

RHEOTEC XL coatings

Reduced fettling and cleaning costs through superior 'as cast' surface finish

Introduction

High production iron foundries throughout the world continue to be faced with a common challenge - the manufacture of increasingly complex, higher performance castings at lower production cost.

Refractory coatings have always been recognised as an important factor in helping achieve the desired casting quality standard. However, the trend towards more complex castings and demand for higher quality levels for components such as cylinder heads, engine blocks and hydraulic castings, is placing even greater demands on the refractory core coating.

In addition, it is not uncommon for fettling and cleaning operations to contribute as much as 25% of the total production cost of an iron casting. Whilst much of this can be attributed to the removal of gating and risering systems, core or mould "flash" etcetera, the removal of areas of veining or adhered sand/coating residue from internal cavities can be both costly and time-consuming.

Foseco has supplied the proven range of RHEOTEC water-based coatings to leading production iron foundries for over 10 years. RHEOTEC XL coatings maintain the excellent application properties of the standard products but provide superior resistance to veining defects from amine-urethane cores and lower retained sand/coating particulate levels.



Figure 1

Experimental

RHEOTEC XL coatings have been developed as a result of a fundamental study into the interface between molten metal, refractory coating, and core surface during the casting process.

A test casting, see figures 1 and 2, was used to benchmark the performance of existing core coating technologies and to study the effect of various factors including sand type, metallurgy, pouring temperature, binder chemistry etcetera, on veining tendency and ease of removal of the coating/sand layer on shake-out.

Process parameters were then carefully controlled during experiments studying aspects of the refractory coating composition and application behaviour such as:

- Refractoriness
- Thermal conductivity
- Coating thickness

Figure 4 shows typical casting quality obtained with the test casting. The uncoated core shows considerable:

- Metal penetration
- Veining
- Sand adhesion

The situation is improved by the use of a conventional water based coating, but veining defects remain. The RHEOTEC 541XL coated core provides a clean surface completely free from veining and penetration defects.

The effect of coating chemistry on the temperature profile of a standard AFS compression core during pouring was studied through the use of thermocouples embedded in the core. The highly insulating nature of RHEOTEC XL coatings is illustrated by the graph showing the increase in core temperature versus time immediately after pouring for RHEOTEC 541XL and a 'conventional' coating, see figure 3.

It is believed that the reduced thermal shock experienced by the core when coated with RHEOTEC 541XL delays the α - β phase change of the silica sand and is a key factor in obtaining superior anti-veining characteristics.

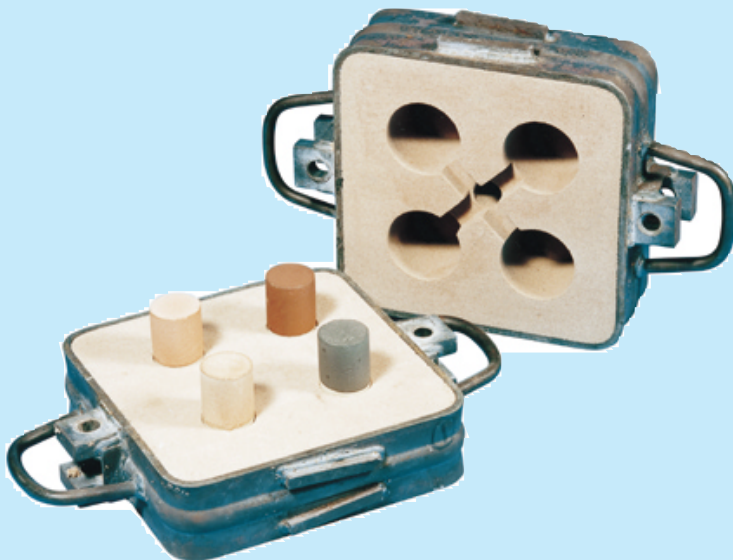


Figure 2

Product Evaluation

Tests of RHEOTEC 541XL coating on production castings have confirmed the performance observed during development work. Figure 5 shows a comparative study carried out at a large UK iron foundry.

The casting is the base of a large hydraulic lift cylinder, weighing 12 Kgs. The internal cavity is produced using a cylindrical amine-urethane core, 75 mm. in diameter. The current coating practice is to apply two coats of alcohol based coating, one graphitic and one zircon based.

A single coat of RHEOTEC 541XL coating applied by dipping at 39°Baume, resulted in a clean, defect free casting that required no fettling other than the removal of runners and risers. This performance standard will enable the foundry to reduce fettling costs significantly and improve dressing shop productivity.

Similar improvements in casting quality have been observed in other production tests.

Product Benefits

Although designed specifically to eliminate veining on castings made using amine-urethane cores, RHEOTEC XL coatings are equally effective on other resin-bonded cores. The coatings exhibit the following features:

- High insulation - reduced thermal shock
- Excellent application characteristics.
- Controlled penetration of refractory fillers into the core substrate.
- High hot strength, giving a stable coating layer at casting temperatures.

These characteristics combine to provide significant benefits for repetition iron foundries:

- Improved cast surface quality.
- Reduced fettling and cleaning costs.
- Reduced retained sand and coating particulate.
- Simplified coreroom process – elimination of double coating practice.
- Improved productivity - faster casting throughput.

Summary

RHEOTEC XL water based core coatings meet the demands of today's high production iron foundries by providing superior casting quality and a significant reduction in costly fettling and cleaning operations.

The coatings are particularly suited to amine-urethane cores but are compatible with all common resin core binder processes and, being water based, do not produce a hazardous working environment.

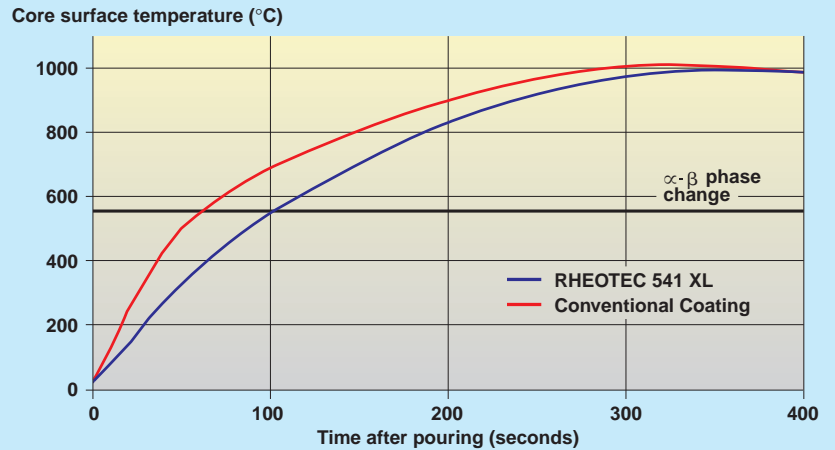


Figure 3: Illustration of the superior insulating behaviour of RHEOTEC XL coatings.

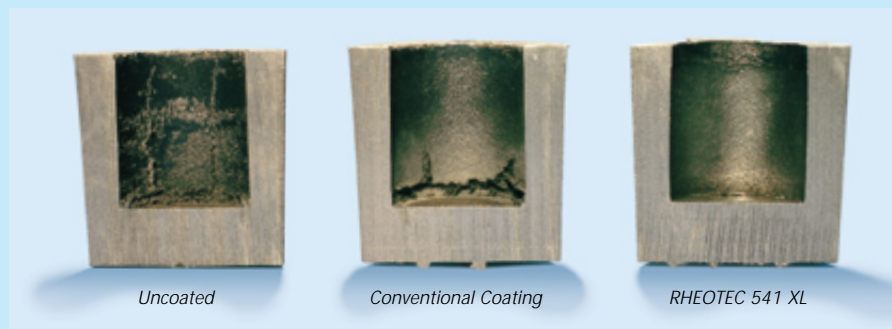


Figure 4: Test casting showing surface quality from uncoated, conventional coating, and RHEOTEC 541 XL coated cores

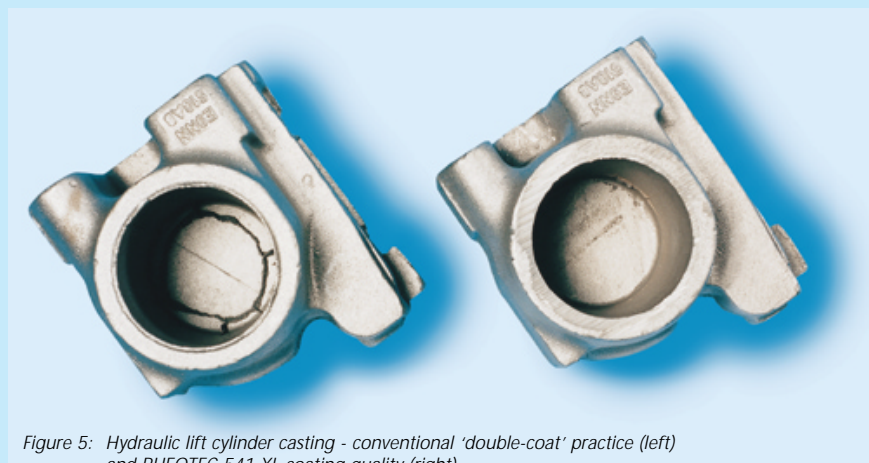


Figure 5: Hydraulic lift cylinder casting - conventional 'double-coat' practice (left) and RHEOTEC 541 XL coating quality (right)