the chips toward the discharge end. The chip level would be less than one foot high, thus providing the maximum steam volume and opportunity for all chips to become equally pretreated.

From the steaming vessel, the chips fall by gravity into the chip chute, item 5, and then are transferred to the 165 psi operating pressure of the digester shell by the high pressure feeder, item 6, which is the heart of the system. This feeder, traveling in the order of four to six rpm, does the difficult job of transferring chips at 15 psi to 165 psi without performing any mechanical action on the chip. This is accomplished by two independent liquor circulation systems, one at 15 psi pressure using the chip chute pump, item 7, which pumps liquor into the chip chute and flushes chips and liquor into the through-type pocket of the feeder when the pocket is in the vertical position. The chips are retained in the pocket by a coarse grid on the casing while the liquor passes through to the suction of the pump and is recirculated.

When the feeder pocket rotates 90 degrees to the horizontal position, the second circulation system using the top circulation pump, item 8, flushes the chips out and on up to the top of the digester shell. This circulation pump derives its suction from the top of the digester vessel, where the liquor is separated from the chips by means of the top separator, item 9, which consists of a cylindrical slotted screen equipped

with a cleaning screw to ensure chips moving down into the digester.

The high pressure feeder has been made a continuous operation by having four through-type pockets at 45 degrees to each other, thus insuring that at all times there will be the equivalent of one full pocket in the filling position. The feeder, also having equal pressures on both sides of the pocket in both the filling and discharge positions is completely balanced and requires a minimum of horsepower to operate.

The rotor of this feeder is tapered to allow for wear, and because of the high pressure in the discharge position, a slight flow of liquor takes place from the high pressure side to the low pressure side, thus providing a seal of lubricant liquor in which the rotor rotates. As the pocket will be filled with liquor in the discharge position, this liquor in turn provides the flushing medium when turned to the vertical position and an excess is built up and carried away to the liquor supply pump, item 10, to be returned to the digester shell, item 12, along with the make-up cooking liquor and the necessary bulking spent liquor. This liquor is pumped to the digester at a hydraulic pressure of 165 psi.

In order to have distinct temperature zones in the digester shell, the liquor is maintained as indicated above at a hydraulic pressure of 165 psi, which is higher than the vapor pressure at the highest temperature in the shell. All boiling has been eliminated, and due to the faster rate of chip flow downward, the rate of heat conduction upward has no effect in maintaining a relatively cool zone at the top of the vessel. In the upper portion of the shell, therefore, impregnation takes place with the active alkali at a temperature of 240°F, and not until the chips are approximately one-third through the vessel are they subjected to the higher temperatures.

The rise to cooking temperature is accomplished by two separate liquor circulation pumps, items 13 and 14, each deriving liquor suction from headers, nozzles and slotted strainer plates located inside the digester shell. You will notice that the inside diameter of the strainer plates is the same as the inside diameter of the digester shell in the penetration zone, the shell increasing in diameter to provide the space required for the screens without having to reduce the diameter of the chip plug moving down the shell. Heating can be provided by indirect tubular heat exchangers, or direct steam, the heated liquor being returned to the digester by means of two central pipes, one inside the other, each ending at the top of its respective strainer zone.

The upper heating zone will increase the temperature from 240°F to, say, 300°F, the second zone from, say, 290°F to 330°F, the blank space between each zone being a dwell zone or equalization area where the temperatures of each individual chip evens out throughout its mass. No further heating takes place, and the chips are retained at cooking temperature according to a cooking graph until they reach the discharge zone some 90 minutes later. To avoid fibre degradation while still at cooking temperature, it has been found most essential to cool the chip mass in the digester shell prior to discharge, before subjection to the action of the bottom outlet device, item 18, a slowly rotating paddle required to break up the compressed chip mass prior to actual discharge from the shell.

Cooling is performed in a manner similar to the heating mentioned above, by introducing spent black liquor at approximately 180°F from the brown stock washing system through a high pressure pump, item 19, and through a small central pipe inside the two heating zone central pipes, and discharging into the chip mass at the top of two further slotted strainer plate sections. Again, the digester shell diameter is increased to maintain a uniform chip plug diameter. With the addition of the cool liquor, the hot high solids liquor is displaced and extracted through a set of screen plates, nozzles, and a header to a flash tank, item 20, where the hot liquor is flashed at 15 psi and the resultant flash steam going to the pre-steaming vessel, item 4.

Although the one-to-one displacement gives the maximum heat recovery from the system, it does not sufficiently lower the temperature of the chips to a point where degradation cannot occur, so further cooling is added and extracted as above to a second flash tank, item 21, where the liquor flashes at 0 psi. Also, the liquor from the first stage flash tank flows to the second stage flash tank and flashes at 0 psi. This

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steam can be piped with the relief from the steaming vessel to a condenser for the production of pulp mill hot water. This system, now referred to as the diffusion-extraction system enables the stock to leave the digester shell at approximately 200°F or less.

This system although installed primarily for uniform cooling with maximum heat recovery, also results in improved brown stock washing. It is obvious that the high solids liquor is being removed from the system before the pulp goes to the washers and can be sent directly to the multi-effect evaporators, thereby reducing the load on the washing system. In effect, we have now introduced a partial washing stage in the digester shell.

Relief of the digester pressure is taken care of in the blow unit, item 22, which is a pressure vessel equipped with a variable orifice blow valve and a rotating wiper paddle to keep the outlets free of knots or foreign materials. The pressure drop is accomplished in the blow line through two valves; and as most of the heat has already been removed from the chips by the diffusion-extraction system, discharge can be made into an atmospheric blow tank.

Having covered the general principles of the system, let us now examine the potential danger points in the system and the steps we have taken to ensure safety of operation.

First, with reference to the pre-steaming vessel—it has been designed for an operating pressure of approximately 15 psi with a maximum pressure of 30 psi. The vessel is equipped with a relief valve discharging to atmosphere in order to prevent overpressure. Since the vessel is filled with chips and steam, it has been necessary to place a screen in the relief line at the point where it is connected to the steaming vessel shell. A small 40-pound steam line is connected to the relief line behind the screen. Periodically the operator will clean the screen by blowing back into the steaming vessel with 40-pound steam.

The lower portion of the steaming vessel is clad with stainless steel for 180 degrees of the surface. This cladding is necessary to combat the erosive action of the chips and the corrosive action of the condensate cooking from the chips. The steaming vessel should be checked at least once a year internally for signs of corrosion.

The high pressure feeder also acts as a sealing valve between the digester which is at 165 psi pressure and the steaming vessel which is at 15 psi pressure. You will note from Fig. 2 that the high pressure feeder is so designed that at no time is the high pressure side of the system connected to the low pressure side. Thus if there is a power failure, there is no danger of a blow-back of high pressure liquors from the digester to the steaming vessel.

The digester shell is designed with extreme care, from the point of view of safety. The smaller shells up to say, 150 tons per day capacity are shop-fabricated to ASME code specifications and are completely stress-relieved and tested to 280 psi, as compared to the operating pressure of 165 psi. Generally, digesters with a capacity of more than 150 tons per day must have field-erected shells. In this case, rolled cans are shipped to the site and the complete shell is erected and welded in place. After welding, all welds are X-rayed. After approval of the welding, the exterior of the shell is insulated and the entire shell is raised to a temperature of 1100°F for stress relieving. After stress relieving, the shell is hydrostatically tested to a pressure of 280 psi at the top.

Since this particular type of continuous digester operates with the vessel 100 per cent of liquor at all times, and since the digester is held at a uniform temperature for months on end, we do not appear to suffer from the shell corrosion that is so common in batch digesters today. The units in operation on this continent today show negligible loss of metal on the shell walls due to corrosion. However, as a precautionary measure, we still include approximately one-quarter inch of shell wall thickness as corrosion allowance over and above the code requirements. It is advisable to audi-gage the shell wall every year or two during the first five years of operation to determine if your particular combination of liquors and woods is resulting in any corrosion.

We have had some history of erosion in the bottom head of the digester at the point where bottom scraper has been discharging the chips. We today stainless-clad the bottom head to combat this erosion.

We have had some history of corrosion in the top head of the digester due to improper relief of the vessel allowing a small vapor pocket to form. We also stainless-clad the top head of the digester shell as a precautionary measure.

The digester shell can be completely isolated from the feeding and discharge system by closing valves 51, 52 and 81. This is normally done when stopping operation for short periods of time due to interruptions in the rest of the mill and in some cases as a regular practice, where mills operate for only six days out of seven in the week.

Since the material in the center portion of the digester is at a temperature of approximately 340°F and the material in the top portion of the digester is at only 240°F, there will be a gradual rise in temperature of the liquor in the upper portion of the digester. This results in a thermal expansion and it is necessary for us to provide a relief valve to compensate for this. This relief valve must operate under difficult circumstances, since the material in the digester is a mixture of super-heated liquid and chips.

The relief valve utilized in this case is valve P10 on the flow diagram. This is set to automatically open if the digester pressure rises to higher than 185 psi. The amount of liquor that has to be extracted from the shell to compensate for expansion is very small.

There is always the possibility that the relief valve would open to compensate for thermal expansion and then would remain open due to being plugged with a small chip under the seat. This could result in draining liquor from the digester shell. In order to combat this we connect the relief line to the shell behind the cooking circulation screens.

We also provide valve 55 immediately ahead of the relief line. This is a hand-operated shut-off valve and should be wired open. In the event of valve P10 failing to close, the operator can close the hand valve to prevent complete drainage of liquor.

The piping on this type of digesting system must be designed to take care of rather large expansion problems. All piping connected between fixed equipment and the digester shell is provided with expansion loops, and in some cases the pumps and heaters are equipped with spring-loaded foundations to allow them to move upwards and downwards with the digester shell.

Special safety switches are provided between the digester shut-off valves 51, 52 and 81 and their connecting piping. These valves cannot be opened until the connecting pipelines have been filled with liquor and brought up to pressure. If it were possible to open these valves without the connecting lines being filled with liquor, the high pressure liquor in the digester would be released at such a high velocity that the feeders connected at the other end of the pipelines would probably be torn completely from their foundations and the pipelines would most probably rupture. Great care must be taken to see that the pressure switches on these lines are not by-passed.

All piping connected to nozzles at the digester shell utilize male and female flanges at the point of connection to the digester. This is done in order to reduce the possibility of blowing a gasket at the digester shell.

We have, in the course of this paper, covered very briefly the general principle of the operation of this type of digester and have enlarged on some of the major facets of the safety features which we do build into the system.

A digesting system such as we have described is simple, and safe to operate so long as the safety features which are designed into it are not by-passed. Thus those people connected with safety in the mill should make sure that modifications are not made to the system without investigating to determine how they effect the safety features which have been incorporated into the original design.

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WHAT DOES TOP MANAGEMENT EXPECT FROM AN INDUSTRIAL SAFETY PROGRAM?

By G. A. OECHSLE
Plant Mgr., Continental Can Co., Elkhart, Ind.

I sincerely believe in sound industrial safety programs.

The subject assigned to me—"What Does Top Management Expect from an Industrial Safety Program?"—could possibly be answered in one sentence: *Management expects a safety program that will reduce industrial accidents and their resulting costs to an absolute minimum.*

I'm sure that each of you could probably agree with me that this sentence is, and well should be, the objective of any safety program worthy of the name. I am also aware that each of you is undoubtedly better versed in the field of industrial safety than I am—so while some of my observations may seem somewhat basic or elementary to you, at least they will give you an idea of what one manager expects from safety.

Although there are some rumors to the contrary, top management people are human beings just like anyone else. First and foremost, they abhor the physical suffering which results from any industrial accident, and when such an accident results in permanent disability, or even death, any of you who have had such an experience will attest that the matter is given the attention of even the highest executives of a corporation.

Most states have statutes which fix the amounts of compensation to be awarded for various disabilities, but who can really set a price for the lost limb, the lost eye, or the lost life? Even if the worker is able to resume active employment, chances are that his future earnings may be greatly limited due to his disability. I am sure that all of you probably have some examples which come to mind, especially in the papermaking industry where you are considered a rookie until you have lost a finger or two in a calender stack.

Another group which may well suffer as a result of an industrial accident is the employee's family, not only because of temporary or permanent loss of income of the bread-winner, or of reduced future income, but also the discomfort and shock of seeing good old Dad laid up, to say the least; or permanently maimed or disfigured, to say the worst.

No good manager can ignore the suffering which can be brought about as a result of industrial accidents, so no good manager can expect less of his safety program than to keep accidents and injuries to an absolute minimum.

Money spent in caring for and compensating those who have experienced needless industrial injuries is pure waste. It adds nothing to the business, and if permitted to get out of hand can well mean the difference between making a profit or not. What top manager worthy of the name can fail to realize the economic impact of unreasonable compensation costs?

This, then—*the keeping of cost to an absolute minimum*—is the second great area of what a manager expects, or should expect, from a good safety program.

I am sure that I do not need to emphasize or even discuss the direct costs associated with any injury. There are, however, *indirect* costs which are associated with any injury that I would like to call to your attention.

1. *Lost production.* This occurs when the injured employee is part of a crew, and, without the injured employee the crew cannot function.

2. *Repairs and waste.* This is something that each year adds thousands of dollars to our cost of doing business and something which management wants to see reduced.

For example, the power truck driver who drives into a retaining wall, or loses a load of cartons or board and a truck off the end of a loading dock. I'm sure this is a familiar area to most of you.

3. *Morale effects—Supervisory time lost.* The effect on the morale of the employees is another cost item difficult to measure in dollars and cents, but can be substantial.

For example, a number of years ago we had a serious flash fire in our gravure printing operation that left two men critically burned.

For a number of weeks it was not certain whether these men would survive, and the effect on the other men in the department was very noticeable. Not only were they depressed, but the quantity and quality of production slipped badly.

Supervisory time lost can be very costly. When we have our supervisors adjusting work loads and other details associated with an accident, he is not being productive.

4. *Partial production.* This can occur when the injured employee returns to the job with a bandaged arm, finger, or leg that might affect his effectiveness on the job.

5. *Training replacement.* We know that in all jobs, whether skilled or unskilled, there is a definite training period needed. The cost of training a replacement for an injured employee is another hidden cost that continually plagues us.

These are five *important* indirect costs of accidents that are not always apparent to our employees, but are of vital interest to management. These are the *costs* that we expect to see reduced under an effective safety program.

There can be no weak or missing link in a safety program. Management must clearly state its policy toward safety, and then must exhibit in every way that it intends to carry out the policy. Mere lip service will be found out at once, and if that be the case, it would be better if no policy were put forth in the first place.

We have all heard the slogan *"safety is everybody's job"*—and it begins at the highest level in the company. To illustrate Continental Can's feeling on safety, let me read you a directive from our division vice president which I feel sums up our top management's policy on industrial safety:

"It is the established policy of the Continental Can Company to consider safety of its employees as the responsibility of the supervisory function at every level.

"The physical injuries and loss of earnings suffered by employees as a result of occupational accidents, as well as the substantial financial loss of production and equipment, can be reduced to a minimum by a successful accident prevention program.

"When we speak of an accident prevention program, we mean a definitely planned and organized program, the purpose of which is to enlist and maintain the combined efforts of the entire personnel of a plant in the work of preventing accidents.

"Current safety programs have resulted in progress in realizing the goal of an accident-free operation. Improved future programs tailored to meet local requirements can, with proper direction and support, help us realize our goal.

"Support of the safety program by the supervisory group at all levels must be active and continuous. If not already existent, the plant manager should publish a clear and concise policy, outlining the management philosophy as regards employee health and safety. Such policy should reflect the manager's personal attitude and should cover the general procedure to be followed within his operation.

"While staff assistance will be furnished by the head office and division industrial relations department, the responsibility for the local accident prevention program *rests solely with the plant manager.* The division supervisor of training is responsible for reviewing the progress in safety of each location and reporting to me the status of safety activities throughout the division.

"I will follow with personal interest the safety activity progress of each plant within the division."

To get practical and illustrate how an active and effective safety program can work for you, I would like to outline an example of what happened at our Elkhart, Indiana plant:

We have had a dramatic lesson in the past few years as to what the cost of serious accidents can be, and also what can be done when an all-out effort is made by labor and management to correct an intolerable situation.

For the past several years we had experienced a gradual increase in our frequency rate. In 1959 we experienced *fourteen* disabling injuries, four of which were very serious and costly, and our severity rates had gone up accordingly.

We as a management group decided that something had to be done to reverse this trend. Being rather practical-minded, we also realized that there is no short-cut to a successful safety program. Gimmicks may add a little spice, but soon lose their effectiveness.

Up to early 1960, safety at our plant had been mostly a unilateral function on the side of management. As some of you may have heard, we were blessed with a strong union, and a labor leader who seemed to be some years behind the times in labor-management relations. We still decided to

invite the union leadership to join with us in combatting our mutual problem, because it is my opinion that if there is one area in which labor and management would seem to have identical goals, it is in the area of *industrial safety*.

We found that we and the union could agree that safety was a mutual problem, and so with the union's help we set up a 1960 "Safety Kick-Off Meeting." This was attended by all members of supervision, and by all officers and stewards of the union.

We had a quick-moving two-hour meeting, with short talks by the union president, the plant manager, and several experts on safety from both our company and our insurance carriers. We outlined our problem, and our program for the ensuing year. The meeting was followed with a modest luncheon.

The program we adopted for the year had to do chiefly with re-vitalizing our existing safety organization, and with selling our supervisors and the union that we intended to see that the program was carried out in all phases. We have a rather basic organization, with three levels of safety meetings: hourly committee and foremen; foremen and superintendent; and a central committee of staff and line department heads. We also hold approximately three meetings per year which are attended by all employees.

Without any attempt at modesty, I am happy to say that in 1960 we went a total of 283 days without a disabling or lost-time injury, for a total of 1,151,506 man-hours. We went from 14 lost-time injuries in 1959 to just two in 1960; and to date in 1961 have had just two, both of minor severity. We have gained considerable notice in our community with our safety progress, and believe me—that's the kind of publicity we love!

I would like to sum up what I feel that we as management expect from an industrial safety program:

1. Top management must first believe in and forcefully state its policy on industrial safety, and must definitely designate the responsibility down through the line organization.

2. Management expects its staff people, safety director, personnel manager, and medical department to establish and maintain an effective safety program.

3. Management expects its managers, superintendents and department heads to believe in and actively support the safety program, because they are in the best position to motivate the supervisors.

4. Management expects its line supervisors to be the motivating force behind any program, for they are in the best position to pass on to the employees the policies of management, and are also best able to report back to management the safety problems and suggestions of the hourly workers.

5. Management expects its employees to follow established safety rules and to use safety equipment provided; and it must hold the individual employee responsible for his actions as they affect his safety.

Through these efforts we expect a reduction in crippling accidents and the tremendous costs related thereto.

There is one underlying message I would like to have you take with you, and that is that management *expects* and must *insist* on "results." And if we use the same insistent, persistent attitude toward safety as we do our daily production and manufacturing problems, we will attain these "results."

JOINT SESSION WITH WOOD PRODUCTS SESSION

SAFETY IN PULPWOOD LOGGING

By CHARLES T. WRIGHT
Safety Eng., American Mutual Liability Insurance Co., Raleigh, N. C.

Last February, I had the pleasure of meeting with the Safety Section of the American Pulpwood Association in New York at their annual convention; an informative meeting.

Many constructive ideas and plans were developed. However, on several different occasions, I heard the supposition mentioned that a rather wide difference in educational levels exists between worker groups in the woods in different geographical areas of the United States. Somehow, this so-called "educational level" was getting the blame for differences in work methods, types of tools, etc., between different geographical areas. The impression was left that this somehow created an insurmountable problem safety-wise. Nothing tangible, mind you, just an impression.

For instance, one man gave an opinion that this "educational difference" is the reason the bow-type chain saw is used down South while the blade-type saw is used farther North. I leave it to you to judge whether or not this is signficant in the measure of accidents.

I mention all of this only in making the point that we sometimes use pointless and often unrelated excuses for not having effective accident control in our operations. Is it not a fact that when we have a problem to cope with we must take *whatever* approach and action is necessary to an effective solution? You might say that "Teddy" Roosevelt's policy of "walk lightly but carry a big stick" meant that when he had a tough problem he managed to get just a little bit tougher and solve it for a desirable solution.

About two years ago the North Carolina Forestry Association decided something had to be done in the logging and lumbering industry in North Carolina, as a whole. Putting their decision into action, as a first step they organized an insurance committee and began doing research analysis to determine just what the reasons were behind the high cost of insurance in logging operations.

The committee, after much study, found out what insurance companies and the various state labor and compensation departments had known for some time. They found that while a number of factors were actually involved, just one major item was visibly responsible. What was this? Just this: The logging industry was having a high frequency of accidents which were, for the most part, of a rather severe nature. That is, they were costing a lot of money in hospital bills, doctor bills, and in many other tangible, directly related ways. All of this cost was in addition to the very high cost of inefficient operations which resulted from the same *basic* causes as the accidents.

What are these *basic* causes? The most important, at least the most basic and most in need of immediate attention, were:

(a) Lack of adequate top management safety policy.

(b) Poor to no enforcement of any existing policies.

(c) Poor liaison or supervision between management and field.

The basic lack of top management policy had resulted in a disparity in equipment, tools, etc., used in the woods. A nearly complete lack of adherence to any safety standards existed. In a nut-shell, everything was wrong. Something had to be done about it.

On receiving the committee's report, the North Carolina Forestry Association and the North Carolina Department of Labor, who had worked so effectively in development of accident prevention in other industries in the state for so many years, called on some of the insurance companies' safety engineering departments to work jointly toward the attainment of the safety objective dictated by the high accident frequency referred to earlier. American Mutual hap-

pened to be one of those available and willing to do everything within reason to help.

The over-all record in both the pulpwood and saw log experience indicates that a lot of people have either forgotten some of the things they do know, or else they just aren't taking time to plan ahead and be guided by the things they have learned.

The main points we are trying to make here are:

First, people who are concerned with pulpwood in its various phases of production and use, go to great length to assure full growth and high production of pulpwood timber, but give *considerably less* attention to safety, in either the use of proper tools and equipment or in training workmen in safe work methods and practices.

Secondly, I would like to show that these same people are capable of accomplishing the latter by showing evidence of certain types of effective planning which they are doing, in a contrast comparison to some of the weak points where planned attention is missing.

Workmen's Compensation insurance carriers and other organizations, as well as individuals interested in safety, found many years ago that high accident frequency and severity go hand-in-hand with low operating efficiency, and therefore, result in high operating costs. The same sound engineering principles that can and do control accidents will normally produce highly efficient operations as well.

Safety in pulpwood logging can also mean efficiency in pulpwood logging.

The forest in North Carolina is third-ranking in product value in the state. It produces approximately $750,000,000 in product value annually. The forest is second only to textiles as a source of industrial employment, furnishing 78,000 jobs. The total annual payroll amounts to approximately $243,000,000.

These figures give us a basis by which we may estimate the value of safety as an efficiency factor. They also provide a measure of exposure to accidents and suffering in the industry as a whole. A relatively high percentage of this exposure, and certainly the majority of severity is to be found in the log woods.

The forest, in most any area, is a beautiful place, that does not readily reveal the vast number of hazards that lie there waiting to trap the poorly equipped, the poorly trained, or the careless pulpwood worker.

The great progress that has been made in controlling and improving the growth of forest timber is phenomenal, to say the least. Read the story in growth rings. Is there any doubt that the same brainpower that has developed such control could also develop controls that would prevent accidents and suffering to workmen? No, I'm sure there isn't.

There are examples of the results of very poor or no attention to *planned* forestry. Misshapen and damaged sections of trees which you often see are proof that many men in the pulpwoods are operating or have operated unsafely and without planned control of accidents.

An outstanding example of control of timber growth is found when a tight intersection of growth rings indicate the forest was being choked off by too thick growth for the first 15 or 16 years, but after thinning, the width of the growth rings increased immediately. Such a tree grew as much in the last six years after thinning, as in the 15 years prior to thinning.

When you see planning in action, the forester marks the butt of a tree, using a yellow dye and a manually operated pressure can. The tree is marked also at a higher point. When this tree is harvested, it will be cut because it is marked, and the stump, left in the ground, will show the mark. Trees that are not marked will not be cut. This is planned thinning.

The forester checks height of trees, and measures diameter. Often he takes a boring sample as a means of checking width of growth rings to determine rate or speed of growth. Seedling trees are used in reseeding clear cut land.

Certain tools should be available and used by pulpwooders in the woods. Fire control items are a must for a well rounded control plan. Unfortunately, on many woods operations, we do not find these items.

Woods workers must learn basic safety precautions. Often you may find a man filling a chain saw gasoline tank by using an unsafe type can, perhaps with a spout too short and too large to enter the opening in the tank. Gasoline is often spilled on

saws with this type of unsafe equipment. This creates a rather serious burns hazard to the operator, to say nothing of the potential for setting fire to the entire woods area. Explosion is also a major accident producing potential.

Another unsafe operation is often found in starting the saw. On a very still day, the fumes that have risen from the gasoline filling operation are still hovering in the area. When the saw is started, the fumes may be ignited. If the unsafe gasoline can is too close, this can, and probably will, start a fire. It isn't necessary to explain the many heartaches that could result from this unsafe practice.

When felling a tree, the men should be properly equipped with safety helmets. When a tree is over 10 inches in diameter, it should be notched before cutting, in order to be sure of controlling direction of fall. Many other things must be taken into consideration but this is a primary need in directional control.

The men should be warned about felling a tree without first properly clearing or "swamping" on the back side of the cut, although the opposite area is clear enough to allow a proper escape route.

When you see a man pushing the tree with his hand, to control direction of fall, this puts him in a rather awkward position. Obviously it is necessary that he push the tree, because he *has not* notched it. It is all right to push the tree, but this should be done by another man with a pole long enough to reach well above the man using the saw.

When the tree falls through brush that was not properly cleared before the cut was started, the brush could whip back and strike the eye of the sawyer. A man experienced in this type of occurrence usually will turn his head well away from the potential whipping brush. However, this does not constitute proper protection. Certainly the man should have spent just a few seconds clearing out the area before cutting, thus minimizing the exposure.

When a felled tree has lodged on the heavy limbs on the underside, the sawyer may limb the tree by cutting underneath the log to remove the supporting limb. This means a high probability of the tree falling and causing injury to the man. He should have properly blocked the tree to prevent its falling. Better yet, proper study of the tree would probably have dictated falling the tree in another direction where there would have been no blocking limbs.

When a sawyer is cutting tree into pulpwood lengths without proper support underneath, his saw will probably hang, creating additional hazards in trying to loosen the saw. It is conceivable that damage could be done to the saw causing interruption of work. Need for proper shoring here is obvious.

Woodsmen must be always on the lookout for the "widow maker" (broken limb hanging above men who are preparing to cut a tree below). Any disturbance of this broken limb could drop it on a man's head or shoulders.

At times you may find a sawyer breaking just about all the rules of safety in felling a tree. You can see that he does not have on a safety helmet. He is pushing the tree with his right hand while holding the saw with his left, throwing himself into a rather awkward position. Then you'll observe the vulnerability of his head to any loose or dead limbs that may be overhead and become dislodged. The brush is so thick that the saw could hang and cause it to jump into the man's leg. Worse, the brush will probably obstruct his escape route. In addition to creating unnecessary hazards, this is a case in point of complete *inefficiency* in the woods.

After the cut the tree may hang suspended in the air and the men are going to have to cut other trees before they can drop the intended one. This means they will expose themselves to serious "falling objects" hazards.

Proper pre-planning for direction of fall and good clearing would have allowed a clean fall to ground. This further demonstrates what we mean when we say safety and efficiency are one and the same.

When a small tree is bent over by the tree that hung, the man cutting it with a hand axe may be setting up a dangerous situation by cutting from the top side of the tree rather than underneath. With his first cut, a long sliver splits off and springs outward. This frequently causes injury to either the axeman or other personnel. This is a completely unnecessary operation that

could be eliminated or avoided if proper planning is utilized in the first place.

Fortunately, there are occasions in the woods when you see a little more planning for safety. The men are all wearing safety helmets, and are properly dressed otherwise. The sawyer who will be wading out in the swampy areas is wearing snake bite leggings in addition to the safety helmet and good protective clothing. Men with yellow helmets are supervisors. You may see the producer who stays with and supervises this particular pulpwooding crew.

You will see one of the sawyers approaching the tree, with his foreman looking on. The sawyer will be sizing up the top, determining best direction of fall, etc. He will take into consideration shape of top, location of other trees, direction of wind, velocity of wind, most advantageous point on ground for limbing, etc.

Prior to cutting the tree, the sawyer will use an axe to swamp out around the tree or clear the area for freedom of movement and safety. This is being done to prevent saw from hanging and jumping into his legs and also to give him a clear path to get out of the way of the tree when it begins to fall.

When the sawyer is making a cut, in the properly cleared area, he will be using both hands on the saw. This demonstrates what we referred to earlier. That is, the sawyer can hold onto his saw with both hands while another man uses a stick with a sharp point that will reach up some 10 feet on the tree for the purpose of pushing so it falls in the proper direction. And the supervisor will be looking on.

The limbing operation with chain saw presents the hazard of the saw hanging in brush and jumping into the legs. Severed limbs should be moved out of way as they are cut, as a means of improving controls over this potential accident producer.

A limbing operation with an axe should be done on the opposite side of the log from which the axeman is standing. Loose limbs also present a very serious hazard here in that they may be deflecting the axe into the person.

In some operations, logs are snaked out of the woods into a clear area for additional cutting and loading. There will be a protective cover over the tractor cab. This protection is a must for safety of operators. The hard hat will protect against relatively light limbs, etc. and will give a measure of protection against larger trees. However, the sturdy cab protector is necessary for full protection of the operator.

One of the most hazardous situations in logging is found where a man is operating a *farm type* tractor which shouldn't be in the woods in the first place. In addition to the fact that it does not have any protection overhead this machine is not designed to snake logs. The tow chain is positioned *above* line of axle.

The center of gravity, that is the line of force, is located well above the axle and if the log hangs, the tractor can turn backwards onto the driver. This frequently happens.

In a specific accident resulting from one of the farm type tractors turning backwards on to the operator occurred recently down near Beaufort, North Carolina. Investigation revealed that the operator was 15 years old (violation of the North Carolina Labor Law) and had been placed on the tractor without any previous experience, although he had told the pulpwood producer that he had driven a tractor some place before.

At any rate, the log being towed by the tractor hung against the stump and the youth's foot slipped off the clutch and the automatic drive caused the tractor to turn backwards and crush the young fellow. The details of the investigation of this accident are too numerous to mention here but they did reveal many areas where planning was lacking and apparently absolutely no attention was given to safety of workmen.

Another major producer of accidents is lifting and handling of heavy materials. This produces serious strains. The safe handling of material requires a thorough knowledge of the correct way to lift; requires putting this knowledge into practice at all times, not just part of the time. It is estimated that manual loading of logs is practiced in approximately 90 per cent of the cases.

If anyone doubts that loading a truck of pulpwood logs is a big job, just multiply the weight of the log (about 80 to 90 pounds) times the distance it is handled, times the number of logs on the truck and you get a pretty good idea of the foot pounds of energy expended during a loading operation.

The man on top doesn't have an easy job either. He faces a number of very serious accident producing potentials. For instance, we could list the strain hazard from the lifting and handling of the log; the falling objects hazard in case he drops the log; the hazard of falling off the truck. Spikes should be worn on the shoes of the top loader. Just imagine what would happen if he makes a misstep backwards, or if a foot slips on loose or slick bark.

You may often find the wood being loaded by a man much too old to be straining and lifting in the log woods. Better selectivity and job placement would control this needless exposure.

An example of poor planning found recently was in the elevation plates welded on a truck bed to keep the logs off the tires. They were too small. The man has to cut short timbers to lay lengthwise on the bed to keep the logs up off the rear set of wheels. This lack of effective planning is symptomatic; may be a major cause of woods accidents.

Badly worn tires are hazardous. A blowout on the road means, at the very minimum, a spilled load and a reloading operation, (again we have *inefficiency*). It could mean many more things, such as a severe wreck, death, collision with some other vehicle, and death or permanent disability to several people rather than one.

We have found there is some effort underway to reduce the exposures to accidents and to increase the efficiency of pulpwooding operations. Machines have been designed and built by people who have had many years of experience in pulpwooding. Such a machine can go into the woods and pick up a load of pulpwood, one stick at a time, load it onto a cradle, hook on and drive out to a more convenient pick up point for transport trucks, in an extremely short time. All of this is done with just one man at the controls. This man controls the pickup arm and does all the driving of the tractor. All of his pick up, handling, loading, etc. is done long after the sawyers have dropped the tree and sawed it into pulpwood lengths. This eliminates exposure to others being near by.

Obviously, this machine can take a lot of work off the individual and it is not nearly so subject to strains, injuries from falling objects, etc., as a man is. Unfortunately, all pulpwooding operations cannot afford such a machine. What they have to do instead, is to properly equip their men with the best available, properly select the men to do the job, outfit them with safe clothing, and teach them the correct way to do the work. Sufficient supervisory follow-up is absolutely necessary to see that this is done.

It is reassuring to find a logging outfit that has taken the trouble, and felt it economically worth while, to construct a good useable road for access into the logging area. We'll find the foreman of the wood crew equipped with safety boots and safety helmet.

He will have the safety devices necessary for topping out trees on the stump, or for setting up derrick rigs for skidder operation where high water is a factor. The man's spikes are sharp and workable. Those rubber boots he is wearing have safety toe-caps.

Another safety type shoe shows the proper method of wearing trousers tucked into boots to prevent hanging on snags, etc. when trying to get away from a falling limb or tree.

We photographed a work truck with a lot of unsafe features:

1. Gasoline cans were carried on the same truck with workmen. (Unsafe type at that.)
2. The safety sides or cover over the truck only extended part way back, certainly not enough to fully protect a truck load of men.
3. There was no tailgate to protect men from falling out at the rear.
4. The truck was not equipped with a rear bumper and we doubt seriously if the lighting arrangements on the truck met highway standards.
5. Preventive maintenance was obviously lacking.

Another better rig for hauling men, not considered completely safe, did not have proper type seating. The truck did have a tailgate, was equipped with a complete cover and carried fire extinguishers and first aid kits.

Additional hazards inherent in log woods operations include the black widow spider, timber rattler, copperhead and cotton-mouth moccasin.

Yes, the log woods are beautiful, but such a small thing as an axe with blade up can

be compared to the copperhead—just waiting to strike. A small thing, but it's the small things that accumulate and result in big losses. Many times it's the small things we do and fail to consider important that create our most serious accident occurrences.

Most any way you go in the log woods you find beauty. You also find many hazards, many places where men can be badly injured or killed. Careless workmen can injure themselves and others, they can start fires that will damage millions of feet of timber, and destroy wildlife that furnishes sport in hunting and trapping, for people who like the outdoors.

Proper planning, proper outfitting, careful selection of employees, training of employees, and sufficient supervision to see that this training program is carried out on a continuing basis, can prevent such happenings.

THE FUTURE OF TWO-WAY RADIO IN LOGGING SAFETY

By DONALD R. JONES
Mgr. of Marketing, Mobile & Portable Communications Products
Motorola Corp., Chicago

Your presence here today marks each of you as an expert in safety. As representatives for your company or governmental agency, your principal objective is to further improve safety programs and to seek out new tools which will aid you to reach your objective. My purpose is to provide you with information about two-way radio—a working tool which can assist you in your efforts for greater safety.

How can radio help you? Many ways! There are many examples of companies who have successfully employed two-way radio to improve their safety record. The problems of safety programs are not simple to solve. Each of you has specific problems. Effective use of radio in one particular application to provide improved safety for one of you—will not necessarily be what is required or needed by the man next to you. Nonetheless, the results achieved in some applications can provide insight to possible other applications.

I will have accomplished something worthwhile if one of you takes away the germ of an idea, which when further developed, will increase the safety in your organizaion. I shall spend my time exposing some sample applications of radio equipment to safety programs. I hope that the examples will stimulate your thinking and result in solutions to your particular problems.

First, radio can provide you a means of communication which no other medium can provide in your particular working environment. Practically all operations today require a high degree of mobility. Without the application of radio, the person on the move, whether on foot or in a vehicle, is out of contact—unable to be reached until he checks in at various times during his tour. Lack of communications due to the requirement of mobility can make management substantially more difficult and operations far less efficient. For you, it may make an effective safety program impossible.

A good example of the use of radio in a safety program occurs in the trucking industry, which has had a substantially bad safety record. Two-way radio has become a common operating device for truck fleets in various industries. Expanding its use from the usual status as a means to increased efficiency to a place in the company's safety program has proven to be rather profitable in several large fleet operations.

In one trucking company, for instance, radio is installed in the vehicles used by the firm's five very active safety coordinators. The radio keeps the inspectors always available so that they can be directed to any place their presence is required—at the scene of an accident, for instance. More important, the radio communication allows the supervisors to prevent accidents because they can continually check the drivers.

By monitoring the radio channel, the inspectors can determine the location of the company trucks. It is an easy matter, then, to follow and watch for poor driving habits. This procedure allows the inspectors to pick out those drivers who need to improve. Further, since the drivers do not know when an inspector may be near by, they tend to use safe driving habits all the time. This company has improved its safety program with this procedure. It could not have been accomplished without two-way radio.

In another industry, ready mix concrete, the value of radio is looked at in a different way. One company reported that its safety record was in poor shape—so poor that the insurance companies were inquiring about it. With the aid of a radio system, this company built its safety record to the point that it was specially honored by the National Safety Council. How was this accomplished?

In this company, many of the dangerous situations encountered by the drivers occur not on the road but at job sites. Much of the safety supervisor's time is spent traveling from job site to job site for routine inspections. Radio has been installed in the supervisor's vehicle. Now, when a driver encounters an apparent hazard on a job site, he does not proceed. The driver contacts the safety man, by radio, and he moves to the job site immediately and sees that the hazard is eliminated. This procedure has substantially helped efficient and timely delivery of ready mix concrete and once again the safety record was improved.

Portable two-way radio has been successfully applied in the construction business to provide greater safety. A company engaged in the erection of steel frame work in multi-story buildings has made good use of radio. The crane operator unfortunately does not always have good visual contact when moving a girder into position. This lack of visual contact allows some potentially dangerous situations to exist while the beams are moved.

These dangerous situations were eliminated by providing the foreman with a pocket sized transmitter and placing a radio receiver equipped with a loud-speaker accessory in a central location. The foreman can use the transmitter, no matter where he is located in the structure, to talk directly over the loud-speaker. He can give instructions to the crane operator or the rigging crew and everyone is simultaneously alerted. All personnel on the site are now aware and alert to girder movements and safety is maximized.

There are more specific examples of which I am aware and thousands of which I am not aware. The point made is that the ability to communicate alone can substantially enhance your safety program. The ability to get the right person to the right place at the right time can prevent accidents. Most of you have operations which require movement of personnel and equipment so that they cannot use standard wire line communication.

Radio is the only answer. In many cases, the increased efficiency obtained through the use of radio in your operations can more than cover the cost of equipment purchase. In these cases, the increased safety is a bonus. In other cases, the increased protection to life and property will fully justify equipment purchase.

Let's move to some specific examples closer to your interests; namely, the logging industry.

One of the most modern methods of signalling in yarding operations is a radio device known as the "Talkie Tooter." With this device, members of the rigging crew can directly control the Yarder whistle. Through the use of a whistling coding system, everyone in the area is kept informed and alert to movements. Keeping the working crew alert to movements makes the operation substantially safer.

Use of the Yarder whistle as a method of signalling was in use prior to the application of radio. It was handled by running a wire line from the Yarder to the point where the rigging crew was working. One man was assigned to the job of controlling the whistle from the wire line. This was the man's only function.

The application of radio, then, did not improve safety, but it provided a means to have equal safety at substantially lower operating cost. The man previously assigned to controlling the whistle is no longer needed because the rigging crew chief can control the whistle directly from the small transmitter which he can carry on his belt. This allows the crew chief to move about freely and perform all of his normal functions.

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Credit for applying radio to the specific requirements of the logging industry, in this case, goes to Rotlenbuhler Engineering of Sedro-Wolley, Washington. This company has taken this standard radio product and added modifications which perform the signalling function. The system works like this:

The rigging crew chief carries a small transmitter which has an encoding device added. When he wants to actuate the Yard whistle, he depresses a lever switch on the belt unit in accordance with the predetermined code. This signal is transmitted to a mobile receiver with a decoder unit which is mounted in the Yarder. The signal is received, decoded, and actuates the whistle. When a situation arises not covered by the code, a voice message can be transmitted from the belt worn unit to the Yarder.

This is a relatively simple system, but it is effective and reliable. It satisfies the safety requirement and at substantially lower cost. One logger using "Talkie Tooters" on three sides, reports that he saves $1,200 per months because he needs three less men. He paid for the equipment in less than four months of operation.

An extension of the "Talkie Tooter" principle was outlined in an article in the January-February 1961 issue of the *Western Conservation Journal.* It was written by John Gruddall of the Skagit Steel and Iron Works. The article describes a system which combined a radio controlled sky car with a Mobile Logger, equipped both as a grapple loader and a self-propelled mobile tower to support the sky line. In this system, the movement of the sky line carriage and the choker lines is radio-controlled by the rigging crew utilizing the same "Talkie Tooter" which I described. The system provides efficient operation with maximum safety because movements are controlled by the workman who has visual contact.

This example represents a case where remote control of machinery is provided through the use of radio. It is probably in the area of remote control of equipment, or automation if you will, that great advances in equipment application are yet to be made. And it is here, that radio will play an important role as the communications link required to provide the remote control. Unfortunately, standard products will not generally be available for this purpose because each system will have a uniqueness. But standard equipment will provide the necessary building blocks for our systems engineers to provide workable, reliable control systems to help solve operational and safety problems.

I shall not take your time here today to review the many standard radio products which Motorola has available. Many of you are already quite familiar with our line. I would like to mention two specific products, however, in our portable line of equipment, since portability is so important to many of your operations. One unit is a fully transistorized pocket transmitter with an R.F. power output of ½ watt. The smallest, lightest, most reliable communications class transmitter yet made available.

Another unit is a fully transistorized pocket receiver with performance equal to that of any good mobile communications receiver, except for the antenna efficiency. These two units combined can provide easy to carry, two way voice communications never before possible. The ability to communicate with the roving man on foot without burdening him with a large package to carry, has opened up new applications in many industries. Perhaps some of you can already see where equipment of this type can aid in your programs.

In a brief period of time, we can only scratch the surface of the possible application of radio to safety programs and your business in general. I hope that some of the examples and equipment applications discussed may have application in your operations. As a manufacturer, it is our responsibility to learn about your industry and your problems so that we may demonstrate to you new systems which can benefit and serve you. Our representatives in your area stand ready to assist you in working out answers to your communications problems. Call him in on your problems. Motorola has the systems engineering department ready and capable to evaluate your problems and recommend solutions. Motorola is expert in the communications business, but no one knows more about your business and problems than you. With our combined knowledge, I know that systems can be evolved which will aid you in your safety program.

PRINTING & PUBLISHING SESSIONS

THE CRAFTSMEN'S INTEREST IN SAFETY

By MICHAEL IMPERIAL
Mgr., Finishing Dept., Skinner Kennedy Co., St. Louis, Mo.

I have had a very busy schedule the last month traveling practically all over America. I have visited many, many printing plants and I think I can speak from experience, from visitations, and also from my long experience in actually working at the trade with my hands, and I have the hands also to prove that some 32 years ago I thought I was smart but machinery is just a little smarter than we are.

In my opinion, I think that our safety programs are essentially based on good communications. Without communication, all the posters, all the backing up of management, and so forth, is of very little use. Back in 1958 the firm that I work for now had many small accidents in printing plants. Incidentally, the principal supervisory capacity I have at Skinner & Kennedy is with about 80 per cent ladies and about 20 per cent men.

We find that in any bindery there is room for human accidents, made by the human being. They are not accidents that ordinarily would have happened. They happened because we want them to happen—carelessness. I think that we as supervisors—I consider myself in the supervisory field rather than the top echelon—we carry the ball. We are the men that make safety worthwhile. My job is production, getting things done, getting them done on time. And many, many time our workers will sacrifice not only production but their limbs and their lives for the sake of doing things easily. It is up to the supervisor to create an image and an attitude, and I like to use the word "willingness." If people don't do things willingly, then they don't understand them. It is up to the supervisor to create that image and that attitude of doing things willingly, have them understand what safety does and what it means.

Communication. Let people understand what we are trying to say. Reverting back to 1958, in our plants we had many accidents. At that time I was chairman of the policy committee and I knew the advantage of having a safety program that would work. We didn't want management to run the safety program. We wanted their backing but we supervisors wanted to run the program. We have some fifteen supervisors in the plants and we delegate three each month, and one person to be chairman. They go through the building and inspect every known hazard there is. We had a report that we would make out. But this is the thing that is important. Reports are no good unless they have teeth in them.

If there were violations, the report would go directly into the department that was responsible for it. If they weren't corrected in ten days, they would go to management and then management would see that they were abided by. That is where we need the support of top level management. Without their support, a safety committee is of no use.

Then each month you would have three new men that would find some of the hazards that the other people wouldn't find, particularly in the department that they were working in. They overlook some of the hazards in their own department. But when you had a new chairman and new group, they would find the faults in these other departments. The thing we liked about this program, which I believe had the greatest amount of benefit, was that some supervisors weren't in favor of safety, but once they were on the committee, they too became enthusiastic and willing, and once they became willing, you had a safety program that would work.

It is important that the individual worker understands safety for their own good. We say that safety *sometimes* holds up production. It certainly does. If we were to be selfish, we would admit that every accident that we have in our printing plant costs money. It holds up production. In a bindery operation, if you take a girl from the street and try to break her in on a given operation, it takes from three to six months to become anywhere near proficient. If that girl should be hurt and you start a new operator, you are holding up production and it costs money. Safety does not cost. It pays.

SAFETY LOOKS TO MANAGEMENT

By O. R. SPERRY
Senior Vice Pres., R. R. Donnelley & Sons Co., Chicago

There are no unimportant people in the printing industry because wages and salaries comprise well over half of the cost of our operations. Therefore we are dependent upon people for our existence, and when we are dependent upon something, it is not expendable. So, strictly from a cold-blooded and hard-nosed business standpoint, to maintain the safety of our people at the highest level is a profitable endeavor.

I doubt whether this opinion is generally shared by all of our top management people. If it were, I think we would find greater interest, greater concern and, above all, greater participation by these VIP's in safety. The big question is, how interested is the top management of your company in this subject?

The title that was assigned to me is "Safety Looks To Management." I imagine that if this were erroneously printed in the advance notices of this meeting to read—"How We Can Eliminate Safety Programs Because Safety Programs Cost Money"—most every one of your top management people would be here. If there is anything lacking in industrial safety today, it is too much tolerance and not enough demonstrated personal interest on the part of top management. What I have to suggest on the subject may be more properly directed to your top management, and may more appropriately be entitled "Safety Looks To Management For Help"—or, "Safety Depends Upon Management."

First, let's discuss management participation and management support and I emphasize *participation* — not just approval. Now the term "management" is relative and must include every level of management from the first-line supervisor to the president of the company. Assuming that any first-line supervisor not interested in safety would be replaced, let's talk about higher echelons of supervision.

Of course we don't expect that the chief executive officer of a corporation will participate in every meeting of a safety committee, but we can expect that he will be kept informed, and that he will communicate to this group in such a manner that they know he is informed, and, above all, that he takes serious interest in their accomplishments (and, conversely, that he is seriously disturbed if there is a lack of accomplishment). People like to know that the big boss is aware of what is going on, and who is involved, in areas of activity other than the bread and butter operation, mainly those in the field of quality, service and production.

It is my belief that most of the people in top management have to be pushed, urged, egged and, above all, staffed, on this phase of managerial function and of course that is the responsibility of the person who is in charge of the safety program.

And it is a continuing chore on the part of this person, because if there is anything that can cause this activity of safety to bog down, it is a one-shot program without regularly repeated boosters.

Now, about "management support." I'm not referring to the normal day-in and day-out approval of expenditures for a series of safety posters—meetings on company time —improved first-aid kits and the like. I am referring to the enthusiastic support of safe

practices, rules, regulations, policies, etc.; enthusiastic support of always making safety first in the order of importance of any and all company policies. And, included in the term "enthusiastic support," I refer to backing up the line management organization in support of strict enforcement of safety practices and rules—most of which are developed as a result of experience (and sometimes sad, bitter and costly experience). I happen to believe that there is no such thing as a workman being "accident prone." It is a worn out cliché. What I do believe is that to the extent that management will tolerate the repeated use of unsafe methods of procedure and, of repeated carelessness, a workman may repeatedly sacrifice safety for production, and consequently be more susceptible to accidents.

Let me give you a case example. A number of years ago we had one particular man out of a group of several operating similar machines—and by comparison it was a relatively hazardous operation. As a result of experience, we had developed a safety procedure for handling the product on this operation that actually reduced the daily output of the operator. This particular man was an exceptionally efficient operator but on the liability side in this case he was allergic to any change that reduced his output. Now this is a most remarkable asset except that it cannot be tolerated at the expense of sacrificing safety. If safety is first in the order of importance, and it well must be, then there is no choice but to make something else second, and since quality was not involved in the case at point, it was production.

This man insisted on reverting back to what we had previously determined were unsafe practices and the foreman finally had to demote him because he was unable to change his habits. As a result of the change, the unit cost of the operation increased considerably, because this man, by comparison, was our highest producer to the extent of some 20 to 30 per cent, under any method. Here was a case where safety looked to management (for support) and got it—and it is a good thing that top management did support it, because I was the foreman. A reflection on the supervisor for not being able to change the man's habits—certainly—but a clear-cut case of safety first, meaning what it implies.

Another basic factor, not specifically related to management but in my opinion, one that may be too often overlooked in safety promotion, is that of "change." Unlike the philosophy of "let us not change simply for the sake of change," when it comes to retaining worker interest in safety, "change for the sake of change" is the life's blood of the program. I'm not in any sense referring to the development and maintenance of safe practices and procedures, but specifically to the gimmicks, the glamor the novelties, the attractions that will keep people conscious of and interested in the subject of safety. In this field, today's standards are tomorrow's antiquities.

Have you ever noticed that the completely demolished automobile that you occasionally see in the main circle of a small town to remind motorists of the terrible consequences from reckless driving, usually impresses the tourist who is driving through the town, but a week after it is put on display, the townspeople walk by it countless times without ever seeing it. It's old hat and they are not interested until the display is changed after someone else has been killed. The same is true in our plants with respect to safety posters, safety records, and other conventional procedures. Let's change for the sake of change. Let's constantly look for something new, something different, something novel, and then remember that when you find it, change it — frequently. Safety committees are rotated frequently and each committee should be charged with the responsibility of coming up with something new, novel and different to keep up the workers' interest in safety.

Now, in conclusion, I want to touch upon what you may call a cold-blooded approach, a thought for attaching more significance to the factor of frequency of accidents that we are in the habit of attaching to the factor of severity.

If we are ever to reach perfection and eliminate accidents entirely, we would automatically eliminate both of these factors. We of course know that we will never attain that goal. However, I do believe that if we succeed in effectively reducing the frequency of accidents, we will automatically reduce the severity factor. This same philosophy worked at one time in our company when applied to the principle of spoiled work. "Spoilage" we called it, where every

item of cost related to repairing a defective product had to be isolated, classified and accounted for separately in each instance. We laid so much stress on frequency, that taking out a spoilage job number became a reflection of sin. In one particularly large department having almost a thousand employees, the idea took hold so well that anyone who caused a spoilage was actually frowned upon by his co-workers and, as a result, in one year that I recall, the frequency was reduced by 50 per cent and the severity, in this instance, the cost, was reduced by 90 per cent.

I believe that if we attach enough importance to frequency in our safety programs, so that we will take corrective action to reduce frequency, we may be saving a person's life. We need disciplinary action to reduce frequency and when we get it, we will reduce severity.

Yes, it's just good plain business sense for safety to look to management and for management to support safety.

WITHOUT KNOWING IT YOU MAY BE KILLING YOURSELF

By ALFRED A. JASSER
Chief Chemist, Anchor Chemical Co., Inc., Brooklyn, N. Y.

Safety is everybody's business. Members of the National Safety Council especially should be aware of the hazards present in our industry. We owe it to ourselves, to our employers and to the men under us to spread the word and the habit of practicing safety.

Directors of safety know that workers are safe workers if they have the proper knowledge of potential hazards and the correct attitudes toward their jobs and the tools and equipment with which they work.

Practical psychologists, and I guess every director of safety has to be one, recognize that one of the most powerful forces controlling human conduct is the desire for self preservation.

That in a nutshell, is the reason for the startling title for my talk on the chemical hazards in the graphic arts. Its purpose is to bring to your attention the little known but definite dangers that lurk within some of the materials many of us use in our everyday work.

For purposes of discussion, I classify these hazards into three groups:

1. The danger of fire.
2. The danger of toxic fumes.
3. The danger of skin ailments.

The danger of fire is too frequently caused by ignorance as well as carelessness. In my visits to hundreds of plants, I've found men who did not know that the solvents they were using were EXPLOSIVE. In some cases the men were confused by the words "Inflammable" and "Non-inflammable." Webster says that "inflammable" means "Easily set on fire, that which will burn readily or quickly." "Non-inflammable" means, "Not easily set on fire. will not burn," etc.

In New York City. the fire department regulations define an inflammable liquid as one which has a flash point below 100 degrees Fahrenheit. The ICC requires a red caution label on materials which have a flash point below 80 degrees F. Some cities have regulations which require red labels only on products which have a flash point below 70 degrees F.

It certainly is a confusing situation.

Most safety engineers use the Underwriters' Laboratories lists as their guide and usually consider any product that has a flash point below 100 degrees F. as requiring speical precautions in use.

The vapors of those inflammable solvents which have a flash point below 25 degrees F. are usually explosive. In this class are such solvents as: ether, acetone, methyl ethyl ketone, benzene (benzol), gasoline, carbon bisulphite, collodion, most lacquer thinners, and paint and ink removers that

contain these. Whenever possible they should be replaced with safer materials having higher flash points.

You would be surprised to know how much gasoline is still being used to remove ink from type, rollers and blankets. Recently on one of my trips, I had the opportunity to visit one of our governmental agencies. The duplicating department was a neat clean looking shop. But whenever the men need blanket wash, they would send down to the Division's garage for some "gas." "Of course," the foreman hastened to assure me, "we always send down a safety can." He was aware of the potential dangers. But what precautions had he really taken? Hardly any.

For when the safety can was brought upstairs, the men poured a quantity of gas into an open pan which was kept alongside the press. You see, they claimed the safety can was too heavy. The men felt it a nuisance to lift it each time. It was easier to dip the rag into the pan. No one thought of buying small bench cans or quart dispensers.

They never stopped to think about the three hazards involved.

The car in which we drive to work each day is powered by a motor designed to use the EXPLOSIVE FORCE of each molecule of gasoline. On the coldest day, even way up in Alaska, just a faint spark is all that is necessary to explode that drop of gasoline. The chemists of the petroleum industry have added chemicals and changed the octane rating of all gasoline to the highest it has ever been.

In the plant, the foreman forgot to think about the spark generated by the electric motor on the press. He forgot about the static electricity generated on the press, about the gas flame on the Kelly Press nearby, about the heat generated by the friction of the rag due to the "elbow grease" needed to loosen the dried ink because gasoline at best, is a poor solvent. Any one of these factors, plus a careless smoker could have turned his plant into a flaming inferno in seconds.

A plant in Massachusetts forgot to care for the "gas-soaked" rags and the effect of spontaneous combustion. The semi-headline was, "$25,000 payroll lost." There was no watchman, so nobody was injured, but the plant was damaged, and people were out of work for some time.

But even if the plant continued to be lucky, what about the second danger—that of toxic fumes. Most gasolines, including the "regular" and less expensive grades contain tetraethyl lead. This lead salt and other additives make its use as a cleaner prohibitive. Many states now have regulations which prohibit the use of gasoline as a solvent in order to prevent lead poisoning.

Lead poisoning is that same disease which we used to worry about in composing rooms and line-casting shops years ago. Today, there are few cases because we are careful to exhaust all vapors from the melting pot and we wash our hands thoroughly before eating.

Then why should we use as a cleaner any liquid which already contains a dissolved lead salt, easily absorbed by the body? It doesn't make sense. Furthermore, the continued use of this poor solvent very often leads to dermatitis. Over 17 per cent of all compensation claims are found to be in the class listed as dermatitis and skin troubles.

Maybe gasoline is cheap, but I think it only proves that old adage, "The cheapest things are usually the dearest in the end."

Because gasoline and the rest of the petroleum derivatives are such poor solvents for dried inks, many people have turned to the more powerful coal tar solvents—benzene—benzol and toluol.

Benzene is a darned good solvent and it is fairly inexpensive. It is a colorless liquid with a pleasant but penetrating odor. You may have smelled it when you used your rubber cement thinner or watched the shoemaker apply adhesive to a rubber heel.

Not only is benzene highly inflammable with a flash point down near zero degrees Fahrenheit but its vapors are highly explosive. It is one of the most poisonous solvents used in the industry. Safety regulations require that its vapors be confined and down draft exhaust ventilations be present whenever it is used.

Inhalation of its concentrated vapors can lead to death. Pamphlets distributed by the U.S. Department of Labor warns that "chronic poisoning, due to daily exposure of unsafe concentration of benzene may so

reduce the blood forming functions of the bone marrow as to cause anemia. Contact with the skin should be avoided."

What is an unsafe concentration? Imagine a pressroom 50 x 100 with a ten foot ceiling. Allow to evaporate over a period of eight hours, only one pint of benzene and you have reached an unsafe concentration.

What size is your pressroom, or stripping department, or composing room? Half that size? 50 by 50? Then all that can be evaporated is eight ounces.

Is your room 25 x 50? Then all that can be safely evaporated is only four ounces. In the pressroom that is as much as you might use in only one wash-up.

The injurious effects of benzene poisoning are usually slow in being noticed. The body stores up the toxin until suddenly the effect is pronounced. Very often, unfortunately, the symptoms are easily mistaken for other common ailments, such as that tired feeling, frequent headaches, dizziness, loss of appetite and even nosebleeds.

Listen to what the U.S. Public Health Service says in their booklet, "Clara gives benzol the run around"—"Chronic benzol poisoning comes from breathing small amounts of vapor every day. Not all workers so exposed become ill. If it goes on long enough without being noticed, it may at least have the same effect as an acute attack. It also makes people more susceptible to infections like pneumonia, blood poisoning and other germ diseases." When the patient drops dead, the doctors may call it "heart failure" or people may say "Poor Joe, he worked hard."

But pressmen and compositors are not the only ones susceptible to this poisoning. I know of a bookkeeper who contracted this illness while he worked for a printing company. Only recently a stripper in a litho shop dropped dead at his desk. The coroner found the cause to be benzene which he had been using to clean the film before sending it to the camera.

Cases of benzol poisoning have also been found in the bindery, where girls were tipping in art work with a rubber cement.

Benzol degreases your skin and makes hands dry, scaly and sore—then they are easy marks for infections.

While benzene has its place in many industries where proper safety measures and methods of handling it are part of a controlled operation, you must agree that it should not be used in the graphic arts field.

After many printers took notice of these facts they wanted replacements for benzene. We found that many were supplied with cleaners which were formulated with methanol. Methanol, or wood alcohol, as you may know it, is an excellent solvent for aniline dyes but it too is very poisonous and inflammable. Its flash point is 65 degrees F. It is one of the few solvents that the government suggests should carry a skull and cross bones warning label.

When methanol is absorbed into the body, it affects the central nervous system and does particular damage to the optic nerve. It also has a damaging affect on the kidneys, liver, heart and other organs—irrespective of how it enters the body.

The maximum allowable concentration is only 200 parts per million of air. Poisoning from methanol is slow and symptoms may be delayed because it accumulates in the body and is slow in being eliminated.

Handling of wet rags can cause very dry skin, sores and dermatitis. But the most common complaint with methanol is the damage it does to the eyes. Many cases of blindness have been due to the use of this dangerous material. Here too, it doesn't matter how it gets into the blood stream—by mouth, through the skin or nose—it is dangerous.

Unfortunately, the odor of methanol causes it to be confused with "corn liquor." Many serious accidents have occurred when this solvent was dispensed from unlabeled cans or bottles.

Methanol is quite corrosive to lead. This, added to all the other facts outlined above, should make you agree that methanol does not belong in the graphic arts.

Because people are aware of the fire hazards of the inflammable solvents, many have switched to those that will not burn—and thus assumed that they were safe.

If these fluids contain carbon tetrachloride, and most non-inflammable cleaners do, then they are dangerously in error. The vapors as well as the liquid itself, are capable of causing serious poisoning and even death.

Several years ago, a large tag and label printer in the east, decided to save some money by buying naphtha and adding carbon tetrachloride to raise its flash point. The alchemist who decided this, thought that they would surely be protected by mixing the two—50/50.

Everything went smoothly until one day, several of their pressmen became ill. The doctor discovered that they were suffering from carbon tet poisoning. But that's not all. They suddenly had a fire caused by static electricity due to the flow of the naphtha from the full drum through an ungrounded hose. After the plant was out of production for several weeks, the supervisor decided that only safe mixtures, bought outside, would be permitted in the plant.

Let's get back to the carbon tet. The maximum allowable concentration of carbon tet vapor permitted by safety engineers is 25 parts per million of air. Compare this to deadly carbon monoxide gas with which you are all familiar. Carbon monoxide has a rating of 100 parts per million and you now can see how deadly carbon tet can really be.

This is what the state of California says in Bulletin #125—"This concentration (25 parts per million) would result from turning into vapor one-half a teaspoonful of carbon tet in a room 10 feet long by 10 feet wide with a 10 foot ceiling. Don't rely on your nose to detect harmful concentrations of carbon tet. It won't detect concentrations of less than about 80 parts per million, and when you can smell the odor, it may have already harmed you."

Many people have become ill from exposure to this popular solvent without realizing the cause. The symptoms of carbon tet poisoning are similar to heart, liver and kidney diseases. In milder attacks, the symptoms are headaches, nauseau and a tightness in the chest.

I know a man who operated a small offset duplicator in an office. Each evening, upon his return home from work, he had to sit on the porch for at least ten or fifteen minutes to "catch his breath" before going in. He told me that he lost his appetite and that he didn't feel right, until he had filled his lungs with "good country air again."

I learned that he was using a blanket wash which I knew contained 80% of carbon tet. Not long after, he followed my suggestion to stop using that mixture, he wrote me that "he felt good again."

There have been cases in shops where only some people in the group using carbon tet, became ill. Investigators have reported that those who are most susceptible are those who drink alcoholic beverages, those who are malnourished and all those who have had a case of poisoning before.

Sometime ago I read a news story about a husband who returned from a drinking "binge" with his clothes dirty. While he was lying on the sofa, "sleeping off his hangover," his good wife attempted to clean his clothes with a carbon tet mixture. The windows were closed. The husband died of poisoning, but his wife was unaffected.

Although carbon tetrachloride is the most deadly of the chlorinated hydrocarbons, many others, often found in cleaning fluids, are also potentially dangerous. These include: trichloreothylene, perchlorethylene, chloroform, trichlorethane and ethylene dichloride. They should all be used with care and only where there is sufficient ventilation.

When any solvent accidently spills on your clothes it is important that you remove them at once. The portions of the body which have been touched by any solvent should be washed with plenty of soap and water immediately.

Although much of my talk has been about solvents, there are other dangerous materials found in our plants. Time prevents my doing more than listing some:

1. Among the inks are the yellows and reds which contain lead and chromium salts.
2. Rotogravure ink which contain coal tar solvents—benzol, toluol, etc.
3. Analine dyes found in flexographic inks and toners.
4. Spray fluids and powders that contain silicates, carbonates, talc phenol and formaldehyde.
5. Chromic and bichromic compounds found in platemaking and fountain solutions—even spills on shoes should be removed at once.

I know of several cases of platemakers who had severe cases of dermatitis and it

was traced to the fact that the material spilled on the shoes, and the people didn't take the trouble to clean it up, to change the shoes.

6. In the bindery may be found adhesives that contain phenol and formaldehyde preservatives.

7. Care should be taken with thinners used in finishing operations. Static electricity, built up on cellophane and plastic laminates can cause explosions when loosely handled.

8. Care should be taken with nitric acid and other acids used in platemaking. Nitric acid can cause explosions as well as give toxic fumes.

9. Lye, caustic soda and other such potential disablers should be used with extreme care.

Some printers, who have not kept up with next advances in chemistry, have been giving their synthetic rubber rollers a weekly lye bath to get rid of glaze. This operation of soaking the roller and scrubbing it with steel wool and benzene, has caused many an accident. It is a risky job even with gloves, apron and goggles. It is no longer necessary. You can now clean every roller in your plant without using lye or benzol or any of the toxic materials—and do a faster and better job at that.

Another risky habit which should be discouraged is the use of naphtha, turpentine, typecleaner, etc. to remove ink and dirt from the skin. Some of these solvents may be toxic, some highly inflammable, but *all* have a drastic de-fatting action which can lead to infection.

I hope that my remarks have succeeded in making you aware of some of the chemical dangers. Unfortunately, time does not permit me to give you more details.

In closing, may I repeat this advice:

1. Accept nothing in your plant which is not properly and freely labeled.

2. Be sure to read these labels.

3. Replace toxic materials with safer substitutes.

4. Store inflammables in a safe place, away from work rooms.

5. Dispense inflammables only from approved safety cans.

6. Be sure to label each flammable container correctly.

7. Dispose of waste inflammables carefully. Spent liquids should not be poured down the sink.

8. Know what you are using and handle it properly.

9. See that everyone else in the plant does too!

SAFETY MOTIVATION

By LARI BURKHART
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This area of motivation is not peculiar to safety alone. In fact, we are coming in at the very hind end of it. You have been exposed to motivation in advertising for many years. The cereals that your children browbeat you to buy for them, the automobiles your wife wants you to buy, all this type of indirect stimulation is by motivation.

What I am going to try to do this afternoon is to speak broadly of the concept of motivation, and then to tie this in with specific safety examples as others and myself have been able to apply them to printing plants and newspapers.

Dr. Sonntag states that motivation is nothing more than directed learning. "The basis for all learning is the striving by the individual to lessen anxiety by mastering problems as they arise." Keep this in mind. We will be using it a little later.

Dr. Earl Hannaford has developed a sequential definition for motivation, where he takes motivation and then several parts of it and defines them in turn. "Motivation," according to Dr. Hannaford, "is supplying

the incentives which impel an individual to achieve a pre-selected goal and the incentive is anything the individual feels will satisfy a drive or a motive." And he says, "A drive is a persistent stimulated condition usually arising out of body tissue needs which demand immediate satisfaction. A motive is any condition, and it is usually emotional that arouses, sustains and directs an individual's activities toward a pre-selected goal."

Obviously, from our definitions it would seem that motivating people for safety would center primarily about proper individual incentives, which is a motive, since safety is not a one shot thing but calls for sustained persistent, directed activities on a continuing day after day basis. Moreover, it has a high emotional content.

Before we make any more conclusions and comparisons with respect to drives and motives, let us allude to a few of the basic drives and motives: Hunger, sex, exploratory instinct, masterliness. All are familiar with the drives which are shown in the order of dominance. Actually, masterliness lies between drives and motives. There has been recent research which places masterliness more as a drive than it does as an emotional motive. This is a natural deduction because there is new evidence that our motives have their own roots in the natural drives. The important thing to remember is that drives have an order of dominance; in other words, a precedence which operates so that the strongest one in that order of precedence gets attention before the others. With motives it is different. Motives, being emotional, do not have a natural fixed order of dominance but can vary in strength, depending on the appeal to the emotions. Since many motives can be and usually do compete for our attention at times, the one that appears to be the greatest—anxiety or fear—usually wins out over the others.

A motive must withstand repeated competition with the other repeated drives and assaults over a period of time. Drives with their tissue order do not have to face such competition. In fact, it is obvious when thirst or hunger are extreme, these override all others. We see that the particular motives can face several fates. The motive can be successful in competing with other motives or it can be only partially successful. It can be replaced or give way to a substitute or block inhibition. I am afraid too often in safety we find our motives blocked or inhibited. From this we can see why motives must be strong. In the struggle of the survival of the fittest, we know from experience that safety has strong competition, so it behooves us to know the facts and use them realistically.

Let's list some of the motives that we are talking about: Social appeal; conformity; security; achievement; belonging; attitude; self expression; interest; and prestige.

Probably many of you are wondering why I haven't included praise, reproof and reward. That is just the point here. Before we can arrive at the secret of motivation, we must be sure of what we mean by drives, motives and incentives. There is a good deal of confusion on this point and how they function. All too often incentives and motives are interchangeably talked about and this, of course, is wrong. It leads to conflict and confuses the effort to motivate. The underlying truth is this: Drives and motives are the same for every one. They are broad concepts. Incentives vary with the individual, for they are the intermediate achievements which impel the person to achieve the goal. Remember our definition of motivation: Supplying the incentives which impel an individual to achieve a preselected goal. Incentives may be anything which makes an individual feel will satisfy a drive of a motive. Such things as praise, reproof, reward, participation, and so forth, are incentives. It is the incentives we must supply. Far too often we are trying to supply motives. Motives are universal, human conditions are the same for every one, the same as drives are the same for everyone.

Our definition of motives, we said, is any condition, usually emotional, that arouses, sustains and directs an individual's activities to a pre-selected goal. Motive is a condition, we also said, that drives an individual but is a different kind of a drive, a persistent, stimulated condition, usually arising out of body tissue needs of the individual and demands immediate satisfaction. Here is the important concept that distinguishes drives and motives from incentives. Drives and motives are conditions. A condition is

something that precedes and sets up the climate for an action and the result, and does not in itself produce that result. It is the incentives which produce the result that is the achievement of the goal. Any one drive can provide the necessary conditions under which the incentives can function.

Before we sum up the key facts about drives, motives and incentives, I will get down to some actual accident situations, case illustrations.

There is a very important concept, the pivotal concept. I borrow this from Hannaford. He has dug up quite a word which we are using across the nation. This pivotal concept is the point of departure which determines whether we are going to motivate in the true sense, or if we are going to try to prevent, divert, practice thought control, brainwash, propagandize, or what-have-you. The pivotal concept is this: There are two kinds of motives—positive and negative motives. In the partial list of motives we spoke of a couple of minutes ago, we mentioned the positive motive. Too often discussions deal with the positive motives, because precisely only things that give pleasure reduce that tension. That gives us a distorted picture.

We have motives that can be both positive and negative: Attitude, tension, punishment, discipline; then going down to negative discipline, negative tension and negative attitude. They appear on both sides of the pivotal point. These four motives of discipline are what we psychologists call ambivalence. They are opposites of love and hate.

Let's take discipline. Understanding discipline in the interest of the person being motivated is positive. While discipline solely in the interest of the motivator, and particularly when not in the interest of the motivated, is negative. At the same time, this is true of punishment. When both are negative, they have a close kinship with fear and anxiety. Too highly and solely negative motives can disable a person and in the extreme case cause panic. When they are positive, they are among our strongest motives. It is unfortunate these two motives are viewed from the negative standpoint, and the same is true of tension. People see attitudes differently. Most people agree it can be good or bad. We can see further out from our pivotal point.

Here is an interesting thing about the ambivalent motive. It has an unconscious added impact on an individual. When he senses the intent behind it, the effect can be intensified and amplified. This can be true even when the person is griping about it. Why? His ambivalent feelings are associated with an authority figure. When we have confidence and respect for the authority figure, we get a relief from tension by assuming the responsibility.

Emotional content, impact and positive and negative nature of this motive are dependent on the use made by them by the authority figure. The solely positive motives are effective. So the negative ones are barriers to goal seeking attainments. Even so, negative motives—fear and anxiety—can be strong motives. Here is an example of its use in a field which requires strong motivation. This I borrow from Dr. Barnes, who is the psychologist for the National Collection System. He consults with the collection agencies. The basic approach in the collection of debts is the creation of fear and anxiety in the debtor, which he can only dispel by paying the debt. He can't get away from the use of fear and anxiety as motives and the collector has to create a certain amount of anxiety and fear.

From Herlock works, in three carefully chosen incentives, where the discipline is the startling factor, he used four groups: A control group which was given no incentives; a group which received high praise; a group which was given severe reproof in their own interest; and a group which was ignored, but heard both the praise and reproof.

Using the control group's performance as a percentile figure of 100%, the ignored group had performance of 104; the reproved group had performance of 105.8; and the praised group a performance of 180. Discipline of a positive nature is a motive which is inherent in all of our captive groups. It is a condition and climate which probably cannot be duplicated. The praise group increased its performance by 80 per cent over the controlled group. This is direct testimony to the solely, socially approved motive effectiveness when praise is used as an incentive. We must keep in mind that

praise was given to a captive group, operated under a state of discipline, and whenever the praise was warranted. This incentive can be associated with the discipline and a socially approved motive of this kind is closer to the discipline motive.

Please understand why I am dealing with ambivalence. It is not because I am ranking discipline above the other motives but because of its key position and impact. It is all too frequently misunderstood. All the jobs of safety motivation take place in a setting where discipline exists as the way of life. We don't have free choice, but we do have on off-the-job work.

When we motivate, we select a goal, decide upon what motives are most closely related to the goal, and then proceed to provide the incentives which will appeal to the individual or group as satisfying that motive or motives. Because of the possible mortality or fall-out of motives, it is best to use several and to choose your incentives accordingly. We don't provide motives but we supply incentives which satisfy a motive that already exists for all of us.

A couple of simple examples of how we can put this to work. Because of the time element, I will take just one example which we all run into in our composing rooms and stereotype departments—eye injuries. This is our goal—no eye injuries; positive motive, security; positive discipline, dealing with security. These are possible incentives: publicize loss of sight cases; publicize cases of eyes saved by safety glasses; provide safety glasses, and also paying the cost for prescriptions ground into safety glasses, the taking of personal responsibility. Possible incentives were the plus motivation of discipline, enforcement of the rule of wearing safety glasses at a time when on the job.

Apropos to this, when we try to get full use of glasses and are paying for prescriptions, we achieve 70 per cent reduction of eye injuries. When we made it mandatory to wear glasses all the time on the job and enforced it, we brought our eye injuries down to virtually nil.

Talking about how to successfully motivate people for safety, we have to be realistic. I am going to use four actual cases; two concern group motivation and two deal with motivation of individuals. Since we took time to explore just what motivation is and also discuss basic definitions, we can cash in on it. All we have to do is put the pattern of successful motivation in flow diagrams which I am sure you use for routing of material. We will use it in discussing our four cases.

First, in setting up our flow diagrams and what to do, on this hand, and how to do it. We selected our goal. We became acquainted with the objectives. We reiterated frequently what these goals and objectives are: Develop and sustain good safety attitudes. On the other hand, personal contact, individual and group participation. We test for achievement, check for better performance, persistence, interest and attitude and goal. As the goal is approached, we inform the people of our progress—again personal contact and mass media. We command, when it is justified, on what to do and how to do it; again personal contact. I work this personal contact to death. It is the only way I know of selling safety.

The only new term we have introduced in talking about the motivation pattern is goal grading. If motivations work, the nearer we get to the goal, the stronger the motivation. It also applies when we provide a continuing long term goal, with intermediate, successive goals. For instance, if you want to achieve "no amputations" in your pressroom, rather than give the whole setup as to your goals, start with no accidents for, say, seven days, then for longer periods, until one of these goals is achieved and you build on each one until your pressroom will be running without amputations. If we'd analyze these cases in detail, we'd be here for hours but I am describing briefly what was done and some of the factors involved.

The first group was a group of 900 women, divided among five newspapers throughout the non-mechanical departments —phone solicitors, clerks, runners, girls in secretarial positions, editors, and just about anything you can mention outside of the mechanical operation. When we started this, we had a frequency rate of 1.19. This was reduced to 0.16 over a twelve-month period. The people I work for aren't interested in frequency figures. They are interested in dollars and cents. We had a figure of $2,595 at the beginning, and the

costs for the next twelve-month period were running $372.

When we started out, we made a careful and detailed field study that showed all of our safety programs and activities were basically oriented to the mechanical department needs, objectives and the way the men were thinking. We got a couple of our lady editors together and tossed the ball in their laps. What are we going to do to interest the dolls in safety so they won't stand on chairs or trip over phone cords? The women's safety committee was oriented and developed objectives, programs, material and activities in terms of women's needs, incentives, interest and thinking. The program activities were given to women by the women. The men stayed completely out of it, much to the ire of several of our managers.

Here are some of the motives and incentives used: The motives—belonging; the incentives—participation in small groups of ten or twelve discussing subjects such as "A Woman's World," "It Is Smart To Be Safe," and actually working on safety activities suited to women and their needs.

Another motive—challenge and achievement—and here we had individual rivalry, group rivalry, women vs. men, and women vs. women. The motive—social approval. Top management had personal interest in what these women were doing and paid frequent visits to their departments and spoke with them. There were many more motives and dozens of incentives and all of these items were designed to follow the pattern of successful motivation. There was evidence that they did.

Case No. 2 was a diversified group of 90 mechanics and pressroom workers, working under stop paper conditions. The frequency rate, under normal working conditions, is 1.9. Under emergency conditions, no accidents whatsoever. This case differs from the preceding one in group motivation. It has situational motivating factors which Case 1 didn't have.

Looking at our pattern of successful motivation, we can see that the goal is clearly defined. When we got to sheet rolling. the previously developed safety attitudes, habits and training were all brought into focus due to this emergency. We had to get the edition out. Without question, the achievement is constantly before them as to the progress of their work, and warranted praise is quickly given to them, including word of praise by rival departments—stereotype, composing and editorial.

An added incentive arising out of the situational motive operates to strengthen the pattern of motivation in this case. As for these incentives, there is a multitude of them. For some, it means to help in the time of need; for others, the reward of overtime; for others, the group effort and the esprit de corps; for others, rivalry between the different gangs getting the web back up and putting in the new roll and putting on the new blanket. All these things came into play. The critical thing about situational motivation centers on this one point. Unless the situation impact has been preceded by good sound safety attitude development, habit formation has nothing to build on and will increase injuries rather than reduce them or prevent them.

The third case is one I think most of you probably run into if you have just one truck driver or anyone driving for you. This was a situation where we had a man with a very poor driving record, having continual accidents, both personal injuries to himself and damage to equipment, but yet the circulation department wouldn't let him go. He was the one fellow who would get out in the poorest weather and get the paper delivered. In both this case and the last case I am going to talk about, I will limit the discussion to the unique aspect rather than to reiterate the principles we have discussed.

This case concerns a driver with a very poor accident record, but whose physical and mental qualifications were quite satisfactory. The incentives were group and individual rivalry, financial reward, participation in the motive of achievement, conformity, identification. The poor performer was put in with three drivers with good records. These rules were applied: Each driver was to get $50 bonus at the end of the accident free year. If all four drivers had an accident free year, all four would receive $150. These three good drivers really went to work on this poor one, and he tried to conform and identify with the good ones. It worked so well that all the drivers in this particular company, which is on the coast, are now work-

ing in a group of four. A lot of you feel sure it works if you give him some money, but money wasn't the key. The reward incentive wasn't money. It was the rivalry that did the trick in this case.

Notice how well this ties in with the following research done on the value of rivalry as an incentive, where no rewards are used. Dr. Sims used three groups in his study. The first, a control group, in which there was no special motivation. They just did the job. A group in which only group rivalry and participation was used. And a group in which only individual rivalry and participation were used. An incentive score of 100 is the starting base. The control group got 108. They had an 8 per cent gain. The rivalry group, 115, representing a 1 per cent gain. Individual rivalry, 153. The group of four plan combined motivating value of both the group and individual rivalry incentives in the most effective manner, and this shows why it worked so well.

The last case is a case that developed a week ago. In one of our plants we had a chief engineer, who had been chief engineer in the boiler room for all mechanical repairs for five years. His crew had not a single lost time accident in this entire period of time. He was closely supervised by a mechanical superintendent that had control of three papers, all in the New York area. This man was known by his supervisor to take some short cuts here and there. This was all right, the work got done. When they had problems in the other papers, they called this chap to trouble shoot and he whipped the thing into shape.

This particular day he had the job of cleaning up the checkerboard floor of one of the main boilers in the plant. These boilers in New York are fired by No. 6 fuel oil which is heavier than molasses when cold. When it hardens up it is impossible to get it off. The usual method is to chip with a non-flash chip, because we have no known explosive gas in the air. He chipped away for a spell and didn't make much progress. Gasoline penetrates pretty well, so he goes to the auxiliary generator and siphons gas out. And by some means sprays it in over the checkerboard. The floor of this particular boiler goes from these draperies, let's say, all the way in this area. It is called checkerboard because the bricks are laid that way. He throws this in, and the watchman sees him check out. He thinks he went over for a couple of beers. After a spell, he came back and figured the gasoline soaked down and got the No. 6 loosened up, also penetrated enough and got the No. 6 fuel oil so it could be burned a little bit. No more chipping. In goes a match. The boiler went up through the third floor. The man himself, because he had all the ports in the boiler open, escaped with his life, but not too much more, because most of his skin suffered third degree, severe burns and he lost an ear. Here is a case where the man knew the ropes, had good sound safety motivation for five years, and it has been working, and all of a sudden it doesn't work.

But we have one other factor involved here. The motives that were involved were for doing the job right, as he knows how to do, or doing the job easy. He doesn't think it is easy any more. But the motive of doing it easy went out, it failed. Also notice the absence of the discipline motive in this. We didn't have the reinforced value of the function of this man's mechanical supervisor, who knew he was inclined to take short cuts. He knew this task was a tough one. But the supervisor let this chap go ahead and do this.

I chose this fourth case for another reason besides its aptness in illustrating the conflict of motives—the neurotic paradox. As a contribution to the new concept of motivation, Dr. Gower, research professor at the University of Illinois, has put it this way: "Why does a person still persist in unrewarded, self-defeating injurious behavior when he knows and is familiar with the safe, rewarding method of behavior?" In the last case the employer knew it and practiced safety procedures for a number of years. Recent research indicates that we have not been fully conscious of the high motivating elements in the forced choice of opposition, from forces outside of our own unconscious drive to do things we are told not to do.

The commonest of all emotions is the pressure to resist anything that may be felt to be coercion. This is one of the reasons why the mechanical superintendent didn't want to dictate the exact way the man is going to do the job, because of this matter of coercion. He didn't want his good

employee feeling that he was being coerced. This is the core of the motivation problem, since we have said that we do not use propaganda, brainwashing, and so forth, which destroys the creative incentive.

In the fourth case, the general procedures are incorporated in the flow diagram we discussed before, the disciplines, motives and incentives. More particularly though, incentives must be personalized for the individual and work through the proper selected motive, that is, conditions which gave the emotional kick to put and keep that person in the safety orbit. The more strongly the desired goal is presented and reiterated, the stronger the motivation and the development of the desired motive.

How do you tell when motivation is working? There are four simple tests:

1. The effectiveness and efficiency of the desire of learning is increased.
2. The individual or group effort to achieve the goal are persistent. The goal gradient effect is clearly evident.
3. As the motive becomes stronger, they get closer to achieving the goal.
4. The individual or group voluntary expresses interest, satisfaction and interest to achieve the goal.

In the first three of the four illustrations it was obvious that these four tests were satisfactorily met and would be observed by anyone making the check. In the fourth case, when the motivation failed, it was and should have been evident to the supervisor that these tests were not being met and there was need for immediate action.

In winding up, it may be difficult for some to believe what we have discussed *today* is the key element in our lives. But its effective use spells the difference between success and failure in virtually everything we do, and whether happiness or misery is going to prevail, the whole solution to emotional adjustment in lieu of maladjustment. It contains the key to self-motivation as well as the motivation of others. There can be no continuing safety without motivation. Even our conquest of outer space and solving the problem of outer space will be meaningless if we fail in solving these problems of our own personal behavior.

ENGINEERING ANALYSIS OF ACCIDENTS

By LLOYD L. LOTT
Mgr., Loss Prevention Dept., Bruce Dodson & Co., Kansas City, Mo.

Our companies, Casualty Reciprocal Exchange and Equity Mutual Insurance, serve that section of the printing industry that prints books and periodicals, magazines, job printing work, but not newspapers. I think you are primarily interested in newspapers, perhaps not interested, but more closely allied with them. I know practically nothing about the printing of newspapers, and their performance and accidents. But I doubt if there is a great deal of difference in it at that.

I would like to say that our company insures all sizes of printing companies, but the average company probably is small; that is, has 40 or 50 employees, some even less. We do have a few of the larger plants who have from 500 to 700 employees.

What the larger insurance companies, such as Liberty Mutual, Travelers, and Aetna, do in the way of accident prevention might have little relation to what we do, because, as I say, we are a small company. We have a relatively small safety engineering force and we are well scattered over about forty states. I wouldn't say that what we do is the best way to do it but it does seem to be the best way for us. We feel that we have had more than a little success at it.

Last year we returned a savings of $34.82 to every printer in the United States, and we provide workmen's compensation insurance. For $100 premium we gave them back $34.82, which is very good, we feel. This year, with one more month to go, the pic-

ture looks even better. So what we are doing and what we have done works for us fairly well.

When our safety engineers call on a printing company, these are the objectives that we have: We try to help the insured; we try to help the printer help himself safety-wise. We do not attempt to do the safety work for him. We feel that isn't our province, that it is strictly management's job and, frankly, we can't get there often enough. If we are able to call on each policy holder every 30 days, that would be fine. I know some companies do that and do beautifully at it. I mean, some insurance companies.

But our aim is to advise with the insured, to help him plan and set up a plan that is appropriate for the size and nature of his operation. Obviously, we wouldn't use the same plan for a large plant employing five or six hundred people, as you would one that has 35 or 40.

We start, of course, with the owner, the top management, and filter down through the supervisors and foremen, working on them primarily. The thing that we are trying to get over to them is to make sure that they understand clearly the relation between safety, accident prevention, and efficiency. It it rather difficult to sell safety on its merits alone. It has to have a dollars and cents value, as Mr. Burkhardt mentioned. That is what they are interested in. We try to increase their safety activities and stimulate their interest in safety, and finally—I purposely put this last—we make inspections of the plant, not that that is less important, but we think it is something they should do themselves on a regular basis—a daily inspection, a weekly inspection, a monthly inspection, in degrees. We try to show them how to do it most effectively.

We will take a small printer with 50 employees, who is mightily concerned with getting business, getting the work out and getting it delivered and collecting the money. Accidents with him are not a real serious problem as a rule; not that their accident record is better, but they don't have accidents on the scale that the larger plant does, or where the insurance company is looking at hundreds of plants.

The one thing that we have learned is that somebody in the plant understands every machine in there and every operation, and understands it thoroughly. They understand it far better than we outsiders, even those who make a living in safety work. Now, the question is, do they always make use of the knowledge they have of that machine? Obviously, they don't. That is why there are accidents. Where we put a great deal of our stress, safety-wise, is with the manager of that department or that area, who is responsible for the people that operate the various machines, to make sure that they make a job study as needed for each operation.

The printing industry, I believe more than any industry that I have had any experience with, is geared to production. I mean, that is their bread and butter, their life, that is their life's blood—production—and sometimes it is such a problem that safety comes way down the ladder, just about the last place. So we come to the type of accidents that we have. I am going to hit the highlights of this and talk about accident types, with just one or two illustrations later.

Machinery accidents. In other words, getting caught in moving machinery is the most serious type of accident that we have encountered. In our analysis by types, we found that 18 per cent of accidents involve some type of machinery. I mean; getting caught in it, or by it. The average cost—and this is always important to a printer, the man who pays the policy—the average cost of a compensation claim in this category is $223. Perhaps I should also explain that in figuring cost, for instance, we don't figure frequency, like the National Safety Council, where lost time injuries are involved. Quite often we don't even have that information. These cost figures are composed of medical expense and hospital, if any, the adjuster's expense that had to handle the claim, and compensation payment, those three things. Out of 100, 93 of the claims did not involve any workmen's compensation payment with medical and adjustment cost; only 7 involved that. So, you see, we have the total cost here, and that is what the insured is interested in, because that is the bill he is going to pay.

The second most expensive kind is material handling, usually lifting and moving materials, resulting in back injuries, muscular troubles, hernias. That involved 13%, with an average cost of $206.00.

Falls is the third highest category in terms of cost, being 6%, with $154 average cost per claim for that type.

Then other types of lesser consequence, objects struck someone, or vice versa, someone bumped his head, and so forth, with an average cost of $28.

Cuts, foreign bodies in the eye, dermatitis, skin rash, burns, things of that sort, make up the others.

The one thing that we recommend after we have had our discussion with management is that they persuade their foremen and supervisors, whoever has the responsibility for a certain group, that they actually go out and make a job study of every operation, and by that we explain what we mean, the procedure, like time studies in a Ford plant, or something like that. But determining the most efficient, the most productive and the safest way to do every job. Usually, we work with them on that if we can. We find that oftentimes very simple rearrangement of material or stock, or changing the floor plan, or the positioning of the operator can mean the difference between a safe and an unsafe operation, and we thoroughly recommend that.

In the smaller plant particularly—we will in all plants—but in the smaller plant, we ask the owner to talk frequently with his employees about safety, about their welfare, pointing out that he is interested in their welfare, he doesn't want to see anybody hurt, and that is very true. The smaller the plant, the closer the relations. Also pointing out that involvement in an injury can seriously affect not only their own well being, but their income as well, which we are all vitally interested in. Once again, the emphasis is on the foreman part of it.

As we go into any plant, the first thing that we are concerned with, and I am sure all of you are, is housekeeping conditions. Believe it or not, it is a simple thing but it is the one thing that causes so many accidents. If you don't believe it, just look over the list of accidents that you have had during the past year in your plant, or that you are familiar with. You will find that you've got probably one very serious accident that cost $1500 or $3,000.

Due to the fact that there was a little puddle of oil or grease, someone hurrying by stepped in it, his heels shot out and he fell and sustained a bad injury. This is so elementary that I feel ashamed even to mention it, but it is the thing that creates really bad accidents.

Crowded conditions. Sometimes there is not much you can do about it. But other times it is the thing that has grown like Topsy—you haven't become aware of it. You have let things be stocked or piled in an area when they really belong out in the warehouse or some place apart from the working area. Whenever you have crowded conditions, you have an unusual accident hazard.

Hand trucks, dollies and things that are left in the aisles, even mops and brooms. That is a frequent violation that we find. Obviously, it can be corrected and it should be corrected, and the only way to do it is to make sure that somebody is continuously alert for those things.

One particular hazard that one of my engineers points out is the use of fork trucks, industrial trucks, in the plant. He said, "My experience is that they travel far too fast for the safety of other people," and he mentioned that they are always difficult to hear because there is a lot of noise when the presses are running, and they can sneak up on you. It is a thing that usually grows in proportion to the use of the number of trucks. They really form a serious hazard, and accidents will attest to that.

The cleaning of the rolls presents a serious accident problem and we have had mighty serious injuries from that. It will always be a problem. The one thing that you don't want to use is carbon tetrachloride. But I am sure the method you use, and every man that works at that job knows how he should do it, but too often takes the short way out. They do it the hard way. If they use the rag, the rag is caught while moving and the hand is put in and it is a very serious injury.

The thing that we look for as we visit a plant is what the foremen are doing. If we see some workmen doing something that is obviously unsafe, that any school boy would know wasn't safe or the best way to do it, if he does it in front of the foreman and the foreman ignores it, he doesn't notice it or passes it off, then we have a foreman problem, and we talk to

the foreman rather than to the man that made the violation. We feel that it is the foreman's position to correct that, and we think that is the biggest field we could work with—the foremen of management.

Last year the safety manual for the graphic industry was discussed. It is a fine publication. It was put out by the National Safety Council, but the objection to it was that it dealt mostly with books and periodicals and such, and had very little newspaper production in it. I believe there was some thought given to revising or making a new one for the industry. I don't believe that has been done yet. But it is a fine thing for anybody that has time to study it. But that is the catch in it—having time and interest to go through it. We bought a lot of those and began giving them out to our larger printers, feeling that they would be interested in it. They had never seen it. But just like if somebody had given it to me I would probably turn it around in my hand and say "That looks good and I will read that when I get time." But the point is I probably would never have gotten time.

We have found that in order to get through to a busy man, a man that is running a printing business, we've got to boil it down to essentials, and that is what we have done on our one-page basic safety program, "A Basic Safety Program To Prevent Injuries to Employees." We have listed six principal points, with subheadings under each one. If we can get them to take the time, after we have left their office, to read that and consider doing as much of it as they can, we feel that we had made great progress. I don't blame them, and I don't blame you folks for not taking time to go through that. It isn't your field. You haven't the time, but if you can try to do as many of these six basic points, it would help you.

For instance, the proper selection of new employees. That is basic. It eliminates a lot of needless expense. If you hire somebody that has a back injury or a hernia, weak heart, diabetes, epilepsy, you have hired yourself a workman's compensation claim that is going to cost from $1,000 to $10,000. Not only do you save on compensation cost, but you get a more efficient, a more dependable work force by selective hiring. Your unemployment taxes, an even greater cost to you than your workmen's compensation insurance, is vitally affected by your hiring program. It even affects your hospitalization, Blue Cross, or whatever you may have. So it is extremely important that you give thought to that. However, you've already got a houseful of people and there is nothing you can do about that. But when you hire new people, that is very important.

Then teaching and training everybody for a job. I think it is important that you teach every man, I don't care if he has worked twenty years at a particular job and you are going to place him on one just like it, he still should be trained and taught. He should be shown what you want done, not the way they did it somewhere else, because that is not the way. He may have twenty years of bad experience instead of good experience behind him, so it is worthwhile to take the time to train him.

Then supervise the working practices of all employees regularly.

Then institute a safety education program, a thing that each company has to work out for its own needs, to stimulate employee interest, keep it alive, give them safety tips.

Make plant inspections, do that yourself and don't wait for the insurance company, and study and analyze past accidents.

We have found that inasmuch as we can only get around to each printing company once, twice, three, maybe four times a year —I would say that twice a year perhaps is the average for our visits—obviously we are not going to do a great deal to improve the safety record of that company, unless what we do the day we are there carries over. In other words, have we helped them to help themselves?

Now we supplement our engineers' visits, maybe two or three a year, with a monthly safety suggestion letter, a simple little letter that we write with a certain industry in mind, and we mail that to the owner of each company we insure. We try to get over a very simple message about safety.

We thus give twelve more shots, and they are rather painless for the insured. They don't break into his working day. They don't tie him up in his office for an hour or two hours. He reads it, and I think we have accomplished a great deal by that.

If you have an interesting message and say it simply, and leave lots of white space, that is the best part of the message—the white space. You know, somebody has said that anybody could make a good speech, or write a good letter, if they have the three principal ingredients: A good opening, something that catches your attention and attracts your interest, then a good ending, a good summation and summary, then practically nothing in between. So that is what we try to do.

When we first called on them, the safety engineer inquired about their safety program. He said, "What sort of a safety program do you have, if any? Perhaps we can work with you on that." The man was very frank and said, "Well, we don't really have a safety program. We are interested in preventing accidents and we have done a pretty good job, we think, but we just don't have any formal program. We are very careful who we hire. I don't want to hire anybody that isn't going to be an asset to us. We want somebody that we can build on and we are very careful. They fill out an application form and we check back with former employers for at least four or five years. We check on all of the jobs they have had, and we inquire by telephone what they thought of the man, what his work record was, what his accident record was, what about his health, and so forth. Unless it comes up to real good, we are not interested in hiring that man."

Our engineer said, "That is good. What else do you do?" He said, "Well, we hire nobody without a thorough medical examination." The engineer said, "That is even better, that is wonderful." The man continued, "Oh, yes, we have little meetings every once in a while. I have them in our office with the foremen and then the foremen have little meetings on the floor when time permits, with his people, but we don't have any safety program."

Our engineer said, 'It seems to me like you have a pretty good safety program, whether you know it or not. What do you do about accidents, when an accident happens?" The man said, "Well, we are concerned when somebody gets hurt and we try to find out exactly what caused the accident, what went wrong, and then we try to prevent it ever happening again. Let me show you what we do. Here are some that recently happened.

"Every time they have an accident of any consequence, or one in which there is a lesson to be learned, particularly, after they have investigated it thoroughly, they go back to the machine on which that accident happened, or wherever it happened, and they take a photo. Then they reproduce that picture. And let me just read what it says:

> "'Safety is a full time job. Think safety in every task you undertake. Know your machine and respect it. You will never be asked to perform a task which doesn't provide you with safe working conditions.'
>
> "Then it says what happened:
>
> "'The printing department was shorthanded and all of the pressmen were busy. The operator wanted to help, so she started washing the large impression roller on the 20" printing press. The clean rag got caught and the operator followed a natural tendency to try to pull it out of the press. Instead, her hand was pulled between the two metal rollers. The press was not running, just on jog, but the roll of this press was enough to pull her hand into the press.'

"That is what happened. Then it describes the nature of the injury, how her hand was hurt. Then it says 'How could this accident have been prevented?' All operators should have sufficient knowledge of the equipment they are working on before they undertake such a task. Experience in handling this equipment would have taught her caution in this operation. She should have waited until a pressman was available before attempting to clean the machine."

That is one accident and they went to extreme lengths and yet they felt they didn't have a safety program. I just wish we had about 100 per cent of our printers that had "no safety program" like that.

So often we get committee reports, perhaps minutes of a safety committee meeting, where they have been reviewing accidents that happened, and they will describe it thus: "John Brown accident; did so and so." Then down at the bottom, they say "We voted guilty." That isn't the point. We are not trying to pin guilt on somebody.

Where we have safety committees, and lots of your plants probably do have safety committees, I would advise that every man on that safety committee see the National Safety Council safety film entitled "Cause and Cure."

I just wonder how many here have ever seen that film? Do you remember the title? It is an extremely interesting and very informative film, which shows a safety committee in action. It really makes a member aware of what he is trying to do and how he should go about it.

Those of you who are responsible for safety back home, or are interested in it, or have anything to do with it, don't be afraid to repeat a good idea, or every day instructions if they are needed. Believe me, so many things can be repeated dozens of times and be just as effective the second time. Perhaps you think you are wearing it out. You are wearing the people out by telling them to mop up, clean up, keep the aisles straight and don't put things in the aisles. If you think that, if you think you are wearing it out, believe me, it isn't true.

I was interested in a little article from the NATIONAL SAFETY NEWS for October, 1961. It is on page 9 under the heading, "The Safety Valve," by Carmen Fish. I am just going to quote the first part, which applies not only when you are writing a directive, a bulletin, but also when you are doing it verbally.

> "Old Stuff. One of the shortcomings of most publications is that they are so afraid of repeating. Editors kid themselves by thinking every reader has read everything they published. Inevitably, of course, editors do repeat. But they always feel guilty about it. It is an admission of sterility when they dish up old stuff and even dress up well worn out ideas in new dress."

Whether you are a supervisor, or whether you are the man in charge of the supervisors, or whether you are going direct to your employees, believe me, don't be afraid to repeat the good old fashioned safety rules that make a lot of sense.

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