



2018 AIIST European Steel Forum

Explores Technology, Sustainability and Workforce Diversity



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During the last 170 years, the primary challenge before steel producers arguably has been one of efficiency: how to make it faster, better and less expensively. But as the 21st century progresses, the challenges are shifting, and today's producers are confronting a new set of social and environmental questions: how do we continue to manufacture steel sustainably and how do we create a more diverse workforce?

There are no simple answers; however, there are plenty of ideas, many of which were highlighted during the AIST 2018 European Steel Forum. The latest installment of the annual innovation forum, held 3–5 October in Udine, Italy, brought together European industry representatives for three days of knowledge sharing and networking.

The 2018 forum delved into a variety of subjects, but it brought into focus ongoing efforts to improve steelmaking technology, reduce steel's carbon footprint and make the industry more inclusive.

As to the former, the forum's attendees learned about several research and development initiatives that are investigating hydrogen's potential in the process. And as to the latter, they heard from several female leaders who shared perspectives on their careers.

With respect to hydrogen steelmaking, one of the companies pursuing that route is Sweden's SSAB, which has partnered with iron ore miner LKAB and energy producer Vattenfall on a joint venture called HYBRIT Development AB. Together, the companies



are developing a process route that pairs electric arc furnace steelmaking with a hydrogen-based ironmaking process.

Dr. Christer Ryman, head of strategy and business development for HYBRIT, said they currently are operating a lab-scale, hydrogen-based direct reduction furnace. However, HYBRIT executives broke ground last spring on a larger, pilot-scale facility that utilizes Tenova technology. The facility is scheduled for completion by 2020, with operating trials taking place through 2024. Once the trials are complete, HYBRIT aims to build a complete demonstration plant.



Elsewhere in Europe, a consortium led by voestalpine AG is also investigating hydrogen-based steelmaking. Called KI-MET GmbH, the consortium is aiming to lower steelmaking carbon emissions by 80% from 2005 levels over the next three decades. Axel Sormann, the consortium's senior expert for iron and steelmaking, told attendees that the goal is ambitious, but feasible.

He said that if the industry benchmarks progress against the modern blast furnace and basic oxygen furnace route (represented as 100% of the benchmark), then the current DRI/EAF route represents a 38% reduction; and the scrap-based EAF process already meets the 80% target. He said that by using hydrogen technologies, the DRI/EAF route



could meet the 80% target depending on the share of carbon dioxide for energy.

The consortium is trialing a small reactor system at voestalpine's site in Donawitz, Austria, and a larger reactor is to come on-line in 2023.

While hydrogen steelmaking represents a new process route for the industry, it is not a wholly unknown route — the technology already exists and has been commercialized. Case in point is Danieli's Energiron ZR process.

As Alessandro Martinis, executive vice president at Danieli Centro Metallics, explained, the Energiron ZR process combines hydrogen with syn-gas, natural gas, carbon monoxide or other fuels to produce a high-carbon, direct reduced iron (DRI) with significantly lower reactivity than standard DRI.



The third-generation Energiron system would use more hydrogen and further reduce the amount of carbon dioxide emissions, he said.

The technology came about through a collaboration with Tenova HYL and Ternium Mexico, both parts of the larger Techint Group.

Despite the promise of hydrogen as a way to reduce carbon emission in steelmaking, there is one major obstacle — generating the hydrogen itself. While hydrogen can be produced through electrolysis, the problem is generating the electricity without carbon emissions. But Mats W. Lundberg, a sustainability specialist at Sandvik Materials Technology, said he believes there is a solution.

He said electricity is difficult to store, which presents something of a problem for renewable generation in that electricity demand doesn't always coincide with optimal weather conditions.





So for the times when the sun is shining or the wind is blowing, but electricity demand is low, it might make sense to divert power to electrolysis for hydrogen generation. By using the electricity to make hydrogen, the hydrogen can then be stored and used as required.

As the industry looks to evolve its technical processes, so does it look to modernize its workforce and recruit more females. Attendees heard more about the importance of having a diverse workforce from seven influential female leaders at global steel organizations.

The panelists discussed how they overcame challenges, while providing insights on: changing stereotypes related to gender roles in the workforce; educating women about opportunities for careers in STEM fields; and recruiting individuals to be role models, both male and female, for women new to the industry.

Monika Pretorius, owner and managing director of BBD Steel Suppliers, a South African steel processor and the country's largest woman-owned business, recounted the obstacles she and her business partner, Gwendolyn Mahuma, faced in starting the operation in 2012.

She said that South Africa is a conservative country and stereotypes remain well rooted in the culture. She said the attitude toward women in business is very conservative, especially in the steel industry. So





she and her partner founded BBD precisely to break down stereotypes and change mindsets.

She told attendees that BBD works to lift up — and create a positive environment for — the community in which it operates.

The odds were against them, she said, but they believed in themselves and in their purpose. She also said female leaders have an advantage that they may not realize — they have the ability to be nurturing and therefore are attuned to the needs of the workforce. And that's important, she said, because a better work environment is simply good business.

“Take care of the people and they will take care of the business,” she said.

She also said she believes that women tend to have exceptional organizational skills and stronger intuition, which also gives them advantages over their male counterparts.

“Be passionate; surround yourself with excellence; find mentors and don't be afraid to try new things,” she advised.

Also on the panel was Maria Elena Fabiani, chief executive at SIME S.r.l. She, too, spoke to the importance of finding a mentor and recognized two who have influenced her own career: Dr. Fabio Miani and Dr. Gioacchino Nardin, both professors at the University of Udine.

She also spoke to the importance of lifelong learning and to the power of research, a vitally important tool for discovery and understanding. She said that research ought to be motivated by growth and wellness and not by academic competition or to amass power.

Another panelist, Dana Mareschi Danieli, vice president for finance and contracting at Danieli, discussed efforts within her own organization to increase the number of women in its workforce. At Danieli, the company has increased its hiring of women by 500%, going from seven in 2016 to 35 in 2018. She also noted that technical training for women has greatly increased.

Women should not let gender be a hindrance to pursuit of a steel career, she said. At Danieli, skill,



To Drive Results, Closer Partnerships are Key, Industry Leaders Say

Despite the steel industry's maturity, there are still many technical problems to solve. And while the challenges may often be many, they can be solved through close collaboration and a cooperative attitude, a point that was driven home during one panel discussion at the 2018 AIST European Steel Forum.

Moderated by AIST European Member Chapter chair Mauro Bianchi Ferri, the panel discussion highlighted two examples of the types of successful outcomes that have been achieved through close cooperation between steel producers and equipment and service suppliers.

One such example is the work that Techint Group companies Tenova HYL and Ternium Mexico put into commercializing the HYL direct reduction process. Ternium's Monterrey plant in Mexico was the site of the world's first direct reduction facility, which was started in 1957.

In recent years, the collaboration has expanded to include Danieli, which contributed its own process know-how in development of the gas-based Energiron ZR process. Energiron plants are capable of producing a variable carbon DRI that has significantly lower reactivity than standard DRI.

Stefano Maggiolino, president and chief executive of Tenova HYL, and Mario Llamas, pelletizing and DRI process manager at Ternium Mexico, explained that the need for constant improvement makes such collaborations necessary.

Offering another example, Carlo Travaglini, director of technology for Gerdau Long Steel North America Petersburg Mill, and Gianluca Maccani, chief executive for BM Group USA, discussed how digital tools can be more effectively deployed when a producer and supplier work closely together.

In their case, BM Group worked with Gerdau to install automatic charging cranes, task-oriented EAF robots, an auto-tapping system, an automated laboratory, an automated tagging system for products and in-line shape measurement systems.

The two companies then worked together to tie the components into a master system that monitors process conditions and, using real-time data, models the relationship between material and the manufacturing process.

These days, such projects are occurring with more regularity as healthy economic growth and favorable steel prices are supporting renewed capital investment, according to representatives of several equipment manufacturers.

Speaking during a second panel discussion that focused on innovations in plant design and process equipment, the representatives agreed that new concepts and technologies are generating faster and larger returns on investment as well as improved production efficiencies.

Despite that, there are many in the industry that have yet to take advantage, said Prof. Dr. Pino Tese, president and chief executive of SMS group Inc., the German steelmaker's U.S. subsidiary. Many of the world's "newer" steel plants are more than 30 years old.

He said innovation can extend a facility's lifespan while additive manufacturing can lower costs associated with spare parts – instead of stocking a spare part, it can be "printed" on demand. He also said digitalization will give



rise to “learning factories,” ones that can assist in production planning, monitor equipment conditions and product quality, and assist in their own maintenance.

At the same time, melting, casting and rolling technologies can all be improved through the use of Industry 4.0 technologies, he added.

Andrea De Luca, vice president for micro-mill technology at Danieli & C. Officine Meccaniche SpA, talked about the company’s Endless Casting and Rolling process, which turns liquid steel into finished product in 12 minutes.

The process combines casting and rolling into a single, uninterrupted step. The latest in the technology allows for a twin system capable of producing either bar or wire rod on the same equipment. It also integrates digital technologies that allow for monitoring of key performance indicators and that statistical analysis to suggest process modifications.

He also discussed Danieli’s Universal Endless (DUE) mill for flat products technology, which is designed for high production of ultra-thin and value-added grades. The DUE system merges a thin-slab caster with a tunnel furnace and combines the reduction and finishing stands, all in a single production line.

Also on the panel was Andreas Jungbauer, vice president for continuous casting and endless strip production at Primetals Technologies. He spoke about Primetal Technologies DynaGap system for soft reduction during casting and its DynaJet high precision, secondary cooling spray nozzles, which allow for accurate edge cooling of cast slabs.

But more broadly, he said the next evolution in plant design will be to turn steel plants into smart, self-learning operations. The benefits are tremendous, he said, as plant operators who utilize smart sensors, robots, automated process steps will see improvements in operational efficiency, product quality and personnel safety.

AIST executive director Ron Ashburn said he expects the industry will see new plant designs move off the drawing board and into reality as world markets generally are healthy, at least as of October 2018. Ashburn shared a few perspectives on the global economic situation and said that any new mill investments must be weighed against the ongoing specter of global overcapacity. Ashburn said that although global capacity declined slightly in 2017, the very real potential exists for capacity to climb 4% over the next two years.

“Considering the current landscape, the mills will have to consider carefully whether local and regional demand that otherwise would support a new investment could potentially be eroded by foreign excess production that finds its way across borders,” he said. “In this era of technical innovation and growth, regulatory protections against unfair trade become even more important.”



passion and team spirit are the qualities that matter in new hires, not gender.

Elena Petrášková, vice president of subsidiaries and services at U. S. Steel Košice, said, “Women shouldn’t be afraid to be themselves, and endeavor to build respect through their work. The company has been diligent in efforts to include more women, who have roles in working groups and in management at all levels.”

Today, she said, women make up 16% of the overall payroll and hold about one-third of all management positions.

Lisa Karlsson, the bearings product line manager at Ovako, advised that adversity can be an asset. Borrowing from Michelle Obama, the former First Lady of the United States, she said: “You should never view your challenges as a disadvantage. Instead, it’s important for you to understand that your experience facing — and overcoming — adversity is actually one of your biggest advantages.”

The panel also included Paola Pedani, the Italy and Adriatic region sales manager for application products at Sandvik Materials Technology. At Sandvik, the trend line has been positive for new female hires, she said, but there is still room for improvement. Still, the company has been making a concerted effort to bring aboard more women. To that end, the company drafted a diversity and inclusion statement to help reinforce the effort.

She said that for women to be successful in the industry, they need to be true to themselves.

“Be the woman you were meant to be,” she advised. ♦

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