

Q-CUT

Cutting process optimization for continuous slab casters

BENEFITS

- Possibility of installing it on existing slab casters
- Maximized production yield
- Real-time updating of slab cutting program
- Comprehensive range of optimization tools (scrap, defects, mixed steel, etc.)
- ROI < 6 months

PROCESS

Q-CUT maximizes the number of prime quality slabs by rearranging the sequence of cuts when a defective part of the casting strand is identified. The steel between the slab head and the defective part is divided into an optimal sequence that takes into consideration the current order book, the scheduled cutting lengths, any other allowed lengths and tolerances and/or additional production orders. After every significant tracking event (start of new heat, new defect detected, material cut, etc.) the Q-CUT model calculates the optimal cutting sequence by determining the combination that makes the best use of the available steel quantity.



EQUIPMENT

Q-CUT communicates with the oxy-cutting machine and the PLC, and is capable of managing one or two casting strands simultaneously, taking into account the following factors:

- > Slab section containing defect detected by Q-ART;
- > Head and tail crops;
- > Required samples;
- > Mixed steel;
- > Flying tundish changes;
- > Unplanned strand shutdown.

The system reacts immediately when an unexpected change in steel quality occurs, or when an unplanned anomaly is detected. Q-CUT updates the cutting schedule according to the production plan, the current situation on the strands, and those products already cut for the current heat.

PROCESS CONTROL

Q-CUT cut-to-length optimization system maximizes the amount of prime quality steel by re-arranging product length between the defective part and the product head. Q-CUT continuously adjusts the product cutting schedule, thus adapting to changing circumstances. Main tasks for Q-CUT are:

- > Dynamically changing the cutting schedule during a sequence.

- > Maximizing the length of prime quality material products.
- > Minimizing losses to out-of-specification material.
- > Identifying the sampling time.
- > Managing cutting lengths when multiple cutting stations are provided.

Q-CUT requires the following input data:

- > Required production targets;
- > Machine geometry from a database;
- > Online process data (length, speed, sizes);
- > On-line scheduled and unscheduled events, for example: slab section containing defect detected by Q-ART, head and tail crops, required samples, mixed steel, flying tundish changes, unplanned strand shutdown.

Q-CUT then issues the optimized dynamic cutting program. Different optimization strategies are supported:

- > Alternative length: the model selects the length between a group of commercial acceptable length;
- > Sub-elements: the length of the product is recalculated on the basis of a sub-element length corresponding to the length required to produce in the RM a single final product

Q-CUT model is often tailored for the customer, to include his own cut strategies. Here is shown a clear difference between a cut schedule without and with Q-CUT

rearrangement. In the upper part, a complete slab is scrapped because of an internal defect. The opposite happens in the lower part, optimizing the cuts, the defective part is placed at the end of the product and can be cropped separately. The future cutting positions and sections to be scrapped are displayed in a set of dedicated screens. Q-CUT can be combined with Q-ART (Quality Assessment in Real Time) to rearrange production schedule if an unexpected deviation occurs in steel quality. In this way, the affected product portion can be isolated.

PERFORMANCE ACHIEVEMENTS

Without the Q-CUT (in case of continuous/predefined/constant cutting sequences), if we consider 100 heats with an average of four slabs per heat, in which an alarm occurs involving at least one slab, approx. 0.25% of the production would be defective. With the Q-CUT, half of these slabs can be recovered by changing the cutting sequence, essentially recovering about 0.13% of the production total. Due to the reduction in scrap steel, especially at the end of casting, the Q-CUT function could increase the yield of the casting machine by up to 1% for a single heat, and up to 2% for a sequence of heats. In combination with Q-ART, the overall increase in yield could be up to 5%.

