

New Hydraulic Mould Oscillators for Alfa Acciai CCM, Brescia (Italy)

Project: Revamp of continuous casting machine #1
Startup date: September 1st 2016

Introduction

During the last spring AIC get the order from Alfa Acciai group for the Electrical & Automation supply for the control of new Hydraulic Mould Oscillators.

The new equipment were commissioned with the target to improve the steel quality on the CCM#1 (5 lines) of the Brescia plant, where an EAF, n°2 LF, CCM#2 (5 lines) and n°3 rolling mills (for bars, wire rods and coils) are in operation.

In collaboration with the mechanical suppliers SBM-IRFI and LOMA, AIC designed the whole control system for a turn-key project.



Overview of casting lines of CCM#1 (and related local control stations) during the start-up

Scope of supply

The AIC's scope of supply for the project included:

- Upgrade of the PLC control system through the supply of n°5 new PLCs (one for each line) to be installed into the existing cabinets;
- Interface with the Tundish
- Interface and control of new Stirrers
- Management & control of new hydraulic oscillators
- Control of cooling system
- New auxiliary drives panels for Hydraulic units
- New main control desks
- New local control station for each casting line, suited with safety devices and Operator Panel

The whole supply has been designed to accomplish and satisfy the **safety requirement of ISO Standard 13849-1 (Safety of machinery)** and the specific **safety standard for Casting Machines EN 14753 (Safety requirements for machinery and equipment for continuous casting of steel)**.



New main control desk (left) and Hydraulic Oscillators (right)

Main technical data:

Actuator: Moog servo proportional valve mounted on hydraulic cylinder

Hydraulic unit: Dedicated hydraulic unit, working pressure 180 bar.

Automation: Dedicated PLC mounted inside existing strand panels

Features:

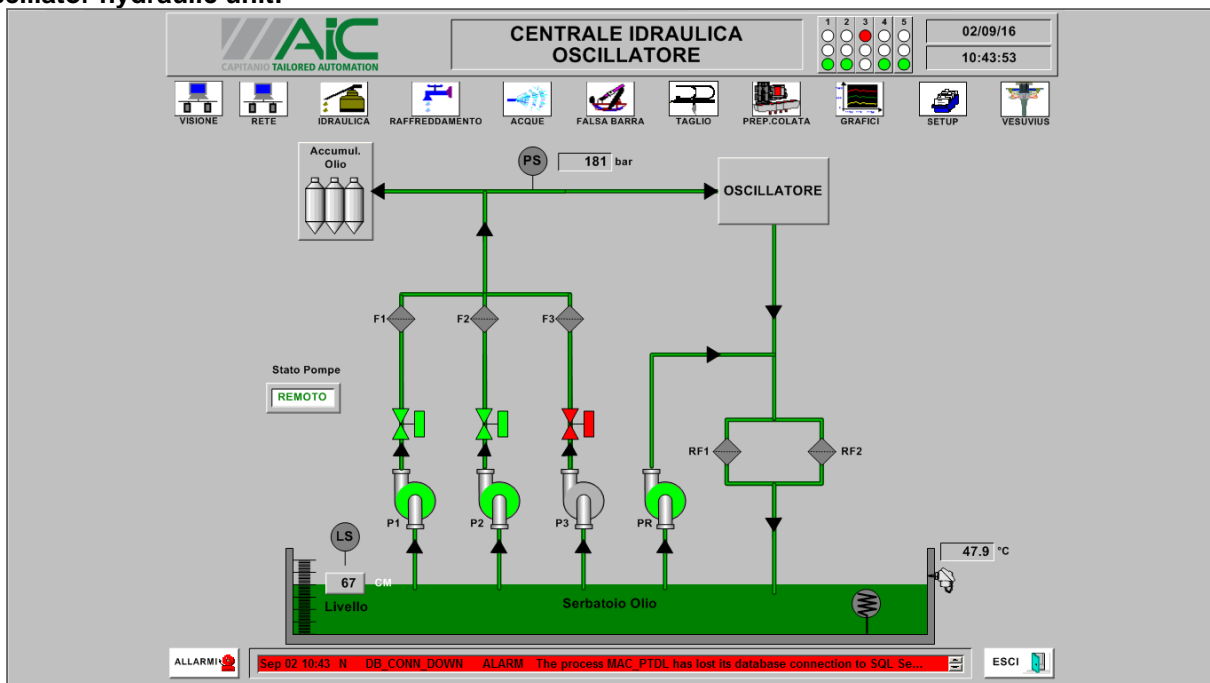
Generation of oscillation movement of the mould following a sinusoidal curve with variable frequency and stroke.

Frequency range: 30 to 300 spm.

Stroke: 3 to 14 mm.

(Ranges can be modified according to the customer request).

Oscillator hydraulic unit:



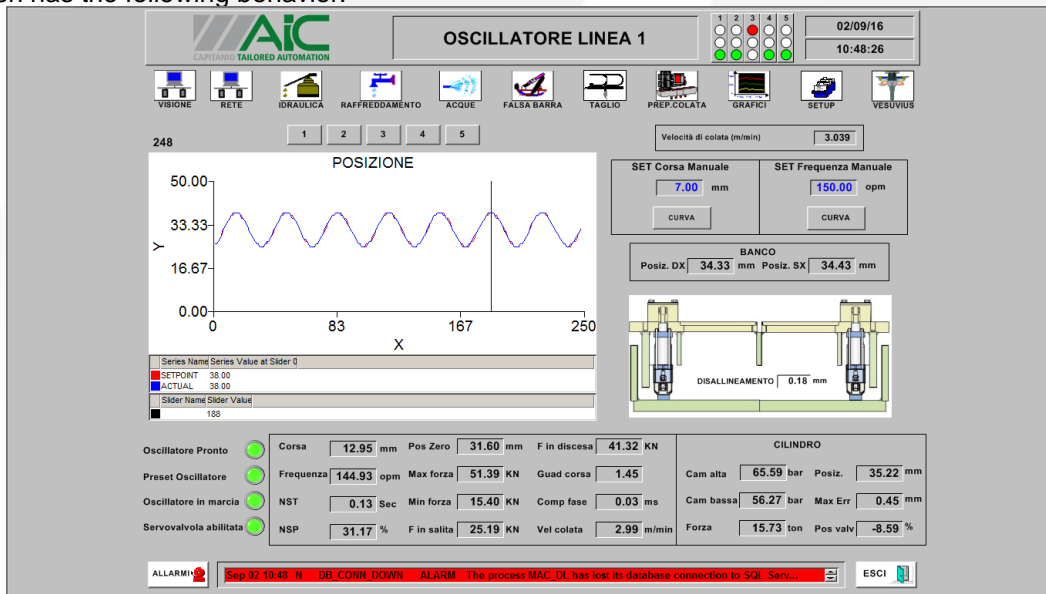
The oscillators require a new hydraulic unit and in this case it is based on 3 main pumps (2 working and 1 in stand-by). This unit serves 5 oscillators and the working pressure is 180 bar. The unit is also equipped with a recirculation pump, filters and heat exchangers to let the oil be cooled properly.

Control and setup:

The setup of oscillator is based on curves: Frequency Vs casting speed and Stroke Vs casting speed. The curves are included on recipe system and can be modified both from Level 2 or from HMI.

Additional screen on existing HMI has been made in order to visualize the actual statuses of the oscillators and the control parameters.

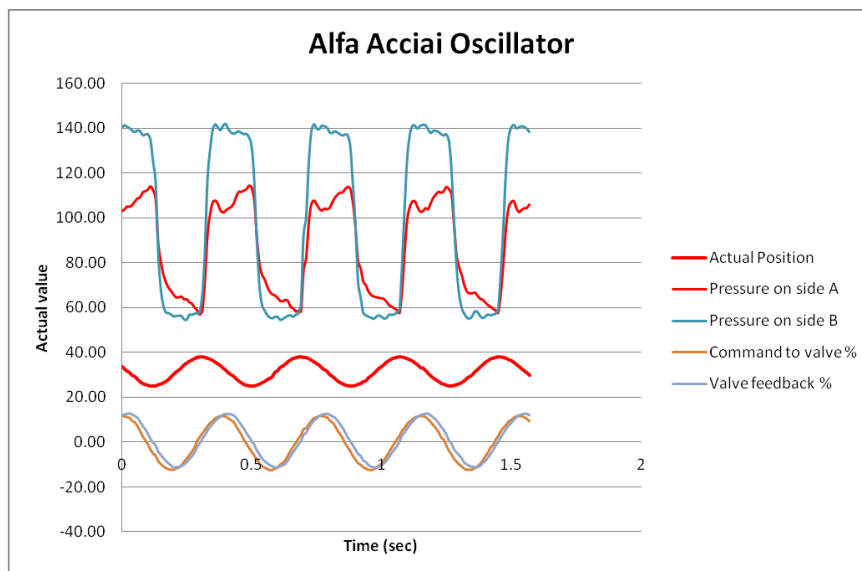
The screen has the following behavior:



On the screen is possible to plot the last cycles of the oscillator in order to verify the actual position and the target one, moreover is shown the table misalignment based on two additional position sensors placed at the right and at the left of the mould. The maximum misalignment is evaluated and shown each oscillator cycle.

Results:

The following graph shows the main trends of oscillator during cast. The stroke setup is fixed to 13mm, while the frequency depends on speed.



The results are:

Maximum position	38.10 mm	Actual stroke	13.05 mm
Minimum position	25.05 mm	Actual frequency	157.89 spm
Zero Position	31.57 mm		
Error on stroke	0.05 mm	Error on zero position	0.03 mm

Conclusions:

The great technical result, together with a really short and efficient commissioning and start-up (CCM into operation at the first day of hot commissioning) allowed AIC to completely satisfy the customer needs and to confirm its role of technological partner for the steel producers.