

Q-MOD

On-line mold oscillation diagnostic system for continuous slab casters

BENEFITS

Possibility to install it in existing slab caster plants

Planning of preventive maintenance

Increased oscillator lifetime by identifying abnormal working conditions

Reduced slab surface defects due to bad oscillation

Less reconditioned material

Historical data recording and trending

ROI < 6 months

PROCESS

The Q-MOD monitors mold oscillator performance during production. Q-MOD utilizes accelerometers applied on the moving oscillator frame, which measures in 3D and in real time the displacement of the moving frame during casting. These real movements are compared with the theoretically correct movements, and the system evaluates the deviation from the ideal path and gives the operator different levels of warning concerning the misalignment of the oscillating system. In this way preventive maintenance can be carried out before a slab quality-related problem occurs, and this also will extend the life of the equipment by preventing the oscillator from operating in deteriorated conditions that could result in vibrations and extra loading.

EQUIPMENT

Q-MOD consists of four different modules:

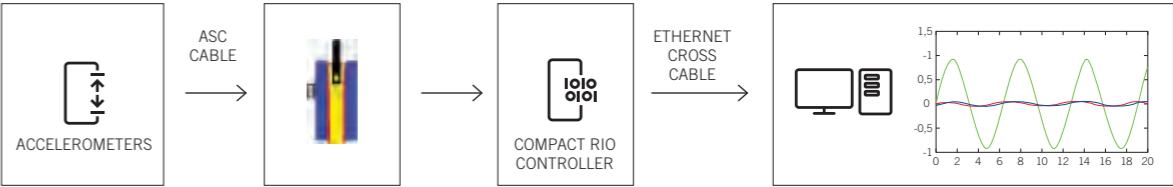
- > Real Time (RT) Logger: it captures data from analog inputs and makes them available to the mass memory;
- > Real Time (RT) Managing: it manages the module, is started up on the PC and establishes a TCP connection with the software installed on the remote acquisition unit;

- > FPGA Buffered DAQ: it is installed on the FPGA of the RIO and manages timing and streaming of data from accelerometers to real-time software;
- > MOD Analysis: this software analyzes recordings and shows relevant data and calculations on the HMI.

The final results of the analysis are presented in a graph showing displacement, speed and acceleration along the 3 axes (X; Y; Z) of each measuring point. There are two ways to visualize the results. 1) With separate graphs for each direction (X; Y; Z) and each accelerometer; 2) With 3D spatial displacement. In this way Q-MOD gives the operator an immediate understanding of mold oscillator behavior. By making a simple selection it is possible to choose between on-line and off-line visualization.

The on-line mode allows real-time monitoring of the accelerometers, while in off-line mode the recorded data can be viewed. Additional features are:

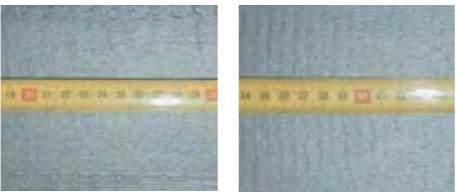
- > Possibility to process and monitor the Fast Fourier Transform for the three axes;
- > Set threshold values for assessing the correctness of all oscillator movements.



Four, 3-axis accelerometers are fixed to the corners of oscillating frame.



Effect on oscillation mark performance from an oscillator with Q-MOD and without Q-MOD.



Monitored

Not Monitored

Danieli Automation Q-MOD HMI screen.



PERFORMANCE ACHIEVEMENTS

Thanks to continuous oscillator monitoring it is possible to achieve a better final product quality, as shown in the image below:

Without Q-MOD monitoring system, if the mold oscillator falls out of performance standard and then it takes one month to replace it during a plant outage, this will mean one month of slabs produced with poor surface quality and extra slab conditioning.

Maintenance programming:
At the time of the acknowledgment of an error/mis-performance of the oscillator in terms of displacement tolerance on X-Y axis plan, statistics show that two weeks are required to plan and execute the oscillator replacement. Before the execution of replacement of oscillator, the slab quality is downgraded (due to reduction of surface quality), and hence of reduction in slabs' selling price by approximately 30%. Statistics show that oscillator mis-performance happens on average two times per year. In case of the presence of the Q-MOD system, a programmed maintenance scheduling of the oscillator can be done and hence with no downgrades of slabs due to mis-performance of the oscillator. Hence, the average profit is equal to 6,700,000 Euro.