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Advanced Instrumentation and Holistic Process Improvement in Continuous Casting at Outokumpu Tornio

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Outokumpu, a global leader in sustainable stainless steel production, has implemented advanced instrumentation in its Tornio casters to gain deeper insights into the continuous casting process and enhance product quality. The casters are equipped with molds containing optical fibers, achieving 1786 Fiber Bragg Grating (FBG) based temperature measurement points, quality prediction software, and a hot surface inspection system. This setup provides detailed information from the molds, enabling the investigation of the potential prediction of future sticker cases and other quality related events.

A holistic approach to process improvement is also presented, exemplified by the prediction of longitudinal cracks. Depressions within the mold can be detected, but whether these depressions develop into cracks is determined during strand guidance, depending on the steel grade and cooling profile. Detected depressions are combined with the results from the Steel Quality Indicator, which analyzes steel chemistry, bending and unbending processes, and the temperature history of selected surface positions for each 1-meter segment of the strand as it passes through the strand guidance. Considering all this information allows for a more comprehensive evaluation of quality issues.

Vertical fiber installation offers optimal meniscus level detection, the highest thermal resolution of the mold and is used as a tool for design of SEN, evaluate mold powder and steel flow in mold. Horizontal fiber installation can achieve higher horizontal resolution of sensing points to improve LFC detection and by using only a few rows of fibers the system is fully functioning for breakout detection using a less advanced fiber installation. At Outokumpu, both systems are installed and compared, and a method to predict meniscus behavior even with horizontal fiber installation will be presented.

This paper discusses the advanced instrumentation and holistic process improvement strategies at Outokumpu Tornio, highlighting their impact on continuous casting quality and efficiency.

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