Q-MAP
Real-time mold monitoring system for continuous slab casters

BENEFITS
Possibility to install it on existing slab caster plants
Reduction in the number of breakouts
Improvement in surface crack prevention
Improved caster availability
Improved caster yield
Optimization of mold powder performance
Improved slab surface quality
ROI < 6 months

PROCESS
During casting, abnormal mold conditions may lead to several kinds of problems. When a critical condition is developing in the mold, Q-MAP reacts, giving a warning and automatically taking the appropriate remedial action to recover the initial situation. Q-MAP is based on several algorithms that estimate, during casting in real time, the critical surface and thermal conditions in the mold. They are capable of recognizing process phenomena like:
> Sticking
> Breakout
> Cold tooth
> Narrow side crack
> Slag washing
> Incorrect narrow side taper

The users of the Q-MAP have the ability to visualize the data of the thermocouples in a row or as a spatial column view, or as a heat flux trend.

EQUIPMENT
The mold is provided with an array of thermocouples that covers the whole broad and narrow face surface. The signals coming from the thermocouples are collected by a PLC and sent to the technological workstation, where the incoming information is processed according to the Q-MAP algorithms and displayed.

Thermocouples are designed in order to be easily and quickly installed; all thermocouple cables are protected and paths are defined.

Q-MAP equipment can be installed on all types of molds, including molds equipped with electromagnetic stirrer equipment.

A reduction in thermocouple temperature at the meniscus level (red line), and a sudden increase in temperature in the rows of thermocouples below the meniscus (green, yellow, purple and grey lines) indicate a sticker breakout is forming in the mold. Q-MAP recognizes this, and generates an alarm (black line).

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The signals from the thermocouples are processed in the PLC by dedicated Q-MAP Process Control software. Q-MAP automation analyzes in real time the surface and thermal conditions in the mold and shows it to the operator. Q-MAP interface presents to the operator a complete thermal map of the mold, suggesting the most appropriate corrective actions or automatically initiates a speed reduction, strand stoppage or narrow-side taper correction.

Q-MAP can display data in real time (as acquired and computed from the PLC) or retrieved from historic database to allow the analysis of process conditions during the desired heats.

PERFORMANCE ACHIEVEMENTS
Thanks to Q-MAP technology many of Danieli’s customers are able to operate with virtually zero breakouts even whilst producing high-quality sensitive grades such as peritectic steels, electrical steels (high silicon) and high carbon steel.

Break-out rate drastically reduced - estimated cost saving for one break-out:
> > 50,000 Euro of scrap losses (tundish skull and slab in strand)
> > 100,000 Euro for additional spares and maintenance
> > increased caster availability.