American Metal Market

BRIDGING THE DIGITAL DIVIDE

Nov 29, 2017 / *Bette Kovach*

When Andrew Zoryk looks out at the world's steel industry from the bird's-eye view afforded him as managing director for Accenture's metals practice in Frankfort, Germany, he sees an industry facing a deepening digital dilemma.

With anticipated global growth running fairly flat at one- to two-percent per year and the industry facing declining consumption intensity in large markets such as Asia and by large users such as the automotive sector, the industry, Zoryk says, is facing some key decisions.

"Producers need to look at how to best manage on-time delivery, cost efficiency and the entire supply chain from raw materials to the finished product," Zoryk insists. "On top of the production processes is technology, particularly information technology – such as Industry 4.0, e-commerce trading platforms, the IoT (Internet of Things), and research and development – to shorten the product development cycle. Through it all is the human factor in the form of today's workforce and, increasingly in the future, the digital workforce. How steel companies manage those processes and workforce development will greatly influence their future," he emphasizes.

Steelmakers would be wise, Zoryk advises, to view and evaluate their businesses in five key contexts "One is to look at your internal knowledge of Big Data and data that can be digitized and consolidated across the enterprise," he notes. "The second is to apply analytics to leverage that data to reduce costs such as energy, decrease deviations in the production process and standardize processes and people through those analytics.

"Intangible data is harder to collect," Zoryk acknowledges. "This is the next big area to be addressed through machine learning and cognitive learning. Finally, the Accenture executive recommends steelmakers "extend their knowledge beyond their business through collaborative platforms involving the users of your processes and products" and "develop data-driven insights to manage and predict your business."

Zoryk cites voestalpine AG's new wire rod mill in Austria as a prime example of "building intelligent, smart factories." The rolling line is controlled by an innovative monitoring system counting more than 2,000 data acquisition sensors and more than 15,000 continuously recorded parameters. Franz Kainersdorfer, head of voestalpine's metal engineering division, notes that the new technology "allows us to evaluate and continually optimize all process steps in real time, enabling us to offer our customers even higher quality products."

Germany-based SAP's Stefan Koch agrees. As SAP's global lead for metals, Koch also has a wrap-around view of the steel industry and is quick to note that there is "30-percent overcapacity in the worldwide steel industry let alone (accounting for) the competition from alternative materials.

“To remain competitive, steelmakers need to increase their use of analytics, including financial forecasting, to help manage and justify investments in new technology. Koch comments. “By using faster data, it is much easier to determine your financial position, set price points and determine margins. On the sales side, there is greater opportunity to cross-sell to determine the right products and the right mix using ‘big data.’”

Along with technological advances, the human factor plays a major role in retaining global competitiveness, Koch emphasizes. “People will increasingly be used in support roles to repair and maintain the equipment,” he says.

“With data centers moving off-site, the challenge is to equip your workforce with the knowledge and the tools – including handheld devices to capture data – to proactively manage situations on the production line to ensure a steady state,” he elaborates. “Based on the data, repairs can be ordered from an offsite location to the workers on the mill floor.”

Koch pointed to Big River Steel (BRS) in the United States as being one of the most modern plants in the world “where you literally see almost no one on the shop floor.”

Big things breaking at BRS
Dave Stickler, Big River Steel’s chief executive officer, confirms that there are not a lot of people to be seen on the mill’s shop floor but that 400-plus employees with a high degree of computer and analytical skills are at work in the Osceola, Ark., facility that started up within the past year.

Big River’s Flex Mill™, the first of its kind in the world, offers cleaner, more formable steels, the ability to adjust casting widths from thin to medium slabs and enhanced customer responsiveness by investing in leading-edge technologies.

The evolution of steelmaking and finishing technology has “reached a point where products that had been off limits to electric furnace
producers no longer are,” Stickler notes. “With certain adjustments, melt shops are capable of meeting metallurgical requirements by using 100-percent virgin material in the form of HBI and DRI. Add to that mix the first Ruhrstahl Heraeus (RH) degasser installed at a mini-mill in North America that can produce ultra-low carbon steels and achieve nitrogen levels half those of more traditional mini-mills.

“With other technologies such as variable-width capabilities, extensive scale removal and a tunnel furnace with multiple temperature zones, we are producing steel grades that the integrateds said not too long ago weren’t possible at a mini-mill,” Stickler points out

Big River’s top executive freely admits that building technology from the ground up, as is the case at Big River, is more efficient and cost-effective than retrofitting existing mills. “Along with our technology provider SMS Group, we designed the mill to include tens of thousands of sensors to capture millions upon millions of data points,” he notes. “You have to be able to mine that data and that is where machine intelligence comes in. The result is a more precise operation with reduced unplanned outages.

“There is a direct correlation between speed, temperature, gauge and width that all influence roll wear,” Stickler adds. “Keeping an eye on these operating parameters allows you to take corrective

action before there is a problem such as a cobble or a breakdown. Sometimes it's cool to be the new kid on the block," he quips.

Another relative newcomer to the North American steel industry, Outokumpu Americas began operations at its electric furnace-based stainless steel plant in Calvert, Ala., in 2012 and became fully functional in 2014. "SAP is our business system, and we utilize two OEM-provided systems to optimize furnace charging and rolling practices to achieve the optimal outcome of outstanding quality and lower costs," Mike Williams, president, Outokumpu Americas Business Area, notes.

Highest level technologies employed at Calvert include predictive digitized strip inspection systems to reduce rework and provide the best quality in terms of length, width and surface. "Images are stored in large data bases that can help determine whether the strip quality is good to go or needs to be reworked," Williams says.

Drones with cameras are employed for thermal inspections of crane equipment and runways while in use to provide "better data than manual inspections when the equipment is at rest," Williams notes. "In the future, we envision more opportunities for robotics in our operations and more smart-connected production to improve internal supply chain management to optimize production utilization."

Robots don hard hats

Gerdau is also tapping into technology to enhance customer service and modernize its' work environment. According to Carl Czarnik, Gerdau's vice president of operations in Tampa, Fla., the company has made substantial investments integrating advanced robotics and automation in its production process.

"For example, we are using a first-of-its-kind, unmanned steel temperature and sample robot recently installed at our Petersburg, Va., mill," Czarnik says. "The robot is equipped with new capabilities that enable it to independently and repetitively collect temperatures and samples, and inspect the furnace by changing tools depending on the required task.

"Proximity to hot areas and the need for physical interference is drastically reduced, and, in some cases eliminated, allowing our operators to operate our furnace from the safety of the pulpit," he adds. Gerdau is also using new technology to automate billet and bundle tagging along with other processes.

Gerdau's Smart Plant originated at the Ouro Branco mill in Brazil and is now being piloted in North America. This concept, developed in partnership with General Electric, integrates on-line sensors into plant equipment. The technology monitors production, identifies anomalies and then uses the captured data to build and report trends, thus detecting potential failures well in advance of an unexpected breakdown.

Gerdau's Midlothian, Texas, mill is the first North American operation to pilot the Smart Plant. "Our journey has taught us that not all digital has a business case that justifies it," Czarnik cautions. "We continue to benchmark with other organizations, including other Gerdau business divisions, to ensure that the technologies we invest in improve the service and products we offer customers."

Brain vs. brawn

For all the potential and real-world results being delivered by the latest cyber tools, leading-edge technology is only part of the equation. In other words, what good are the "Cloud," thousands of

smart sensors, robots and drones if your workforce doesn't know how to manage and maximize their use?

Big River's Stickler characterizes today and tomorrow's steelworker as being "90-percent brains and 10-percent brawn" rather than the reverse that has historically served as the stereotypical image of the industry's average worker. "We also consider it swear words to state 'that is the way we have always done it around here,"' he notes. "Instead, we are spending the intellectual time and effort to challenge how we work."

Big River's employment recruitment notice attracted 7,000 applicants for 400-plus jobs. Partnering with the state of Arkansas, which provided a $10-million training grant, Big River offered training to prospective employees before they were even hired "to see who had the insight and ability to challenge the norm and to gauge their ability to learn, cooperate with others and work as a team," Stickler explains.

Those hired had computer skills "some of which were superior to what was needed," Stickler points out, and the ability to work in the Cloud. Describing Big River as a "mill of continual learning," he sees Big Data mining, correlations and simulations as "being even more valuable in the future. The ability to understand and manage logistics and production planning will also be needed as we move forward," he notes.

Developing the digital workforce

ArcelorMittal USA has been working since the mid-2000s to address its upcoming needs in the maintenance technician mechanical and maintenance technician electrical (MTM/MTE) fields.

"We knew a lot of our employees were eligible to retire within the next several years and the number of potential skilled hires was very low," recalls R.D. Parpart, team lead for ArcelorMittal USA's Steelworker for the Future® located at the firm's Burns Harbor, Ind. Plant. "MTM and MTE positions are highly technical and require employees to have the necessary skills to install, maintain and upgrade automated equipment in the advanced manufacturing sector.

"In general, potential students and future employees were not aware of this career opportunity," Parpart says. "Furthermore, ArcelorMittal USA could no longer offer the traditional, five-year apprenticeship programs to train employees with the necessary skills."

In late 2007, ArcelorMittal USA and the United Steelworkers began developing a plan to help individuals become future steelworkers. Steelworker for the Future®, launched in 2008, is intended for high school students who like working with their hands; are interested and successful in science, technology, engineering and math (STEM); and do not intend to enroll in a traditional four-year college or university. Also attracted to the program are people looking to change careers.

Steelworker for the Future® seeks to build a pool of candidates that are prepared to work for ArcelorMittal or any manufacturer as a maintenance technician. The program is designed to have students develop the basic skills at a partner college, get them to a minimum level to pass the craft entrance exam and then have the knowledge to be continually trained on specific equipment.

"Through our outreach, it's important that students, parents and administrators understand the importance and need at ArcelorMittal – as well as the importance and strength of U.S. manufacturing as a whole – and that the skills they obtain in the program are applicable to all manufacturers," Parpart emphasizes.

Since 2010, 90 students have graduated from the program and have been offered a full-time job with ArcelorMittal. Some 144 students are currently enrolled in Steelworker for the Future®-related curriculum at partner schools in Indiana, Illinois, Ohio and West Virginia. After receiving a two-year associate degree, Steelworker for the Future® graduates may have the opportunity to work as an MTM or MTE at ArcelorMittal, work for another manufacturer or continue their education at a four-year school to obtain a bachelor's degree.

Gerdau's workforce preparation for the digital age "began several years ago as a culture change to modernize the way we do business," Czarnik recalls. "With that came empowerment, collaboration and the changing of our mindsets to allow for risk-taking.
"To get different results we need to work and think in a new way," he adds. "Our employees, especially our operators, facilitators and frontline leaders, play an integral role in our innovation evolution. They are helping find solutions and are encouraged to implement the viable ones fast. Technology allows us to do that."

From the earliest days of Outokumpu's new stainless mill, investments were made, "in training involving specific technologies as we were starting up," Williams recounts. "Employees were given internships within the mill before final job assignments were made.

"Both the original suppliers of the mill and the state of Alabama made investments to advance the skills of our workforce," he adds. Computer skills are essential to fully utilize the real-time data of visual shop-floor management, enabling employees to see the mill's key performance measures on large boards that are continually updated with cost, quality and internal, supply-chain impact data.

Looking to the future, Outokumpu's Williams sees a symbiotic relationship with the local and regional educational community. "We continue to partner with high schools and select engineering schools give strategy into curricula to advance both steelmaking and business technology," he notes. "The world generally doesn't understand the sophistication of stainless steel production technology, which is ever evolving and globally competitive."

ArcelorMittal USA's Parpart agrees. "We are constantly battling the misperceptions associated with manufacturing," he notes. "We often open our doors to students, parents and administrators to show that today's steelmaking is much different than what their grandparents and other generations experienced. Steelmaking today is much safer, highly automated and demands trained and tech-savvy individuals."