



Coating a core at SLR in one of the new modernized coating dip tanks.

Quality Assurance

Ensuring quality by utilizing efficient process technology

The SLR Group is investing with the aim to optimize its cold box core coating process. Utilizing the „Arena All-in-One“ dip tanks from the Italian company Proservice s.r.l., repeatability, cleanliness, safety, maintenance frequency and power consumption have all been improved. Thereby, contributing to improving the core quality within a reasonable payback period for the investment.

by Gianni Segreto, Borgoricco, Italy

The SLR Group in Germany produces over 130,000 tons of machine parts from high-quality nodular cast iron (GJS). The foundry in St. Leon-Rot (parent plant and headquarters of the SLR group) was founded in 1981. One production site is located at St. Leon-Rot near Heidelberg. Another foundry location is Elsterheide near Dresden. There is a machining/ assembly shop in Hungary, while the pattern shop is located at the company site Eging near Passau.

Process optimization, costs reduction and research for innovative solutions

have always been the basis of the philosophy for the SLR group. The two foundries in the group have therefore invested in equipment for the control of coating filtration as well as the control and application of alcohol-based coating of cold box cores.

As with many other foundries, this part of the foundry process has not been automated.

The application of core coating is a delicate part of the process and has been associated with defects in the final castings which create hidden costs.

The cores are finished by immersion with lifting gear or manually by the operator working at each core shooter, where the cores from 0.5 to 80 kg (for Leon Rot) and from 0.5 to 300 kg (for Elsterheide) are produced.

Very ambitious goals were set from the beginning of the project. On the one hand, it was a matter of controlling the varying wet layer thickness of the core coating, as well as controlling the problems associated with the core dipping duration. In addition, the cleaning and filtration costs of the core coating were to be reduced, as well as reducing

Dense coating and alcohol storage area, separated from the work area.



the alcohol emissions into the environment.

The design and installation was to be a turnkey supply, performed by a single supplier, with a storage area for the undiluted coating and the alcohol supply to be separated from the actual work area, as per instructions from Martin Scherz, the managing director of SLR foundry St. Leon-Rot.

From the goals to the solutions

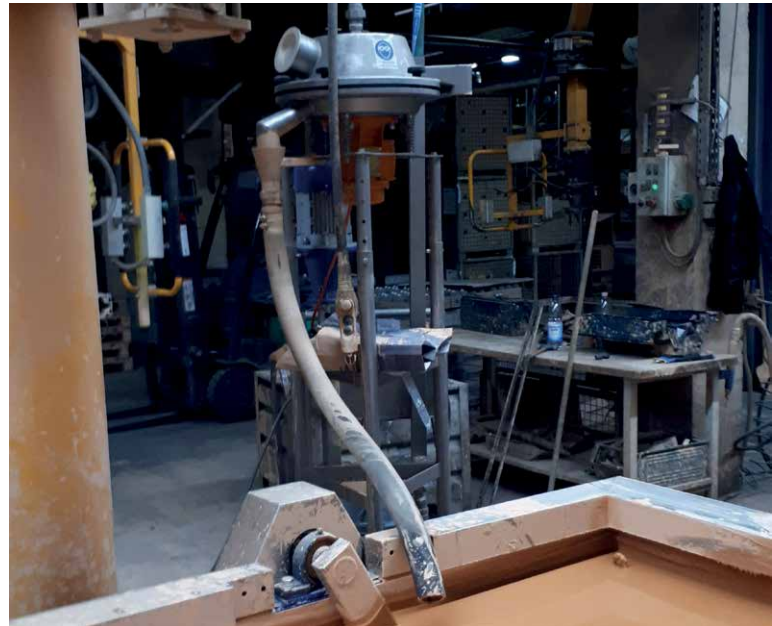
ProserviceTech of Borgoricco Italy, had taken on this challenge. The company analyzed the process in every single step to understand how to punctually achieve the targets set by the customer. Thus, together with the customer it identified some safe areas where to install a plant for the storage of the dense coating and alcohol containers, this plant was to feed to each individual core coating tank. In this phase every detail was considered, from the safety (being an Atex area) to the automatic pre-mixing and pre-dilution of the dense core coating. The reason was to make it easier mixing and pumping through the piping (including the supply pipe), and to manage the mixers for the containers of dense core coating as well as the control of the alcohol and dense core coating levels.

The following pictures show the storage area, the pipelines where the alcohol and the dense coating intermittently circulate safely, and the various coating tanks positioned in the foundry on two floors in St. Leon Rot and on only on one floor for the Elsterheide line.

Goal: constant quality advance

Once that the storage and the supply of the dense coating and the alcohol were

Vibro-filter, which filters the coating through a sieve which removes sand particles.



stabilized and optimized, the focus was placed on each individual coating dipping tank. Means of choice in this case and at this time was the Arena All-in-One series advanced dipping tanks, which collect from a centralized unit, the automatically controlled mixed and prepared coating and kept the coating at a constant level. In fact, each coating tank is equipped with a storage tank, where the coating is continuously controlled by means of the Density Sentinel. The automatic supply of dense coating and alcohol, as well as the ability to set fixed density targets for each unit in which the coating density needs to be maintained. Each coating tank is interconnected through its own network with the other units, but also with the storage area. The advantages of the Arena All-in-One solution is that the coating does not settle and the power consumption is thereby optimized.

Mr. Christian Zouplna, Foundry manager: "After approximately a year of use, we already are able to measure the achieved benefits. Before installing Arena All-in-One, even if we manually controlled the coating up to 10 times per day, for each coating tank with the related corrections, the wet layer thickness of the coating before drying still had a deviation of +/- 25 µm almost daily. With the "Arena All-in-One" we were able to reduce the deviation by approx. 70 %, even if there was still a residual deviation, which is mainly due to the manual operation of core dipping. The current tolerance range is from -10 µm to + 5 µm. The resulted in more consistent repeatability and a considerable reduction in quality control problems of the cores in the downstream processing area with the associated rejects or corrective measures on the cores.



Another coating dip tank. In St. Leon-Rot the dip tanks are located on two floors, while in Elsterheide on one floor.

Minimized maintenance.

Where the coatings are used, usually there are three words: cleanliness, manpower and spare parts. The cleanliness seems to be a condition accepted as a divine punishment universally associated with the use of refractory core coatings.

For example, every week SLR had to drain all the coating tanks and manually remove the residual coating sediment and core sand. These operations required a lot of manpower (up to one hour for each coating tank every week) and a consequential waste of coating and solvent due to the inefficient mixing. (to reject sedimented coating means to pay the coating twice: once when purchased and again for the special disposal as a dangerous material).

In all the coating tanks at SLR, ProserviceTech has introduced solutions that have almost canceled all of these costs. Thanks to the use of a system with static filters on each tank and of the innovative Arena Vibro-filter, a portable vibrating unit which allows for the filtration of the sand from the coating in few minutes without interrupting the production. The operations of the weekly process of emptying and cleaning are something of the past. They are now performed in the two annual stoppages. Arena Vibro-filter is moved from one tank to the other only as and when required, almost completely eliminating the presence of sand and dried coating pieces in the core coating. Consequently, eliminating the common defects of sand inclusions and coating lumps in the castings.

A diaphragm pump is usually required to achieve a constant level within the dipping tank. The installation of a diaphragm pump is usually fraught with many problems: noise, considerable consumption of spare parts, energy usage (compressed air) and manpower for its maintenance.

The Arena E-pump has consistently maintained a constant coating level for more than two years, (the original pump is still working) with an operational life that has already exceeded 8,200 hours. Without requiring any maintenance or any spare parts. With a noise level of 55 dB while the pump is working, is like a quiet conversation and with huge energy savings. Therefore, it is not a surprise that in similar conditions and when only considering the energy costs, the E-pump allows a payback period of less than a year, when compared to a traditional diaphragm pump.

Safety first.

The use of alcohol based coatings imposes some very strict safety procedures, related to and governed by the relevant ATEX certification. To design and to certify with ATEX is not simple, especially in foundries with existing equipment. After the implementation of the system, the alcohol consumption has been reduced by up to 3 %. This is thanks to the system's new circulation/mixing technology.

Moreover, by eliminating the cleaning operations (the removal of the coating sediment and the sand), the

new system of coating mixing and circulation, as well as the installation of alcohol fume detection, has resulted to a remarkable reduction of the alcohol dispersion within the work environment. Which has considerably improved the MAK (Maximum Workplace Concentration) index.

Now, operators who came into contact with the coating are no longer required for the manual dipping, including the cleaning as well as the dilution and control of the coating. Regarding this, Mr. Zouplna (Foundry manager, SLR St. Leon-Rot) has commented: "The preparation, the density control, the dense coating dilution with alcohol and the transportation of the alcohol and coating containers to each individual tank introduced some safety problems (which were related to the logistics and contact with the coating that is no longer required for the coating operation) and also a manpower cost saving. We had one person dedicated for 3 to 4 hours/day for these operations, who can now be employed for other activities".

Mr. Scherz ends: "The low payback time allowed us to purchase two additional All-in-One units. Installation was done in July 2020 for a different area in the core shop, with the aim to replace all the other existing coating tanks in the group's two foundries, in the next few years".

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