

SAVELLI SANDCONTROL and AQUATEST

Devices for the automatic control of the foundry green sand features

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Automatic control system for the molding green sand features

INTRODUCTION

It is well-known that the sand returned from the shake out is subject to sometimes significant temperature and humidity fluctuations.

A good sand preparation plant has the main task of processing the return sand coming from the shake out and bringing it back to its optimal features. Concerning the sand preparation cycle, the reliability of the machines should be integrated with an adequate control of the working process, to ensure a constant result.

It is to be assumed that in general a SAVELLI-designed sand preparation plant is provided with a SAVELLI mixer-cooler, which ensures that the return sand, before going into the silos, has a temperature below 45°C and a humidity level between 2% -2.2%, in order to allow the pre-activation of bentonite and optimize the following sand preparation cycles.

SAVELLI has developed a sand measuring system both for the sand features and for the process control that is based, in particular, on two devices: **AQUATEST** and **SANDCONTROL**.

The **SAVELLI AQUATEST** system operates before the sand is loaded into the mixer.

During the loading phase of the weighing hopper above the mixer, two electrodes measure the electrical conductivity of the sand and a pyrometer measures the related temperature.

Knowing the exact weight, the average of the observed temperatures during the loading of the hopper, and the electrical conductivity allows a reliable measurement of the humidity of the sand, therefore a calculation of the correct amount of water to be added in the following mixing phase.

This method, allowing a preventive calculation of the water to be introduced into the mixing phase, does not affect the mixing cycle time, thus guaranteeing the supply to the molding plant of a constant amount of sand with a constant level of quality.

The control of the exact amount of water introduced in the mixer is carried out by an electronic litre-counter, which ensures its accuracy.

The sand sample that will be used to determine the compactability and the mechanical resistance, is taken directly from the mixer, in the final phase of the mixing cycle.

The **SAVELLI SANDCONTROL** system operates in the phase immediately prior to the unloading of the sand processed in the mixer, a phase in which the sand characteristics will be as close as possible to the ones in the moulding machine, and in due time for any deviation of the loading in case of wrong mixing (bad batch).

Additives corrections and potential set-point corrections for the addition of water will occur in the subsequent mixing cycles.

Here after the detailed description of the functioning operations of these sand control systems.

AQUATEST

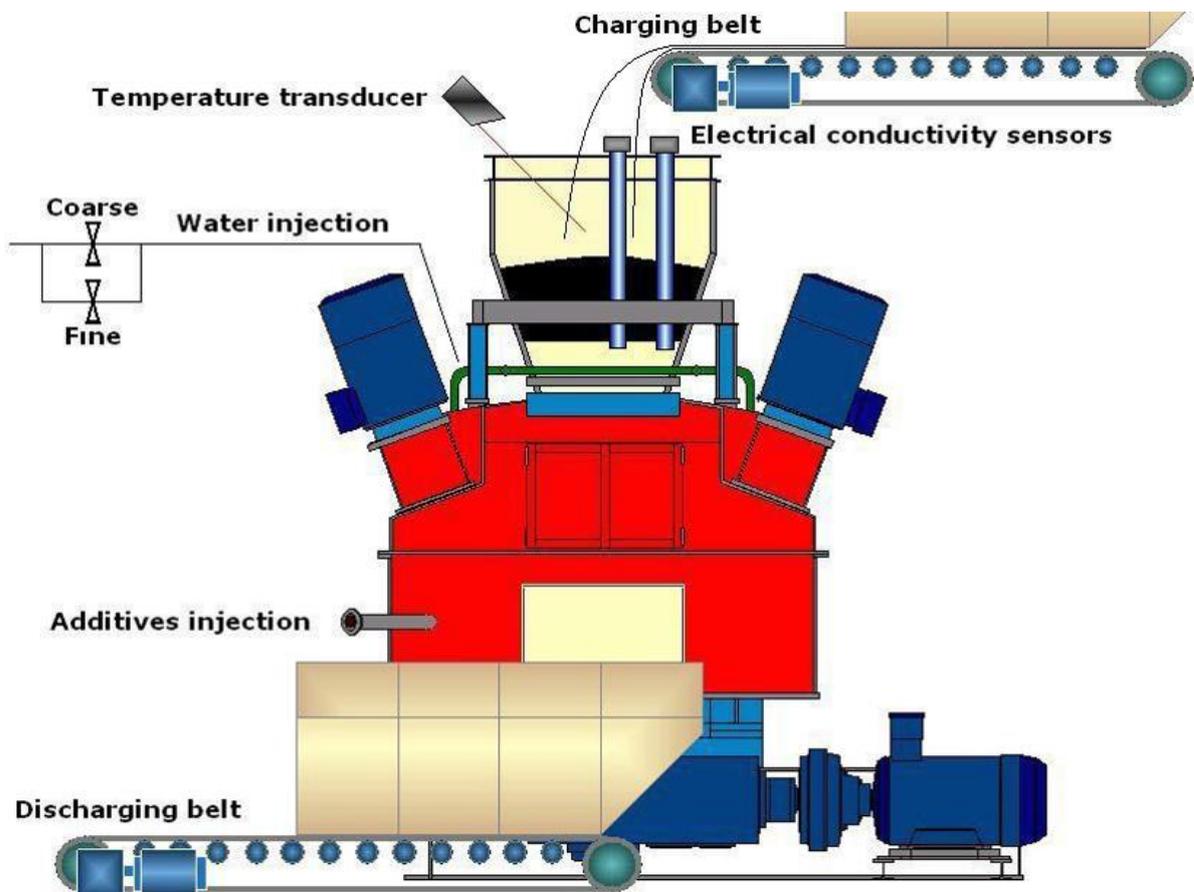
The AQUATEST measurement (picture 1) is taken during the pre-load in the weighing hopper above the mixer, and therefore does not affect the mixer cycle time.

- **Temperature measurement:** is detected throughout the whole loading time in the hopper and, at the end of the loading, the software calculates the average of the detected temperature.
- **Humidity measurement:** it's carried out after finishing the pre-load in the hopper. The final result is an average based on multiple readings. All measurements last for ~2 sec.

All test data will be stored in a historical file.

The **AQUATEST system consists of:**

- two humidity probes, assembled on the pre-load hopper above the mixer.
- a temperature transducer assembled on the upper edge of the pre-load hopper. The transducer is equipped with a small compressed air intake that keeps it clean.
- Electronic equipment with Siemens PLC, operating unit and data processing sheet. Such equipment can be interfaced with any PLC.



Picture 1

SANDCONTROL

SANDCONTROL is a device to measure the following sand features in the mixer or on the line:

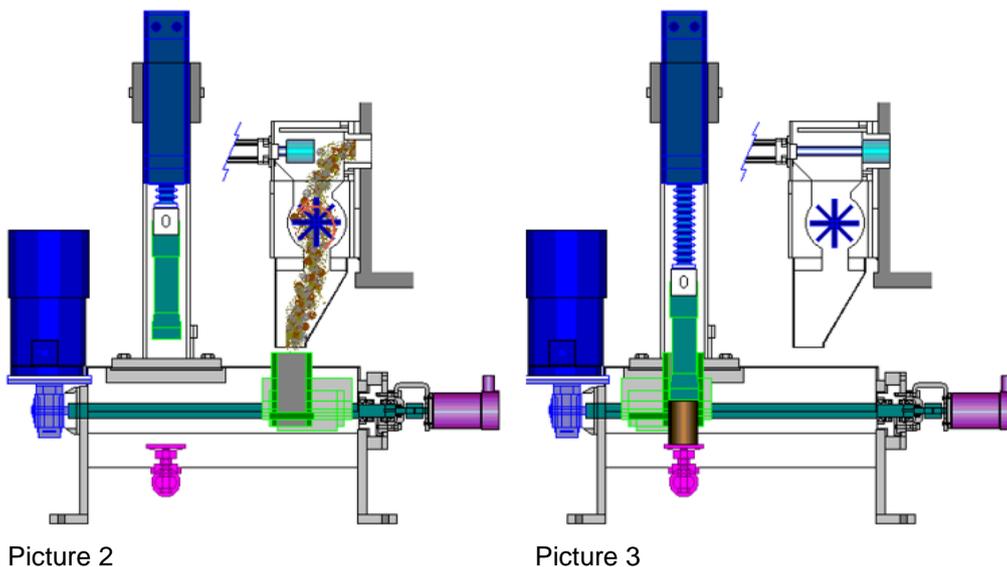
- Compactability
- Compressing strength

The sand sampling to be analysed takes place about 10 seconds before the opening of the mixer's unloading door and the complete cycle (from the start to the end) of the SANDCONTROL takes about 30 seconds.

SANDCONTROL functioning

At a determined moment, the positioning device transfers the sample cylinder below the sand sampling point. A rotating feeder feeds the sand into the sampling cylinder, which receives the determined sand quantity thanks to the sample filling control probes (picture 2).

The positioner transfers the sample under the test station, while the sampling unit is cleaned with an air blow. At the test point, the compactability test is carried out at constant speed and controlled torque (picture 3).



Picture 2

Picture 3

If the compactability data are in tolerance within the pre-set value, the device performs the compressing strength test. The test is carried out by translating the sample, opening the bottom, ejecting the sand sample on the loading cell and consequent controlled pressing of the sand sample till it gets broken.

The tolerance parameters (determined in reference to a certain number of mixings) determines any potential variation of the additives that will be dosed in the mixer during the following cycles.

All test data will be stored in a historical file.

Pressing through a **brushless motor** is a guarantee of precision.

The SANDCONTROL system consists of:

- Pneumatic sampling unit assembled in the mixer or on a belt conveyor after the mixer.
- Motorized sand preparation unit (whisk)
- Motorized positioning unit to position the sample
- **Brushless driven** pressing unit.



N. 2 SANDCONTROL – manufacturing phase



SANDCONTROL installed beside the mixer

CONCLUSIONS

The synergic functioning of AQUATEST and SANDCONTROL guarantees the correct control of the sand preparation process by means of pre-determined and automatic adjustments.

Depending on the compactability of the detected sand, the system updates the set point on the AQUATEST to correct the amount of water introduced into the mixer starting from the next cycle.

Following a series of measurements carried out by SANDCONTROL, based on the set limits, the system can make any corrections by varying the amount of additives to be inserted in the following cycles, depending on a customizable algorithm with the supervision system.

In case of a batch processed with out-of-tolerance parameters, the system will intervene by sending the bad-batched sand along a by-pass, which will bring the sand back to the used sand silos or towards a container for the waste sand, depending on the planned design solution.

Thanking you for the interest, SAVELLI Technologies staff remains available for any doubt or questions.