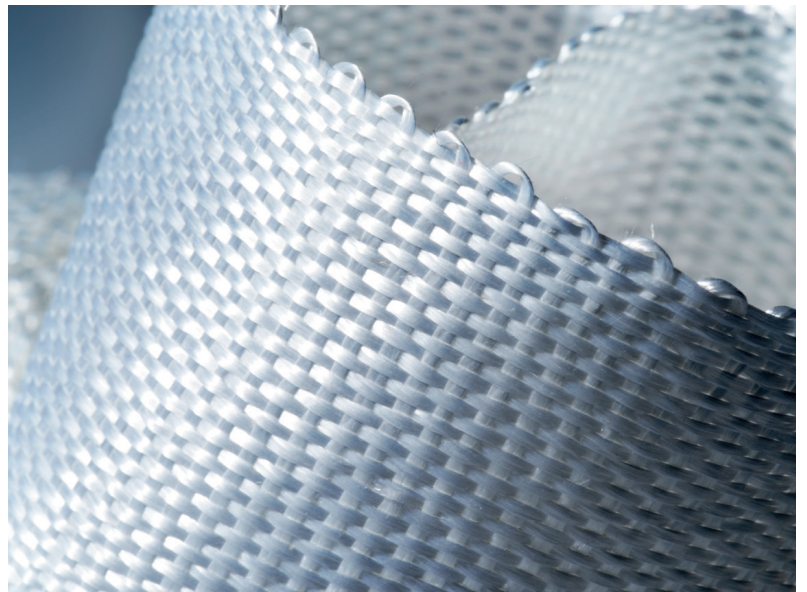


Investment casting mould reinforcement

3M™ Nextel™ Ceramic Textiles can be used to reinforce moulds to help prevent failures in casting and control cooling.

The utilization of investment casting dates back to approximately 3.700 BC, where it was initially employed in the creation of idols, ornaments, and jewellery. This ancient technique involved the use of natural bees wax for crafting intricate patterns, clay for constructing moulds, and manually operated bellows to stoke the furnaces. The process itself involves transforming molten metal into precisely engineered parts using a single mould, with a focus on minimizing material wastage, energy consumption, and subsequent machining.



Designers often opt for investment casting due to its reliability and its ability to meet the demand for complex design requirements. The advent of new materials and manufacturing techniques, such as CAD/CAM and 3D printing, has further enhanced the capabilities of investment casting, enabling the creation of even more intricate and complex parts. This has led to a resurgence in the popularity of this technology.

However, casting large parts using this process does present challenges. Ensuring the correct geometry and metallurgical properties of the finished part requires careful consideration of factors such as shell strength and cooling times.

To address these challenges, 3M™ Nextel™ Ceramics Fibers and Fabrics have been specifically designed to reinforce the mould, preventing fractures and deformation. These materials retain their strength and stiffness even at extremely high temperatures during the casting process, exhibiting a coefficient of thermal expansion similar to that of the mould system.

The compatibility of Nextel materials with various slurry types allows for reduced wall thickness, resulting in fewer dipping cycles. This, in turn, facilitates improved temperature and cooling time management, ensuring dimensional stability and reducing the need for extensive post-work such as grinding and polishing.

Furthermore, the exceptional heat resistance and high resistivity of 3M™ Nextel™ materials at elevated temperatures make them suitable for use as thermal insulation for thermocouple wires in investment casting and heat-treating operations. Roving, yarns, and tapes are available in a wide range of dimensions to accommodate different requirements.



For more information, please visit our website at www.3M.co.uk/nextel where you can download our technical reference guide or contact a 3M Technical Specialist.



Challenge

Requirement to selectively strengthen investment casting moulds to prevent fractures in specific areas without redesign of the mould or additional dips and provide proper cooling times to finished part metallurgical properties.



Solution

To wrap a flexible fabric tape or yarn around the more susceptible areas prone to cracking.



Insight

Nextel™ 312 and 440 fiber products include AP-18 tapes up to 2" width.

These alumina-based products provide strength retention at elevated temperatures. Nextel™ 312 is comprised of 62.5% alumina and has a continuous use temperature limit of 1200° C. Nextel™ 440 is 70% alumina and has continuous use temperature limit of 1300° C.



Why Nextel?

This flexible cloth can be used for wrapping around an investment casting mould while being compatible with the ceramic slurry used.



Industry

High nickel and super alloy investment casting foundries specializing in larger turbine blades or large or technically challenging parts.



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