RICHARD J. FRUEHAN • IRON & STEEL SOCIET

Dr. Richard J. Fruehan, the recently appointed 1990 President of the Iron and Steel Society (ISS), is a professor in the Metallurgical Engineering and Materials Science Department at Carnegie Mellon University (CMU). He is also director of CMU's Center for Iron and Steelmaking Research (CISR), a National Science Foundation Industry/ University Cooperative Center. CISR has over 20 industrial members who contribute to a comprehensive research program. In addition, Dr. Fruehan has held the endowed chair of POSCO since 1987.

Dr. Fruehan is the fourth representative of the ISS's Process Technology Division (PTD) to serve as President. He served as a chairman of that division in 1984. A year later he was elected to the grade of Distinguished Member, the Society's highest honor.

Prior to his joining CMU in 1980, Dr. Fruehan was a research consultant at the USS Monroeville Lab. He joined USS in 1967 upon his return from Imperial College, University of London, where he spent two year as a National Science Foundation Postdoctoral Scholar.

Dick has been a very active member of the Society. In addition to going through the chairs of the PTD Steering Committee he has served on the Advanced Technology Committee, Howe Memorial Lecture Committee, Robert W. Hunt Committee and Continuing Education Committee. As a member of the Continuing Education Committee he has presented several short courses for the Society on such subjects as ladle metallurgy, vacuum degassing and electric furnace operations. He has been a member of AIME since 1966.

Dick resides in Murrysville, PA, with his wife Bonnie and two daughters: Elizabeth, who is a senior at CMU, and also has a son Scott who recently received his MBA from the University of Pittsburgh.

I&SM visited with Professor Fruehan at his office on the campus of CMU to review his concepts of the Iron and Steel Society's role in our industry.

I&SM: How do you think the North American steel industry can remain competitive in the international steel industry?

FRUEHAN: One way I that I think we can remain competitive with countries like Japan and Germany, which are still spending a lot of money on research and development, is to cooperate. Not all research can be done this way, but certainly a significant portion – particularly in the front end of the iron and steel process.

When I first started at U. S. Steel they could go ahead and try to develop a process themselves. They had the money, they had all the people that were necessary. Now no individual company has enough research funds or the manpower that's required for a long range, high risk development.

I think that major steel companies, research organizations and technical organizations will be primarily focused on developing and improving existing technologies, improving quality, improving relations with the customer. Examples of areas where a company would develop something on their own are the coating processes and finishing processes and things like that. When you get closer to the customer then you have to do all the research within the company.

One example of cooperation is the AISI committee to look at zinc, the recycling of zinc-containing materials. So much of the automotive material today is zinc coated on both sides, or one side or whatever. And there's a lot more of this material coming back into the recycle stream. What do we do with the zinc-coated steel? It's a problem that faces every single company.

I&SM: Would you consider the AISI Direct Steelmaking Project a collaborative effort?

FRUEHAN: Yes, I think the AISI's direct steelmaking is really exciting in two ways. First, the technology is very exciting. Second, the way they're going about it is exciting in the fact that all the steel companies are working together to develop the process. The cost will get into the hundreds of millions to get it to a commercial stage. No company wants to spend that kind of money or has the necessary manpower. They may have the kind of people that are required but they have to do other things. They can't just be concentrating on this. So taking one or two key people from each company and putting them on a project like this, it makes it feasible to do.

When we talk about competition, we can't just think about USX, Bethlehem, Inland in competition with each other. We have to think about the competition with other nations and other materials. Once we do that we see that there is an area where we can do cooperative research.

I&SM: Could you explain exactly what 'direct steelmaking' is?

FRUEHAN: It's an exciting new development, if you look back at the history of iron and steelmaking, we have been making iron in the equivalent of a blast furnace for at least 500 years, maybe even longer if you consider places like China. Now we're saying, 'We have a better way of making iron' more efficiently in terms of smelting intensity.

Did I say 'we know there's a better way?' OK. We think there's a better way in terms of smelting intensity, that's tons per hour

RICHARD J. FRUEHAN • IRON & STEEL SOCIETY

per cubic meter of reactor. So you need a smaller reactor to produce as much iron and, what is very critical today, a process that uses coal directly. Environmental laws are getting stricter and stricter. In fact, I believe that one law that Congress has been considering could close down every coke plant in the United States. That form of the law probably won't pass, but at least the direction is cast. Now we know that we're going to have to look at a process that can use not only coal directly but maybe a large variety of coals, not necessarily coking coals, to make iron. And it can make iron economically in smaller units. Today, for a blast furnace to be efficient it's got to be a million plus tons per year. A bath smelting process can operate theoretically at 200,000 tons a year and be economical.

So that means if a large integrated steelmaker like U.S. Steel decides they want some extra hot metal at a given plant, but not a million tons, they can do it. It means that if we want to produce steel in California with its strict environmental laws, but we only want half a million tons for some market, we can do it.

I&SM: What do you feel the Society should be doing to enhance the competitiveness of the iron and steel industry?

FRUEHAN: If we look at what the steel industry has been able to accomplish in the last decade, it's been remarkable: improvements in quality, improvements in productivity. But unfortunately, due to the poor economic conditions in the Eighties, there was a major scale back in their technical staffs. Right now the industry has a reasonable number of high quality senior people. And these are people that are over 40 and they're been in the industry a long time. But there's only a small number of quality people under 40 or 45 years old. This is partially due to the fact that we had to let some people go because of the economic conditions in the Eighties. But also it has to do with the fact that young people are not attracted to the steel industry like they once were. It's hard to believe that 25 years ago when a lot of us got interested in the steel industry, it was the glamour industry to get into. In the areas of metallurgy, thermodynamics, physical chemistry or product development a lot of the best young people wanted to work in the steel industry. But through the years, partly because of poor image, partly because of opportunities in other areas, the good students are no longer interested in the steel industry as much as they once were. To give you an example, back in the Seventies half of Carnegie Tech's graduates used to go to the steel industry. Now today, maybe, this is on the undergraduate level, 10 percent go to the steel industry.

I&SM: Can you be more specific?

FRUEHAN: Oh, out of a typical class size of between 30 and 35, we used to send 10 or 15 to the steel industry. Now we're sending two to four undergraduates. And so I feel the industry is definitely going to be suffering from a lack of a number of quality people that are available to help it compete internationally and against other materials. And what I think the Society can do is try to 'publicize,' for lack of a better word, the opportunities and the exciting new developments that are going on in the steel industry.

I&SM: How do you see the Society accomplishing this goal?

FRUEHAN: The ferrous metallurgy grants were a good step in the right direction. They helped ensure that there would be professors available to teach ferrous metallurgy. Now we have to ensure that there are students who want to learn ferrous metallurgy take it up as a career. And to this end we've established a committee which has been called the University Relations Committee. We put on it what I think are four of the best people that we have in the Society, namely Alex McLean, John Moore, Bob Bouman and Bill Beible, all of whom have been very active in the Society in one way or another. All of them are doers. They get things done. They held their initial meeting at the Detroit Spring Conference last month and they are hoping to come up with programs to attract students to the steel industry. The types of programs that we have in mind are a distinguished speakers group that would be made up from the better speakers in the Society. These people would be available to go to universities at, if necessary, the Society's expense tot talk about the opportunities and the exciting things going on; bath smelting, near-net-shape casting, new melting technologies, application of expert systems, advanced quality improvements, etc. There's a lot of opportunities. My graduate students, they're the ones that I have more intimate knowledge of personally, have more offers and higher paying offers than any other graduate students in our department. So there are definitely opportunities in the steel industry for young people if they're qualified.

I&SM: Do you have any other goals in mind for the University Relations Committee?

FRUEHAN: I'd like to see them coordinate the scholarship programs. We offer some 15 scholarships now. Granted we have a Scholarship Committee that does a good job. But I think this University Relations Committee should be involved and try to coordinate all the activities that the Society has relating to universities, plus start new programs.

I&SM: Are you talking about graduate or undergraduate students?

FRUEHAN: My first concern is undergraduates. Selfishly, I should think about graduate students. But I feel that if we can improve the quality and increase the number of undergraduates interested in going on to graduate school. Fine. Then we solve two problems, the graduate and undergraduate. You can't solve the graduate problem without solving the undergraduate problem first. So that's where I'd like them to center their activities. And it could go all the way down

RICHARD J. FRUEHAN • IRON & STEEL SOCIETY

to the high school level if necessary to try to get information to high schools. But I'm really leaving it up to that committee. It's really up to the members to come up with ideas and the programs that can expand this area. And we're not going to see immediate results. It isn't like we're holding a conference saying, 'Oh, that was a success. We've had 300 people to this advanced technology symposium or 100 people to this continuing education course.' It's something that we won't be able to measure its success for five or more years. It's going to take that long, but we've got to plan and do something now or the problem is only going to get worse.

I&SM: Other than encouraging students to enter the world of ferrous metallurgy, what else do you see the Society doing?
FRUEHAN: If you look at the past decade, the Society has done remarkably well under the circumstances. The steel industry has been through a restructuring period during the early 1980s, and we lost a lot of production and a lot of management. Despite these temporary setbacks by the industry, the Society actually grew in membership. More importantly, it expanded its activities in this period to give more benefits to its members. The three areas which I think deserve special attention are: Continuing Education, Advanced Technology and the Ferrous Metallurgy Research Grant. All of these became significant programs in the Eighties. It would be good to give recognition to people like Dick Hill who has headed up the Continuing Education Committee for many years, Howard Hubbard in advanced technology, and John Stubbles and his committee for the excellent job they have done with the Ferrous Metallurgy Grant Program.

I&SM: Let's talk about the Society's continuing education program.
FRUEHAN: When we look ahead to the next decade, or the next few years, we have to continually upgrade and improve our courses. The survey which Dick Hill just conducted will be very valuable. It has recommended continuing some courses, updating some courses and eliminating the ones that haven't done the job. I think that is good. Constant education has to be done to make sure we give our people a good product.

After 1985, when the steel industry started to pick up again, people were so hungry for information and technology to improve their quality and productivity that they would do almost anything in terms of education. Now they've gotten up to the level where we have to ensure that we give them a quality product. We have to make sure our courses are up to date. We have to make sure that they deliver what we say they're going to deliver, and we have to ensure that the speakers don't put people to sleep. In the period from 1985 to 1989 it was easy for continuing education because there was an absolute need for everything. Now I think our audience is more sophisticated, they know more. We just have to be very careful and make sure that we give them a good product. And I think this course assessment has been a very good thing in this direction.

I&SM: What do you think about the Advanced Technology Symposiums?
FRUEHAN: I think the Advanced Technology Symposiums have been successful. Sometimes I get concerned that it's not advanced technology. But advanced is a relative word. Advanced to me might mean something different than it does to you. An example is the one very successful conference on ultra-low-carbon steels that was held in Toronto. When I suggested the topic two years ago it was advanced technology, but from my viewpoint when it was given it was existing technology. But it was advanced enough to other people that it was extremely successful. We had over 200 people there, you couldn't get in the room and the papers were quite good. And so we are definitely serving a need for our members. It's a good thing that the Advanced Technology Committee is very diverse. You have some people there who are very involved in research who might see things down the road a little bit farther, but that's not the only people you want to have. You want the people that give it focus on which technologies we have to look at. But the programs to me have been one of the big success stories of the Eighties.

I&SM: For you personally how has the Society helped you?
FRUEHAN: In my particular case, belonging to the Iron and Steel Society has been one of the most positive things in my life. You get a lot out of being a member but if you take the time to participate in some of the programs, what you derive from the Society is even greater. It is like anything else in life – the more you put into it, the more you will get out of it. Being a member, attending the conferences, receiving the publications, is certainly well worth the cost. But you can actually get a lot more out of it by participating in the Society's activities. There is such a wide area of things that you can participate in ranging from: publications, education committees, conference sessions, being a member of a particular division committee. All of these things enable you to get the maximum from the Society. In my particular case it was a case of a person being interested in fundamental and long-term research and becoming more aware of the everyday problems in the steel industry. For the guy who is in the everyday steel industry, he is going to become more aware of the long-term research and long-term things that he may not be intimately familiar with. Just to summarize again, you get a lot out of being a member when you just partake in what the Society has to offer. But you can get a lot more if you actually participate in the various committees and activities. It will certainly help you in your career. It has done wonders for my career – and I am sure the profile the society gave me helped CMU's Center for Ironmaking and Steelmaking Research considerably. *I&SM*