

## Latest Innovations for Surface Quality Control in the Aluminium Manufacturing Process

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### **Abstract**

The aluminium industry holds a strategic place in the worldwide economy, fostering innovation, growth, and employment, and linked closely to many downstream industries such as automotive, construction, electronics or electrical and mechanical engineering.

The demand for high-grade aluminium is increasing and driven dominantly by the automotive industry. Yet, superior surface quality of the end product is influenced by every single step of the production chain, already from the very beginning during casting. Next to the increasing demand for highest surface quality, another key challenge for the aluminium industry is to reduce the overall CO<sub>2</sub> footprint by increasing the efficiency and yield. Therefore, the need for reliable data and for further process optimization up- and downstream based on automated decisions, is continuously increasing.

To match increasing demands for highest aluminium quality, automatic 2D surface inspection systems have become state of the art throughout the entire aluminium plant. The main motivation of automatic surface inspection in a coil producing line is to guarantee that all produced material matches the quality requirements of the subsequent processes and the final customers. To achieve this, not only all defects have to be detected but also all detected defects have to be classified as accurately as possible. This is important for proper root cause analysis – the base for process optimization – and the distinction between critical and uncritical defects.

Besides typical surface defects like scratches, slivers, holes, and uncoated areas, also waves, buckles and distortions in the material will cause massive problems in the following use of the material. Especially larger topographical defects (waves, buckles) need to be detected as early as possible. The combination of latest 2D inspection technology with color cameras and 3D inspection technology using laser triangulation ensures the reliable detection of all quality relevant defect types, summarized in a single report.

The presentation will show approaches for enhanced surface inspection by 2D and 3D image acquisition technologies and demonstrate innovations of automatic surface inspection systems that provide multiple fields of view at highest resolution. It will also be shown that the future of automatic defect classification will be determined by adding Deep Learning, Neural Network classification to the inspection system.

Finally, the transfer of the latest inspection technology and its successful application to the highly demanding field of aluminium extrusion will also be highlighted.