

Investment casting mold reinforcement

3M is a leading provider of fused silica as a raw material for investment casting of precision cast parts. 3M™ Nextel™ Ceramic Textiles can be used to reinforce molds to help prevent failures in casting and control cooling.

Investment casting, also known as ‘lost wax casting’, is a manufacturing technique first used in ancient China to create bronze artworks. It is a process that converts molten metal into precision engineered parts using a single mold with minimum wastage of material, energy and subsequent machining.

Designers often choose this process as it offers reliability and the ability to meet most complex design requirements. However, casting very large parts using the process does present challenges, including using the right shell strength and cooling times to ensure the finished part has correct geometry and metallurgical properties.



Challenge

Requirement to selectively strengthen investment casting molds to prevent fractures in specific areas without redesign of the mold 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 mold 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.

3M™ Nextel™ Ceramics Fibers and Fabrics retain their strength and stiffness at very high temperatures during the casting process, demonstrating a coefficient of thermal expansion similar to the mold system. This means that the 3M™ Nextel™ fabric or tape can be incorporated into the mold design and wrapped or layered to provide added strength. 3M™ Nextel™ AP-18 tape is our most popular product for this application, coming in 2" width for ease of wrapping. Its temperature capability makes it excellent for mold reinforcement for high nickel alloy and super alloy castings with melt temperatures up to 1500°C. In addition, another popular product is Nextel™ 440 yarn which comes on 2lbs bobbins.

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

“Additionally, due to the heat resistance and very high resistivity at elevated temperature, 3M™ Nextel™ materials can be used as thermal insulation for thermocouple wires used in investment casting and heat treating operations. Rovings, Yarns, and tapes are available, and 3M™ Nextel™ AS-40 Braided Sleeving offered in 1/16" – 2.5" diameter.”





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