

# The GMBOND® Sand Binder from Hormel

## History

In the early 1990s, researchers at the General Motors (GM) Research and Development Center in Warren, Mich., began to evaluate new sand binding materials for use in the metalcasting industry. GM was looking for an alternative “binder” – a material which holds the grains of sand together to form molds<sup>1</sup> or cores<sup>2</sup> for cast metal parts – that had to be non-toxic, environmentally safe, yet as strong as other existing binders. (Generally, molds form the outside part of a casting and cores form the internal cavities in a casting.) After studying several possible materials and considering input from Hormel Foods Corporation, GM determined that protein-based biopolymers held the most promise as a strong, environmentally friendly sand binder material. In 1999 GM, which owns the patents on the sand binder process, granted Hormel a sole license to administer the evaluation phase of the product licensing program. Casting trials have been performed at the Teksid Aluminum Foundry in Carmagnola, Italy and continue at several other foundries throughout the world.

## What is the GMBOND® Sand Binder?

The GMBOND® Sand Binder is a protein-based binder that casting manufacturers can use to form internal “cores” of sand around which metal is poured to create metal castings. Because GMBOND® Sand Binder is made from renewable, natural materials – unlike many competing, chemical-based binders – it has the potential to reduce the foundry industry’s effects on the environment and improve worker safety – all while reducing foundry operating costs.

The foundry industry faces tough environmental challenges, including the need

### Advantages

- *Environmentally friendly*
- *Increases efficiency of metalcasting processes*
- *Reduces operating costs*
- *Enhances design & engineering*

1. Mold – The form, made of sand, metal, or refractory material, that contains the cavity into which molten metal is poured to produce a casting of desired shape.
2. Core – The specially formed material inserted in a mold to shape the interior or other part of a casting that cannot be shaped as easily by the mold.

to reduce hazardous emissions and waste streams like the disposal of spent foundry sand. The GMBOND™ Process can help foundries meet these environmental challenges because it is bio-based and non-toxic, so foundries waste significantly less sand and minimize pollution.

In fact, indications from data recently collected by the Casting Emissions Research Program (CERP), an auto-industry and Department of Defense program that provides casting emissions information to the foundry industry, show that the GMBOND™ Process drastically reduces hazardous air pollutants (HAPs) and volatile organic compounds (VOCs) released during the many casting processes. According to CERP, the GMBOND™ Process reduces both HAPs and VOCs by about 90 percent when compared with the established binder baseline.

The four main advantages to metalcasting with GMBOND® Sand Binder are:

- *Increased operational efficiency* – The GMBOND™ Process makes it easier to rid the metal casting of its internal sand core, eliminating the need to heat or hammer parts to remove the core. The results are stronger, more complex castings, reduced energy costs, increased worker acceptance, and less pollution.
- *Reduced operating costs* – The GMBOND™ Process enables metalcasters to save money by improving a casting facility's operational effectiveness. It reduces core-removal problems, solid waste streams, and processing costs other binders incur. And because it's recyclable, less binder is used in the production process, resulting in increased operating margins.
- *Enhanced design & engineering* – The GMBOND™ Process allows metalcasters to create strong, complex cores for more intricate value-added cast parts. This improvement in the quality of cast parts is possible because cores made with the new binder retain dimensional integrity during casting and don't require potentially damaging mechanical force or heat to remove them.
- *Environmentally friendly* – Due to its non-toxicity, the GMBOND® Sand Binder:
  - improves the foundry environment, and therefore worker safety;
  - allows for easy reuse and recycling of core sand, which reduces the solid waste stream; and
  - minimizes pollution by significantly reducing toxic gas emissions.