ORAL HISTORY PROGRAM

Ron O'Malley: Innovation, Education, and the Future of Steel

2026

PREFACE

The following oral history is the result of recorded interviews with Dr. Ron O'Malley conducted by Sunday Abraham on October 7, 2024. This interview is part of the AIME Oral History Program.

ABSTRACT

Dr. Ron O'Malley is a renowned metallurgical engineer, researcher, and educator with a decades-long career encompassing both industry and academia. O'Malley developed a curiosity for engineering at a young age, focusing on civil engineering before discovering his passion for materials science. Today, as the Director of the Kent D. Peaslee Steel Manufacturing Research Center at Missouri University of Science and Technology, he leads pioneering work in sustainable steelmaking, including hydrogen-based DRI, sensors for extreme environments, and electrified industrial processes. With decades of experience in areas such as aluminum casting, thin slab casting, and steel plate and sheet production, O'Malley has also made significant contributions to professional education through his long-standing role in the Keith Brimacombe Continuous Casting Course. A committed mentor and industry leader, he is currently serving as president of AIME and has held numerous roles within AIST, including President. O'Malley's faith in industry inspires his students and other young engineers to keep pushing for progress in the steel industry. He is passionate about inspiring the next generation of engineers and promoting visibility of materials science through outreach, camps, and social media, advocating for a vibrant, tech-driven future for the steel industry.

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00:00:16 Introduction

Abraham:

Good morning. Today is October 7th, 2024, and we are in Pittsburgh, Pennsylvania, at the Materials Science and Technology Conference. It is my pleasure to be here to interview Professor Ron O'Malley, the F. Kenneth Iverson Chair, Professor, and Director of the Kent D. Peaslee Steel Manufacturing Research Center at the Missouri University of Science and Technology. My name is Sunday Abraham. I'm with SSAB Americas. The recording is a part of AIME's oral history capture program.

Well, Professor O'Malley, let's start from the very beginning. Your childhood experience. Tell me about where you grew up and what your childhood experience was like.

00:00:55 Early Influences and Educational Journey

O'Malley:

First of all, thank you, Sunday. It's a pleasure to have you as my interviewer. What I want to do is talk a little bit about my background and where I came from. I grew up in southern New Jersey. I was the only person in my family to go to college, but even before that, a family of five. My dad was an electrician. My mom was a homemaker, and I grew up learning to do things with my dad, who was also a tinkerer. We would work in the basement shop and do woodworking, electronics, and all sorts of interesting things. So, during that time, I became really interested in science and engineering, and I knew from the beginning that's what I wanted to be. I also had uncles who were professionals in their careers; one an electrician or in electronics, I should say. The other one is in the biological field doing biochemistry, so I had some exposure from that front. I went through high school. I was pretty much a geek in high school, and I enjoyed doing things like audio-visual and so forth. I decided to go to college locally because of financial reasons. We didn't have a lot of money, so I applied to several schools and ended up applying to Drexel University. Drexel was a co-op school, so I actually had the possibility of paying my way through school as I went. So, I started as a civil engineer. As a civil engineer, I spent my first year in college taking basic courses. One of them was a materials course, and it caught my interest. I did go on a co-op that summer and worked with the Army Corps of Engineers. I came back from that experience realizing that maybe this isn't exactly what I wanted to do. So, I started to explore changing my major, and I ended up doing that and joining the materials science department. I'll stop there for the moment.

00:03:52 A Major Shift – Civil Engineering to Materials Science

Abraham:

So, what is it exactly that made you change your mind from civil engineering to materials science?

O'Malley:

Well, at the time when I was a co-op, I found that it just appeared to me that a lot of what civil engineering, civil engineers were doing, and the types of jobs I was doing, were just applying formulas out of a textbook to solve problems. Maybe naively so, at the time, it just felt like it was cookbook engineering. I was, at the time, more interested in the art and architecture side of it as well. The engineering side, you know, calculating the bank on a road or the size of a pump for a dam just didn't

excite me. The course I took in materials science was one, like a lot, I've talked to students that I've been involved with about, where you get exposed to a lot of the really unique features of materials science, and the descriptions of how things work made a lot of sense to me. It was physical chemistry and chemistry-focused. You could rationalize how things happened and what cause and effect took place. And I also found that I didn't have to deal with organic chemistry. So, chemical engineering was another option. But this one appealed to me a whole lot more. I'd also say that there were certain individuals at Drexel who played a key role in helping me make that decision. There was a young professor who is well known now, Diran Apelian, who had just, I think, left Bethlehem Steel to become a professor, and he started up a program there. His work really intrigued me, and I linked up with him pretty quickly and actually became his first master's student. But it was part of that effort, and being able to travel with him on consulting experiences that got me interested in molten metal and molten metal processing.

Abraham:

So, you had two influences in your life that led you to pursue engineering and materials science? It's your dad being an electrician, and then this professor at Drexel University. So, my question is, initially, you wanted to do civil engineering; is Drexel University very strong in civil engineering?

O'Malley:

Well, it's interesting you asked that because when I explored architecture, they did have a program, but it was a night program. I thought about it and actually moved into civil engineering because it was a day program. I thought that perhaps I might consider moving into a night program later. That ended up not being the case. So, the one thing about my high school period was that I was very much an artist. I did a lot of artwork. I was also very interested in creating, and architecture appealed to me on that basis. But I also found that later in life, those art skills became very handy in other areas, you know, in the engineering world, too.

Abraham:

Seems you were in the right place because people say materials science, steel making, is sometimes an art, and sometimes it's a science.

O'Malley:

Yes.

00:07:37 Direct-Reduced Iron, Furnace Building, and Completing My PhD with Help from John Elliot

Abraham:

You had the right combination. So, then you went on to pursue your PhD at MIT? What motivated you to pursue a PhD?

O'Malley:

At the time, I'd completed my master's. I had worked through several co-ops and other industries. Foote Mineral Company they were a ferro alloy and nonferrous master alloy producer, and I worked with

several folks within that mineral research organization. During that time, they actually were very influential in my considering MIT as an option for a PhD. Now, I have to say, when I finished my master's, I did interview at an industry as well and thought very seriously about which way I wanted to go. Ultimately, I decided to pull the trigger and go to MIT. I originally went up to interview with Mert Flemings at MIT at the suggestion of some of the people who were kind of guiding me on my co-op career. I did some interviews with several folks while I was there, and ended up linking up with John Elliott, who is, of course, a very famous steel maker and thermochemistry professor, and made the decision at that time to join him. When I joined him, he allowed me to work for six months, jumping around with various researchers in the group to see what kind of research I would like to do.

Abraham:

So, what was your focus for your PhD?

O'Malley:

So, in my PhD, I finally settled in on a project looking at direct-reduced iron. It was evaluating the behavior of direct-reduced iron in EAF melting. So, what was nice about MIT was that you got to actually build your own equipment. I built my own furnaces, my own analytical gas trains, and everything else. I did some studies at the time, trying to understand the relationship between the carbon content and DRI, the evolution of gases, and its influence on convective stirring and enhancing melting rate, as opposed to the endothermic load associated with that carbon and iron oxide reduction reaction. So, I actually built an experiment that allowed me to melt individual pellets, collect the gases, evaluate the gas evolution rates and melting rates, and then build a mathematical model of the process.

Abraham:

So is the furnace that you built still operational today at MIT?

O'Malley:

I went back two years ago to see, and I couldn't get in the lab to find out, so I don't know.

Abraham:

You mentioned John Elliott as a mentor of yours. Do you have other professors at MIT who also mentored you, besides John?

O'Malley:

John was one of the big ones for me. But there was King and Szekely. I'm trying to think who else. Those are probably the big ones.

00:11:17 Transitions from Steel to Aluminum and Back Again

Abraham:

Let's transition now to professional development. Your first professional job was on casting and refining

technologies in aluminum at Alcoa. Why aluminum?

O'Malley:

Well, interestingly enough, of course, my PhD was in steel, right? But during my co-op, my undergraduate, and my master's time frame, I had done some consulting work with Alcoa and had worked with some folks in the group at their research center in Pittsburgh, and they were one of the jobs that I was considering at the time. There were several others. I think I had, at the time, interviewed at LTV. I had also interviewed at U.S. Steel, but I looked at some of the things they were doing in aluminum that really appealed to me in the refining and casting area, and the facilities that were available at the research lab at the time, and decided to go that route. Research labs at Alcoa at that time had 1300 people. So, it was a huge lab, and they had full-scale production-scale equipment that they could do trials on and develop process technology on. So, there's lots of stories about those experiences, but we could talk about those in a minute, I guess.

Abraham:

Was it difficult, given that your basic knowledge is in iron making, to transition to aluminum making?

O'Malley:

Nah, it's much harder going the other way. I think now, of course, I had done work in aluminum. My master's was in direct injection alloying of molten aluminum with manganese. So, injection of manganese powders, and I had done experimental work on my co-op, looking at the dissolution kinetics of manganese powders in molten aluminum. I had built a piece of equipment to do the injection and did the studies for different forms of manganese powder to look at the optimal kinetic melting behavior. So that experience was there. And of course, during that time as well, I had also been involved with some solidification work. You know, a lot of universities have the ability to melt and cast aluminum, and Drexel was the same way. They didn't have it for steel. So that was probably the new experience for me when I went to MIT and had to melt steel.

Abraham:

After four years at Alcoa, you joined Armco Inc., now AK Steel, which is a part of Cleveland Cliffs, where you were responsible for steelmaking and casting technologies for flat roll specialty steels. So, the transition back to steel- what was that like?

O'Malley:

It was actually pretty interesting. When I took the job at Armco, I joined because there was a program; they were just starting on strip casting. I was very interested in strip casting because I had focused a lot of my work at Alcoa in twin roll casting, which is a form of strip casting. To me, it was appealing to be able to move into a different metal system with some of the same basic technologies. So, when I went to Armco, I actually interviewed for the job, and I got two offers, and we ended up splitting my time 50% in long-range research and 50% in production-based research. So, half of the time in the plant environment, half of the time working on advanced solidification technologies.

00:15:27 Growing Pains – Learning to Deal with Fellow Engineers and Fireballs at Alcoa

Abraham:

Okay, Professor O'Malley, let's circle back to your experience at Alcoa. Can you tell us what you liked? What was it like working with colleagues, what you liked, and what you didn't like?

O'Malley:

It's an interesting experience. You know, when I left MIT, I had built a lot of my own equipment. Right? And had done a lot of really neat experiments. I actually did a one-year post-doc at MIT as well, and built a very high-temperature furnace for aluminum carbothermic reduction, which was another driver to go to Alcoa at the time. When I got to Alcoa Labs, I realized I wasn't allowed to build anything. You had to work through technicians and technicians' schedules. And, originally, that was a little frustrating for me because I knew I could do that in about two hours, and it would take a week. Right? But it was something I had to learn. I had to learn patience and how to deal with people.

Alcoa, though, was a really interesting place to work because there were experts in all sorts of areas, from the fundamental science side to the very applied side. They had experts like John Jacoby, who was a DC casting expert, who worked on the aluminum lithium pilot plant, which I got to spend part of my time on. And others. Let me see, Ed Eckert, who was really a fascinating guy, in that he would apply really neat technology to improve inclusion, removal, and alkali metal removal from aluminum. And then, mentors that I was involved in as well, that I got involved in, in the twin world casting part of the world.

The twin role casting part of the world was kind of fascinating to me, because what we were trying to do was take a conventional technology and push it to its extremes, to the high-speed limits, to expanded alloy contents, and so forth. The pilot plant, I will say, was interesting because—I don't know [if] you know much about aluminum lithium casting—but it's the first test they did at Alcoa Labs under the direction of John Jacoby. They did a cast in their DC pit, and he heard a little rumble in the bottom of the pit, and that was a red flag for him. So, they actually took some aluminum lithium and put it out on an explosion testbed site, which was far away from the main buildings, and they did an explosivity test. Let's just say they shook the buildings in the main administration building, shook the windows. So, they actually had to halt that process and come up with a new way of casting.

It turned out that aluminum lithium, in reaction with water, was exceptionally explosive. So, if the liquid metal got in contact, that was a big problem. So, if you had an aluminum-lithium casting process and you had a breakout, you had a big explosion. In fact, whole plants have been blown up. I think Pechiney blew up a plant trying to cast this material. So, they actually developed a process that used anhydrous glycol as a coolant instead of water. And anhydrous glycol could cool the surface of the ingot, but it was also one if you had a breakout, it would create a fireball. Right? So, they actually had CO2 dumping to put the flame out if they did have a breakout and had a fireball.

One of my experiences was being on one of the platforms while we were casting, and they had a breakout and they had a fireball. So, I was surrounded by flames on all sides, and I'm waiting for the CO2 to dump. And it never came. So, I had to jump through the flames off of the casting platform. Lost a little hair, but I was in full gear. I was protected, but it was an interesting experience, to say the least. You know, aluminum is an exceptionally reactive metal, and exposure to water and steam can be a big problem.

I worked in other parts of the process on aluminum powder production. I don't know whether you know it, but they had a plant in Texas that actually produced the aluminum powder used for the fuel in the solid rocket boosters for the space shuttle. That's actually what those fuels were made of. And when you worked in that plant, you actually had to wear conductive shoes with ground straps because you could kick a spark and light up any dust that was there.

So it was an interesting process. Experience with a lot of really fascinating and different areas to work in in the aluminum-lithium world. We visited Westinghouse to learn how they were using lithium: pumping lithium to direct alloy lithium into a molten aluminum for the aluminum-lithium alloys. They found that direct alloying in the furnace would catalyze aluminum nitride formation, and they grew an aluminum nitride crystal the size of a Volkswagen in their furnace the first time they tried that. So, there were just a lot of really interesting challenges. In the end, Alcoa's research was shrinking. I could see the writing on the wall when you started spending more time selling programs and doing programs; it was time to start thinking about other options. That's why I made the decision to go out and look for other opportunities. And Armco was one of them. Again, attracted by, at that time, the twin roll casting processes and the strip casting processes they were involved with. They had a DOE program going on, but it turned out they had a lot more going on as well. Armco became sort of the grounding for my whole career in steel.

00:22:08 Aggressive Approaches, Unusual Machines, and Exciting Experiences in Industry

Abraham:

Well, you spent four years with Armco, sorry, 14 years, and then you joined Nucor?

O'Malley:

Yes. Yes.

Abraham:

So, what motivated you to leave Armco for Nucor?

O'Malley:

Well, I actually left AK Steel, and Armco is a great place to work, and has a history of great developments. Hot rolling was developed by Verity, and IF steels were invented; electrical steels were developed in conjunction with Westinghouse. So, there was a really rich history. That development kind of went away after a while. As you know, the Armco organization got absorbed into the AK organization, and so I thought it was time to consider moving on again.

Abraham:

You spent 12 years at Nucor Decatur, and then you decided to transition into academia. You joined the faculty in the materials science and engineering department at Missouri University of Science and Technology as the F. Kenneth Iverson Chair Professor and director of the Peaslee Steel Manufacturing Research Center. So, what was that transition like from industry back to academia?

O'Malley:

Well, it's interesting. The first transition, going from Armco or AK to Nucor, was a transition in its own right, because here I was moving from largely involvement in specialty steel development. I mentioned, originally, that I had been given a dual role working on long-range research and plant support. There's a whole period in there during my Armco career where the long-range stuff went away, and I spent my time exclusively in the plant support area, almost entirely in specialty steels. So, the first half of my career there, I was largely involved in the development of 409 stainless steel development, no-grind practices for austenite stainless steel, development of casting practices for martensitics, duplexes, and so forth. That was a great experience because, as part of that program, I was essentially given the mandate to develop practices to do what we could to eliminate grinding on those products, which is very expensive when you start talking about the cost of nickels and so forth. Traditionally, these materials, the slabs, were 1.5% grinding yield losses. So, one of my early programs was involved with modifying oscillation strategies on the continuous casters. These were old casters. They had long stroke, low-frequency oscillation, deep oscillation marks, and they were contributors to the need for grinding. So, one of my early programs was to actually convert over to high-frequency short stroke oscillation, and as a result, redeveloped the lubrication strategies: the mold powder development for all those grades. There were something like 140 grades on the books at the time. So, trial by fire, right? And of course, with them, I had also worked in the development of 409, when, in the early days, Armco was struggling in 409 with surface quality issues, and there was a team of us that traveled different parts of the world, looked at technologies, and came back and developed a practice to make these high surface quality products.

That part of it actually allowed Armco to move to be the dominant producer in the automotive chrome exhaust market. Those experiences were really great, but they also gave me an opportunity when Armco decided that they were going to acquire Empire Detroit Steel. As part of that portfolio of plants, there was a plant in Mansfield that was an ingot facility making stainless steels. This was right around the time when Nucor was just starting to dabble in producing stainless steel by thin slab casting. So, there was a lot of concern about the possibility that we could lose market share, and it spurred an effort to invest in Mansfield and put in a thin slab caster to replace the ingot operation. That was a project that I was intimately involved in. I lived many years of my life in Mansfield, starting up that thin slab caster, helping develop the technologies for it, the specifications for it, and the practices to make it run.

So it was, again, a really exciting experience. That transition was still almost all specialty steel. So, when I went to Nucor, all of a sudden, it was all carbon steel, and that was a whole new thing, right? So, I had a lot of experience, and I knew a lot about steelmaking and casting practices. But there was a lot I had to learn about traditional carbon steels that I had never really worked in. I was able to do that in Decatur during the startup. Of course, they had acquired and just started up the Trico Mill as Nucor Decatur. It had gone into bankruptcy, and the assets were bought and then restarted. So, there was a whole bunch of work there to do to develop the practices suitably for that machine, which was also a thin slab machine, which was an unusual machine, a very tight radius, parallel mold, thin slab. And that took a lot of years of my life as well, but [there is] not anything in any of this I would trade any of my time for, because they all help build really strong experiences. One of the things you learn is when you start up something new in a crisis, you can try anything, right? And you get to try some of the most aggressive approaches to things that you'll ever be able to do in your lifetime.

00:29:05 Putting My Hat in the Pot – Finding My Dream Job at Missouri S&T

Abraham:

So, how have those experiences helped you at the Missouri University of Science and Technology?

O'Malley:

Well, all throughout my career, I had used my knowledge of metallurgy, physical chemistry, and so forth to solve problems in the real world. So, when I considered the move to academia, that move really came about because of some events that happened with a former professor, whom I had been in support of, Kent Peaslee, who, unfortunately, had passed away right before he was starting up his center. There were many of us from industry trying to support him to get that center started, because we knew we needed more steel-focused universities in the U.S., and there were very few. The technologies that I learned in industry, it turns out, were very fruitful when I moved into the academic career, because I knew what was real and what wasn't, right? I knew what was important to industry people, and I ended up taking over that position, a role that Kent had started, and was able to continue to build the steel center and attract consortium members. And we've built a very strong program now. It's largely, I think, because we stay very focused in a line to steel producers and their problems. But we also are able to apply the fundamental science to fix those problems and advance the state of the art.

Abraham:

Did you have any interest in joining academia before you got the offer to join Missouri University of Science and Technology?

O'Malley:

Interesting you would ask that question, because when I left MIT, actually right before I left MIT, I was asked if I would be interested in joining the faculty there as an assistant professor. I decided against it because I knew I would need stronger industry ties than I had, and it would be really hard to do that from within that type of position, especially with some of the real powerhouses that were in place there at the time. So, I decided to go out into industry. I thought I would maybe go out for five years and come back to academia. Well, 30 years later, I finally had the opportunity, even though I wasn't really thinking at that time of pursuing it. So, the situation with Kent Peaslee's passing opened up an opportunity for me to move into that role, and I had to think hard about it for a couple of reasons. Number one, my wife really loved Alabama, and we had planned to spend the rest of our lives there, retire there. Nucor is a great company to work for, and, under other circumstances, I'd probably still be there. But as I looked at this role in the center and the role of teaching, I always knew I loved teaching. I was very active even in those days at AIST teaching, and did a lot of teaching internally within Nucor as well. So, I liked that part of it.

I thought about it, and it was also really attractive to think that I could now maybe work with a larger group of people in the industry. I knew many people in the industry at that time, from my time at both Armco and, of course, at Nucor. I collectively had over 20 years of industry contact experience, and this looked like it would be an opportunity to do some really neat and exciting things. Kind of like a kid in a candy store, right? You get to play with all the cool toys, work with people who are your family and your friends. So, it looked really attractive. The first thing I had to do was go to my wife and say, I think I found my dream job, and she says, where is it? And I say, it's in Missouri. The next question was, does it

snow in Missouri? No, never snows in Missouri, and she said, well, now, I would never stand in the way of your dream job, but this is what it'll cost you. So, I'm still paying the price today! But the second group I had to go to was Nucor, because the position I was applying for was a Nucor endowed chair. In fact, I had been on the committee that picked Kent Peaslee for the first Iverson Chair Professorship. So, I was one of the industry folks who was responsible for him getting that position, with others who really did a great job promoting that endowment and so forth within Nucor. Gary Pennell, for example, in particular, was very instrumental in making that happen. So that was an endowed chair. Now, what I had to do is go to Nucor and say, well, as a Nucor employee, I'm thinking about leaving Nucor and taking an endowed chair at Missouri S&T that you guys provided. Are you okay with this? I basically told them that, look, if you're uncomfortable with this or don't like this, let me know; I'll back out. Of course, they were very supportive and have been to this day. So that was really the impetus for me to move into academia. It was, I think, just an opportunity I had at that very first meeting that we had, where we went to the meeting the first day, and Kent's funeral the second day. I had people start whispering in my ear, don't you think you'd like to do this? Right? So, the more I thought about it, I thought this could be a really interesting change in my career. I can teach, I can do fundamental research, and applied research. I can work with the entire industry. So, I decided to put my hat in the pot.

Abraham:

This year, you'll be celebrating your 10th anniversary as the director of the Peaslee Steel Manufacturing Research Center. The center has grown its members over this past ten years. What do you think is the main reason for this success?

O'Malley:

The Peaslee Steel Manufacturing Research Center, I think, has been successful because we engage with the industry on the types of projects they're interested in. We train students who end up working in their industry, and those two factors, I think, are very attractive for people to kick money in to support research at the university. Our approach is, we have a tiered structure so that every member is actually involved in applying voting points to pick projects that are developed, as you're aware. In brainstorming sessions—we held one of the brainstorming sessions at your research facility, what a couple of years ago now. It was essentially where we decided what kind of research projects we wanted to put together. We put together a portfolio of programs, and then the industry members themselves actually picked those programs. So, I think that's probably one of the main successes. The other thing is we tend to deliver on what we really pursue, and that's always been good. And we're pushing new boundaries, like the fiber optics programs that are going on, which I don't know anybody else that's trying to apply that technology in steel today, the way we are. So, we're really excited about that.

00:37:38 Sustainability Projects in Industry – Green Hydrogen and the EPIXC Program

Abraham:

Certainly, a neat technology, we are part of this as we are helping to evaluate it, and we can't wait until we have the final product. You are involved in a couple of sustainability projects, i.e., the grid-interactive steelmaking with hydrogen, and the other one is electrified processes for industry without carbon. How will these initiatives shape the steel industry in the future?

O'Malley:

Well, the steel industry is certainly in a position to consider a whole variety of ways to reduce their carbon footprint. In many ways, the U.S. steel industry is ahead of the rest of the world because of its high electric furnace percentages in production, right? Seventy percent of the steel in the U.S. is made by electric furnace routes, which are quite a bit lower in emissions and CO2 already. But to get further, we've got to look at new technology routes. You know, SSAB is certainly pursuing one with HYBRIT hydrogen DRI production. We're also running GISH, doing that same type of work in a pilot operation to look at grid-interactive reductant switching based on the availability of green hydrogen, based on the renewable availability time frame, and switching between that and natural gas in the time periods in between. So, the dynamics of those switches are going to be really important if you're going to operate successfully a commercially viable plant, especially if you haven't yet developed a sustainable hydrogen supply. So, it's a technology transition that I think is really important, and if we're going to be successful in converting to these technologies, we have to understand the costs of those transitions and how to mitigate those costs with intermediate solutions before we get to the final goal.

We've been successful, as you guys also have, at producing hydrogen DRI, and here just last week, we successfully did our first natural gas hydrogen transition. So, understanding the nature of those transitions and whether they can be easily maintained during operation is vital. The product viability in this case, you know, metallization of the DRI, is really vital to understand how you handle those dynamics. In the case of EPIXc, we're really just getting started in that area. But the EPIXc program with Sridhar Seetharaman is really looking at the broader industry in total, not just the steel industry, but a portfolio of industries, and includes chemical processing, cement, agriculture, food services, steel, and looking at ways that combustion processes can be converted to electrified processes. We're lucky because we've put in a proposal to be the steel testbed site for EPIXc, and part of our role will be to look at what types of combustion processes we can convert to electrified processes. The first thrust of this EPIXc program is looking at microwave plasma systems to actually replace conventional burners. The technology in many respects looks a lot like a burner system and has the potential for direct replacement in existing processes, which is a real advantage as opposed to having to build a completely new infrastructure.

But it also offers other potential long-term advantages for heating of reactive gases used in the DRI process. Today, even in hydrogen DRI, you've got to heat the gas, and you use combustion to do that. You burn part of your hydrogen supply to do that, or you burn natural gas. Well, if we can do that by electrified processes, we can reduce the combustion burdens there, but also potentially provide a more reactive form of hydrogen in the form of monatomic or ionized hydrogen, which can enhance the kinetics of the process in the reactor. So, there are some really neat things that we're looking at here. And like I said, the last one is in early stages, but we've done a little bit of work even within GISH, looking at the influence of plasma on the kinetics of reduction and seeing some benefits. Others have published some potential benefits as well. So, I think it's an area where we can help improve the kinetics of reduction, the efficiencies of the processes.

00:42:42 Growing Lectureship Roles, White Lies, and Maintaining a Work-Life Balance in My Career

Abraham:

Apart from your primary job as the director of the PSMRC and the lecturer at Missouri University of Science and Technology, you are also a lecturer of the Keith Brimacombe Continuous Casting Course, and are now serving on the board of trustees for AIME. What keeps you so motivated?

O’Malley:

I can't say no. No, these are things I love, right? I mean, first of all, when I first became a professor at MS&T, I became eligible to join the continuous casting course. I got a call from Alan Cramb saying that he was stepping into a more administrative role, and would I be willing to take over for him as a lecturer in that role? I was honored. To be honest with you, as a young engineer, I took that course with Keith Brimacombe many, many years ago. So, I had done a lot of teaching. I taught a lot of short courses in continuous casting for AIST. So, I thought this was a great opportunity. And you know what? It's also exposure for the university to help the center grow. It was just a positive thing overall, and I loved doing that course. I've done it every year except one year for COVID, so, coming up on year 11 now, my role in that course has actually expanded because we've had others retire, and I've taken over their lectureship roles as well. So, this year, actually, Ed Szekeres is stepping down, and we're going to be distributing his portion of the lectures amongst the three of us now. Me, Indira, and Brian Thomas. And, I'm hoping we can keep it going for many years to come, because I really enjoy it.

Abraham:

How has your work impacted your family life?

O’Malley:

Interesting you should ask that, because I would say for many years my life was heavily impacted by my efforts in the plant environments, particularly during start-ups, and in having to travel to the extensive level that I had. I'm very lucky. My wife is very independent. She was a pharmacist and was able to take time off to cover family, and then go back to pharmacy. So, her finances actually help support my son's and daughter's school and college costs. She is now retired, and we're just living off of mine at this point. But I would say it was hard for a while. It was hard on my family when I'd go through a start-up. I would be living off-site for a week at a time sometimes. There were times where I actually took my family, my young kids, to the hotel with me when I had to do work in the plant, and they would stay at the hotel and swim in the pool. I would meet them for lunch when I was working in the plant for extended hours, so I could spend a little time with them, and they could have a little vacation and swim in the pool in the hotel. But there are times when we used to lie to my daughter that this was her birthday when it wasn't, because I was not in town when her birthday was. Our family is very close, so I think things have gone well. But I have to say, there were times that I probably took more of the time than I should have.

Abraham:

So, you have a son and a daughter? So, have any of them taken to your discipline, engineering?

O’Malley:

They both ran away (from engineering) initially. My daughter is a family practice doctor. My wife was a pharmacist. My son went to a school to become a physical therapist, but decided to change. Now he's moving into the engineering field. He's actually working at the university, with the fiber optics group, over with Gia. He's doing work in that area now, so he's migrated back a little. I can tell you that he's taken over my house with 3D printers, CNC lasers, and all sorts of things. He's very much into the engineering gadgetry.

Abraham:

Well, your dad was an electrical engineer. So, this is as close as it gets, right?

O'Malley:

Exactly.

00:47:47 The Howe Memorial Lecture and AIME – My Proudest Contributions to the Steel Industry

Abraham:

You've received many awards and recognitions for your contributions to the steel industry. Which of your contributions are you most proud of and why?

O'Malley:

Wow, that is such a tough one because I would have to say probably the highlight for me was doing the Howe Memorial Lecture recently. That was quite an honor because, as I go back, the history of that lecture goes all the way back to John Elliott and his advisor, John Chipman. So, the legacy of that award goes on with such a rich history. It contains former lecturers whom I hold in the highest esteem, and I was just honored to be considered in that role at all. That was just really exciting, and it made me feel good. I felt really proud to be able to do that lecture. But I'll tell you what, AIST has been good to me. I mean, I'm a distinguished member and fellow. And, I guess now a lifetime member, and, as far as awards go, it's hard to pick just one because it's always nice to have that recognition and to work for an organization like AIST, which is really good at recognizing people and helping them grow.

I can remember the time when I first got involved with AIST. You knew an AIST staff member by the name of Pat Philbin, who is retired now. But Pat was one of the ones who got in my ear to go through the rotation and start thinking about how you can take on various roles in this at this time, and the technology committee, the continuous casting committee. So, with his push, I did that, and I went through those roles a couple of times. I think I went through a board rotation twice, and then when I became a professor, I got a call asking if I would be interested in moving on to the rotation for the executive board and through the presidency. So, that's a long transition; about seven years. But I have to say, it's been a great experience. Now I'm on that same rotation, I'm on the board at AIME, and I think next year I step up as president of that organization, and I think I'll probably be done after that.

Abraham:

You never know.

O'Malley:

Never know, right?

00:50:57 Don't Be Afraid, Jump at It – Why I Love to Teach and My Advice for Young Engineers

Abraham:

Professor O'Malley, you've had a very long career. You have experience in aluminum casting, aluminum lithium production, thin slab casting, and carbon manganese steel plate production. Many wish they had such a glamorous career in the industry. But we also know that the steel industry is shrinking. The question is, what do we have to do to develop the next crop of individuals that will carry this legacy forward?

O'Malley:

It's a really interesting question, and one we wrestle with all the time at the university level, because it starts with attracting young people into the industry. As well, our industry sometimes has an ill-gotten reputation of being a dirty industry, right? Dirty, uncomfortable, and the reality couldn't be farther from that now. Sometimes you have to wear safety gear, but the honest truth is, there is so much technology in the industry that we work in that is so exciting. We've got to find a way to make that visible to the young people out there. When I started as an engineer, I started in civil engineering. I didn't even know what materials science was, right? I suspect that's still true today for many students who are considering careers. If they only knew, we could probably draw them over. In fact, probably the most successful recruiting strategies that I've seen have been summer camps where students come in, and they experience metallurgy and materials science in experiments and programs that are put on for a week as part of a camp. We have our Jackling Camp at Missouri S&T and the ASM camp, for example, which are really good at helping us recruit people. We don't often get down to a lower level than that, certainly not in elementary, but even in high school, I don't think you could go to a high school, and two percent would know what a metallurgist even was, let alone what they do. So, I think we have to find ways to communicate to that part. Everybody talks about social media as well as a great tool, and we have some really good young professors that are using social media quite successfully, showing what we do in the laboratory environment, pouring metal, making things, and doing experiments, and visually making that available in places like YouTube and all the other social media outlets. And that's also been quite successful in attracting people. So, I think it comes down to visibility.

Perhaps we need to spend more time in our careers going out to the younger people and telling stories like this. So, in the end, I think we need to spend more time as professionals in the industry to expose young students, young people, to our industry, the technology of the industry, its benefits to our society, and also the role it plays in science and the benefits it provides as a satisfying career for them to follow in the future, because there are many places you can work, and many career paths you can take. But the role of metallurgy is a really exciting one, and I think often overlooked. It's one that has many, many opportunities that span a whole range of expertise, from the extraction of ores all the way to product development. All of those fields are going to need talent in the future. In fact, my biggest fear is that those talent pools are shrinking, and at some point, we won't be around anymore, and we need to have people follow in our footsteps. So, I think it's part of our role to give back in that regard. It's one of the reasons I love teaching Brimacombe, for example, is we get to spend a whole week focused on the latest technologies and continuous casting, and basically teach young engineers and operators in the field the latest that's going on. How do we carry that down to the younger generation? I'm not sure, but we need to figure out a way to do that.

Abraham:

What advice will you have for today's young leaders in the engineering profession?

O’Malley:

Don't be afraid. Get involved. If you have an opportunity to do something new, even though it looks scary, jump at it. A start-up will allow you to apply your talents to the extreme. It will tire you out. It will take many hours of your life, but in the end, the rewards will be way greater because you will have worked with a team of people who will be your colleagues for life, and you will get to do things that nobody else has done. And there is a lot that feels good about doing things like that. So, being involved is key, right?

Abraham:

Well, it has been an honor to spend this time with you, to learn about your fascinating career and the incredible life you've had. Thank you so much again for your willingness to share your story with AIME.

O’Malley:

Thank you, Sunday. It's been a pleasure talking with you today.