

Benefits of organic sand binders (Thursday, October 20, 2005 at 10:57)

Benefits of organic sand binders in the core making process

David Parker of Hormel Foods Corporation looks at the attributes of the GMBOND Process.

In the metal casting process, materials and design are of the utmost importance in creating a flawless part, but success also depends on the core. If the wrong sand binder is used, cores can degrade too quickly resulting in a malformed part, or worse, not break down sufficiently to be removed. Both instances leave the foundry with useless scrap and wasted resources. While some foundries are limited to the types of binders they are able to use because of the metal being cast, others have explored newer, more environmentally friendly binding agents such as GMBOND sand binder and found it has helped improve their environmental performance and overall competitiveness.

Built on protein

The basic ingredient of GMBOND is protein. Because it is non-toxic and organic, it has many advantages compared to petroleum-based sand binders, such as substantially lower hazardous air emissions, improved core removal, and waste stream reduction. One of the most compelling benefits to GMBOND is the substantial reduction in hazardous air emissions. Testing by the Casting Emission Reduction Program (CERP), an applied research group that works with the United States Department of Defense and other federal agencies, has proven that GMBOND reduces emissions of volatile organic compound by more than 90% in baseline comparisons with cores made with phenolic urethane resins. Because the material is completely non-toxic, workers do not have to wear any personal protective equipment to shield themselves from chemicals and solvents when working with it.

GMBOND is a water-soluble protein powder, which forms biopolymeric bonds when coated sand is mixed with water. These bonds adhere the sand particles together enabling it to be formed into the core shape. After cores have been formed, the water continues to evaporate, further hardening the core.

Because cores made with GMBOND are cured via dehydration rather than a chemical reaction, the aggregate surface chemistry has little effect on strength or bench life. Also, the bond is reversible which allows for recycling of scrap cores. In fact, GMBOND coated sand can be reused several times without loss of integrity and will biodegrade in spent sand.

Improved performance

Aside from its environmental benefits, GMBOND used both with silica sand and a synthetic aggregate offers comparable dimensional accuracy and tensile strength to a base line phenolic urethane cold box binder (PUCB) coated silica sand. Cores made with the material do not have to be completely dried for handling since a strong, hard shell develops during the curing cycle. The tensile strength of cores ranges from 250psi and higher depending on the aggregate medium with strength increasing as it continues to dry. Cores can be hardened more quickly with various methods and can also be coated for increased strength in specific applications. During casting, GMBOND also offers excellent dimensional and hot strength properties. Because it is not thermoplastic, it does not deflect or warp when heated like thermo-set resin systems. This is due to the semi-crystalline structure it gains when cured.

Complementing GMBOND core strength properties, the binder's transverse strength decreases more quickly than the PUCB binder does with heat over time so does not require hammering or bake-out for core removal. This allows material to be removed easily and minimises the likelihood of unwanted core sand in the casting.

The easier core sand removal and tighter dimensional accuracy allows thinner casting walls to be employed to remove weight from the cast part, further reducing the component's cost. These qualities also benefit high-volume foundries by saving time, reducing energy costs by eliminating bake-out, and reducing damage caused during core removal.

For foundries casting non-ferrous metals, which are cast at lower temperature ranges, easier core removal can help speed production rates.

Running a competitive foundry business and being environmentally conscious are not conflicting goals. Non-toxic sand binders like GMBOND offer quality, performance and cost benefits that can help foundries run efficiently and achieve their environmental objectives.

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