FAST DRYING COATING - THE CONVERSION FROM SOLVENT TO WATER-BASED FOUNDRY COATINGS

FOSECO

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One of the very last challenges of jobbing foundries is still to find a way to remove solvent coatings. Foseco with their new faster drying coating products can help to transition customers to water-based products. For those foundries that have already implemented the change, Foseco can help to improve productivity, reduce drying costs and CO_2 outputs.

INTRODUCTION

The challenges for the modern foundry are diverse with castings becoming more complex, requiring improved surface finish and increased yield to drive down costs. In addition to this there is increased pressure and expectation to reduce environmental footprint, decrease carbon dioxide emissions and become more energy efficient.

In many foundries the use of solvent-based (typically isopropanol, ethanol or methanol) coatings for cores and moulds is still prevalent due to their fast drying nature or the ability to burn-off the solvent rapidly. However from an environmental and local working environment perspective a transition to water-based products would bring significant benefits:

- Reduction in Volatile Organic Compounds (VOC's)
- Improved local working environment
- Reduction in the storage of flammable goods
- Reduced cost of compliance to ATEX or equivalent legislation for equipment
- Cost benefits of replacing expensive solvents with water

In the majority of automotive or similar mass core production foundries the conversion to water-based coatings has already taken place due to the repeatability of the work being undertaken, however in the jobbing foundry sector there are a number of factors that have limited conversion opportunities:

- Size and shape variations of the individual cores
- Extended drying times leading to productivity issues
- Higher energy consumption to dry water-based products
- Limited space available for large drying ovens
- Equipment cost of large installations

IMPROVED DRYING RATE OF WATER-BASED COATINGS

When transitioning from solvent to water-based products, maintaining productivity and the cost of drying equipment are two of the main concerns. The development of faster drying water-based coating technologies helps to alleviate these concerns; SEMCO* FDC is formulated to offer excellent rheological properties and is ideally used for flow coating. It is capable of building the required coating layer in one application without the formation of runs and drips, yet has significantly higher solids content than is typical of flow coating products, meaning the water content is much lower and can be removed quicker.

The reduced water content of the applied product means that there is less water to remove after application, resulting in:

- Reduced drying cycle times with associated productivity benefits
- Smaller drying facility requirements requiring a smaller footprint at lower cost
- Reduced energy consumption and the associated carbon dioxide emissions

By reducing water content of the coating, the energy required to dry the coating is also reduced. In the example shown in figure 1 the drying costs are related to the casting output of the foundry based on an estimate that 3kg of coating are used for every tonne of grey iron casting produced. Therefore a foundry manufacturing 30,000 tonnes of grey iron castings per year could save approximately 40,000 Euro/year (€120,000 - €80,000) through reduced energy consumption related to the drying of foundry coatings from the SEMCO FDC range. These energy savings can be further extended to the calculation of the overall reduction in carbon dioxide emissions related to the process.

The SEMCO FDC range is most suited to the flow coating application and is available with a range of refractory filler combinations to suite most foundries needs:

- Zircon - for the heaviest cast metal components
- Aluminium silicate - for heavy iron and smaller steel castings
- Mixed silicates - for cost-effective production of less demanding components

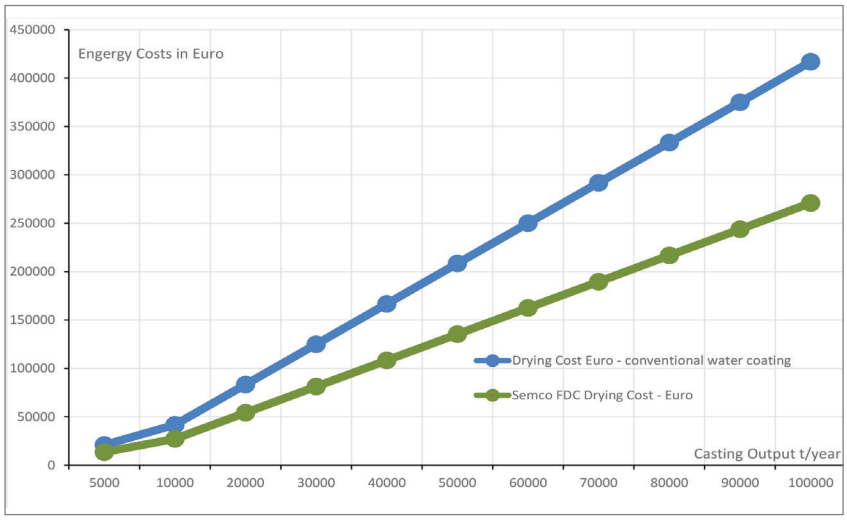

Figure 1. Approximate coating drying costs per annum versus casting output

Drying time in oven	Conventional Water Coating	SEMCO FDC
	Surface Temperature/ Remaining Moisture Reading	
5´	30°C/3,2%	40°C/0,8%
10´	40°C/0,7%	48°C/0,0% DRY!
15´	53°C/0,3%	53°C/0,0%
20´	60°C/0,0%	58°C/0,0%

Table 1. Remaining moisture within coating during the drying process

Figure 2. Checking surface temperature of the coated mould

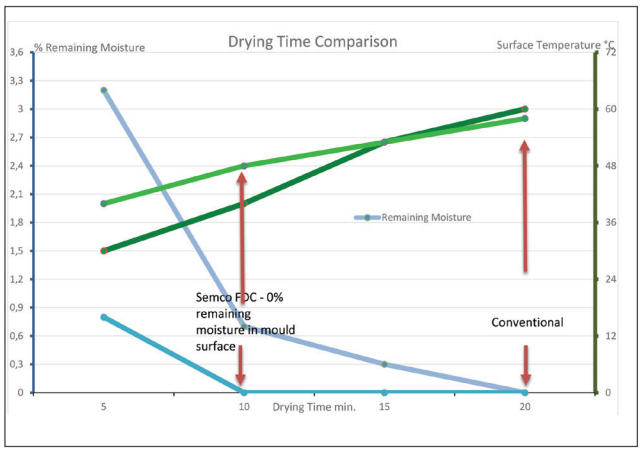

Figure 3. Remaining moisture and surface temperature versus drying time of two different coatings

CASE STUDY

The Global Castings foundry manufactures ductile iron castings for the wind turbine sector, and used a traditional water-based coating applied to moulds that were subsequently dried through a large oven. Trials with SEMCO FDC where undertaken to provide like-for-like application and applied coating layer thickness, before being processed through the oven. The results of the trial showed that the SEMCO FDC coating dried 50% faster than the traditional water coating and that the resultant energy demand and calculated carbon dioxide emissions were reduced proportionally.

During the trials the surface temperature of the moulds were recorded every five minutes (figure 2) and a remaining moisture reading was recorded (shown in table 1 and figure 3).

SUMMARY

Reduced energy consumption provides a significant cost saving to the foundry and with regards to the use of water-based coatings; energy reduction benefits can be achieved through using high solids containing products such as SEMCO FDC combined with an optimised drying process. These benefits are equally shared within the wider environment through contributing to the overall reduction in carbon dioxide emissions.

Additionally by transitioning away from solvent-based products significant benefits and cost savings can be achieved through reduced VOC emissions, improved working environment and the removal of flammable goods.

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