ArcelorMittal South Africa boosts its yield by getting the kink out of its coil

Proficy fast-tracks process improvement in the Rolling Plant

ArcelorMittal South Africa produces steel for niche markets with specific quality requirements. The plant has an annual output of about 1.2 Mt.

The company has embarked on a Six Sigma continuous improvement drive that included, among things, the implementation of Proficy software from GE Digital.

The application helps eliminate production problems by analyzing plant data in real time and determining the probable causes at the Iron making plant. At ArcelorMittal South Africa, one of the problems was cobbling. The Rolling Plant receives 20 ton steel slabs from the Thin Slab Caster.

These go through four stages of rolling:

- Firstly, thickness is reduced from 82 mm to 20 mm by two roughing mill stands.

- The sheets are then coiled in a coil box.

- After uncoiling, the material goes through a five-stand finishing mill to reach a final thickness of between 1 mm and 4mm.

- In the final stage the sheets are coiled in a down coiler.

Cobbling can occur at any stage of the Hot Strip Mill, when the steel jams rather than passing smoothly between the rolls – similar to a paper jam in a printer. The cost of a cobble is significant, as both the affected coils and the upstream slabs at the caster (the kick-off slabs) are usually scrapped. In some cases the cobbled coils can be used after being reworked.

At ArcelorMittal South Africa, 0.4 percent of all coils produced were cobbled. The elimination of cobbling would therefore increase the yield of the plant, as well as its productivity and revenue.

"Since commencement of production we've made this product with consistently high quality and corresponding customer satisfaction."

— André Theart
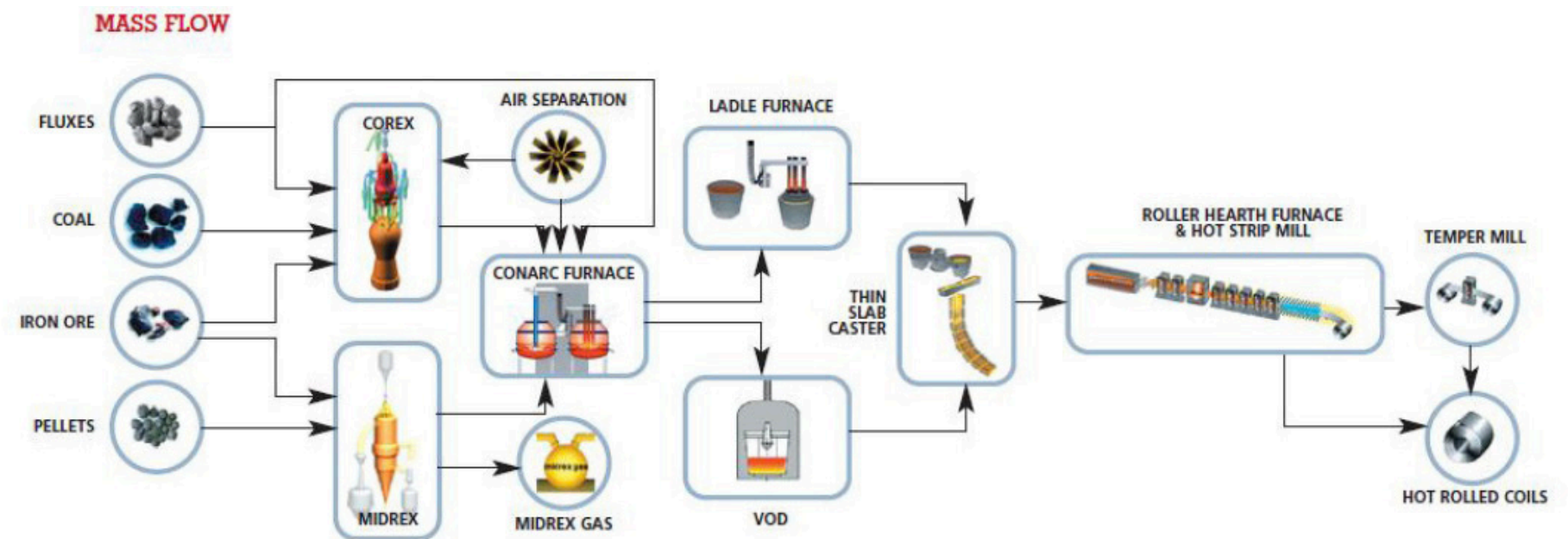**Six Sigma Black Belt**
ArcelorMittal South Africa

Figure 1: Steel-making Process

By using Proficy CSense, including the Troubleshooter module it was possible, within 30 minutes, to identify the major causes of cobbling at the down coiler:

- A principle component analysis (PCA) fingerprint was created by using the process data relating to cobble-free coils. Three clear operating clusters were observed representing, respectively, the start, middle and end of a rolling instance.

- Next, the process data relating to a specific

- Cobble instance was loaded. With a click of a button the major contributor to cobbling was identified: the pressure transducer on the side guide.

- By replacing the pressure transducer, the root cause for the cobble at the down coiler was eliminated.

André Theart, one of ArcelorMittal South Africa's Six Sigma black belts in training, says that with Proficy, the plant's project cycle times were significantly reduced, process set-points intelligently established and implemented, and knowledge of the overall process greatly enhanced. The result was a significant improvement in business value.
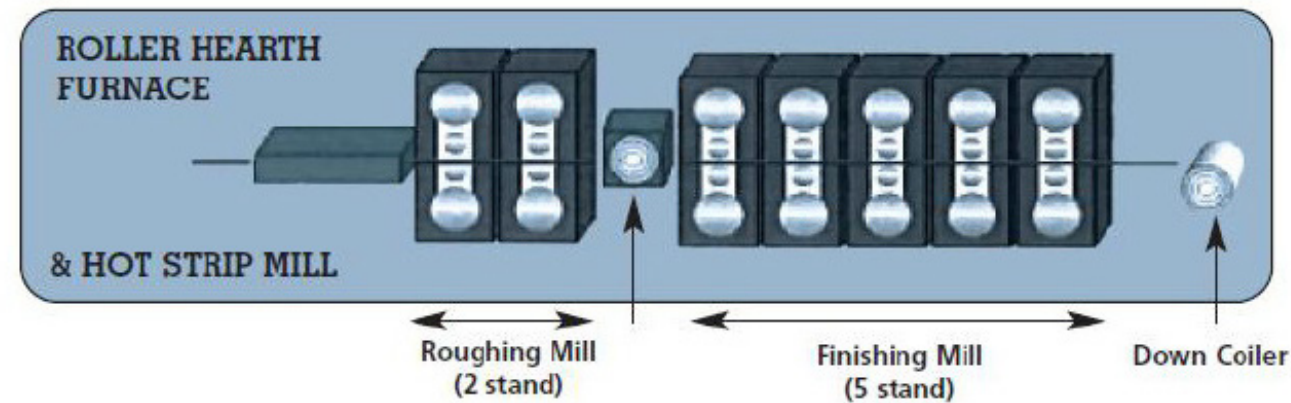

Figure 2:
Steel Rolling Process

Launching a new product with confidence

Proficy not only enabled ArcelorMittal South Africa to improve the production of its existing products, but also helped it launch a new product. The company had identified an opportunity to supply the market with high quality steel for cut-sheet applications having a flatness measurement of less than 56 I-units. André Theart employed Proficy CSense's Troubleshooter to establish the process conditions under which this specialist product could be rolled. He extracted this set of rules from historical production data making use of, among others, Proficy's intelligent decision tree. This methodology, facilitated by Proficy, gave the manufacturer

the confidence to implement the set-points recommended by the software prior to the first rolling campaign. "Since commencement of production, we've made this product with consistently high quality and corresponding customer satisfaction," says Theart. "Over this short period we've succeeded in rolling more than 20 000 tons of steel in line with the strict flatness specifications and supplied it to our various customers – a first for the plant." As a result of its contribution to process and productivity improvements, Theart plans to continue using Proficy for Six Sigma projects at ArcelorMittal South Africa – "*and we hope to get even more astonishing results in the future!*"

"*Now that we've proved that Proficy can effectively and rapidly find the cause of cobbles, our next step should include its application to finding the root causes of cobbles in the Finishing Mill, the Roughing Mill and the Coil Box.*"

— André Theart
Six Sigma Black Belt
ArcelorMittal South Africa

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