AMERICAN INSTITUTE OF MINING,
METALLURGICAL, AND PETROLEUM ENGINEERS

ORAL HISTORY PROGRAM

Sara Hornby:

A Rebel Leader Propelling Women in the Steel Industry

2021

PREFACE

The following oral history is the result of a recorded interview with Sara Hornby conducted by Lauren Keating on May 6th, 2019. This interview is part of the AIME and Its Member Societies: AIST, SME, SPE, and TMS Oral History Project.

ABSTRACT

Challenging stigmas of women in engineering, Sara Hornby has been a rebel in the steel industry. Hornby grew up in a military family, where her experience roaming the world – from the UK to South Yemen – influenced her type A personality. It is with this characteristic confidence she was compelled to study metallurgy and do what a woman "can't". Hornby has had an extensive career working for companies such as Air Liquide and INTECO implementing new technologies in foundries across the globe. She has been outspoken in her career to push her ideas forward against adversity. Now the founder and president of her own consulting company, Global Strategic Communications, Hornby has become a role model and leader for women in the steel industry. Through her involvement in professional societies AIME, ISS, and AIST, Hornby promotes the advancement of the industry for the next generation. As an outstanding figure across the steel industry, her ambition and outreach into the community will influence and attract future professionals and women to the field.

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0:00:13 Introduction

Keating:

Today is Monday, May 6th, 2019. My name is Lauren Keating, and I am here with Sara Hornby, in Pittsburgh, Pennsylvania at the Association for Iron and Steel Technology's AISTech 2019. Sara is the president and owner of Global Strategic Solutions, and she has been a prominent member of the iron and steel community for over 35 years. We are doing this capture for the American Institute of Mining, Metallurgical, and Petroleum Engineers oral history program. Thank you, Sara, for agreeing to talk to us today and share your experiences.

Hornby:

Thank you for the opportunity.

0:00:47 Growing Up Military and Roaming the World

Keating:

So, let's start at the beginning. Tell me about where you grew up.

Hornby:

No fixed abode. I had two Army parents. My mother actually came out of the Army when she was pregnant the first time. So, we were roaming family. I spent two years in Fort Rucker, Alabama in the seventh and eighth grade, age 10 to 12 then was shipped home to boarding school because we weren't getting a good enough education.

From there we went to South Yemen. My father, in the U. S., had been the British liaison officer to the helicopter training school here. He was learning how to arm the British helicopters for the actual incidents (The Aden Emergency/Insurgency) that we had in South Yemen at the time. He was there for the last three years that England was in Saudi Arabia. My father was in charge of the unit. (and was awarded the Order of the British Empire (OBE) for his service there).

From there we went back to the UK and I was taken out of boarding school and lived at home for a year or so. Then my parents were shipped to Yorkshire, which is where my father had come from and wanted to be all his life, and I ended up at college in Sheffield, which is also Yorkshire. So, it was an interesting upbringing, very strict. I had more freedom at boarding school than I ever had at home, but it was a different childhood, and I've been roaming the world since.

0:02:31 Doing What a Woman "Can't" – Studying Metallurgy

Keating:

Yeah, it sounds like it's had a large impact on what you've done since. What did you choose to study at university?

Hornby:

At university, I chose subjects nothing like what I'm doing.

When I was taken out of boarding school, the reason at the time was that I had wanted to do two maths

and art as my A-level subjects> As I was at an all-girls boarding school, they basically trained us to be young ladies. There were very few sciences available and I was given the opportunity to do just maths, physics, and chemistry, which I took, and I did art as a side subject. When my parents came back to England, they took me out of boarding school, the excuse was I could do two maths and art down at the school in Wiltshire under a different exam board. This actually turned out not to be the case, and I went on strike. They had studied what I had not done, and they were about to do what I'd already studied. I just blew off the rest of my A-level studies up to the exams and ended up with two A-levels (Maths and Physics), one OA-level pass (English), and an O-level (Chemistry), which meant I actually couldn't go to university.

But during the procedure of choosing subjects for different universities, I had chosen cybernetics, geology, tribology, all sorts of weird subjects that weren't the norm, partly in rebellion to my father who was by then the examiner for the Officer cadet intake of the British Army. He had various suppliers come to talk to the students that were going through (options in case they failed the course). And one of these, Rank Hovis McDougall, at the time, had said they'd take me on as a new employee, but I had to get a degree, any degree but computing, and I can become a computing person. I didn't want to do that. As I ended up failing to qualify for my chosen Universities/courses, my options were to look for something else, go back to school for a year, which I was not going to do, or go to a polytechnic (I'd never even considered that or heard of them). So, I started talking to a career advisor about what was available. It was the usual boring subjects until we got to metallurgy, and he said, “well, that's something you could do with the three subjects, but you're a woman. You can't do it”. So, guess what? I did it.

0:05:05 Co-op Experiences and the Applied Research Laboratory (ARL)

Keating:

Did you have any internships or other experiences that further encouraged you into the steel industry?

Hornby:

I actually interviewed with two polytechnics. One was Lanchester (Coventry). After an eight-hour exam (interview) with them, they decided I couldn't go there because I was under age. As they had a co-op program (as did both of the colleges), they offered to put me through a year of training with one of the co-op partners, but I decided I probably would never go back to school if I started earning money and got freedom. So, I went to Sheffield. They didn't mind how old I was, but they were a little bit concerned I'd be the only woman in the engineering school.

My first co-op was with a company called Joseph Lucas Ltd (Birmingham), who had hydrogen cars running around in 1970. I went into the research group with seven women. That was the last time I worked with a lot of women.

The second one was actually a year later, and it was six months at a cupola foundry with hot metal (William Lee Malleable, Dronfield). That's basically where I decided I wanted to be a melter.

Keating:

So, what was your first professional job in the industry?

Hornby:

Well, apart from the two co-ops, I ended up working for Applied Research Laboratories (ARL, Luton), which made spectrographic equipment, which I had used when I was doing the co-op in the cupola foundry. I was

technically the European sales manager, but I spent most of my time making coffee for my boss. I was the only woman in the office. So, it was quite an interesting start to my career.

Keating:

So, you've mentioned that, of course, at the time, being a woman was a rarity.

Hornby:

Oh, yes.

0:07:05 Overcoming Challenges as a Woman in Engineering

Keating:

Were there other difficulties that you found as you transitioned into your career?

Hornby:

I was challenged from the minute I started at college. I was two weeks late starting, and I remember the first day I walked into the lecture theater, and it was a theater, and there were 24 men age 18 through 24, 25. They all asked me what room I was looking for because this obviously wasn't the right one. I crept slowly to the back of the room to take my seat because it was the right room. The whole college was pretty much expecting me to fail. It turned out they'd had one female student in the engineering department before me who had succumbed to pregnancy very early on, and never finished the first year. And that was the expectation.

Keating:

Where did you find the confidence to continue to pursue your passion that you found?

Hornby:

I'm an Aries, type A personality, and you know I was told by my mother growing up that there was nothing you couldn't do if you put your mind to it. So.

Keating:

Excellent advice.

Hornby:

Yes.

Keating:

Did you have any mentors at that stage?

Hornby:

College, they really expected me to fail until I went through the two co-ops. So I was, by then, three years into my four-year degree program. I had a supervisor, obviously. He [Vic Gibson] was a pretty good

mentor, but he also he taught me how to play bridge 'til four or five o'clock in the morning, and go to sleep in class the next day.

But, yeah, he was pretty good. And there was the professor that taught us welding [Brian Murphy]. He thought it was a delight to have a woman in the room, spent most of his time with metallurgical jokes because of it, but he followed my career after I left. He really promoted me when we went on steel mill, or foundry visits, or even to the copper companies. He would make a special attempt to show me what was going on and feel out where I was interested.

Keating:

As you began in the profession, what was your first major project like?

Hornby:

Steel related, it was heat tinting. I developed a heat tinting process for quality control of a high-speed steel and tungsten carbide tips for the high-speed steel (at Firth Brown Tools, Sheffield). I was always accused of being an artist throughout my metallurgy course (artistic renditions of microstructures we observed down the microscope). I got to play artist.

0:09:52 Attaining a PhD in Industrial Metallurgy

Keating:

Your PhD is in Industrial Metallurgy from Hallam University, Sheffield City Polytechnic, United Kingdom. What inspired you to pursue a PhD?

Hornby:

I didn't to start. When I finished my degree, they (Sheffield City Polytechnic Metallurgy Department - SCPMD) offered me the opportunity to do a PhD immediately, even though I hadn't really excelled in my grades. Then again, I'd been part of the MetSoc, part of the student union and partied my way through my four years.

At the time, the only PhD subjects they had were what I would call lab related, and truly genuine research. I wasn't interested. I wanted to do something that was industrially related. So, I went into industry (ARL and Firth Brown Tools).

Two years later, British Steel Corporation (BSC) was having problems with their ingot molds. They were failing rapidly, and they wanted to sponsor a PhD. So, they (SCPMD) came to me and asked if I would be interested? Just the year before the Poly had started the industrial metallurgy course, which comprised two and a half years, part time, one day a week, 12 hours a day doing a Master's course. That included advanced metallurgy, an MBA, and a case study on your related PhD. So, I analyzed the problems of British Steel Corporation. At the same time, we did our PhD research. So, it was kind of an interesting three years.

Keating:

Absolutely.

Hornby:

And I was actually hired as a lecturer. I wasn't a PhD student. I was a lecturer one, and I got to teach some

of the students as well.

Keating:

Sounds very challenging.

Hornby:

It was interesting. It was fun. The Master's culminated with an eight-and-a-half-hour exam that took me from the bottom of the class to the top of the class! All the staff were like, we knew you had it in you, but you know, you finally showed us. It was like, wow. It was time to prove a point.

Keating:

Sara, I notice that you have a Lean Six Sigma Black Belt. Tell us about that.

Hornby:

Yes, there are a couple of reasons I took it. I told you earlier that when I doing my PhD, my master's program, the eight-and-a-half-hour exam at the end, I pulled myself up to the top of the class and surprised everybody. I had taken quality control as one of my three advanced courses for the exam and chosen to take that as a subject. ~~And~~ [I] wrote a quality control manual in eight and a half hours for a Foundry. That was called quality control then, but of course, now the big buzzword is the Black Belt Six Sigma. When I had the opportunity a few years ago, I went and commuted my quality control into the Black Belt Six Sigma to be current. The other reason was I thought I could use it as an additional piece to my consulting business, and I could go outside the industry and look around, but people don't want that, I found out, but that's fine.

0:13:18 Career Progression Through the Steel Industry

Keating:

So, tell us about your career progression in Europe, and then transitioning to North America.

Hornby:

Well, the PhD was sponsored by British Steel Corporation, so they expected me to go to work for them, and I did. They at the time had a young managers program where you learned every part of the steel industry from start (scrapyard) through to finished product, all of them, Even to the blast furnaces and BOS. In our plant, it was an electric arc furnace.

Because I had a PhD, I was sidestepped to do special projects for the plant manager. Then there was a melt shop job that came up, and I applied for it. I was told very nicely that I was the most qualified person for it, but there was no way a woman was going into the melt shop in those days.

So, I ended up as a hot strip development metallurgist, rolling high strength, low alloy steels for Ford Motor Company, the obvious commentary being hot strip metallurgist. But that was fun too at the time, and they challenged me unbelievably throughout the time I was doing that work.

By then I had married, and my husband had applied for a job in Montreal and went to work for what was then Quebec Fer et Titane (QFT), which is now Rio Tinto (RT). So, we moved to Montreal. I was offered a job with Quebec Iron and Titanium (QIT/QFT), and with Sidbec Dosco, Contre Coeur with the condition that I would learn French in two years. I mean, I spoke French, but not Quebecois. That was a problem.

0:15:04 Seventeen Years Traveling the World with Air Liquide

Hornby:

I joined Air Liquide, and traveled the world as my husband was going to do with QIT. So, from there, let's see, I spent 17 years with Air Liquide - Quebec, then to Chicago, and I went to San Francisco to the head office, well actually Walnut Creek. Then they asked me to move again either to the new corporate office in Houston, back to the tech center in Chicago, or, preferably, to the job in Toronto that they created as per my request. This was combining the management of not only the marketing but the research and the applications groups to make sure that they were all in tune and communicating properly, making it easier to facilitate the actual applications development and installations at the customers.

We started with a new application that came out of France, which was off gas analysis for the electric arc furnaces. We had the gas technology, but we weren't so clever on the computing side. At the time, Goodfellow Technologies, now Tenova Goodfellow (Mississauga, ONT), had a similar program, but they were proficient in the computer side of the business, and really needed some help with the electric furnaces and the off gases. So.

Keating:

Sara, we were discussing your career progression, and you began to talk about off gas analysis and Air Liquide.

Hornby:

Yes, Air Liquide. We had an off-gas analysis application that was called ALARC-PC™. They combined post-combustion and the analysis of off gas. But we were very much interested in the use of gases, obviously, and we weren't doing such a good job with the computer side of things.

At the same time, Goodfellow Consultants had split off what became Goodfellow Technologies to promote the off-gas analysis system. They were computing engineers and capable of doing analysis, but didn't know much about the steel industry. They had done a lot of off gas analysis for other industrial plants, but nothing like a steel mill.

So we started talking about a joint venture, which was not acceptable to Air Liquide, France. And ultimately, Howard Goodfellow came to me and asked, would you like to come and be director of technology, and teach us how to deal with the steel industry?

0:17:17 Industry Positions and Independent Consulting

Hornby:

Goodfellow Technologies had already signed an agreement with Co-Steel Lasco to do the first EFSOP™ system demonstration. I was asked to come and help them promote the system, basically consulting to technical sales, and manage the group, and help them learn about steel making. It was quite a fun two years.

I ended up doing a lot of work in England, funnily enough, with one of the old people from British Steel Corporation (John Clayton), who was running Co-Steel Lasco's plant at Sheerness (Later ASW Sheerness). We put an installation, actually two installations in there, and then they asked me to consult to tell them why they weren't saving the money they should have been with EFSOP™. So, it was fun. There was a

problem with Howard's family, so he sold the business. By then, I was the director of technology and operations, and Howard had gone to teach at the University of Toronto, taking the sabbatical. But the new owners had asked him to come back in as part of the agreement, so I was downsized. And by that time, I was about to have my first litter of kittens, so I decided to take the summer off.

Midrex came looking for me to move down to Charlotte to be the product manager – steelmaking/melting., which I finally did in August 1999. I was there for a couple of years. Our mandate in that group was to look for new technologies that could use the basis of Midrex's core business for the DRI plants, and find some way to use it in other industries.

But I also found out there was a misconnect or a disconnect between the DRI plants, what they were doing and making, and the actual EAF steelmakers, in general, who were using the DRI. I was a proponent, having had some major experiences with Air Liquide, of having high carbon contained in charge materials, whether it's pig iron or DRI, because it improves carbon efficiency. So, I started to do a lot of the training for the DRI plants, and what their product would do to an EAF. And the EAF steelmakers on the technical restrictions and economic impact of EAF needs on the DRI plants. This became a teaching scenario which assisted in building DRI business worldwide.

Let's see, from Midrex, we had those two big, big downturns in the steel industry, and I was downsized, so I decided I would start my own business, which is the one I'm currently running. I continued to consult to the industry until, oh let me see, Linde Gases asked me to join them. They had put a division together here to look at the German research, to see whether or not it was applicable in North America. So, I got involved again in a new off gas analysis system for the electric arc furnaces, which was laser based. I spent most of my time with them doing that project. There were a couple of other minor projects, like welding cast iron to steel, which hadn't been done before, which was interesting too. They were then finally bought by BOC (British Oxygen Corporation) up in Newark, New Jersey, and the HO eventually moved from Cleveland, Ohio to Newark, New Jersey. So, some of us were left behind. I went back to consulting.

The next position I had was with Process Technology International. They're now INTECO. We had worked together on a potential laser off gas analysis system. They asked me to come and be the vice president of sales and marketing for their combustion-based equipment and injection systems for EAFs. We (the steel industry) had another downturn, so I went back to working for myself. I did some consulting for Nucor along the way, and Gallatin Steel, and I ended up working for ...

Actually, I interviewed and got two offers the same day. One was for SSI (the Thai firm Sahaviriya Steel Industries UK) in England, back in the frozen cold wastes of the northeast at the old BSC plant that was being restarted after being shut down when British Steel demised. And Tube City IMS here in Indiana. I took the job in Indiana. The weather was better. So, for the third time I was supposed to move out of Charlotte, go to Indiana. But I was left where I was, and I managed the optimization group for Tube City IMS from afar. We were optimizing charges to electric arc furnaces or to BOFs to produce low-cost steel.

So yeah. When that job finished in 2013, I went back full time to my own consulting business, and I've been doing that since.

0:22:27 Steel Mills and My Favorite Town to Work In

Keating:

You've done some travel to European metallurgical plants.

Hornby:

Yes, my first trip-- we had some German HR people from steel mills into the Polytechnic where I was at the time, on a training course, and they actually stayed in our hall of residence. We only had one. They talked to me about the industry in Germany, and as it turned out, I won the second-year student award. I was given funds to go do what I wanted, to look at something metallurgical, wherever. The Germans were still in town and they helped me plan a three-week trip around Germany to see a couple of the steel mills, the integrated steel mills. Oh, there was a forging plant who remembered the war and said, oh, we've got a Brit in the place. You won the war and we're supposed to show you all our secrets. But it was a great experience. I got to see a whole different side of the industry from what I'd seen in England. And then, of course, I revisited a lot of the steel mills as I went through my Air Liquide roles. I used to take customers, Canada, or US customers, or potential customers, to Europe to see all the different technologies. I think the craziest trip was we did 14 steel mills, 12 countries in 10 days. It was awful, and one of the vice-presidents of Slater Steel's suitcase was on the ground 10 minutes after we got in the air. They said, "Sorry, sir." Because of our schedule, they caught up with us over a week later, including bomb squads to pull a strange suitcase out of someone's bathtub where we put it when this suitcase up. It's been very interesting. So we did Luxembourg. We did Germany, France, Belgium, all the way around Spain, lots of Spain over the years. We looked at the new technologies, the DC furnaces that were coming out of Europe. The Oxy filled burner technology the bottom stirring, all those technologies were ahead of the time, and some cases still are, in Europe. And we took people to see the new technologies.

Keating:

So, as a follow up, I have a nontechnical question and a technical question for you. You've traveled, and you've lived in so many different locations. I'm sure what a great opportunity in some senses, and probably some challenges in others. Is there a location or a facility that stands out to you as perhaps your favorite, or a particular experience that stands out as a favorite?

Hornby:

Steel mill, country, or actual town, or all three?

Keating:

All of the above.

Hornby:

As an adult, I found San Francisco to be the most conducive to a single female. They were so accepting of anybody and everybody that moved into the area. Chicago, there were cliques everywhere. Even though I knew the people I worked with for five and a half years, I was a single woman and a threat to everybody and their wives, wives more especially. And it was crazy.

Plant wise, oh gosh. That's difficult, they're all so different. I mean, I've been from Asia through the Americas to most of Europe. I don't know. I guess the smallest furnace I worked on in the steel industry, not foundry, was Western Canada Steel (WCS) who originally had (now there is a good mentor) a 20-ton electric arc furnace sunk in the floor. They wanted to use Oxy-fuel burners and they were actually Air Liquide's first installation of Oxy-fuel burners in North America. I was in the hospital at the time they installed them, unfortunately. That's another story. The boss said, if you're going to give me burners, I want the biggest ones you've got. And he put three, six megawatt burners into this 20-ton furnace, and when they pushed the button, they set the whole thing on fire. So, there’re pictures of flames pouring out of this furnace**.** We actually put smaller ones (3.5MW) on in the end. But yeah, that was the smallest one I worked on, but favorite? I don't know.

The scariest one I worked on, and I have done some crazy things in my life which would have got me terminated by everybody that's around now, was Sydney Steel (SYSCO) in Nova Scotia. I had worked for British Steel, who had lots of open-hearth furnaces, but I'd never seen one. At SYSCO we were running ingot mold trials, CO_2 purging the ingot molds, and they were tapping the open hearths' steel into ladles (I think 250 tons) which were teemed into the ingots. Well, the first thing they did was, at two o'clock in the morning, put me in the crane while they blasted open, and I mean blasted with dynamite, the tap hole. First problem, I don't like heights never mind all the debris build-up dislodged from the rafters from the explosion. Second one was they asked me if I'd like to tap the ladle while we were shrouding the ingot molds. I had to stand with 250 tons of liquid steel over my head moving it down the mold line. He said, if it (the ladle) starts to leak, push it that way (forward) and run that way (backwards). Yeah, and it was, I think something like minus 20 degrees (C) in the middle of December, and it was not fun, but it was fun. The only place to keep warm was the men's washroom, and still is in most plants.

0:28:39 Developing a Foundry Application Using Hospital Truck Supplies!

Keating:

What are some of the biggest technical challenges you've had?

Hornby:

You want some funny ones?

Keating:

Absolutely.

Hornby:

I got very frustrated with the steel industry at one point, and having come out of the foundry industry, I decided to redirect the efforts of my (Air Liquide) team to the foundry industry. We had put liquid shrouding on continuous casters. It hadn't been very successful. Not very many plants installed it, especially in North America, I think Co-Steel Lasco was the only plant that did it here for a while. I couldn't understand why we couldn't take that into the foundries and melt under liquid. So, we did. Well, we started calling on all the foundries from here to LA. Then one day after a very frustrating three or four days in LA with the traffic and negative foundry men, we came across a German running a foundry, and he said, if your process is that dot dot good, be back here at eight o'clock tonight. And I said, done. We'll be here.

We had no foundry gear, no boots. We had no equipment. We hadn't even thought that far ahead. We raided, well Air Liquide knows about it now, the hospital truck and took the diffusers, the pipes, the lines and the tanks, and we put the equipment together. We bought saucepans and soup scoops and we graduated them so that we could use them to pour (liquid industrial gas) into the molds. We went in with our dewars, I think it was liquid nitrogen there as they were melting copper beryllium heats.

The process was very archaic. They would melt the copper with some beryllium (Be) in the furnace, and then they would tap onto Be in a ladle, and tap it back into the furnace and repeat several times. We had these lances with liquid dripping out of them through the diffusers, which didn't last very long because they weren't very high-temperature resistant metal. We had to put steel wool pads wrapped with aluminum foil on the end of the lances in the end. I was following the furnace motion from flat bath to tapping, the furnace pour back, and the tapping…. endlessly. I had muscles the next day I didn't know I'd ever had before! The operators all worked with us. We poured liquid nitrogen (LIN) into the molds, and tapped into

them as well. And all the non-anglophone Mexican operators were motioning can we have a scoop? And watching, following us, and copying. We saved them $6,500 each heat (preventing Beryllium losses), and the guy asked us to put a full installation in the next day.

I mean, it was crazy. At the initial call we hadn't got anything ready to do a demonstration. The local applications managers got me outside, and said, you did what? What am I supposed to do now? I suggested they find a solution. I just got you the potential contract. So yeah, that was probably the biggest challenge.

0:31:39 My Crazy Ideas Became My Proudest Achievements

Keating:

So, a similar question, a little bit of a different twist on it. You've had a wide array of achievement throughout your career. Various facilities, various operations, which stand out as the achievements that you're most proud of?

Hornby:

I don't think there's any single one. That process was named the SPAL process, surface protection Air Liquide, or it got nicknamed Sara's process for argon liquidation. It is still running today. Gosh, now, I don't know how many years later (32+), and not how many customers anymore. I think there were quite a lot.

It was applied from the gas fired furnaces making copper, right the way through to all of the high-quality investment castings for the medical industry. So, you know, it was fun doing it. It became such a success at Air Liquide (AL). After we assessed the potential, AL gave me a team, I think, of 15 people who ran and knocked on every door in the country so we could get a head start on all the other gas companies before they started to find out what we were doing. And we gave papers, and we never told them we were using liquid industrial gases.

I mean, it was a fun time, but we've done something similar with CO_2. We took an idea from Japan, and did the first trial with what was IVACO (L'Orignal, PQ, Canada). I stood and shoveled 250 pounds of CO_2 pellets about size of my thumb into a ladle. It was a front tapping furnace, and we tapped the hot metal onto the CO_2. Everybody was expecting it to explode. I was the only one out on the plant floor above the ladle with my toes crossed in my boots praying, I was right; it wasn't going to explode.

But yeah, I mean, the plants have done a tremendous job over the years, in helping me do what I call applied research and development. Once they began to trust my crazy ideas, they were more than willing to help out. Charter Electric in Chicago, when they existed, they were right down the road from our tech center. We'd say, we've got a crazy idea. Can we come down and try it? We took the SPAL process into the steel mill there, and we put liquid argon in the ladle furnace to stop the problem with hydrogen and nitrogen pickup. It was too expensive to use in the steel mill, but it worked.

0:34:16 AIME and AIST Mentors

Keating:

It's fascinating. So, you've worked with so many industry leaders. Who has had a profound impact on your career?

Hornby:

I think since I've joined the AIST, a lot of the leaders of AIST and AIME were big mentors. I started to go through a potential list of people who had mentored me, and there were so many it was just impossible, but one of the people that sticks out is Grant Schneider. He was president of AIST, well ISS then, and the AIME.

He had a daughter that was pursuing an unusual career, and he tried to persuade me to continue to beat down the doors. He also used to drag me aside at cocktail parties, and say, come with me, come talk to the ladies. But don't tell them any of the crazy stories, you know, just come and try and persuade them this is a great industry to be in. So, he got me involved with the students. So, I was on the industry university committee at one point with the ISS. Keith Brimacombe. I knew him in part because he was at one point an Air Liquide professor, as well as Alex McLean and Gord Irons. They all worked as consultants for us, so I have had them as mentors, especially Alex when I was up in Canada. I think when I joined AIST, Norm Mills, he turned out to be a good friend too, and he was a competitor of mine for a while when he was with the other gas company. Yeah, but there's been a lot of people. There are so many, I don't want to leave anybody out and upset anybody. But yeah.

0:36:16 Passion for Metallurgy

Keating:

You've been awarded five patents. Can you tell us about how your research and development efforts led to those achievements?

Hornby:

That was the SPAL process from the foundry in LA. We actually got a patent for the equipment we finally developed. We got it equipped. We got a patent for the process, which they said we couldn't really do, but we did.

We took it on to the copper furnaces, the vertical copper furnaces, so that when they had to shut down, we could flood it with liquid, and it would save them losing all the copper. Huge savings. The ladle furnace, of course. I'm trying to think what the first one was. It was also liquid use, and since then there's been more that have been taken by other people, Air Liquide for titanium melting. Yeah, it's still going on. The fifth was for substituting CO_2 for argon in the argon oxygen decarburization (AOD) vessels – also a huge money saver – which Praxair, the AOD developer, had not been able to do. We found a way to reduce CO_2 dissociation.

Keating:

You've also accumulated a tremendous portfolio.

Can you describe how your passion for metallurgy and melting grew and developed as your career progressed?

Hornby:

I think passion was always there; the ability to follow it wasn't. With the exposure that I got within the ISS/AIST, and the mentors that were well known names in the industry, people began to trust me, and they would allow me to come play in their plants.

Some were very successful; others were a little bit challenging. There was one incident in, I think it was Nova Scotia. I was sent out to a company it wasn't a steel mill, it was a foundry, to install something similar to the direct Tuyere injection in a blast furnace. I'd been trained by this French technician, and I was sent out to install the direct tuyere injection in the cupola of the Foundry.

Things started to go wrong, and I told them how to turn the Cupola around. They flat out refused to do it until I got my French technician to fly from Paris, who told them exactly the same thing. He was a very brusque, elderly gentlemen, and he told them that he'd taught me, I knew what I was doing, and they damn well follow my instructions the next time. He wasn't coming back.

But yeah, it was challenging throughout my whole career, but the passion was still there. I loved to be around molten metal. I did not like the heat treatment. I was in charge of that and welding for a while, but they used to joke about me and my passion for pyromania basically.

0:38:58 The Crazy Cat Lady – Cheetahs and Siamese Cats

Keating:

It's obvious when you talk about metallurgy, and you talk about melting, you light up, so your passion is obvious there. What other passions do you have?

Hornby:

Animals.

Keating:

Tell us about that.

Hornby:

Oh, I think the highlight of my life was when I was allowed into an enclosure with three 18 months old cheetahs in South Africa when I was on a business/Christmas trip with a friend from the industry **(**Clara Van Aswegen, then with BOC, now with Nucor, and her husband). I was asked by Midrex to commute a week of a vacation to go down to South Africa to the Cape area, and go visit some steel mills. And Namakwa Sands and Iron Sands Company that might be able to use some of the Midrex technology.

But when we got back to his parents' home, they asked me if I wanted to go on a safari and see lions, and I said, not really. I'd like to go see cheetahs. And we looked it up, and it turned out there was the world cheetah preservation about 45 minutes away, and they took in cheetahs that had been hurt by the farmers because they were poaching, or had been found abandoned. And they were in charge, basically, of a breeding program for most of the world.

And they had anything from six, eight-week-old cubs at the front, you could pet on the way through, to these cheetahs that they were taking out to industry, to the locals and to the farmers, on a leash like a dog, and showing them how friendly they were, teaching them how they should live together with these animals whose numbers were dwindling in the wild.

And throughout the whole of the safari through seeing the wild dogs, I kept saying, can we go and see the pussycats? (I love cats too.) Then finally, after I bought out half the shop to take home presents to England, they let me into this enclosure with the three cheetahs. They were incredible. They were like overgrown

house cats, but they were much bigger, and could do a lot more damage. But they were sweet, and they came, and they purred, and they just wanted attention. Then the friend (Clara) came inside the enclosure, but she wasn't very keen on animals, and one of them took exception, then actually kind of nudged her and bit her slightly to say, please, I need some attention, too. No, that was fun.

Keating:

Do you have any animals at home?

Hornby:

People would tell you too many. I'm the crazy cat lady. I have five Siamese cats now. I just lost the sixth one to cancer. I have a blue point, two lilac points, a chocolate point, and seal lynx point. Four of them are bred in house. And I also have 14 raccoons, three possums, and several deer running around the back garden, and along with the birds.

Keating:

So very lively residents.

Hornby:

Oh yeah. Neighbors don't know. Actually, the gardener came out the other day and wanted to know what a track was, what small dog I had in the house. And I said, none. He said, well, you've got a track through the grass and the garden. I said, yeah, it's a raccoon track, there's another one over here.

Keating:

Somehow in your free time, which I really can't imagine how you have any, but you've taken on some volunteer work. So can you tell us about that?

Hornby:

Yes. I became a volunteer for Charlotte Mecklenburg police department after a very extensive questionnaire and background check. I am certified for the whole of the police department, but my preference is to work with the animals. So animal care and control. Unfortunately, I am now allergic to cats and dogs, over the last two or three years. So I tend to make follow-up phone calls to adoptive parents to make sure that they understand their responsibilities and they understand any problems they've had with the animals, cats, or dogs, and help them any way I can. Tell them they can take their food back to PetSmart and get the money back, and generally help settling the animals. There's a lot of abandoned animals in the Charlotte area. I think everywhere, but I've seen a lot in the Charlotte area. It's really despicable, and dogs are fighting, so we take them in. A big, big program for us now is to not be as big a kill shelter as we have been in the past, and it's working. So I add that to my raccoons that I can hand, feed and pick up. [Laughs]

0:43:57 Lecturing Experience and Training Companies in the Steel Industry

Keating:

You've accumulated a tremendous portfolio of technical papers and presentations, as well as many seminars. How has lecturing and teaching enriched your experience in the industry?

Hornby:

When I started with the industry, I guess I had the understanding, expectation, maybe it was my mother's expectation, that I would be a career woman, a wife, a mother, and I thought the way I could do that ultimately would be to end up in a university teaching. I only got one out of the three, but I enjoy passing on the knowledge and the experience, and sharing the stories. And in today's world, what I've done probably couldn't be done. It would be unsafe; I would be challenged. There are not many crazy people like me around either.

Keating:

How has lecturing and teaching enriched your experience in the industry?

Hornby:

Internal to the companies that I've worked for, I have in some instances had to train them in the steel industry because they had no knowledge. So that's been a great way to pass on my experience to others. Internal to companies that dealt with the steel industry, it's been more a question of persuading them that the industry needs new technology, innovation, and how we might be able to assess them. I must admit, when I haven't been given the go ahead, I've gone without permission, asked for it later after developing some things.

I've also been down in South America because of Keith Brimacombe. They invited me down to do a three-day seminar on industrial gases in steel making because no one was really talking about that down there in terms of the immense possibilities. Steel mills weren't using them all. So, I got to go down and talk about bottom stirring of furnaces, and the obvious Oxy-fuel burners, oxygen injection. We talked about the CO_2, opportunities of replacing argon with CO_2, and saving millions. And so, all of the crazy things we had done, tested AOD replacement of argon. We'd done it The CO2 in the AOD that became a success where Praxair had failed because we actually happened to preheat the gas by accident before it hit the furnace. That's the other patent. We got a patent on replacing argon with CO_2 and AOD.

Keating:

I brought a quote from you that I find particularly interesting. You said, "North American producers need to find ways to reduce their costs further, perhaps even revisiting old technologies to do so. Like fashion, what goes around comes around. Perhaps it's time to revisit them." Can you tell me your thoughts on that?

Hornby:

That arose from a conference where I was chairing sessions, I think for the AIST, three years ago I think it was. There were a lot of questions from the floor on, maybe we can do this, and maybe we could do that, and why hasn't someone thought of— I sat there biting my tongue thinking we were selling you guys this kind of stuff 30 years ago, and you wouldn't use it.

And it just, you know, maybe it's time to re-up the technologies we were offering then. We brought off gas stirring of the furnaces to the country, I mean, all of us, all the gas companies, and some of the ceramic companies. People here didn't want to do it because it, I'm trying to be positive here, it was labor intensive, they thought. There was an issue with some of the systems with lead falling out of the bottom of the furnace, which was obviously dangerous, but mills would put it in for a week, and say, it doesn't work, and walk away.

The off-gas analysis systems were put in, but they had to send someone to clean out the systems once a week, and gee, that was another person's time (It was only like a third of a person's day once a month, you

know?) So, they failed despite millions of dollars of savings to be realized. I mean, it was frustrating, which is why I went to the foundries. There are so many other examples of those types. That CO_2 replacement of argon needs sources of CO_2, and we want to get rid of the CO_2 that's out there. So, why don't we use it? So maybe it's time to start looking again.

0:48:58 Involvement in AIME, ISS, and AIST

Keating:

When did you first hear about AIME and its members society, The Iron and Steel Society?

Hornby:

I guess my main mentor at Air Liquide, originally in terms of The Iron and Steel Society, was Bob Lee. The people that I worked with and around in Canada didn't really come to the ISS. So, he interested me, and I started coming. I believe I joined back in 1982, or was it five? And as I said, at the time Norm Mills was, I believe, president of both at the time. So, I got an overview of both. And again, with Grant Schneider, I remember going to a black-tie dinner with Grant Schneider and his wife. That was one of the first ones I went to with AIME.

Keating:

How did your involvement progress over the years, including up until now, with the new association, AIST, which was formed from ISS in the AISE merger in 2004?

Hornby: [00:45:08] When I joined the ISS, I think it was Keith Brimacombe who persuaded me to join the process technology division (PTD). So, I joined that committee. I helped to organize an AOD conference. Then I got involved in the Board of Directors, through the process technology chair. As my predecessor as chair had to withdraw from his chairing, I joined the BOD earlier, and was on the board, therefore, for three years. I, with Ruth Engels, were the first two women on the board. We even shook that up a little bit. I'm pretty sure no one wants to hear the stories I have to tell about that!

Keating:

Well, I think we do.

Hornby:

Maybe we'll come back to that.

Keating:

Okay.

Hornby:

So, I went through the chairs through the PTD. We had a major conversation when I became chair, whether we should be chair-man or -woman, and I said, no, no, no, we're not changing it. So, I was still the chairman. I was on the board with, let's see, Harry Follwell and then Keith (Brimacombe), as the presidents at that time. Keith asked me to head up the ad hoc committee from the board on international affairs because down in about 1995, we'd started talking to Argentina about joining the ISS. And actually, while I was down there at one of the conferences, the head of the IAS, the Steel Institute of Argentina, they asked

me to sign the document that brought them into the ISS. And whilst I had no signing power, I was not an ISS officer, they said they didn't care. They just wanted a big hoo ha to say “we are now part of the ISS”.

So, that's why I was asked to get involved with the international ad hoc committee to see where we were going in what direction. Since the merger, I have been... Oh and I was on the, I think I said earlier, the student liaison, student university industry committee. There was another one I was on. I can't remember.

And joining the AIST, I came in on the iron making side because I was more involved in the iron making at that point in time. And I've now transitioned back to the electric furnace and the DRI Committees.

0:53:05 Distinguished Service Award for 19 Years Working With ISS

Keating:

In 2002, you were the recipient of a Distinguished Service Award for, at that time, 19 years of distinguished and tireless service to the Iron and Steel Society and its many divisions, committees and boards. Please tell us why you received this recognition, and what it meant to you.

Hornby:

I think it was an endeavor by the powers that be, to recognize the effort that I'd put in. I mean, I enjoyed working with them, and working with the society, and trying to promote it. I was very honored to get it. It was a complete surprise. I mean I had no idea it was coming. They just announced it in front of me.

I guess it, in part, made me feel as though my challenges over the years had been recognized because I don't think any of the men in the industry understand ... And I'm not banging the drum for women. I chose the profession. I prefer to work with men… that every day has been a fight basically. And to a large extent, it still continues to be. I am perceived as arrogant, pushy, whatever you want to say, because I will stand up and argue which also is a negative for women in the industry because we're supposed to be demure, little, silent people on the side. That's not who I am. Never was. I don't think the men have any understanding of the challenges, and the few that do I think are partly wanting to recognize that.

Keating:

You've been a leader in many different capacities, in the ISS and AIME. How has that benefited your career?

Hornby:

I think it's obviously marketed me and my talents, and the companies for whom I've worked. I mean, it's been invaluable. It's given me exposure that I wouldn't have had any other way. It's given me the networking capabilities. I mean, I can pick up the phone or get on Skype with people around the world, and ask questions because of my association with both societies.

Keating:

How do you see the societies benefiting people in the industry today?

Hornby:

I think the same way. I think the societies are imperative in their lives. If they can get sponsorship from their companies, the bonding of their own peer group, and the ability to learn from mentors within the industry is invaluable. And I think today, the societies in general are making a move to make that happen,

and to bring more people in at the lower level, and make sure that they're part of the society so they grow through the society, and they are, therefore, learning from we baby boomers who are about to disappear. It's going to be invaluable.

0:56:35 Attracting Young People to the Industry

Keating:

In your opinion, what can we do to attract young people to the industry?

Hornby:

I'm a firm believer that we could capitalize on we baby boomers who are semi-retired, retired, or generally thinking about it. You know, we could be used to go even down to the school levels, below the universities. I think we need to start there. And someone brought up, in fact it was Harriet Dutka, at the Women in Steel meeting yesterday, we needed to take the parents out and show them what the steel industry is like, and to rebrand the steel industry, and show them that, yes, it's still a dirty but exciting industry.

The AIST just published the results of the survey, and they published one gentleman (anti women in steel) saying, I don't have men telling me I've broken a fingernail or got my hands dirty. I mean, we need to educate people that if they want to get into this industry, it is dirty, you are going to get fingernails broken. I mean, I've dealt with these (long nails), and done trials in steel mills, and not broken one. So it's possible, but we need to educate. We need to educate not only the steel mills on what youngsters need, who are coming into the industry. We also need to educate the parents and the children of the potentials across all of the diverse applications. You know, whether it's engineering or nursing facilities in the future. I mean, mills are going to have everything.

I had a student accost me tonight and say, you're trying to bring new people into the industry. Let me tell you two reasons we can't. The first one is the salaries suck, and the second one is the steel mills are in middle of nowhere. I'm a young kid, and I want to enjoy my life, so can we put some steel mill somewhere near a big town, please? I mean, he was serious. He said, that's why we're not coming into it. He was doing his PhD, but he doesn't think he's going into the industry because of those reasons. It's sad. So, the AIST and all of the societies are addressing the problems, but the steel mills have got to do a good job too, of making it competitive and rebranding themselves.

0:59:09 A Role Model for Women in the Steel Industry

Keating:

You've certainly been a pioneer as a woman in the industry. What are your thoughts on being a role model for other women, and do you have any advice specifically for young women in the industry?

Hornby:

I hope I've been a role model. Perhaps not in today's society where risks are not really a good thing. I think when we have become more safe. When I look back at what I've done in my career, I shudder and think I could have been dead times over if things had gone wrong. We do need safety.

We need safety first. Don't get me wrong. But I think women need to understand that if they've got a passion, they should follow it. And they should not let people say, you can't do it. They should not let people push aside their visions, and they should orient themselves to getting good mentors in the business,

who can teach them and show them how. Now I am a type one personality. I will fight back. I have friends in the industry who are more feminine. I will respond. You give me a trial; I'll show you I can do it. They don't, and they still succeed. So, there's different ways of doing it, and I think talking to the different types of women in the industry would be good because we can show you how we've taken the challenges on, and surmounted them, but not everyone's the same. And I think they need to understand that, but I think the men too have got to change their attitude. Even today, I hear so many people saying, we need women in the industry, but they are talking out of one side of the mouths. The statistics show, I think, 50 something percent want women in the industry, but I would challenge that.

Keating:

I know it's a difficult question, but I have to ask you, what has been your favorite part of working in the industry?

Hornby:

There's not just one thing, I don't think. I've liked the challenge. I've liked the learning. I love the people. We're a crazy industry. We're a specific type. It is dirty, but there's so many challenges, and each plant is different. Each furnace in a plant is different. You can work on two furnaces, and get two totally different results. I mean, it's a constant challenge, I think, in the industry. Constant challenge.

Keating:

What advice do you have for today's young leaders in the industry?

Hornby:

Back to mentoring. I think they need to have the mentors. They need to have open discussions with their own peer group and the hierarchy, and the way to do that is through the societies. I mean, the student population that seems to be here this time, it's phenomenal. It's much bigger than normal, and I think that's great, but whether we can retain the students, and put them into the industry? The steel mills are doing a good job because they are taking on summer students or co-op students, whatever you want to call them. And they're getting a taste of it whilst they're still doing their studies. But I haven't seen any statistics on how many of the co-ops that are actually working in the plants are retained long term. That would be a good statistic to have. I think that's great. I mean, I would have never survived, enjoyed, the university life.

I way preferred going into a four-year degree course with two co-ops at the Polytechnic because I got to see the research, and I hated it. I mean, it was all I could do to go back and do my PhD because I really don't like the minutia. I like the big picture. And I saw the molten metal in the foundry, my passion! It motivated me for life. I'd say Let's do something crazy. Let's prove it works, and get someone else to figure out why the patent is going to work, I just don't want to know. Give me the big picture. So, yeah.

1:03:58 A Thank You to the Industry

Keating:

Anything else that you'd like to discuss?

Hornby:

No, I'd just really like to thank everyone in the industry. I mean, I've had incredible support from customers, potential customers, you know, mentors. They've made my career for me because they've helped me do the crazy things I've wanted to. I mean, even though I was in charge of an R and D department, they spent most of their time doing the non-ferrous stuff that was boring, water treatment. But we went to the plants, and they allowed us to do the crazy R and D stuff with them, and find new ways to keep their costs down.

We used CO_2 cannons that were used in the food industry. We took them to a steel mill (Slater Steel as was), and stuck one through the door of an electric arc furnace, and we blew CO_2 snow in there. Every time they dropped carbon into the furnace, they had flames. Of course, the union was complaining about the environment. They ended up using it until they put the new furnace in with a good off gas system. (see Environmental and Steel Quality Aspects of Carbon Dioxide, 1996 Electric Furnace Conference and Proceedings).

And we had Bethlehem Steel. They weren't allowed to cut their slag buttons by the EPA because there were too many visible red fumes. We put CO_2 in their torches, and stopped the problem, but they let us come out and “play”. So, it's been a great life, and yeah, it's all been facilitated by the companies I've worked for and the industry that I've served.

Keating:

Sara, what a pleasure it's been to spend this time with you today.

You've had a fascinating career, and you certainly have served as a pioneer and a role model for the next generation of industry leaders. Thank you so much for your willingness to share your story with AIME.

Hornby:

Well, thank you very much for the opportunity. I hope it will inspire the new generation, and I'm at the end of the phone if anyone wants to talk.

Thank you.