

# The Changing Complexity of Fire and Health Protection Problems in Vegetable-Oil Processing Plants

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WHEN my subject was first mentioned to me, it seemed that fire and health protection problems had grown more complex with the years. After further thought I realized that this was not necessarily so. Therefore I shall discuss changes and lack of changes, rather than increases, in the complexity of our problems.

As additional clarification, it should be explained that most of my experience with vegetable-oil fire and health protection problems has been in the crude-processing end of the business so what I say is bound to be slanted in the direction of crude milling.

Many years ago, when I first had anything to do with a vegetable-oil processing plant, a crude mill was a multistoried affair, often of brick or stone with wooden floors and roof. Nearly always there was a basement that contained the main lineshafts, which in turn were driven by a steam engine located somewhere near the middle of the building. The main mill building literally was jammed full of machinery driven by lineshafts and counter shafts. The work space between machines usually was dark and inadequate.

Auxiliary buildings, for seed- and products-storage, often were of wood, and many of them were fire traps. Machinery in auxiliary buildings frequently was driven from the main engine by means of lineshafts stretching across the mill yard. As well as I can remember, a great many of our fires were caused by hot bearings, by the rubbing of belts on wood, and by sparks produced by scrap iron passing through machinery. Processing machines, conveyors, and elevators often contained many wooden parts and literally added fuel to the fires.

As far as injuries to personnel were concerned, men were hurt by falls, by getting caught on line shafts, pulleys, and belts, and by being crushed in the process of handling heavy objects by hand. Infections were common because many things were handled by hand and because locker-room and first-aid facilities were poor. In the bulk handling of slow-flowing materials like cottonseed and cottonseed hulls, men often were covered up by caving materials. Regrettably this problem has not been conquered and may even be worse in these days of bulk storage tanks and houses with high side-walls.

Although we often feel that we have not made much progress in our industry, today's crude mills have changed much more than one may think. Most of the older mills that still operate have been electrified and now use group and individual drives. Newer mills have been built on one level and may not have any line shafting or open drives at all. Also the new plants generally are of fire-proof construction. In almost all cases the lighting and cleanliness have greatly improved; and the men have more and better work-space, locker rooms, and first-aid facilities.

The danger of fire and injury from screw conveyors and from material elevators has been greatly reduced by the replacement of the wooden housings with tight and substantial steel housings. Fires

caused by tramp iron are not so serious any more because of improvements in processing machinery and because of the development of excellent magnetic, pneumatic, and mechanical protective devices.

CHANGE however has not been entirely benevolent. It has brought some new hazards too, some of which we have accepted without much thought one way or the other. Electrification reduced fire and injury hazards in connection with line-shafting and belting but introduced dangers of fires, electrocution, and serious flesh-burns. Open seed-unloading conveyors have practically been eliminated, but now we have truck dumpers that can be very dangerous too. It is not often necessary to remove heavy machinery and get it to the shop by hand, but we have a new set of fire and injury hazards in connection with acetylene and electric cutting and welding tools.

Where once there were bull gangs with hand-trucks and carts, there now are fork trucks or other self-propelled handling devices, and we have learned the hard way that these machines are a lot more dangerous than they appear to be. Motor trucks and the increasing dangers of operating accidents and injuries on the highways now are an accepted part of our business. The tendency to get on wheels has brought with it the problems connected with the handling and storage of gasoline and liquefied petroleum gases. Thus, even without solvent extraction, the processor has to concern himself with the safe storage and handling of flammable liquids in fairly large quantities.

In processing in the crude mills there have been some radical changes, especially in connection with the removal of the oil. Solvent extraction has caused many of us to spend a lot of time in the study of the design and operation of plants that can safely use hexane or other solvents which will burn or form explosive mixtures with air. Much fine work has been done on this, especially by some members of the American Oil Chemists' Society.

Installation of large numbers of Expellers and Screw Presses in cottonseed mills in recent years has eliminated a lot of accident-prevention headaches but has added to the danger of eye injuries from hot oil and injuries resulting from the handling of heavy equipment.

In these days of mounting overhead costs, processors have tended to consolidate and diversify operations. Consolidation helps because it results in the building up of better operating crews as a result of larger operations and longer seasons. The addition of new operations however brings new problems, such as safe handling of pesticides or safe fumigation with very poisonous materials, such as methyl bromide or hydrocyanic acid gas. In our company we often work with commercial fertilizers in the same plant yard where we have an oil mill, and we are getting accustomed to handling various types of concentrated ammonia solutions, anhydrous ammonia, and commercial sulphuric acid.

Generally speaking, our industry seems to have met all the changes that have been occurring with a minimum of grief, and at the same time we have incidentally made a lot of progress in fire prevention and protection. The well-coordinated, intelligent work done by members of the American Oil Chemists' Society, in connection with solvent extraction especially, has been of very great benefit.

OUTSIDE of incidental progress through change and progress in dealing with solvent-extraction hazards, I am not sure our industry has made a lot of headway in correcting the basic problems of human injury prevention. Last September in Chicago, during the meeting of the A.O.C.S. Technical Safety Committee, it was pointed out that the oil and fat industry and the fertilizer industry had the highest and second highest accident frequency rates in the chemical industry. The fertilizer industry had the highest severity rate, and the oil and fat industry had one of the high ones. The fertilizer industry is being mentioned because I am familiar with it. It uses the same general type of labor we use, and it has a great many of the same problems we have in the oil processing industry.

For many years I have fretted over our special problems of accident prevention in oil-seed processing. Ordinarily, with tough problems like ours, the first thing to do is to go and see what other people are trying. When this was done, I ended up feeling envious and a little discouraged. It seemed that in most cases the safety engineers in other industries were able to work with the same people under almost the same conditions day in and day out and year in and year out. Our business being seasonal, the kinds of programs these other people used just did not fit our situation very well.

When you call in a safety engineer from outside the oil and fat industry, you too often get the same results you get when you see what other industries are doing. You hear that you need more guards on everything, that you need a lot more safety committee meetings, more bulletin boards, and so on. Somehow this kind of program also does not seem to be the answer even though it may sometimes be helpful.

A technical man sooner or later will think of the "analytical approach" and will begin studying accident reports and statistics. Such an approach is bound to have great value. However the analyses of accident records so far have not been very enlightening. In the first place, there are too many accidents with "miscellaneous" causes. In those accidents that can be classified many accidents are caused by moving machinery or perhaps falls. Men get hurt by moving machinery because they remove guards or go to other considerable trouble to expose themselves or somebody else. When men fall, they fall down in the open yard or down a good set of stairs. They even walk into the side of a building. When this sort of thing happens over and over again, there is something else fundamentally important to get hold of in order to understand our injury record and how to do something about it.

AFTER spending a lot of time looking and thinking, I have arrived at certain convictions about this "something else." First, it seems that, aside from a reasonable amount of guards, safety rules, and similar conventional devices, it is far more important to

have alert employees who are constantly looking for, and preparing for the hazards to which they may be exposed. Of equal importance is the need for these employees to have alert foremen or supervisors who always have injury prevention on their minds and are constantly trying to see that their men work safely.

Lack of such "safety-mindedness" probably is not the real root of trouble, but a symptom. The fundamental cause of most of our troubles is the seasonal nature of our business. We have fairly complicated technical processes, and we run a lot of machinery. When the season opens, we hire a number of men, start up the plants, and jump into full operation. When the season ends, we shut down and lay off all but a relatively few key people. You can see that in these days of plentiful jobs, the kind of men we can hire very probably will include some men who do not want to work regularly or have not been able to get jobs elsewhere. Thus we start out by having a good chance of getting at least some substandard men each year.

Now our real problems become clearer. What we have to do each season is take a mixture of all kinds of laborers (some of them probably substandard) and quickly teach them how to work safely while at the same time teaching them how to do their jobs. After doing this, we have to find out how to continue to keep up their interest in working safely right on up to the last day of the season.

If this is correct, then one thing becomes obvious right away. The nucleus of key men and supervisors that remain on the job the year-round should most certainly be enthusiastic safety advocates. How to build up this enthusiastic attitude becomes problem number one. To be effective, this nucleus of permanent safety workers needs to know how and why people get hurt most often in our industry.

This special group of safety workers also needs to know how well each one of them is avoiding these hazards. How to get really reliable information becomes problem number two. Finally, the important nucleus of accident-prevention, men must know how to teach new people quickly to recognize important hazards, to work safely near them, and to keep in mind what they learn. Finding the best way for people to become good safety instructors for our industry becomes problem number three.

Now here is what I have been slowly working up to. I have been watching the Technical Safety Committee at work on its problems, especially on solvent-plant fire-protection and accident prevention, and it seems that admirable jobs have been done in a way that makes a lot of sense. It certainly would be fine if this committee, or a sub-committee, could extend its efforts and attack the more general problems of accident prevention in all phases of oil and fat processing in the same intelligent fashion in which solvent-plant fire protection and injury-prevention problems and other problems have been studied. I sincerely believe that such work would be of great value.

The three problems I have mentioned are important ones. If the committee will attack the general injury problems, I am sure that our industry will benefit very much.