



Location, Location, Location:

Developing Tomorrow's Engineers Way “U.P.” North at Michigan Tech

By Kurt Edwards and Danielle Schleiden

Even the most ardent Michigan Technological University supporter will tell you it is not for everyone. It is quickly apparent to anyone trying to get to the university that it is not easy to get there. Located in the Upper Peninsula (near the top of Michigan's “mitten”), in-state students traveling from the southern portion of Michigan can travel eight hours, passing a number of other fine institutions, just to get to the campus in Houghton.

And once you're there, it's not easy to leave. There's the snow — the area's average snowfall is 202 inches per winter. That's enough snow to warrant having a snowmobile parking lot. The traditional college spring carnival takes place in winter, featuring impressive architectural structures made out of snow.

Then there's the distance. When you go to Michigan Tech, “you leave your family; you leave your high school friends; you leave the family washing machine. You come up here and build your own community,” according to Paul Sanders, the Patrick Horvath Professor at Michigan Tech and an AIST Foundation Steel Professor.

That distance and separation has its benefits, though.

“You figure out what you want to do in life, with a lot of independence,” Sanders added.

Despite, or maybe because of, the hurdles created by its location, the independence fostered at Michigan Tech has helped the university become internationally recognized for its programs



Paul G. Sanders



Stephen L. Kampe

and students. The rigorous academic programs, combined with innovative hands-on learning opportunities, help develop students that are in high demand upon graduation. Their fall career fair draws more than 350 companies annually. Stephen L. Kampe, the Franklin St. John Professor and Materials Science and Engineering Department chair, said, “I would say that 90% of our (materials science) students go out and work in metals,” including steel producers like Nucor Corp., ArcelorMittal and Gerdau, as well as original equipment manufacturer (OEM) suppliers.

“The metals industry is the reason why Michigan Tech exists,” said Timothy C. Eisele, associate professor and a 2019 AIST Foundation Steel Curriculum Grant recipient. “(The university) was created to support the iron and copper industries of the Upper Peninsula.”

The school started with four faculty members and 23 students on the second floor of a building in Houghton in 1885 as the Michigan Mining School. They soon moved to the school’s current location, transitioning to the Michigan College of Mines before evolving to Michigan Technological University in 1964 to reflect the growing academic programs and dwindling number of mining students. The school now has seven colleges and schools and an enrollment of over 7,200, with more than 1,200 international students from 60+ countries. Ninety-four percent of those students are in STEM programs.

Michigan Tech has invested in its metals programs, including a recent US\$50,000 upgrade to their foundry’s ventilation system to provide cleaner air for students and staff. The foundry supports

metal-casting in iron and aluminum for research and services to select industry partners. The Materials Science department has also invested in their staff, with four experienced full-time engineers to provide instruction to the students, and, as Paul Sanders said, “make sure the equipment gets used.”

Steel plays a significant part within Michigan Tech’s engineering programs. Eisele said part of his grant application was to produce a better model on campus to show students how steel is actually made by making a small electric arc furnace the students could work with.

The Enterprise Program

Michigan Tech’s Enterprise Program is an important part of students’ education and career preparations. Celebrating its 20th year, the Enterprise Program is a multi-year, multi-disciplinary program that’s open to all majors. Rick Berkey, Professor of Practice and director of the Enterprise Program, said the unique and innovative program provides students hands-on,





Timothy C. Eisele



Rick Berkey



experiential learning and an opportunity to get well-rounded professional development experience over a longer timeframe than a typical capstone project.

Each enterprise is organized much like a company in the private sector and emphasizes student leadership development. Engineering and non-engineering students work together. Faculty provide coaching and advice, with industry serving as project clients and professional mentors. The program began with 11 teams and 200 students from 19 majors. This year they have 24 teams with more than 900 students from 31 majors. The teams work on projects from Baja cars to naval engineering to security, said Sanders, who advises the Advanced Metalworks Enterprise (AME). “We do metals-related projects having to do with steel, castings, aluminum and cast iron mostly, and some machining projects.”

According to Joe Nowosad, ArcelorMittal’s division manager for customer technical service, they’ve partnered with Michigan Tech for more than 13 years.

“Our main reason was the materials science department, including the metallurgy program, is one of the best in the country, and what we need for our industry. Also, it had the other key curriculum that we’re looking for — electrical and mechanical engineering — to support the needs for our clients,” Nowosad said.

Michigan Tech Steel Day

Steel Day at Michigan Tech began in 2014 as a way to promote the steel industry to students who were not familiar with the steelmaking process or the career opportunities available.

"Michigan Tech is in a unique position where they have so many companies come up to recruit for talent, it was making it difficult for those of us in the steel industry," said ArcelorMittal's Joe Nowosad. "The steel industry is basically the fabric of society, but it's an older industry. It was making it difficult for us to compete with the newer, sexier technologies that are out there."

ArcelorMittal, Nucor and Gerdau worked with the Career Services department to develop a program that would give the steel companies a chance to talk with students in a more relaxed environment than the career fair. At the same time, Paul Sanders had recently been named the first AIST Foundation Kent D. Peaslee Junior Faculty Award winner, and was looking for a similar avenue to recruit more students for the steel industry.

"Most students don't realize how many engineering fields go into the steel industry," said Jesse Gelbaugh, hot side manager at Gerdau's Jackson, Mich., USA, plant. "Some (students) think that we work in dungeons, we carry big hammers and that's all we do — that there's no technology involved. We wanted to spread awareness that there is new technology out there," Victoria Fueri, power system engineer at Nucor Steel-Arkansas, said. "We need electrical engineers. We need mechanical engineers. We need metallurgists. We need it all."

The program has evolved over the years to its current form of a four-hour window for students to talk with companies (and, at times, AIST) about the steel industry. Each student who stops by gets a free lunch. Industry outreach is the objective — most companies concentrate on recruiting during the following week's career fair.

Paul Sanders said that the partnership between the steel industry and Michigan Tech has led to a new tradition. The success of Steel Day has led to similar programs at Michigan Tech. Steel Day is now one of six fall events at Michigan Tech under the banner of Industry Days that lead up to the career fair.

"It's been really good. I've noticed that the more years we do it, the more people we get coming up to us at the career fair," said Gelbaugh.

Nowosad said the reception has been "fabulous" for ArcelorMittal. In addition to marketing materials,



many of the companies bring virtual reality goggles for the students to take virtual tours of their mills.

"When they take the goggles off, the reaction is always, 'Whoa, what did I just see? I never expected it to be like that,'" said Fueri.

She said all the materials the companies bring help change the students' perspective. "We see a lot more people at the career fair prepared to talk to us, as opposed to asking what Nucor is about."

Steel Day 2019 took place on 19 September. AIST joined ArcelorMittal, Nucor, Gerdau, Steel Dynamics Inc. and Cleveland-Cliffs Inc. in Houghton. More than 300 students came through during the program.

Sanders said the program has multiple benefits.

"A lot of students are exploring. They want to learn what's out there so they can make a decision that's good for them. I think it's great if they come out, talk to people, learn what the steel industry is, and even if they don't join the steel industry or work for a company in the steel industry, I think they'll have a better appreciation of what steel is and what it does in our society."



Daniel Fuhrman



Alex Sergeyev

Nucor Industrial Control and Automation Lab

Nucor also has a long-standing relationship with Michigan Tech. Nucor gave Michigan Tech a gift of US\$250,000 to update what is now the Nucor Industrial Control and Automation Lab. The lab is shared between the Electrical Engineering Technology program and the Electrical Engineering department.

“Nucor hires a lot of our students. When they came to see our old lab, they realized that we were not teaching skills that were relevant to their needs,” said Alex Sergeyev, College of Computing professor and director of the Mechatronics Graduate Program and the FANUC Certified Industrial Robotics Training Center. Thanks to the funding, Sergeyev said they are able to teach very high-level skills using the programmable logic controller (PLC) stations thanks to Nucor’s gift.

The Nucor Industrial Control and Automation Lab is just one part of Michigan Tech’s aim to provide their students with relevant skills as they enter the workforce. Recognizing the growing importance of Industry 4.0 and digital transformation, the new College of Computing was launched on 1 July 2019. Daniel R. Fuhrman, the Dave House Professor and Chair, said

Sanders described ArcelorMittal as a key partner who they could rely upon to support two projects within the AME every year. Nowosad estimated that he has worked on 18–20 projects, including the Enterprise Program, with a number of departments at Michigan Tech. The eventual outcome of the project was less important for Nowosad than the experience.

“It’s not a mission-critical project for the business. I just want to get to know those students, watch them work as a team, watch them develop,” Nowosad said.

“The bread and butter (of the Enterprise Program) is project sponsorship,” said Berkey. “A company has a hands-on project that they’d like to learn more about. A project the company may not have the resources to get to, but can provide a chance for students to engage with industry. You get to test drive a team of students working on something that’s a lot like what they would do for your company.”

Industry 4.0 was an important piece of the new college. Michigan Tech has had a very successful department of computer science since the 1970s. The College of Computing brings together that department with computer network and system administration, mechatronics, electrical and robotics engineering and health informatics.

“I think mechanical engineers are probably going to need skills in industrial controls. We can work with them to provide that,” said Fuhrmann. “We got started with the Nucor Lab and we’re at capacity right now. But we want to keep growing in those areas — Industry 4.0, Industrial Internet of Things, simulation, robotics and security.”

Michigan Tech’s relationship with the steel industry, and Nucor in particular, provided Fuhrman with what he called “one of the most amazing things I’ve seen in my life” when he saw the electric arc furnace during a tour of Nucor Steel–Arkansas. “It was



impressive. I had never set foot in a steel mill before. Thirty years ago, I never thought I would have had anything to do with this industry at all, but there I was, in this gigantic steel mill with sparks going everywhere, realizing ‘they want our students.’ And they want our students who probably haven’t had much exposure to the steel industry either.”

Fuhrman said he was fascinated to see how much there was for electrical engineers to do in a steel mill.

“The juxtaposition of the gigantic steel mill, plus the industrial controls we’re working on here, was enlightening.”

Michigan Tech may be difficult to get to, but once there, it is also hard to leave. It is striking how many of the people interviewed were alumni that eventually made their way back as professors, or continued to be involved as recruiters once they left campus, including professors Paul Sanders, Stephen Kampe, Timothy Eisele and Rick Berkey; and recruiters Joe Nowosad, Victoria Fueri and Jesse Gelbaugh. The campus location, education and programs create a special kind of graduate.

Gelbaugh said the students don’t come

out of Michigan Tech with just a degree. “They come out of here with a lot more than that. They come out of here with real-world experience from internships, Enterprise and other experiences on campus.”

Fueri adds that the Huskies are known for getting their hands dirty.

“You don’t see that at a lot of other schools. We really enjoy being able to take that experience and put it into the real world.”

“Michigan Tech’s just got a lot of great engineers. They are crazy smart,” said Nowosad. “We know when we hire them that they know how to solve problems. Michigan Tech does a great job developing for that.” ♦

