

A successful machine and tooling concept to produce inorganic sand cores

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ABSTRACT

A decade ago both the society and the government's regulations were demanding to the foundry industry solutions to respect our environment. Concerning the aluminium casting production, a new technology appeared to produce sand cores in such a way that respected the environment inorganic cores.

That basic concept behind was that new inorganic binders were used to shape the sand grains into a specific form given by a tooling. The process was so sensitive to so many factors that finding an industrial solution, cost efficiently for a mass production of those cores becomes a real challenge where core machine was main concern, together with sand preparation and core handling.

Ten years ago, Germany was leading this technology and the rest of the world was looking forward to knowing the real potential results of the new process. Nowadays, the inorganic process has been successfully exported to other countries as Spain, Italy, Russia, USA, Mexico, China and Korea, where it has become a reality.

INTRODUCTION

The journey was not easy. There have been many factors which affect in a process where day to day there are new steps and improvements thanks to all involved parties: foundrymen, machinery manufacturers, tooling makers and raw material suppliers.

These new discoveries determined the equipment design and manufacturing and today we already have the required knowledge to carry out also this process in new destinations as Brazil and Japan.

EQUIPMENT AND TARGETS DEFINITION

The start point was an anthropological work to detail all influential factors, which affect directly the inorganic process. From the raw materials to their processing machines, following with the cores delivery into the fusion lines per gravity or low pressure.

After listing all those factors, we need to know how they influence directly or indirectly in the whole process together or separately. Finally, it should be defined the maximal and minimum and maximum limits of those factors in order to redesign the installation equipment.

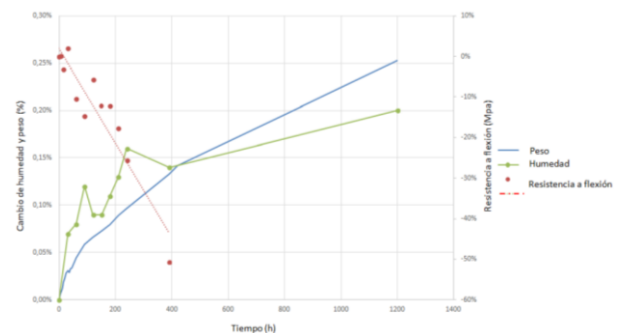


Fig. 1. Properties of test pieces subjected to increased humidity

Knowledge of all these data and their influence are the way to implement this new manufacturing process in new countries.

Moreover, the sensing equipments to directly know the current state of parameters is necessary to act upon the request, which is why this process industry 4.0 has a prominent role in the new developments of Loramendi and Aurrenak.

RESULTS AFTER A DECADE OF OPERATION

After working closely with prescribers of inorganic process as BMW and VW have been, Loramendi and Aurrenak have defined the most significant parameters of the inorganic process being the following:

Sand, solid Additive, Binder:

Particle size, shape, moisture and acidity of sand as well as sand additive and resin temperature,

Mixing of components:

Percentage of each components, sequence, dose rate of components and mixer speed at different steps of mixing.

Maintenance of sand mix before blown in core box:

Control of temperature and humidity of sand mixture as well as contact with the outside environment.

Cores Production:

Time and blow pressure, temperature of corebox, pressure, drying temperature, humidity and air flow, drying time, temperature and flow of tooling and machine cooling system.

Core Box:

Shooting nozzle diameter and length, types of air vents, tooling heating system, air inlets types for cores drying.

Cores Storage:

Temperature, humidity and storage time.

Loramendi and Aurrenak have been working in those fields concerning the industrial solution and came out to a machine concept with the required features that are able to handle the process parameters within the narrow range they must be to produce high quality cores in the industrial scale and costly efficient in any developed industrial place of the world.

CONCLUSIONS AND NEXT STEPS

Many parameters forming the inorganic process and its individual control and adjustment function of the rest parameters, so the Industry 4.0 concept consists of big data collection, fast processing and feeding back to equipment to readjust and reduce scrap levels, is a key issue in the design of new equipments. That's why Loramendi and Aurrenak is in the best condition to perform diagnosis and welcome several sensors, which later on will supply required data for the mentioned concepts and reajust of them to get high production and quality levels as it expected by the inorganic process.

Now the new challenge presented is to successfully implement the inorganic process in countries like Japan where conditions are unique and specific to the knower who have given us the work done during the last decade in the inorganic process.