



## Coatings for high performance cylinder liners

HIGH PERFORMANCE WATER-BASED DIE COATINGS

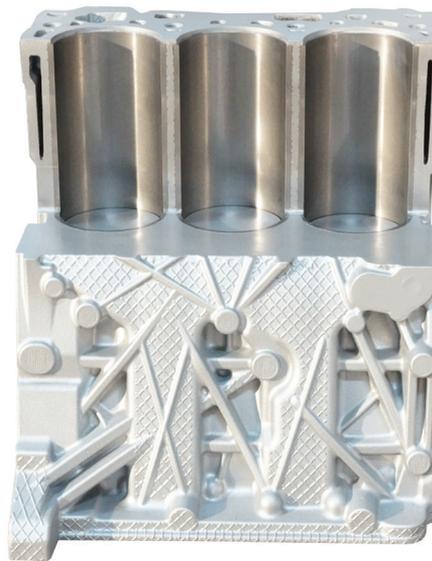
- + Reduced scrap and rework
- + No machining of the outer surface
- + Superior casting quality
- + Higher productivity



# Coatings for cylinder liner manufacture

for the highest quality demands of the modern foundry

Cylinder liners are incorporated into the bore area of internal combustion engines to provide a suitably robust companion to the piston and require good sliding properties, wear resistance and thermo-mechanical behaviour during operation. Pre-manufactured cylinder liners can be cast into or physically inserted into aluminium engine blocks for automotive applications or produced as a replaceable component in larger diesel blocks.



Engine block to demonstrate Foseco liner technology

Typically cylinder liners are produced in grey or alloyed-grey iron using the centrifugal casting process, in which liquid metal is poured into a horizontally rotating steel die to which a protective coating has been applied.

- + High integrity castings
- + Controlled solidification
- + Excellent surface finish
- + High productivity

Cylinder liners can vary significantly in weight and dimension; from single liners weighing tens of kilograms to thin walled tubes with lengths up to a number of metres that are subsequently cut into many small lengths. From a coatings perspective there are two main classifications based on the external surface finish requirements.



Centrifugal casting machine (Courtesy Gibson Centritech Ltd.)

# Coatings for Smooth Cylinder Liners

For the manufacture of cast iron cylinder liners with an externally smooth surface finish the standard SPUNCOTE range of coatings have excellent rheological properties that provide good suspension within the pressure pot of the spray unit and ideal characteristics for spraying, ensuring an even, smooth layer can be applied to the heated die. The refractory filler materials have been blended to ensure optimum permeability to ensure fast drying of the coating when applied to the hot die, without spalling or the formation of craters or blisters, ensuring the cast surface is free from blemishes or entrapped coating material.

The choice of refractory fillers and the build-up of layer thickness on application in combination with die temperature control during casting influences the solidification rate of the metal and the subsequent metallurgical structure.

Refractory binders are also incorporated into the formulation to ensure that the coating layer remains lightly adhered to the cast component, improving the casting release from the die and ensuring that the majority of used coating is extracted with the casting from the die, reducing die cleaning times within the production cycle.



Blank 50kg cast liner for large diesel engine application



**i.** Smooth – to provide an optimum surface for subsequent machining operations a flat, clean surface is required.

**ii.** Textured – for cast-in applications for the production of aluminium engine blocks the preferred surface finish has a rough or spiny profile allowing the cast iron liner to be keyed into the surrounding aluminium.

# Coatings for Textured Cylinder Liners

## Foseco Performance Liner Technology

For cylinder liners that will be subsequently cast into aluminium engine blocks, the provision of a textured surface to the end-user specification is required. The textured surface keys into the aluminium during the casting process ensuring there is no lateral or radial movement during operation. However it is also essential that the aluminium attains an intimate contact with the liner without voids, as such voids will lead to localised variance in heat transfer within the cylinder leading to distortion, excessive wear and reduced lifespan. Generally a fine, rough surfaced cylinder liner can only be used for casting aluminium blocks by the high-pressure.

The textured, high performance Foseco liner is suitable for gravity die casting without further treatments, such as thermal spraying, being required.

### SPUNCOTE BENEFITS

- + Low sedimentation
- + Good layer build up
- + Smooth surface finish
- + Low spalling
- + Easy casting removal
- + Easy cleaning of die

### ADDITIONAL SPUNCOTE SP BENEFITS

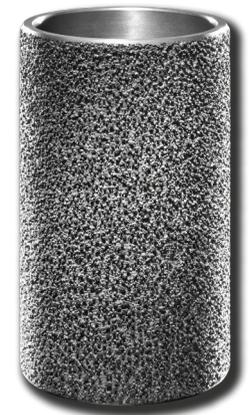
- + Textured surface finish
- + Cylinder liners suitable for gravity, low and high pressure die casting

### Process control

For the optimised manufacture of cylinder liners, Foseco offer a full package of service and product technologies to ensure best-in-class melting, metallurgical control, metal transfer and die coating applications. Please contact your local Foseco team for further information and a detailed introduction to our cylinder liner manufacturing process expertise.



Comparison micrograph of interface rough vs. textured liner



Foseco's Technology Package for Iron Cylinder Liners



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