



SMART STEEL

TECHNOLOGIES

ABSTRACT – ONLINE METAL CONFERENCE

APPLICATION OF AI LIFTS QUALITY CONTROL TO THE NEXT LEVEL –

ArcelorMittal Eisenhüttenstadt Significantly Improves Surface Inspection Results

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Modern requirements for cold-rolled flat steel products necessitate higher production quality, especially for applications in the automotive industry. Manual inspection and quality control with respect to surface defects through the complete production process is usually not possible due to its considerable amount of cost and time requirements. Typically, to perform a complete surface quality control, operators currently have to rely on different systems for each production process. Often, these automated surface inspection systems (ASIS) are purchased from different manufacturers and have no way or only limited ways of centralizing the quality control process. Furthermore, ASIS manufacturers often advertise defect classification accuracy levels more than 95%. However, the responsible quality control employees often report that these levels are not achieved in the actual production. Quality control employees often and frequently must spend a lot of time to tune the ASIS classifiers to improve the classifiers. This approach necessitates a high resource input of time and money.

In order to achieve a significant improvement AMEH chose a new approach through Artificial Intelligence and Machine Learning technologies. The main innovation is not only to predict surface quality for all process steps, but to compute optimal caster and melt shop settings in a fully automated way for each casting sequence, each heat, each slab. Automated optimization based on AI and ML is applied during campaign planning and during production.

Smart Steel Technologies (SST) has developed a wide range of software components that allow improving the surface quality significantly in practice without the need to replace existing inspection systems consisting of expensive integrated imaging systems.

Within the scope of the project, 4 image classifiers, 5 software tools and a multivariate causal inference based full-scale optimization framework that utilizes high-frequency level 1, 2, 3 data have been deployed and optimized specifically for the ArcelorMittal Eisenhüttenstadt plant in 6 months.

The full-scale SST casting optimization suite allows to reduce defects up to 50% in their end products and provides cost savings in many aspects.

1. Reducing amount of slab and coil downgrading
2. After reduction of casting defects, additional grades can be hot charged to HSM
3. Increased production throughput by automatically choosing the optimal caster parameters
4. Reduction of slab repair costs

Another software component that is included in the optimization suite, SST Centralized Coil Map, allows quality inspectors to work with the digital twins of their products. Using precise position-based matching of every single surface defect from hot rolling to galvanizing, quality control of coils is handled very efficiently and accurately.