ORAL HISTORY PROGRAM

Qiulin Yu: Forging Ahead – Forty Years and Counting of Innovations in Steel

2026

PREFACE

The following oral history is the result of recorded interviews with Dr. Qiulin Yu conducted by Dan Topham on May 7, 2024. This interview is part of the AIME Oral History Program.

ABSTRACT

Dr. Qiulin Yu's career in the steel industry spans over four decades of innovation, leadership, and technical achievement. Though initially interested in biology, a class trip to a heavy machinery plant and a 10,000-ton hydro press machine instilled in Dr. Yu a lifelong passion for metallurgy. This passion earned Dr. Yu a B.S., M.S., and Ph.D. in Metallurgical Engineering from China's Yanshan University, and a Post-Doctoral Fellow from the University of Toledo in Ohio. From there, his career took off with significant roles at Nucor Steel and Huntco Steel, where he pioneered methods for converting CSP hot bands into cold-rolled products and introduced techniques like zonal roll cooling and direct quenching. Dr. Yu is a prolific author, award-winning engineer, and patent holder, but most importantly, he is a leader with years of experience leading teams with passion, respect, and understanding. Today, Dr. Yu is an active member of AIME and AISE and hosts seminars on exciting new steel technologies.

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00:00:13 Introduction

Topham:

Good afternoon. It is May the 7th, 2024. We are at AISTech in Columbus, Ohio. I have Dr. Yu here. He is recognized for innovations in steel processing, including converting CSP (Compact Strip Production) hot bands into cold-rolled products and developing techniques like zonal roll cooling and medium-sized casting slab quench methods alongside coil and plate direct quenching technology. He has authored over 50 technical papers and co-authored two books on flat-rolled steel, holding a US patent.

My name is Dan Topham, and we're going to be doing an oral history of his life today. It's my privilege to interview him for AIME.

00:01:02 Growing Up with Hard Work, Family Support, and the Value of Education

So, let's just start from the beginning. Tell me about where you grew up and how that influences who you are today.

Yu:

Thank you, Dan, for your introduction, and thanks, Toni, for recording my oral history. I appreciate that AIST and AIME collaborated on this program. I have enjoyed past videos, and that inspired me to do this for others, too. So, growing up, my dad worked at an auto part manufacturing foundry company as a casting superintendent. As a superintendent in the casting shop, he has a pivotal role in the production process. And his daily job started at 3:00 AM, usually, to avoid the daytime heat shock wave for the daytime production. And during 1970s, working at the foundry was considered as a high-paid job. His salary was sufficient to support my family's living expenses. However, the job was highly demanding. He had to get up early, work hard, and pour liquid steel, and avoid the daytime high temperature.

On the other hand, my mom played a role of a housewife, and she usually took care of my two brothers and myself, ensuring us to grow up in a healthy and also supportive environment in our family.

So that's how I grew up with the family. I appreciate that our parents supported us for our education.

00:03:09 Completely Captivated – My University Placement and Discovery of Metallurgy

Topham:

Dr. Yu earned his PhD in metallurgical engineering from Yanshan University in China and holds a bachelor's degree from the Northeast Institute of Heavy Machinery. He has a strong academic background and has held such roles as post-doctoral associate and visiting professor at the University of Toledo, Ohio. Tell us a little bit about your university experience, just overall.

Yu:

That is a good memory for college. I spent too many years in college. I entered college in 1980, as you said, in the Northeast Institute of Heavy Machinery. And in 1984, I graduated and entered the master's program at the same school and specialized in metallurgy and metallurgical technology. And after two

years of master's study, I did not graduate since I was already selected to a PhD program. I will introduce later on about the details [of] how I entered the PhD program at Yanshan University in 1986.

Topham:

So, I think we kind of alluded on this a little bit, but what made you choose those specific schools?

Yu:

Well, unfortunately, I did not have an opportunity to select a school at that time, or the school I attended. In 1980, the competition for high school graduates to continue education in colleges was incredibly fierce, with only 8.4% high school graduates being admitted by colleges. I was fortunately ranked the top 5% in all high school-qualified applicants and initially applied to Beijing University. But priority for college admission was determined by key [core] university and the remote [outlying] area. And eventually, Beijing University is not in the remote area. Northeast Institute of Heavy Machinery is in the remote area. As a result, I was assigned to Northeast Institute of Heavy Machinery without any consultation. If I insisted on attending Beijing University, I would have to wait for two years and retake all exams and reapply that school again, maybe same results. That's not the school I intended to apply for. So, I was assigned.

Topham:

Determined on competition, sounds like, very competitive. So, why metallurgy and what made you get into the material science and specifically metals field?

Yu:

Well, metallurgy was not initially my choice field to study either. And my original ambition was to study biology. Like today, everybody studies biology. So, the problem was, I was assigned to another school. So, I had two different schools. I lost all rights to pick my major. Whatever they gave to me, I had to take it that time. At first, I was very disappointed with the assignment. And during my orientation, when I toured the number one heavy machinery plant near the school, and I witnessed the remarkable process of forging a 100-ton ingot into a backup roll through a 10,000-ton hydro press machine. That machine forged the ingots like eating a cheesecake.

So, I was captivated. The sheer scale of precision of equipment and the intricate process involved—that stirred me or fascinated me, and I had to get deep into metallurgy, and then changed my view of metallurgy. The attitude change or shift from biology to metallurgy is a big difference. One is like a microscope; another is like a big scale steel. So, it's a huge shift. And also, I firmly believe exposing high school students with a mill tour could start their growth path in the metallurgy side and explore their potentials involving the steel industry. Because in the high school, I never saw anything like this. I saw my daddy casting small parts. That's not metallurgy involved [or] complicated.

But once I saw the big machine, 10,000-tons press, that forged an ingot into a backup roll, that is my future. It was a powerful field I had to work on. And also, I was involved in a couple projects with my advisor's R&D (research and development) program in the senior year. And they were doing research every day—involved how to roll a steel flat, shape control, and make some metallurgical heat treatments. I was involved in those projects. So, I was, in my senior year, involved in R&D projects. And I

looked at them, [and] they asked, what [the] next generation will be? I said, well, I probably can do further study [on] metallurgy and [do] further education for the graduate study program. That's how, in 1984, after graduation, I immediately stepped into the master's degree program.

Topham:

Yes. I appreciate you saying that. I mean, I definitely have a similar experience as far as, like, a young professional and seeing this big equipment; it's very captivating.

Yu:

Yes, that's amazing. If you saw that machine down, that big press come down, the ingot, soft like a tofu or cheesecake—I call that "captivated." That kind of word is probably accurate. Every student or young people were shocked over, heck, this big machine. I've never seen my whole life. You only see in the movies, an earthquake, or something like building [coming] down, those things at that scale. You never see any steel mill like that.

Topham:

Right. So, you mentioned a little bit about you didn't get to choose metallurgy, but I'm sure you did have some choice as far as just becoming an engineer. So, what influenced you to pursue that technical route?

Yu:

Well, it doesn't matter if it's metallurgy or biology. You can say, be a biological engineer; you can say, metallurgical engineer. Being an engineer changed my viewpoint from my orientation program. A professor joked with me that time, said, well, you guys are always blue-collar people. What do you mean blue-collar? He explained it in detail. As you're not wearing the white collar sitting in the office, you're going to wear the blue collar working in the office and the shop, and explain what you designed to manufacturing. Finally, he straightforwardly said, that means it symbolizes what is your practical problem-solving skills and also makes sure your capability to be willing to work with other teams, production team, or manufacturing team—so, as an engineer on your design team, the perspective of contributing positive changes can help your ideas to come true. That is fascinating.

Once you see [a] design come true or your idea come to reality, that's a big, big difference. As an engineer, you have privilege to turn your idea to reality.

Topham:

Absolutely.

00:12:47 Quick Entry into Industry – My Two College Internships at Steel Mills

Topham:

One thing we talked about, especially in the young professional world and with AIST, is mentorship. What was that like for you when you were younger? Did you have pivotal role models or mentors? What

was that like?

Yu:

Yeah, so I grew up, got in the college bachelor's degree, college four-year program, and I had two internships. One happened sophomore year, and in that year, I did an internship at Ansteel company. That was a very old company and backed to the wall too at that time and, was not in good shape. But, in the daytime, I always observed, worked on the [processing] line with production team. I observed all processes and prepared questions. And during evening, I could carry my questions to my college instructors; they would answer my inquiries. So, that's a really good format. You don't have any question overnight. You got a question at daytime observation; night, you got an answer. So, that is a really good program for a mentor style. I'm not sure today the steel mill has that capability. But the colleges, sounds like, send students to the mill and then let the mill teach them; and the college instructors or professors get away from it.

So, maybe we can do better, because that is going to help students fast grow up and understand steel mill terminology. That helped me a lot.

Topham:

Yeah.

Yu:

So, if you leave everything to college professors teaching the class only, they're not talking of the same terminology as the steel industry. So, the steel industry has to reeducate the graduates if they get a job working at the steel mills. So, that needs help.

And the second internship happened in my senior year. That was a senior project assigned to me, so I had to go to a steel mill called Wusteel Company. I did about a three-month internship there, observed the advanced equipment, how to produce the steel, and how to roll steel flat. So, back to school, I designed what is called the "backup roll sleeve shifting position" and [to] control strip shape. So, in that case, I [understood] that I was a lot involved in the steel technology side, especially the metallurgical equipment side. I would like to say, both internships were very important, and I could get in the steel industry quickly and gain the first-hand metallurgical experience through the internship. That played a pivotal role in my steel industrial career. That was a big help. Without those things, I wouldn't understand the steel mill. I talk about it from college to the steel industry. Also, that internship program created a link between college and the steel mill.

So, this means professors are also in the steel mill, too. So, I'm not sure how this is going to happen in the USA, but we could do better. I tell you, this is a big program that I never experienced in my early years. I always try to help interns in Tuscaloosa—our plant—help them in any way they want. They always come to my office, talk to me. I say, yes, I passed through that stage. So, I always try to patiently teach them. One co-op [student] from UA, he just got a summary report last month. He mentioned the program [assignment] that I assigned to him step-by-step. He won a third-place award for the internship. So, that's good.

Topham:

Yeah. It's neat for me to hear you say, like, how much it meant to you at such an early age, because it definitely means a lot to me as well.

00:17:45 Launching into the Steel Industry at the Huntco Steel Cold Mill Complex

Topham:

Thanks for talking about your experience at university. But just launching into the steel industry, what was that like for you? What was your early career like after school?

Yu:

Well, here is the first time I got to know the AISE convention in 1993. I represented UT, the University of Toledo, and presented a patent that is a "Rational Design of the Axially Adjustable System in a Strip Mill" at the AISE Annual Convention at Nashville Opryland Hotel. Roughly around 2,000 people attended my presentation. That's the first time in my whole life seeing so many people. My voice was shaking. My presentation would not be presented smoothly because there were so many people. And it was an astonishing experience for me. It became evident, for the scale of audience, that my knowledge of technology was significantly of interest to the steel industry. So, it was a surprise. And around that time, Nucor Steel had successfully commissioned a CSP mill in Arkansas, Hickman. Huntco Steel was planning to build a Cold Mill Complex nearby the CSP mill. They tried to convert CSP hot bands to cold-rolled coils. This was a challenging endeavor due to the dominance of integrated mills. They used their hot bands to convert to cold-rolled coils, mostly for automotive application. And when the opportunity came to me, I said, well, should I utilize this opportunity or not to join the CSP mill environment?

And at the same time, Mr. Tom Gorder, the general manager of Huntco Steel Cold Mill Complex, who was a steel veteran from AK Steel Middletown, approached me. Mr. Gorder offered me an opportunity to join the Huntco team as a staff metallurgist and rolling specialist. I asked about the opinions of my UT colleagues. You know what happened? Everybody's feedback said, "Damn, you don't want to go that side." Well, I was hesitant that time. Should I utilize or seize this opportunity or not? So, [it took me] a few months to learn the CSP mill, how that new technology works. Finally, I decided to join Huntco Steel Cold Mill Complex in 1994 as a staff metallurgist and rolling specialist. I think I learned three things. Number one is, I was in a network because I had been with AISE. People knew me. The guy presented something over there, Opryland Hotel. Number two is expertise. My expertise could be used for steel mills. Number three is that I had to seize the opportunity. So finally, I think about why I needed to take up two months to think about the opportunity. So, by that time, the CSP mill was not a popular mill. It is a new technology, new leading technology. You don't know what its future is. That's my story.

Topham:

Yeah, thanks for sharing that. Looking back on it for you is a lot different than me just being part of Nucor. That's a big part of who we are.

Yu:

Yeah. One of your best ideas. I tell you, Nucor Arkansas is a working place. It is a growing place.

Topham:

Yeah.

00:22:36 Changing Industry Culture and Views – Innovations at Huntco Steel

Topham:

So, you joined Huntco Steel. What was that position like? What were the day-to-day responsibilities, and what did you take away from it?

Yu:

Well, everybody knows a greenfield complex, to be built up, that was a challenging job. From scratch to the actual building and production operations—that is huge, right? So, starting at the beginning, my duties included reviewing the machine and equipment specifications, the processes, targets, all things at the beginning. But after the mill's built up and erected, the next step was to start commissioning. Starting commissioning, everybody was excited because you were seeing the mills running. They quickly found out [if you] run a product that did not meet a customer's specification or their expectation, what happened? The mill could not roll a coil smoothly, and even if you made a coil, fortunately, the strip shape and gauge did not meet the customer's specifications or requirements. So, quickly, we found out [there was an] issue with our planning for the commissioning. So, that was what happened while we started commissioning the mill. My focus primarily focused on the annealing cycle development, [such as] cold-rolled annealing cycles, to be applied for a batch bell type of Ebner furnace, and also lab operation. A typical metallurgist's job, right? So, every day I worked on the mill, and the mill just stopped there, not running. I asked, why? And they said, well, the mill could not run because it wrecked [cobbled] every 5 to 10 feet. So, it took me a few hours to watch it, [figure out] what's the problem and what's going on.

So, after that, I said, yeah, I could fix that. And I talked to Mr. Gorder, who was general manager. I said, well, let's go this way. Let's change the hot band from the integrated mill to Nucor Hickman hot band. At that time, nobody used Nucor CSP hot bands to convert to cold-rolled coils. So, we were the number one user. The steel didn't go throughout the mill. And then, I said, well, the operating team just got so much and was distracted by other people. During the daytime, there were a lot of visitors. So many people were around them. I just said, okay, let's form a team, and I will commission the mill at night. And at that time, Mr. Gorder said, okay, that's a good approach, good plan; let's do it. So, we immediately bought steel hot bands from Nucor Hickman. At that time, the mill manager was David Chase. He and I talked to each other. And he said, don't worry about it. I give you coils, push them over to you. So, we got hot bands overnight from Nucor Hickman. And then, we started commissioning the coils and watched the mill carefully.

We found that running a few feet the strip was cobbled. We found out it was the roll gap issue. The mill's zero gap was not raised up equally from the drive side to the operating side. So, our mill's zero indicator was wedged.

Topham:

Yeah.

Yu:

So, we had to watch the mill gap through a couple inches window to see how that was adjusted. After that, we rolled the coils successfully. And through this incident at the startup, I won a lot of credits from our teammates. So, my duties in Huntco Steel were expanded as well, and included hot band purchasing, lab operation, pickling, cold rolling, annealing, temper rolling, and product sales specification review, and sometimes included customer service, from head to tail. So, there was one person doing that. That's really a [growth] experience in Huntco Steel. Without that, my focus in the steel industry was probably fixed [to] one area only, just doing one part of the mill, or casting, or melting. That experience expanded my capabilities over all areas. That's what my first job looked like.

Topham:

What made you decide the Nucor hot bands versus—you identified the problem was with hot bands, why Nucor's?

Yu:

Well, that's the issue. That's a good question. Back to the last, previous question, you asked me, why did I take that job? It looked like switching back to Huntco. I expected the CSP mills produced excellent strip shape, especially flatness, because their thin caster started casting two-and-a-half inches thick, right? You run six-stand mills with lighter reduction, and then, as a result, you produce excellent strip shape. So, this is wonderful flatness quality for cold mills.

However, at that time, there was a discrepancy in the hot bands produced by CSP mills because the environment in the steel industry did not expect that happened so quickly. Nucor did convert hot bands to cold-rolled at Crawfordsville. But it's not nationwide. Not everybody bought Nucor CSP hot bands for cold-rolled applications. So, I would say, this is a big one. And between 1994 to '98, at that time, we changed the people's view about CSP hot bands. Before that, so many people were against CSP hot bands for automotive or cold-rolled applications. Today, popular. We just changed people's culture and the industry view. Everything could happen.

Topham:

Right. Thanks for elaborating on that. I know it seems like it happened really quickly, and it was cool. I'm sure it was a good memory to be a part of.

00:30:37 Work Transitions, Problem Solving, and a Milestone Technology

Topham:

Just coming from a young professional, we talk about transitions a lot. What was that transition like for you from your college career into your professional career?

Yu:

Well, that is the transition. As I said, I was in the college from bachelor to PhD. That took me roughly

around 10 years, right? From 1991 to ‘94, for that time, I was working in the colleges as either visiting professor or lecturer. I did those jobs that will be mentioned later. And there is a huge difference between the college campus and the steel mill. In the college, typically, professors spend the time in the class teaching students and talk in the cafeteria and do some experiments in laboratories. That’s their life. Everybody has free time off the classes, self-time-controlled environment.

For the steel mill, it’s totally different. The mills require team collaboration because the mills run seven days a week and 24 hours a day. Team to team must communicate with each other really well. So, it’s team-oriented in the steel mill. So, those skills must be shifted since I had been in the college for 14 years. In the transition to the steel industry, my mentality must align with the steel mill environment. They want me that way.

Topham:

Sure. Yeah. What was your first major project in your career?

Yu:

Well, for my first major project, I was recalled back to Huntco Steel. We started the Cold Mill Complex successfully. Although a bigger hurdle happened in the commissioning. Quickly, we found out we produced some light gauge, gauge 26, for steel building wall panels. That panel was formed from the cold-rolled coil to the corrugated shape. If it’s not flat, what happened? That flat panel is not in flat. If you use a light to shine on the panel, you can see the buckles everywhere. It looks ugly, right?

We knew that the cold mill bought hot bands coming with perfect shape flatness, but after being cold rolled, there were a lot of quarter buckles. Those were on the finished strip. But also, those strips were not allowed to be annealed and tempered. They allowed temper rolled but did not allow full annealed. Softening steel and temper rolling can correct the shape. This must be full hard because the building and the panel need stiffness, right? It cannot be soft, half hard, or quarter hard. It must be full hard.

We called it as “sun shining and annealing” at roughly around 900-950 degrees. After the cold roll, steel is full hard. If it is not flat, you did not make any prime product. Nobody buys it. So, what we did was quickly find out the work roll thermal crown was uneven across the barrel, especially high [extension]. That was called “high crown” at the quarter point. So, we needed to find out how to eliminate the extra crown at the quarter position. Only one technology was available at that time. We called it “zonal cooling technology.”

So, Huntco quickly funded me about $1 million and collaborated with Lechler. They designed the nozzles and the valves and the control stations within six months. After six months, we made a gauge 26 strip successfully. Do you know who was our first customer of manufacturing panels? Our Nucor Vulcraft. Vulcraft loved that product with 0.19 gauge, and the hot bands produced by Nucor Hickman. So, Huntco used the cold mill for converting.

This technology is a milestone for me, how to collaborate with teams within the organization and external vendors, because if one side was short, this project would never be successful, and just a waste of money. The project would be failed. So, that was a very good experience for me to start the number one project in the steel industry by myself.

Topham:

Yeah. Well, we still make that steel. Must have been really good.

00:36:51 Growing Up in the Industry – Reflections on the Support of Colleagues and Mentors

Topham:

We talked a little bit earlier about mentorship, like in a college timeframe. What was it like in your career?

Yu:

Well, I have been fortunate with many people and so many mentors around me in my whole career. Back to the campus, my PhD advisor, J. C. Lian, he gave me a big influence in how to achieve excellency in academia. And he always reviewed my technical paper, experiment data, and simulation results word-by-word and digit-by-digit. He's a very good mentor to me. And then, back to the United States, after my transition to the University of Toledo, I have two good mentors there too.

One is Dr. K. C. Fu, another is Dr. Ted Keith, and both mentors expanded my research boundaries because they knew my capability, but always stretched me further, demanding more and more demands. Back to the industry, as mentioned, Mr. Tom Gorder, the general manager of Huntco Steel, and even President Terry Heinz of Huntco Steel, both had a big influence on me because they really demonstrated how to earn the trust and respect of teams, and how to effectively implement business strategy. And including other co-workers like Mr. Jim Linnell, and Charlie Harper, and Jay Handerson. Jay Handerson was general manager of Nucor Hickman. They helped me in a big part how to collaborate with and foster a team and create a good environment for the team.

Topham:

Yeah.

Yu:

We worked together and had a lot of fun, and they helped me grow up. And through my tenure at Nucor—I have been with Nucor for 27 years—the privilege of collaboration with six exceptional general managers. They offered me invaluable mentorships, from my personality to my professional skills. They always supported me as I needed. Additionally, my department colleagues played a pivotal role in supporting my professional growth and development. I would like to highlight especially one general manager, Colin Muncie, who continuously inspired me and had a big impact on me.

Even today, he has retired so many years, he still texts to me, cheers for me, and also tells me what I should pay attention to. For example, I get a new project underway. He always reminds me, "Don't waste money." I was always kindly reminded through my whole life. And the most important lesson learned is: if we take care of a team, or I take care of a team, the team will take care of me in turn. This philosophy is easy to be extended to every department, every company, even college. Supporting collaboration is mutually beneficial for everybody, in my view.

Topham:

Absolutely.

00:41:25 Career Trajectory – Technological Innovations and Positions I've Held Along the Way

Topham:

Dr. Yu's career in the steel industry includes significant contributions at Nucor Memphis and Nucor Tuscaloosa, particularly in metallurgy and quality. He currently serves as the market development and product applications manager at Nucor Steel Tuscaloosa. What other positions have you held in your career?

Yu:

Over my 30 years in the steel industry—three years at Huntco Steel, 27 years at Nucor—at Huntco Steel, I initially served as staff metallurgist and rolling specialist. One of my notable accomplishments during that time was assisting the team in building the Greenfield Cold Mill Complex, and finally, [I] helped the company be profitable. That's a big one. The second is, after the transition to Nucor, I continued to advance my career with starting as a senior metallurgist, and then finally expanded my capabilities and all responsibilities.

Eventually, I [took the] role of marketing development product application manager. My duties included expanding Nucor's marketing range and optimizing product application of plates. And in addition, also I helped the Nucor Memphis SBQ (Special Bar Quality) mill, and helped them be profitable, and also made a SBQ product successfully as a chief metallurgist. And through my career in the steel industry, 30 years, I would say it is not bad at all. It's enjoyable; excitement [at] every step. Every day, I enjoy working there. That's my life.

Topham:

Yeah, thanks for sharing that. Can you tell me more about your research and your work?

Yu:

Well, my research work focuses on too many areas. Back to the campus, I spent 13 years over there, so I had a lot of simulation skills, like numerical simulation skills, including finite element method, boundary element method, and finite difference method.

Those numerical simulation skills helped me to simulate a steel process involving a big part. That played a pivotal role even in my today's job. And upon the transition to the steel industry, my research work had been shifted. Do you know why? Number one, steel mill today does not have an R&D department. We're in the production. So, the research work must be companioned with production.

So, this is not bad. You can do a trial of development work in the next hour. If you had an R&D department, planning and studying could take years. Eventually, I shifted those R&D skills from the college to the industry. So, my mentality had to be shifted, because why?

Because you're not going to do research 24 hours a day, seven days a week. You have to watch and observe the process from production and build up the program, and complete your R&D subjects or projects. In addition, I have been engaged in equipment updates and also applied some leading technologies to the steel industry. Those are a part of R&D, too. And besides that, I did a lot of trials.

My R&D focuses had been shifted from the college to the steel industry. And recently, I'm focusing on how to directly quench the steel for producing abrasion-resistant steel without heat treatment. So, you will see what will happen with the new technology, new process technology. This is another big area I'm going to focus on in the next few years.

Topham:

Very cool. Thanks for sharing that.

00:46:53 Technical Challenges and Overcoming Hurdles – My Contributions to Industry

Topham:

And we talked about some of your projects. What are some of the biggest technical challenges you've experienced in your career?

Yu:

Well, I think thoroughly about my career the last 40 years. In my memory, it was a really bad experience for the startup. At Huntco, that Cold Mill Complex, so many things happened. We had a consultant from a cold mill who couldn't run smoothly. You know what happened? He quit. So, we didn't have any experienced operators. Second, we didn't have any good support from the vendor in automation.

Both sides struck me out. How did this happen? I think this could be minimized. It shouldn't ever happen like this if the planning was good. I would say, after mills are up and running, how to make products that meet customers' expectations; that's another big challenge. Because everybody's excited while seeing the mill was rotating. Rotating good or bad is determined by quality control, right?

Topham:

Right.

Yu:

This is the reason why producing light gauge led to the zonal cooling technique. It took us a little bit longer time to figure it out. And also, from the steel melting side, carbon content control is another challenge. I still did not figure out how to control carbon content pickup in a ladle. Because every time you got a ladle of liquid steel—you didn't add anything—and moved it from the ladle metallurgical furnace (LMF) to the caster, if taking a sample from the caster, your carbon would be higher than the LMF test result.

Topham:

Yes.

Yu:

So, that's identified as a carbon pickup. Even today, we just experienced a half point to one point of carbon pickup. But the carbon range is very critical. If the pickup is so high, the carbon content in the peritectic range will cause caster folds and a quality issue. For this kind of thing in the steel industry, in the melting stage, we still need to continue figuring out what is the mechanism of the carbon pickup.

If every heat pickup is 20 pounds, you run 50 heats, that ladle lost a half ton of the carbon in weight. So, something is behind the pickup. We need to do further study on that. Also, preventing weld cracks is a long-term task. Steel is going to be cut into small pieces for welding together, regardless of pipe or structure. For heavy-gauge welding, if you're not doing pre-heating well, you still get cracks. It doesn't matter.

Since those certified welders may not understand chemistry and mechanism, we need to help them how to control those things in theory, and help them how to minimize those cracks, especially for heavy size tube or pipe. Those challenges happened mostly within a time constraint. If the things happened, the steel mill is not going to wait for you, like taking two years to fix it.

Topham:

Right.

Yu:

You need to fix up. Otherwise, you lose money, and you make a lot of scrap. And the company is not happy with that.

Topham:

Right.

Yu:

Okay. That's my hurdle.

Topham:

What are some of your other contributions you could share with us to the steel industry?

Yu:

Well, I already previously mentioned a typical area. And the number one, I had a patent of work roll shifting. That technique is for shifting the roll under rolling [load]. That's back to 1994. Today, some vendors started thinking about shifting work rolls during rolling and under the load. The mill can shift the work roll anytime. That's good. The second is the conversion of CSP hard bands to cold-rolled.

As I said, in 1994 to ‘98, that time was not a good time to use CSP hot bands for the cold rolled application. Today, it is popular. Without CSP hot bands for the cold-rolled application, cold-mills probably most are shut down today, since they don’t have any hot bands. And if you‘re not going to make the cold rolled coils for an automotive company, they don’t have enough steel to make cars.

The third is the medium slab quenching technique. And if you’re casting slabs with medium size, Nucor Tuscaloosa is the first medium slab caster in the United States. So, we have a lot of experience on that—how to minimize the surface defects through the slab quenching unit. Today, this technique has been expanded to every CSP mill that can cast slabs with the residuals higher than normal without quenching units.

Topham:

Yeah

Yu:

The fourth is double row nozzles of laminar flow cooling header. The heavy-gauge coils typically show crossbows in the downstream. So, I developed two rows of nozzles on one header. The original single row of nozzles means water is not sufficient to cool the bottom since the water falls off due to gravity, so one side is cold and the other side hot. It results in the crossbow or canoe. Since I published one technique paper, everybody uses doubled nozzles right now at every hot mill almost.

Topham:

Wow

Yu:

The fifth is the direct quenching technique. We installed a direct quenching unit in 2016 at Tuscaloosa. We used that unit to make X70. And those coils have been used for several major projects—Middle Stream and Keystone, but Keystone is not completed; we supplied steel, and made pipes successfully, met the specification. We made over 100,000 tons for the projects using the direct quenching unit.

As mentioned, for the heavy gauge welding, we have to make our heavy gauge coils within the specification in a certain range to help welding with less spring back. This technology, that is called a [welding] procedure has been used within Nucor or external. And my biggest contribution is I developed a medium carbon high-strength grade 65 with X70 toughness at minus 20 degrees [Fahrenheit]. Minus 20 degrees. Medium carbon high-strength low-alloy steel.

That product, developed to date since 1998, has been standardized. The manufacturers of wind towers or transmission poles use the grade 65 today, from 3/16 inch to 2 inches. So, I’m glad to see that everybody talks about using grade 65.

Topham:

Wow. Yeah, those are some very large accomplishments.

00:55:48 A Mindset Shift – From Solo Work in College to Teamwork in Industry

Topham:

Do you recall any significant experiences working with colleagues that you can share?

Yu:

Well, as mentioned, the working environment from the college to the steel industry, one is called a self-management style, [free time] in the college; another one, steel industry is team-oriented, that has a different aspect. As mentioned previously, if you start working on the mill, I would like to discuss how to work with the colleagues in the steel industry. Since everybody graduated from college, everybody is thinking, "My mentality is to fit the steel industry." I don't think so.

You need to shift a little bit mentality-wise because [being] team-oriented is different from the school. In the school, you just go to study, get your classes [passed]. Everything is done immediately. If you do yourself good, everything's good. But the steel industry needs more collaboration work.

And I would recommend that every graduate take some Dale Carnegie classes. As a result, you will be easy to be adopted by the steel industry environment. That will show you how to introduce yourself and how to collaborate with a team, how to present yourself and represent your company, represent yourself, represent your department, and also inspires you to advance to management.

So, this Dale Carnegie class is my recommendation to everybody. If you don't have time, take some Google searches of those classes, and especially for each area they host those face-to-face training, to build trust and respect within teams. Everybody should be respected. However, for the respect or trust, you have to earn. People can give [it to] you in general, but for the special trust and respect, you have to earn from your team. And people can say they trust you from the mouth, but it does not mean it's from his heart. You have to earn those and understand the importance of observation and feedback.

You can say to yourself, I trust you [and] what you do, but personally, you have to, we have to, make some observations ourselves; most of the time, you have to trust the team [and] let them observe and [give] feedback to you. If something needs validating, you go yourself. Otherwise, you distrust the team.

For example, somebody cuts a coil for inspection. How's it looking? Bad. So, the teammate did his job. If you trust that, that's good. If something is suspected, it doesn't mean you distrust that teammate. You need to tell the teammate, I think there is something I need to make clear myself. You need to make an explanation to the teammate. This is my experience of work with a team. It's always that—make a further explanation. Don't try to do it by yourself without proper communication with a team or teammates.

Topham:

Yeah. I appreciate what you said about the Dale Carnegie, and just the trust and respect. Even in my short time in the industry, that's been a pivotal part of my experience as well.

00:59:51 Challenges Are Opportunities – Industry Milestones and the Path Ahead

Topham:

What milestones in the industry do you think had the biggest impact on the industry?

Yu:

Well, I have been in the steel industry 30 years and the college for over 13 years, and that is 43 years total experience. I would say, back to the steel industry, for the milestones in the industry, there is a whole bunch to consider. I only focus on those in the steel mill and steel industry. Back to the 1960s, high-strength, low-alloy steel is a big milestone. That means we can use micro alloys to make stronger steel, tough steel, and also lightweight structures. That is huge. And with the application of the rare earth elements, you compare to what other industries achieved, how they're progressive in strong, tough, and light, those features. They just talked about the nano material about 10 years ago. Steel mills already developed the nano materials in 1960s. We are almost 40 years earlier than other industries. So, is the steel mill like the rocket science, right now? Yes, we walked already on the moon; they are still on the earth. Steel mills talked about or used nanotechnology 40 years ago.

Second, for the CSP mills, the environment is good, and production is good. And also, recycling scrap is a huge milestone.

Topham:

Yeah.

Yu:

Today, CSP mills are everywhere, probably over 50% minimum capacity. Everybody builds a new mill, CSP. That's how big the milestone is, right? I would say Nucor took the leadership role of that. You cannot say other companies. Crawfordsville was the first CSP plant built up. After that, how many lines have been built up?

And the next one is the steel import protection in 2000s. I believe everybody understands. Late or end of last century and early of this century, how many steel mills bankrupted? And this morning, AIST said it's 42, right? The steel mills bankrupted during that time. In that time, our steel price was like $250 per ton, cheaper than today's scrap price. You couldn't get scrap in that time at that price. The prime steel cost was $250 a ton.

As you know, our former president, Dan DiMicco, he was the president of Association of Steel Manufacturers and also Nucor chairman and president. He campaigned and led all steel mills to convince the government to impose import tax. The tax started in March 2002. I believe that was the first time. Dan DiMicco saved all steel industry jobs up to today. I don't know if everybody recognized that, but we certainly appreciate his effort. Without that, I'm not sure I'm still working in the steel industry. And the bankruptcy was not only caused by the imports, but it was also over capacity, too. At that time, there were a lot of mills bankrupted, and leveled out. So, we eliminated some capacities, built new CSP mills, environmentally friendly, and produced steel more efficiently. So, there are two parts. But the protection, import protection, that's a big milestone for the entire steel industry. The digitalization arises in the recent years. We will talk about it. That's also another one.

And I believe I forgot to talk about 1970s automation. In 1970s, the automation at that time is called the Industry 3.0, using most of the PLCs. That is a milestone. I would link that with the digitalization, together, with Industry 4.0. So basically, 70s automation and 2020s digitalization is 4.0. It continued from 70s to 2000, up to 2020s. This [advancement] from Industry 3.0 to 4.0 is a big milestone, too.

And the last one is net-zero initiatives. Everybody talks about carbon, what is warming, global warming, that stuff. I really don't have any science to prove that is true or not true. However, for steel mills' net zero initiatives, we are considering as a big, big challenge, and also opportunities, too. People ask about what is opportunity? The opportunities are huge, such as renewable energy like wind towers. How many tons of steel are needed? And carbon capture. How many tons of pipes are needed? And transmitting hydrogen gas for fuel. How many tons of steel do you need? For the solar panels, we will not talk about it, because it's already been developed in the industry and also around our neighborhoods. So, it's a huge opportunity. However, the challenge is big, too.

How to implement it, make steel reach the critical figures in the spectrum or goals of the net-zero initiatives? I'm not sure how to get net-zero. But if we want net zero, we have to develop new technologies to achieve it. That is a challenge. Maybe all burners are hydrogen burners in the future. Maybe steel making all things use hydrogen fuel, or use something else, or use the current fuels with capturing carbon dioxide gas using the capture technology. The steel mill technology always take a leading role in the industry. But for the carbon emission or net zero initiatives we face in the future, in 2035, 2050, whatever those years, will come soon. We need the new engineers to come to the stage and show us how to achieve that goal. Challenges are opportunities.

Topham:

Yeah, definitely the right perspective.

Yu:

That's a milestone. I just say from my perspective view. I did not think about [what] the future will be, or [if we will] use something else. A different view results in a different attitude. You can create renewable energy to make a CSP mill run. Even nuclear power can run EAFs (electric arc furnaces) efficiently. You know that many things are going to happen. It's not going to limit today what we see. We see smoking from a stack. That's acceptable. The future will be a clean steel industry. There's no doubt about it.

Topham:

Absolutely.

01:08:49 How I Balance Work and Family Life – My Promise to My Kids

Topham:

Let's switch gears just a little bit. How did your work impact your family life, or how did your family support your work?

Yu:

That is a good question. I'll tell you. In my family, I have two sons and my wife. They support my job in a big part. I always do writing technique papers on the weekends and nights. Those things probably restricted my capability or time with children's weekend activities. When you grow up young and have children, they need to play softball, play tennis, and play golf. All kinds of activities started at five years old to teenage. After teenage, they don't need you. From five to 10, they need you because they cannot drive cars. Most of the time, my wife took them to those weekend activities, and they gave me their support. My wife took a lot of jobs at home. Since she works for the government, she had a lot of vacations more than the steel mill. She contributed and devoted her time and energy to our kids. So, I was freed up.

I always make a joke to them: after retirement, I have 24 hours with you guys. Don't kick me out of the house because you always see me everywhere, and I have nothing to do. My joke with them promises them, "Hey, I will have more time with you after my retirement." And they're just smiling and say, "Hey, you will find something to do." I'm not sure how to keep up with my promise.

Topham:

Yeah. Thanks for sharing that.

01:11:04 The Value of Member Societies – Peers, Opportunities, and Professional Development

Topham:

Dr. Yu has received prestigious awards such as the Richard J. Fruehan Award for Best Paper in 2015, the Hunt-Kelly Outstanding Paper Award in 2016, and the Norman D. Hodgson Outstanding Achievement Award in 2019 from AIST (Association for Iron & Steel Technology).

Dr. Yu is actively engaged in industry leadership, serving on various AIST committees since 1995 and organizing international conferences and training events. He currently chairs as AIST plate-rolled technical committees training chair and has been instrumental in recent developments in plate steels. When did you first hear about AIME or your member society, and how has your involvement progressed over the years?

Yu:

I read some AISE engineer journals back to 1982, and they published something on the activities of AIME. I forgot which issue. During that time, I read some literature about shape control from AISE magazine. And sooner or later, as mentioned, between the end of last century and the beginning of this century, there were a lot of bankruptcies. And also, ISS (Iron and Steel Society) was a member of AIME at that time. AISE was not a member of AIME. During that time, our industrial leaders and association leaders thought about membership between AISE and ISS. ISS means Iron and Steel Society. AISE means Association of Iron and Steel Engineers. Two associations competed [with] each other about membership because the bankruptcies led the membership drop out. So, ISS and AISE both agreed to consolidate as AIST back to January 2004. That time. As today mentioned, AIST has its 20-year anniversary.

And AIST, right now, is a member of AIME, and one of the five founder societies of engineering established in the United States. I have been with AISE since 1995. Now, it is AIST—absolutely a part of

AIME. During AISE, I played an active role in organizing training seminars, such as cold rolling fundamentals. That is back to 1998. And the hot sheet rolling fundamental training seminar afterward, roughly around 2000. And the collaboration with industry professionals outlined those classes together. And a number of steel producers were involved in preparing the classes.

Over the past decade, I was involved in metallurgy for all aspects. That's including "Metallurgy, Processing and Product Application," as you attended today.

Topham:

Yeah.

Yu:

That committee. And Plate Rolling Committee, and also Hot Sheet Rolling Committee. That's three committees [I'm] heavily involved [in].

My engagements with AIME also go back to 2007. I served as chairman of the AIME Environmental Conservation Distinguished Service Award Committee. And this role reflected my longstanding dedication to promoting environmental sustainability. In that year, Mr. Dan DiMicco won that award. He deserved the recognition because of CSP mills and DRI (direct reduced iron) green technology. That was involved in AIME. Also, as mentioned at the beginning, we discussed that in the last three years, I was also involved with OTC, Offshore Technology Conference. Unfortunately, this year it overlapped with AISTech. I have to make a choice to come to AISTech and drop off OTC. OTC is a part of AIME, too. OTC is organized by the SPE (Society of Petroleum Engineers). Otherwise, we have more activities to participate in.

Topham:

Yeah. Thank you for that. So, how has the membership to these societies benefited your career today?

Yu:

Well, I tell you, number one is networking opportunities. So, if you want to know something, talk to something, discuss something, you probably not going to use a phone. You can do it face-to-face, talk to experts, peers, and professors, whoever, once you come to annual conventions or committee meetings. And also, you will learn the technical results and resources. If you have any problem, you can go to the AIST website, type keywords, and you can find how the other people solve those problems through the technique papers. Or if you are a committee member, they post your question or problem on the website to seek the answers from experts or other peers. You don't have to fight those problems by yourself. Somebody can share with you their experience.

And also, in professional development, especially, AIST offers various professional development programs such as seminars, workshops, and training classes. That'll help you with a big part to grow up fast. And it's not only things about skill, knowledge, or expertise, but also the most important thing is you are in the network.

To expand your capability, I would say also, you need to extend your views for the future or plan your

career path, okay? Because those guys' grow-up path may be referred by you for your future career. And today, I would say, AIST played a big role in the steel industry. We have facilitated a lot of the technology exchanges. And some companies may limit [you]—you cannot talk about those things. But in the society, we come here and can share ideas. If presenting a paper, you can share your ideas with other people, or somebody presents a paper, you can ask them in detail what's going on. You know, those are not published.

Another aspect is technical committees. You can find that AIST has, right now, nine divisions, 29 technical committees that will meet your needs. Which society do you want to be involved in? Go ahead, join us, join one of the committees you like to participate.

Topham:

If you were to recommend your member society to a new graduate, what would you tell him or her about it?

Yu:

Well, as I told you, and like today, I invited you to the committee's lunch. I said, well, what do you think about it? Let's go ahead to find it out. I would say it is a learning opportunity. If you do not participate in it, you never learn what's going on about those technical committees and members. Besides the members' benefits, the second is networking. You build a lot of relationships with the industry peers. Upon the request, they will help you out if you need help. You reach out, they will help you. The third is job finding. As I said, my job was found from [an] AISE annual convention. So, if you look for a job opportunity, you might find the opportunity in the annual convention. It is not like a formal interview. They could find your personality, your skills, quickly. You did not even submit any resume. And also, AIST publishes the job opportunities from the best companies that are the bigger companies. The posted positions are there. And also, if you really need help, you can call your peers, industry peers. They will introduce you or give you a reference. So, that's huge for the young professionals.

Topham:

Yeah.

Yu:

For career enhancement, if you want to grow up as a manager, whatever you decide to do, there are multiple paths for you if you join the society today.

Topham:

Absolutely. I agree with that, 100%.

01:21:44 Stability, Technology, Educational Outreach, and Attracting Young People to Industry

Topham:

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

Yu:

Well, this is back to my career at the beginning. I would say, we have to think about this: what is the difference between the steel industry and the advanced sectors, called the hot area, today? Number one, we can promote our opportunities to young people, namely, the highlighted career stability. If you worked in steel mills, we had some hurdles at the end of the 20th century because of overcapacity and imports. Cheap steel bubbled up significantly. After that, the government and our industrial leaders quickly recognized that they must work together with the lawmakers and make that happen. Looking at the steel industry, how stable it is, we continue to be profitable, and our jobs continue to be secure. In our Nucor, we did not lay off a single teammate even if we lost money in a single year, right?

Topham:

Right.

Yu:

It was a big crisis, but we never laid off any teammates. Which industry can guarantee you not getting laid off?

Topham:

Right.

Yu:

Right? So, this is why I said the highest career stability. Second, I would say, the steel industry should consider the educational outreach, collaborate with education, including the high schools, colleges, and also institutes. AIST has established so many programs, as you have heard about today. We have $1.5 million for the steel foundation. And the big four steel producers contributed $200,000 for that funding. Small, minimum size contributed $100,000. I counted that it's over $1.5 million just for the steel foundation. What is the program for the college students? We have 50 opportunities for interns, for steel college students. And they will be awarded $7,500 just for tuition, except for interns pay hourly. If an intern works in the mill, the mill pays a minimum. I would say the hourly rate is different from company to company. That's exceptional. So, we need to reach out.

Another strategy is promoting innovation. We need to show people how we, 40 years ago, used and studied nanomaterial. Nobody talks about it. Our societies did not even know it. Only the steel mills talk about it. We need to activate and motivate people to step out of the steel industry, publicize our achievements. Forty years ago, people discovered the nano material, stronger steel as that high [strength]. Our steel industries already used nano materials 30 years ago, right?

Topham:

Right.

Yu:

And also, we need to offer the career program to young people, too. What kind of growth path, make sure that they understand those clearly, what is the growth path for their career? Also, we are engaged with industry associations, such as AIST, AIME, and even others, TMS and SPE. The four big societies.

We are involved together. We can reach out. You're not going to be only a steel mill looking for recruiters or headhunters. If you reach out to everybody, they will come together. Today, I still encourage everybody to reach out to high schools. That will significantly shift the high school student mind to the steel industry during their application of colleges. If we make a tour to high schools or ask high school students to come to the steel mill tour, they watch mega-scale steel mills that they never see in their whole life. It is much more interesting than the game box. As you know, you make them interested in steel mills and let them operate the buttons. When they push the buttons down, and big ingots go through the work roll position, they feel powerful. They will say, I'll throw my game box away and come to the steel industry. That's my thinking.

Topham:

So, you'd rather play on an HMI instead of an Xbox, huh?

Yu:

Yeah, that's exact, yeah. HMI. Yes, that's exact. Let them play with buttons or compute things or make steel fast and strong, also let them get a piece of steel that can be bent either way and weld either way. We just show them the case. We have not done that because we think about, people come out of colleges automatically come to steel industry because the steel industry has been born for so many years and looks like not leading technology. We are not like rocket science anymore. But basically, we are like rocket science every day. Steel is an advanced material. We have been using it much earlier than other industries. You know what I mean?

Topham:

Yeah. Right.

Yu:

I mean, is there anybody talking about a nano material in the steel industry? The steel industry has been using it for 40 years. [laughter] Today we said, everybody applied the funding and proposed a nano material. This is carbon. This is a plastic nano. Come on.

Topham:

Right

Yu:

Steel mills found nano precipitates 40 years ago.

Topham:

I agree with you there. Yeah.

01:28:39 Meaningful Moments and My Greatest Regret – Reflections and Hopes

Topham:

So, just kind of wrapping up here, what has made working in this field meaningful to you, and what's been your favorite part of being in this field?

Yu:

Well, as reviewed, my career from the campus to the steel industry, including Huntco and Nucor—in summarizing, I would say: there are two parts. I really enjoyed the steel industry. Number one is training. Steel mills are living in the fundamentals. All engineering science principles are applied to the equipment and process. If everyone has the same fundamentals, they operate machines or implement processes in the same manner, right? If everybody's fundamental is the same, understanding the same, so their behavior will be the same. So, training is more critical to our teammates of our steel mills, i.e., fundamental training. In the past year, from last April to this April, I have offered 27 classes to our teammates at Tuscaloosa.

So, basically, the feedback is very positive. For those training classes, I did not send out a required meeting notice or a mandatory meeting notice. I just randomly sent it out, and the class is always full. You know what? Our teammates are willing to learn. They want to learn the fundamentals. Training plays a big role in the steel mills. The second is trials. The trial is from your principles to the reality. You want to see if your design is good or bad, or see what happens, right? Like a mystery, right? If your design is good, you expect the good results to turn out. The two things are with my whole career, called as "2Ts," training and trial.

Topham:

That's good. Do you have any regrets regarding the career you chose and where it's taken you? What would you have done differently?

Yu:

I don't have any regrets for my career from the steel industry to the campus, whatever I tell you, because I have experience with two different worlds in my career, that is, self-management and team-oriented. I made a lot of friends in the steel industry, more than the campus, because on the campus I only know students in my class and a few professors in the department. That's for my whole life. So, people would not know me either because I'm in the office, cafeteria, and the laboratory. In the industry, I know a thousand, ten thousand of my peers, friends, and coworkers. This is versatile in my life. I do not regret that.

So, only thing I regretted a little bit, I ask myself, why—I have two sons, two boys, they're adults right now—they did not step in my footprint, choosing metallurgy. Come on. I was frustrated as I reviewed my career back. I was captivated when I saw that stamping machine forge the big ingots, right? Early on, I lured them to review my writing technique papers. They could change some grammar and words. I

asked them to think about it. They did. But the problem is, I probably scared them to death. They complained that "I don't understand this equation," and "I don't understand this terminology." I did not spend time with them to make further education or follow up. They just thought about it. This is a rocket science, we're not going to follow it. So, both of them gave up metallurgy. One of them chose the major biology. I said, eh? This was my college ambition. I said, try [it] out, see what you like. He tried two years there, and then computer science. Try it out, as I said.

They chose their own way. So, I couldn't say anything. None of my children would follow my footprint at this point. Maybe I could do better. I should have taken them to metal lab to look at a microscope, show them some interesting things. I lured them to change their interests or career paths to the steel industry. You never know. They're still young. Maybe someday they [will] come back to the steel industry as an IT engineer because they're in computer science, back to the steel mill. We need all kinds and different types of majors and teammates, right? So, you never know.

Topham:

I think it's really cool, though, that you're able to give your sons almost the freedom that you didn't have early on. I think that's really a testament to who you are and just the aspect of your career, the freedom that you can give to your sons. Really, really cool.

Yu:

Sometimes, too much freedom was not my choice.

01:34:38 Exciting and Popular – Advice for Future Steel Industry Leaders

Topham:

So, if you were to sum all that up in your career in two to three words, what would you say?

Yu:

I would say two words. One is called "exciting," and another one is called "popular." "Exciting" means, as I reviewed back and looked back in my career, there are a lot of challenges and opportunities. That's called "exciting," because [when] every mill started up to crank and run, I was excited, right? So, every job change, I had opportunities. I was excited, too. "Popular" means, as I said, I had made a few friends on the campus. I made ten thousand friends in the steel industry and have become popular, because when I presented my technique papers, they showed up. When I talk to somebody else, ask opinions, they always give me feedback. In both ways, communication. That's what "popular" means. For "exciting" and "popular," if you want exciting and popular, come to the steel industry. Here, I'm going to encourage everybody to follow that way. It is not going to limit you and your growth path in the future. Always, steel mills give you opportunity to grow.

Topham:

Yeah, that's absolutely true. So, what other advice would you have today for young leaders in the steel industry?

Yu:

I offer them two pieces of advice. One is living fundamental; another one is thinking outside the box. Two pieces. Because the steel mill is highly engineering-based, you should not force equipment or shorten capability, otherwise you'll not make a product. That fundamental must be stressed since day one, from scratch to the commissioning and to production. So, the fundamental takes up a very big part. If you are off that principle, engineering principles, you never make things happen in the way you want. So, I would say, living with the fundamentals stresses on and emphasizes the fundamental training, including technology and innovation.

And the second is thinking outside the box. Today, everybody thinks about AI, that will replace our jobs in the future, blah, blah, blah, okay? It's not going to replace our job; it will make our job easy, and also work and think in smarter ways. So, that's the reason of thinking outside the box in introducing new technologies to the steel mills. If Nucor did not introduce CSP mills to the United States, what happened today? We would see smoking pollution everywhere, right? If Dan DiMicco did not think outside the box and start fighting with the import tax that time, today we probably lost a job because the steel mill is going to be bankrupt. The system did not work.

Topham:

Always happens.

Yu:

The industry cannot guarantee your job. So, those things and milestones have to be remembered. So, that's why I said a new leader always looks back to two things, living the fundamental and thinking outside the box. That means: think to bring a lot of new technologies to the steel mills, and to make a steel mill run fast with high quality, less scrap, and high yield. And also, people can get more time off with family, and also you don't have any stress with anything because those programs help you to identify problems. This is not going to threaten steel mill engineers' job. Steel mills still need the engineers in the future. I'm not saying 100 years, 200 years. I'm not saying forever. At least 40, 50 years, for the next generation, steel mills need it.

Topham:

Absolutely. Well, is there anything else that you want to elaborate on or we can discuss further?

Yu:

Well, I think we have discussed enough. Looking back to 40 years ago, my memory has been refreshed today. If I have something else, probably I think it is the close of my career at that time. If I think about something to come out of my mind, I will come to you and say, hey, I want to share another [inspirational] talk with other people, and I'll let you know at the time. And I'm not sure how soon or how long, but I'm still [excited] about the steel industry. I still have my passion about the steel industry. So, my story is going to be continued.

Topham:

Yeah. Well, if you do ever [do] anything, I'd always be interested to listen and hear anything.

Yu:

Oh, no problem. Thank you. Thank you. Thank you, Dan, and thank you, Toni, for listening to my vision and insight. So, hopefully I have not wasted your time.

Topham:

Yeah. Well, it's an exciting career that you've had, and it really is an honor to just listen to it and know your story and hear your advice. So, thank you so much again for willing to share your story with AIME.

Yu:

Thank you.