Iron & Steel Today

Volume 13 • Issue 5
Dec / January 2020
ISSN 1754-4254

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VAT: GB 196 5434 71

Design: Definite Design
www.definitedesign.co.uk

Circulation: *Iron and Steel Today* is available free of charge to those employed in a steel producing, processing, trading or stockholding company, who are involved in the decision making process when purchasing or specifying: plant; equipment; raw materials; steel stock; consumables etc.

Subscription: readers falling outside our controlled-free circulation are invited to subscribe at: UK - £145, Europe - €199, Rest of the world - US$250. Subscribers receive five issues per year plus all wall maps and directories published during the subscription period.

Single copy price: £40, €45, US$55

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Moving towards smart manufacturing

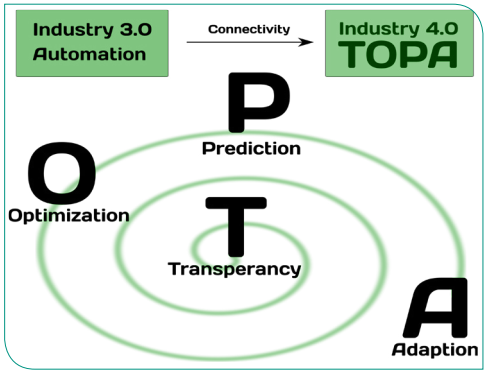
How transparency through Industry 4.0 tools drives changes in company culture

An almost fully automated production process operated by isolated computer systems only maintained and supervised by human operators, is currently standard in our industry. The vast increase in data storage capability, computational power and networking bandwidth triggered the ongoing fourth industrial revolution, denoted as Industry 4.0, and it will transform every step of the steel production process. While industrial revolutions are initiated by inventions, the implementation and adaptation is driven by people. New technologies tend to fail early on not because they are not capable of delivering the promised results, but because the workforce does not trust in its benefits and therefore embrace the changes that come along with it. Value emerges as a combination of technology and the acceptance of people who use it to increase efficiency.

The progress in adaption of Industry 4.0 compliant tools differs hugely across steel producers. Companies embracing the changes early will emerge with the competitive advantage in changing market conditions. Being able to quickly react to ever increasing customer demands at low or no additional cost through smart manufacturing, is key for continuous business success. Companies must undergo a transformation not only at a technological level but also adapt their business strategy and culture.

"Value emerges as a combination of technology and the acceptance of people who use it to increase efficiency"

Trends in process and product quality, events and cost factors need to be visible within the company. That means data needs to be available and easily accessible. Full transparency to decision makers and operators is key. So aggregation, long term storage and provisioning systems become the foundation for all Industry 4.0 solutions. Network connectivity between production lines allows for a variety of technical solutions. We see centralised and decentralised data warehouses and hybrids of those two as dominant, while cloud-based approaches are just starting. Data availability translates to visibility of performance across operators, maintenance teams and management. This eradicates finger pointing and allows people from different areas to work towards the common goal of business success, since issues can clearly be identified and traced back to the root cause. This creates understanding, which is the foundation for acceptance of new technologies under the Industry 4.0 umbrella.



Material genealogy allows the correlation of events and product quality. Verification of this root cause event link establishes trust in operators and management, since issues can be exactly identified, battling human error, equipment failure and changes in planning. Linking these production data to business systems with order information and market trends is the enabler for smart manufacturing, the quick adaptation of the production process to changing conditions and quality events.

Recognising the detected patterns by monitoring incoming production allows identification of reoccurring patterns, and assigns probabilities for failures. Statistical process control (nowadays called six sigma) is a historic, established method of production quality control. Applying it to Big Data is the next logical step. Statistical methods are applied to identify outliers in incoming production data and raise alarms so that counter measures can be taken before product quality is affected.

The ultimate goal is prediction. Instead of monitoring current data streams, the analysis of a combination of all available historic production, line condition and business data by machine learning and artificial intelligence algorithms, allows the prediction of events before they are visible in incoming process data. The most efficient maintenance cycle can be identified by Big Data analysis.

Breaking patterns that are established but have no data-based validation is a challenge. But this is a change that must be implemented. The gained visibility and trust helps to convince people. What is the best way to run our mills? Data will tell us.

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