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Opening photo: A complete front bumper with the components produced and painted by KFTS.



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## An Italian Technology to Coat Bumper Components for the Hyundai Group

Francesco Stucchi **ipcm**®

The largest Korean investments in Europe are currently made in the Eastern Countries. That is the case of KFTS, the Slovak branch of Korea Fuel-Tech Corporation, a manufacturer of components for the automotive industry and in particular for fuel distribution systems based in South Korea.

The parent company was founded in 1996; currently, the group has offices in

China, India, Poland and Slovakia. As it expanded towards Eastern Europe, it progressively specialised in the production of plastic components and bumper accessories. KFTP and KFTS, the Polish and Slovak branches respectively, now specialise precisely in the injection moulding and coating of plastic components for the automotive sector and they are among the main suppliers of the

Hyundai group. KFTP was established first, in 2007; it currently has two factories in Zabrze and Zory. KFTS, the most recent branch, was established in 2014 in Rajec, under the guidance of Seiduk Kim and Joon Hee Kim. KFTS is a young, expanding business specialising in the production of plastic components for the bumpers of KIA cars (**ref. Opening photo**), a brand of the Hyundai group.

## Coating plastics: the importance of plant design

Nowadays, plastic is one of the materials most used for the production of automotive components. Most of these items require coating, but the chemical and physical characteristics of plastic itself tend to make this a complicated process. In order to ensure perfect finishes on plastic parts, a firm needs skilled operators, properly prepared surfaces, and precise and carefully adjusted equipment, especially in the coating application and film drying stages, during which it is crucial to prevent the material from attracting dust or other contaminants. That is where plant design comes into play. “Our competitive advantage is the will to constantly improve our processes and find innovative solutions to the technical challenges posed by our customers,” states KFTS general manager Seiduk Kim (Fig 1). “Whereas many entrepreneurs that have invested in Eastern European countries have preferred to import Korean technologies in their production facilities, KFTS chose to rely on an Italian technology. This was especially true for coating, which is a critical production phase because it must meet the stringent quality requirements of the automotive



Figure 1: From left to right: Jana Schvarcová, Marián Čerňanský, Seiduk Kim, Lorenzo del Passo, and Alessia Venturi.

**“KFTP and KFTS now specialise precisely in the injection moulding and coating of plastic components for the automotive sector and they are among the main suppliers of the Hyundai group.”**



Figure 2: A bird's eye view of the coating system.

sector. Moreover, we had to rely on a company capable of designing a plant in full compliance with the Slovak environmental and safety regulations, which in many ways are more complex and strict than the European standards.”

The coating line (Fig. 2) for KFTS' plastic components was designed and installed by QPD Quality Painting Development, a Polish company headquartered in Chorzów but with Italian know-how. “KFTS' coating process includes the application of three paint

layers in three consecutive booths,” says Joanna Wlosek, QPD owner together with Georgios Bousios. “Only one robot was installed in the primer and clearcoat application booths. This was a cost-effective solution to meet the customer's capacity requirements while respecting the

budget set for this investment. However, the system was conceived to enable a capacity increase at a later time with the installation of additional robots in the basecoat and clearcoat booths. The spray paint booths have an air recirculation system to optimise the costs related to air preparation and, in particular, to maintaining the temperature and humidity levels.”

“The line operation is



**Figure 3: The loading and unloading areas are adjacent.**

fully automatic. Only the material loading and unloading are performed by operators (Fig. 3), whereas the control and adjustment of the process parameters, as well as the coating application, are automatic,” adds Bousios. “Such line automation ensures constant temperature and humidity in the booths and the flash-off stations.”

### Plant layout

KFTS mainly produces components in polypropylene and, in a much smaller percentage, in ABS. The injection moulding (Fig. 4) and coating areas are located in two adjacent buildings: the workpieces are taken from the moulding stations to the coating line through carts. Here, after manual loading, the frames reach the pre-treatment station, where the operators thoroughly clean all surfaces with a manual process using isopropyl alcohol and ionising guns (Fig. 5). The pre-treatment area has been designed for the implementation at a later time of a CO<sub>2</sub> cleaning robot. This is followed by a flaming station and by the three automatic booths for the



**Figure 4: Just a few of the many moulding presses.**

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application of the primer, the enamel and the clearcoat (Figs. 6, 7 and 8) through ABB robots and DeVilbiss pneumatic guns (Fig. 9).

“The plant is equipped with four filtration units: the inlet air is heated and then sent to all areas of the line,” explains Marián Čerňanský, the Paint Line Deputy Manager of KFTS. “Each spray paint booth

has an air recirculation system with filters and exchangers that cleanse air from dirt and overspray and recirculate it to the booth itself. Only 5% of the air used comes from our regenerative thermal oxidiser (RTO, Fig. 10).”

“The primer application booth is equipped with a fool proof security system that uses a camera installed in the passage area from one booth to another to check if the primer has been applied correctly based on the workpieces’ colour,” adds Čerňanský. “After flash-off, the parts go through the bell curing oven ensuring air recirculation and optimum heat distribution (Fig. 11).” The system is also fitted with a separate coating management unit (Fig. 12), although some paint preparation stations have been located before each booth for the most used colours. The line has a takt time of 90 seconds and it is highly automated: only 10 people are needed to operate it. Installed in September 2016, it currently works on one shift producing about 2,500-3,000 components per day, with an expected increase in 2018.

**One of the safest coating lines in Slovakia**

“The Slovak safety regulations are stricter than the European ones,” says Georgios Bousios from QPD. “Initially, we had designed this line in compliance with the European standards; however, we had to redesign some parts in order to meet the Slovak requirements.”

“We use a two-component solvent-based coating system supplied by the German company Peter Lacke,” adds Marián Čerňanský. “In order to ensure compliance with the strict Slovak safety regulations, QPD added a further two-stage firefighting system in addition to the conventional fire prevention equipment: when a booth’s temperature reaches the maximum safety threshold, two automatic shutters isolate it. If needed, an automatic fire extinguisher system with carbon dioxide is activated.”



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Figure 5: The ionisation station.



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Figure 6: The primer application booth.



Figure 7: The enamel application booth.

### A treatment plant for the booths' waste water

KFTS' coating system was also equipped with an advanced treatment system for the waste water from the booths' overspray capture veils. The three spray paint booths have a significant flow rate, about 10 m<sup>3</sup>/min. In order to ensure constant circulation of clean water and avoid wasting resources, the installation of a treatment plant for the booths'

waste water, specifically a flotation sludge remover, was a strategic choice.

For this part of the plant, QPD relied on the technology of Water Energy (San Pietro in Casale, Bologna, Italy), opting for a Skimmerflot 15000 system able to treat up to 15,000 l/h (Fig. 13). "KFTS' three spray paint booths produce an overspray of about 30 kg of paint per day. Skimmerflot performs a chemical-mechanical process," explains Lorenzo

Dal Passo, manager at Water Energy Central Europe, Water Energy's Polish branch. "The coating is subjected to flotation and then separated from water in the sludge remover. Technically, through flotation the denatured paint is aggregated in flakes floating on the water level, thus enabling the sludge to be removed without any sedimentation in the booth's tank. Once the water has been drawn from the collection hole, we



Figure 8: The clearcoat application booth.



Figure 9: A detail of the paint application with a DeVilbiss pneumatic gun.



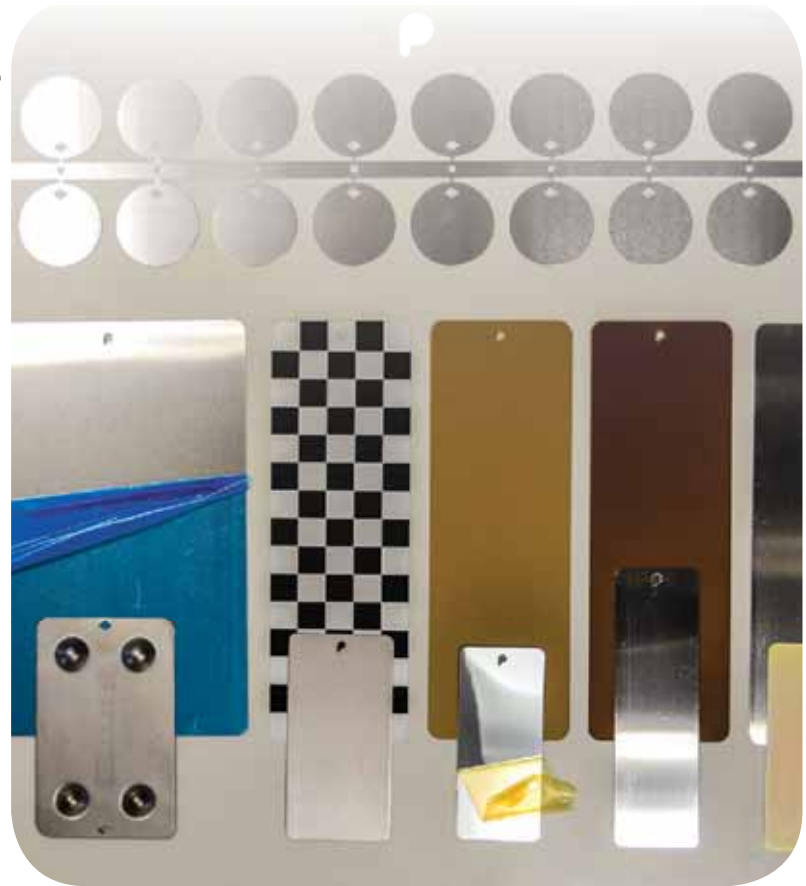
Figure 10: The regenerative thermal oxidiser (RTO) installed by Brofind.

“The Slovak safety regulations are stricter than the European ones. Initially, QPD had designed this line in compliance with the European standards; however, it had to redesign some parts in order to meet the Slovak requirements.”



Figure 11: The inside of the bell curing oven.

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sampling and colour charts





Figure 12: The coating management unit.



Figure 13: Water Energy's Skimmerflot sludge remover with a flow rate of 15,000 litres/hour.

inject a flocculant able to aggregate the coating particles in a pre-set contact time and make them float on water. In the recirculation circuit, we dose a coagulant able to separate the paint from water. The latter returns to the booths' overspray capture veils, while the mechanically separated coating is collected in big bags to be disposed of."

"For the purposes of the sludge removal process, the control of the pH value is crucial, since it must be kept constantly neutral to ensure good flocculation efficiency," adds Dal Passo. "The machine is fully automatic. Level sensors control the recirculation and mixing of the chemicals based on the process parameters, and the operator intervenes only in the event of a problem. Finally, we installed a softener in the booths' water cooling system to prevent any limestone formations in the circuit."

"Thanks to this flotation waste water treatment system, we have reduced the costs for the booths' maintenance and the cleaning of pumps, water veils and abatement systems," explains Marián Čerňanský. "Sludge no longer soils the water veils, the pumps, the back of the booths and all the parts in contact with it. The sludge residues are also directly put into big bags

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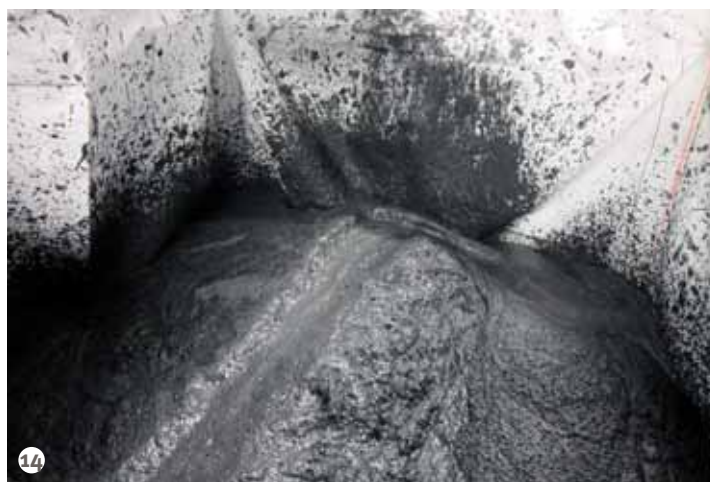


Figure 14: The sludge, with a humidity of less than 40%, is transferred directly to big bags to be disposed of.

and ready for disposal, with a humidity of less than 40% (Fig. 14). In general, the Skimmerflot system ensures an 80% sludge recovery efficiency; we expect to have to replace the booths' water only once a year."

### Conclusions

"We are very pleased with the coating line installed by QPD," states Seiduk Kim. "I already knew its owner, Georgios Bousios, and I was very confident about his engineering skills. Like all new lines, it required some time for the set up, but now, six months after the beginning of operations and with the staff technology

training made by QPD, we are pleased with the coating quality and the production capacity achieved. Within two years, we plan to produce on three shifts with this line. In order to do this, we will add a second robot in all our application booths, which are already fit for such integration. However, we will be able to achieve a significant productivity increase only by investing in a second finishing line. We have already allocated enough space to accommodate it in our Rajec plant." 