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Letters to the Editor

SAFETY IS NO ACCIDENT!

To the Editor:

My recollections of 1951 when I moved from Graduate School (U. of Illinois) to industry brought an introduction above and beyond the modest (at best!) "instruction", or maybe even the "lack of adequate instruction", to the use of safe practices in the laboratory. I recall a text in which chemists taking a course in "The Identification of Unknown Compounds" were expected (and instructed) to smell unknowns, especially liquids, and attempt to correlate odor and identity class. I do not know when that edition was replaced with one warning the students NOT to do so! And I shall not cite the names of the authors of the one I recall! I certainly expect the suggestion to "inhale" has long been stricken from that book!

I wonder at times whether chemists and/or chemical engineers spend the time that is necessary to both read and absorb the physical constants and the potential or actual hazards found in the *Handbooks of Chemicals* circulated to and found in most Chemical Laboratories, Pilot Plants, and Chemical Manufacturing sites. It is easy to believe that you know enough; it is wiser to assume that you do not! It is easy to think in terms of seeking instructions for what to do, while actually ignoring, **for reactants with which you have not become familiar, the Key Safety Data accompanying that chemical.**

I further believe that chemists, chemical engineers, and all such involved people who are employed in establishments where such activities are carried out deserve to be instructed in the potential toxicities and hazards that might be introduced into their site of work by a well-experienced supervisor who has shown to his or her management that "the new project being introduced" has potential problems that *can be handled, and how they can be handled. That responsibility requires broad as well as extensive experience.*

I might also note that *Chemical and Engineering News* will oft-times publish letters of, for example, unanticipated laboratory accidents which might well be clipped and placed into a "Site Booklet" for future reference.

I recall an experience at the U. of I. when I set up a refluxing (relatively low-boiling and combustible) reaction and went to a lecture. Upon returning, I noticed a message in the handwriting of my mentor criticizing my not having fastened the cooling water tubing to the condenser properly. (Someone must teach!) If the tubing had come off and the reaction boiled to distillation, one could foresee a potential accident or fire!

Many of the larger companies involved with both synthesis and manufacturing do support Organized Safety groups specifically dedicated to manufacturing installations and their proper use. I have noticed that focus upon the activities carried out at the bench are not accidents I have seen (and thankfully there are not too many) that could have been prevented or at least moderated. It is fair to say that safe practices come increasingly mainly by continuing interpersonal emphasis. Such emphasis does and will come best from in-line supervisors whose accomplishments also rely upon their subordinates rather than from people whose Major Safety responsibilities require minimizing and, of course, eliminating the problems we have all heard about in Bhopal, India, in Texas City, and other sites too numerous to count, and with too many life-taking cases as well as lesser incidents that may or may not have been broadly reported.

It is interesting that newspapers report a multitude of automobile accidents and the like which frequently are of less severity, but the news media seem to be silent sometimes when more hazardous accidents tend to escape being publicized to many of those who could benefit from them, even in areas of potential exposure. Sometimes they are not reported broadly at all.

In order to complete what might otherwise appear to be a lecture, I shall go back to the title SAFETY IS NO ACCIDENT! with a couple memories from my early experiences which, I hope, will be worthwhile. They are factual.

Among the tasks we chemists were assigned at a new plant under construction was to observe the equipment installation in which our project would be manufactured for the first time. In tracing lines to carry solvents (It was a four-story building with solvents piped to all four floors, located in a part of Pennsylvania with no prior chemical processing or experienced construction companies in the region.) we noted that glacial acetic acid was piped to the safety showers on the first floor, and that electric cables were enclosed within the pipes used for outside hand rails from the ground floor to the second floor, and then properly brought indoors and distributed properly. Both problems were corrected.

The first reaction we ran was a 300-gal Grignard reaction which was in a vessel behind a steel wall and adjacent to an outside wall (in case of accident). Keep in mind that the only commercially available solvent for Grignard reactions then was ethyl ether. THF was not available in commercial quantities. The reaction was to be started by adding the contents of 1/4 lb bottle of iodine to the slurry of Mg turnings in ether with an aliquot portion of the required aryl bromide. All the operators had been taught before production startup. None had ever worked in a chemical plant. I had been chosen to start this reaction and to remain available to answer questions from operators.

The first question I heard when I came back outside the steel door in the wall was: "What do you do if it doesn't start?" Showing my inexperience, I answered (in the presence of my boss): "I don't know. I never ran one this big!"

My boss, satisfied the operator who had already learned that a Grignard reaction can be hazardous, explained how best to ramp up the agitation, "Try a little heat." After that, I was also lectured properly that the operators were relying on us as experts! To have answered "I don't know" was unacceptable!

Another experience on the same step occurred two weeks later. I was not involved; however, it showed that accidents can happen with inadequately trained operators. This experience

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was with a different, but also new, operator who had by now been told a bit more about Grignard reactions in a discussion that included the workup identifying the heat evolved which occurred upon quenching in ammonium chloride.

To shorten the story, he went to the Department Manager after the quench, telling him the quench was faster, and no heat kick was evident on the temperature recorder! The fact was that the agitator in the quench tank had not been turned on; the batch was layered on top of the ammonium chloride solution. The building was evacuated, the Department Manager then pushed both the start and stop button for that agitator and ran out, too. Most of the batch went outdoors to the ground via the vessel vent; no other problem occurred.

When the operator was asked why he hadn't started the agitator, his answer was simple: "The Batch Record did not say to!" That was a mistake of omission by the Department Manager and those who had (too casually) approved his writing it!

In conclusion,

THERE ARE NO UNNECESSARY QUESTIONS!
THERE ARE NO UNNECESSARY PRECAUTIONS!
THERE ARE HUMAN ERRORS!

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