THE IMPORTANCE OF ATTITUDE IN YOUNG ENGINEERS

by A. L. Frye

Minnesota Mining and Manufacturing Company
St. Paul, Minnesota

I know how Rip Van Winkle felt after being out of touch for 20 years, for like our friend, it has been 20 years since I left the University. Under these circumstances, it would be very impertinent to tell this outstanding audience how the students of today should be taught.

On the other hand, I do not believe it would be out of order for me to report certain observations that my colleagues and I have made on the products of your universities. From these remarks, it is hoped you will find an idea or two for reflection.

Having personally hired several dozen young chemical engineers and having worked with scores of others, one cannot help but classify or develop a pattern of thinking (or perhaps you may add "or get into a rut"). I have noted together with some of my contemporaries that three characteristics are important to becoming a successful engineer in most companies including our own. These characteristics are ability, drive and attitude. Although I will discuss all three characteristics, most of the time will be spent on the latter.

ABILITY

By the term ability, I mean inherent aptitude plus its cultivation (i.e. knowledge gained by experience and knowledge gained by formal training.) These characteristics are absolutely second to none for the most responsible jobs in industry either at the top of the administrative pyramid or at the top of the purely technical pyramid. I won't be-labor a discussion on inherent aptitude, however, since my definition of inherent aptitude would rule out anything being done to improve this characteristic and any deficits will have to be made up with additional cultivation which comes with experience.

Relative to knowledge gained by experience, industry is looked to in this area. The one obvious exception to this is the cooperative plan offered by many universities. No purpose is served by stirring controversy in this area other than to say cooperative schools have their merits and my company participates in a program of at least two major universities. I don't believe anyone could disagree that the cooperative program provides a vision for the young student (let me add, I think the instructor can provide a better balanced one.) Broadly speaking, however, the schools that are in the greatest need for cooperative programs are most likely located in areas where industry is sparse and cooperative programs are more difficult to arrange. (Even though historically, they did not grow up in this manner.)

Relative to formal academic training, I would be considered a coward, unless I gave you at least a thought or two on this subject. While it is recognized that great advances have been made in putting chemical engineering more on a theoretical basis, I believe the concept that was popular 20 years ago that "we simply teach engineers how to think" is not as old fashioned as some may believe. For example, I can recall that some companies years ago would ask young engineers the best way to crush a ton of rock. A good many students would recite the chapter on crushing and grinding in Badger and McCabe or Walker, Lewis and McAdams with unbelieveable accuracy. Often times, however, one of the sharper students would say "Get a sledge hammer if all you want to crush is 1 ton of rock!" Fortunately, trick questions are for the most part taboo in these times. (In jest, if anyone dared ask a young engineer such a question today, he would suggest the crusher be programmed to a high speed computer. He might expect a bonus if he suggested buying time on the "Stretch" computer located at the Lawrence Laboratories.)

The point is simply this: It is as important to keep in mind the overall objective and use good judgment in 1962 as it was in 1932. Slide rules, computers, courses in Astro-Physics are for the engineer to use and to control. He should not let any of these tools control him--not if he wants to be an engineer. More on this later.

DRIVE

From a practical point of view, one is often inclined to brush the factor of drive aside with the comment that you have it or you don't. Of course, we all know that nothing can be further from the truth. You have all seen students or technical people who will respond under a particular type of environment and be completely unresponsive in another set of circumstances. Drive (the word motivation is much better) is a specialty of industry and a responsibility of industry. As an example, I have a Section Head who has the philosophy which runs something like this, "My job is to see that each of my Chemical Engineers has the greatest challenge that he is capable of accepting."

As to suggestion for the academic area to help out, there are two: First: I cannot over-emphasize the value of good counseling. An example of this can best be illustrated by a Chemical Engineering student from a large midwestern university, who was 6 months away from getting his Ph.D. He did not seem to know what he wanted to do and after considerable discussion, he stated what he really wanted to do was to become a minister. He would have made a wonderful minister, but the demand for those with 8 years of Chemical Engineering is not very large! Good counseling can reduce the number of heart-breaking experiences such as this.

Second: I suggest that you watch what motivates your students. Tips to their employer (after jobs have been accepted) could save years in the development of engineers especially for those who have exceptional abilities and are somewhat temperamental as far as motivation is concerned. (I find some of the best graduate engineers are temperamental.)

An example of how tips to an employer can be useful can best be demonstrated as follows: During the Korean War, our Company had the responsibility of starting up a government plant. In a 3-week period I had to hire all of the people for the technical department.

One man interviewed had been discharged from his past job. The past employer readily admitted it was partly his fault and gave an objective analysis of the individual concerned. His past employer stated there was one problem that would have to be improved, namely the ability to get along with others. After a long talk about this problem during the interview and by keeping a watchful eye during the first few months, this man turned out to be the best of six men hired. The main point is that if one can go to work right away on problems instead of taking several months to define them, the odds of a mutually successful employer-employee relationship are greatly improved.

ATTITUDE

Nothing is more important than a good attitude in getting the young engineer off on the right foot on any job and especially his first one. The following six characteristics are examples of a good attitude for the young engineer.

1. A real desire to get a job done.
2. Positive thinking.
3. Eye on the ball--not be overly concerned with the machinery
4. Show more concern for what you can do for the company, than what the company can do for you.
5. Not leave opinion that he is too good to do a given job.
6. Ethics and integrity.

The most important characteristic of a good attitude is a real desire to get a job done. Whereas talking about what one is going to do may buy time, it suffices to say that for the long run it is the results that count. I have seen few performance rating sheets that do not ask for a comment on the results and also a desire to get a given job completed.

Positive thinking is a very strong asset for a young engineer. It is very easy to get in the frame of mind that our job as engineers is to be the watch dog of the scientist and tell him what cannot be done. The only thing that can be worse than this is to have no ideas of our own.

Relative to Item #3, I have to admit that the phrase of keeping the eye on the ball sounds trite. What I'm trying to say is the young engineer should not become overly enamored with any one phase of his engineering training. Kinetics is very useful for scaling up a process, but it is only a tool to get a job done. Although I do not want to get into the controversy over the amount of theoretical and applied mathematics that are given in the Ch.E. curricula, let me say that it is possible to become so involved in solving problems that one loses sight of defining the problem in its broadest terms or for the accuracy of the data used.

A couple points of illustration: Recently a Department Head of Ch.E. of one of the Eastern schools told me that it was very common for his engineers to tell him the thermometer reads such and such a value without seeming to care about the accuracy.

As long as a number was available, it made the manipulation of the mathematics possible. (I might add, I'm sure this professor has now solved this problem since recognizing and defining problems, as we all know, is often as difficult as solving them.)

Relative to the student becoming overly enthralled with computers, one midwestern university with which I am very well acquainted, a few years back started introducing computers in the Sophomore or Junior year in order for the engineer to look at the computer as a very wonderful tool in the way we used to look at our slide rules. I might add, that I notice the students from this university are very well balanced.

I do not mean to imply by this that there is no room for specialization in the field of Chemical Engineering, particularly for those who go on to graduate school, but I believe that the mark of the experienced specialist is the ability to use the field of specialty to the proper degree in solving problems.

Item #4, show more concern for what you can do for your company than what your company can do for you. This statement would have needed no comment even though President Kennedy had not borrowed my comment and made a parallel statement to the nation a year or so ago.

It seems obvious that the young engineer should not leave the opinion that he is too good to do a given job, however, this mistake is made quite often.

I have a friend who tells the story that as the top man of his Chemical Engineering class from a large midwestern university, he was employed by one of the large chemical companies and put in a department along with several top Chemical Engineers who had graduated from neighboring colleges. There was one man in the group who was different.

In the language of today's juvenile crowd, he would have been known as a "queer" as he was the first to volunteer for a job whether it be one that he could make himself look good on or not.

Regardless of how insignificant the job or how difficult, this "eager beaver" would jump at the chance. The rest of the young engineers including my friend were more selective. In the end, however, the fellow who was willing to do any job ended up as President of the Company.

Contrast the attitude of the young engineer in the previous story to that of "I am too good to be supervised by industrially oriented supervisors." Yet, a certain Department Head of a prominent Chemical Engineering college has repeatedly made this statement of his students. We all know this is true, but it only aggravates a situation when this attitude shows up in his students.

Humility is not out of style at the top level of a company and although I'm afraid it is found less often in the lower echelons, nevertheless, I feel it is still in good taste.

The last item, ethics and integrity, in my opinion, can be taught only by example in the classroom. I wouldn't go so far to advocate a complete honor system, but this is one way to help the student build a background to meet temptations when they occur.

No discussion of attitude would be complete without injecting the thought that the young engineer as well as his employer, has a responsibility in his development.

Since the Engineers' Council for Professional Development has made kits available to help guide the young engineer during the early years of his career, I will not elaborate on this point.

I agree with the suggestion that the young engineer as he leaves college should have the pre-graduation kit and know how additional literature on professional development can be procured just in case his employer is not familiar with the good work of the Council. Above all, however, I believe you should make him aware that he has a responsibility for his development.

SUMMARY

In summation, I recognize, as does industry in general, that young engineers are better trained academically than ever before. (I might add that it is fortunate for those of us who graduated 20 to 30 years ago that we do not have to compete with your young students of today.)

I would like to emphasize the value of Counselor guidance to assure as best one can that the time of students, professors and industry are not wasted by those who are not cut out to be Chemical Engineers.

Most important, however, I believe that you more than anyone else, control the attitude of our graduating engineers. I believe there is much room for improvement. Professional orientation, appreciation for economics, and the recognition of the importance of other professions in addition to the items covered previously would at least be a start on the problem. Above all, we should be careful about mimicking the scientist.

If I could leave only one thought with you, it would be this: more emphasis on human relations - call it humanities if you will - not formal courses which are all too often considered a waste of time by the young engineering student--but informal education by example of ethics, integrity and chemical engineering philosophy woven in during the daily classes by their own chemical engineering faculty - with whom they have placed their trust.