Continous casting line

The continuous casting process is a very effective method to manufacture high-quality semi-finished products such as bars, profiles, slabs, strips and tubes. Smooth operations are essential for product quality and plant efficiency. Nowadays, more than 90% of the liquid steel worldwide is produced using continuous casting process.

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Cooling system health

In a continuous casting line often a primary (internal cooling of the casting line components), as well as secondary (spraying of water on the cast) cooling system, is applied. A stable cooling system is essential for the longevity of components such as rolls and bearings, but product quality is also influenced to a large extent by the cooling procedure. As such an early-stage detection of deviations in the process or failure to essential components results in relevant productivity gains. Data used are flow rates, pressure differences and water temperatures.

Coupling health

One out of 3 - 6 rolls in the line are driven . Couplings are used to transfer the torque from the motor to these rolls . They are subjected to the continuous torque of the casting process but are also sometimes impacted by shocks when material enters and exits the segment or in case of process deviations. A continuous follow-up of vibrations at both sides of the coupling allows detecting and quantifying specific issues and deviations, such that twarnings are sent in case of upcoming potential problems.

Segment alignment

A continuous casting line usually consists of multiple segments in series. This allows for flexibility during operations, but the alignment between segments and their internal geometry (rolls and bearings) can give rise to premature damage or process distortions. By continuously monitoring accelerations, motor currents, positions and/or mounting forces (bolt tension) at high frequency, non-idealities can be identified and localized in an early stage. Roller or bearing (house) damage can be identified in an early stage. As such significant damage can be avoided and availability can be tuned to a maximum.

Process deviations

When in operation, the casting process is ideally as smooth and continuous as possible. Each deviation might result in product quality issues or sub-optimal production speed. Combining process parameters, material properties and cooling system, a smart algorithm allows to continuously track the casting process. In case of deviations in the process, the operator is warned and can take preventive measures to avoid a noticeable impact on production.

Motor health

Motors are essential for moving the cast through the segments. Although some redundancy is often available, failure or malfunctioning is best predicted well in advance. Also the way the cast moves through the line can influence the health of the motor, by for example inducing additional friction or shocks due to a distorted operation. Combining a follow-up based on vibrations in multiple axes, temperatures and electrical currents the state-of-health of the motors can be tracked continuously, deviations detected in an early stage and unwanted standstills prevented.

Cooling system optimization

The cooling system is monitored through a continuous smart follow-up of pressures, flow rates and temperatures. When combining this data with accelerometer data, strains, material temperature and/or motor currents the impact of the cooling parameters on the actual cooling process, hence material properties can be determined. As such the models can be developed that determine optimal cooling system settings for given material properties and process parameters.

Bearing health

A continuous casting line is loaded with bearings. They operate under challenging conditions. Both temperatures as well as mechanical loads can be high. In some cases the cooling system isn't as stable as required. Damage is progressive. Implementing sensors on the bearings themselves is often challenging due to the operational conditions involved. Therefore a continuous follow-up using accelerometer sensors on the segment frames is applied. As such it is possible to detect bearing damage in an early stage, before any blockages appear, and to identify (and subsequently prevent) those operations that have an adverse effect on the bearing health.

Oscillator health

The oscillator is essential in the process, as it avoids that the cast gets stuck during the initial phase of the operation. Continuously tracking the vibrations in 3 axes allows detecting deviations in an early stage: blockages, issues with mounting, shifts in mass balance...

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