The Unicast Ceramic Molding Process
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**No other process offers so much for so little**

With Unicast you get investment casting quality, without the high investment. Utilizing an array of engineered ceramics and binders, the Unicast Process allows for molds to be created from standard foundry patterns typically of wood, plastic or metal. An advantage of the Unicast process is the simplicity of pattern preparation. No special materials are required, and the pattern can be a composite of various materials such as wood, metal, fiberboard, & glass, all joined together in the desired contours. Since the slurry is mixed and applied at room temperature, the pattern is unharmed and is reproduced in complete detail.

**Exceptional Dimensional Control and Surface Finish**

The process yields tolerances typically only associated with investment casting at costs that can many times approach sand molding. Applications for precision castings produced by the ceramic molding process are virtually limitless. However, almost all appear to have one essential requirement in common: The need to reproduce fine detail and a complex configuration that would otherwise be expensively machined, particularly where quantity requirements are too small to justify special tooling. The process can hold tolerances to 0.4%, and routinely provides surface finishes of 1.7-2.3 μm or better.

**Virtually no alloy limitations**

The refractories used in the Unicast Process are made up of a variety of different ceramics, all specifically engineered for unique applications. Ceramics by nature are inert, and therefore the ideal casting medium. Copper, bronze, iron, and stainless steels all work well with the system. The refractory properties of Unicast molds makes them capable of withstanding the high pouring temperatures of almost all castable ferrous and nonferrous alloys, including stainless and tool steels, hard cobalt alloys, high strength bronzes, beryllium copper, aluminum, Kirksite, and magnesium.

**Cast-to-size detail**

Not near-net-shape. Cast-to-size. Because the process provides a high degree of accuracy and a fine surface finish, castings made in ceramic molds are frequently used without further machining—usually reduced to just surface polishing and fit up. This suits the process to production of tools, dies, and similar mold forms, particularly those of varied geometry that would otherwise be too time consuming and costly to machine. Predominant in this area are precision-cast mold cavities for such diverse end uses as die-casting dies, plastics and glass molds, rubber forming molds, foundry permanent molds, coreboxes and patterns, and extrusion dies. The field for die-casting dies and allied components alone represents perhaps one of the fastest growing areas of application. Machining can be nearly eliminated in many applications.

**Ease of use**

From its inception, the Unicast Process has always had simplicity as its goal. While investment casting can provide an excellent casting, the skills and machinery required will many times put it out of reach for the typical casting house. With Unicast, the process incorporates many of the same techniques used in traditional processing, and many times a foundry will already have the basic necessities to get started with the process.

**Diversify into new markets**

The Unicast Process offers a viable means of diversification for the traditional foundry. New markets can replace work lost to lower priced competitors. In addition to handling existing needs, the process allows for expansion into other fields where there is far less competition than in sand molding or investment casting, and a much wider industrial market.

The Unicast Process is the simplest and lowest cost way for a foundry to become involved in these applications for precision casting.
Key Advantages

- Only a short lead time is necessary due to simple tools and a fast mold build cycle.
- A modest installation cost can be maintained using simple equipment.
- The manufacturing cost is considerably lower than that of alternate methods.
- Patterns are usually inexpensive and quickly prepared.
- The die life of cast tooling is longer in comparison to that of dies made from wrought materials.
- Cast tooling can frequently be used as cast without further machining.
- The process is suitable for ‘impossible to machine’ grain and texture details for large injection mold bodies.
- The process is feasible for casting sizes ranging from small to very large.

The Process at a Glance

An illustration of the steps in the making of a basic solid ceramic mold.

Variations of the process are made to reduce material consumption and when an application calls for a specific ceramic material.

There are also techniques that allow for combining your existing technology with Unicast, such as using a Unicast ceramic core inside of a traditional sand mold.

The Unicast Process involves the preparation of a refractory slurry by mixing ceramic materials with a liquid chemical binder. A pattern of the part to be produced is mounted in a suitable molding box and the slurry poured in. Chemical adjustment causes the slurry to set to a rigid mold form in as little as 3 or 4 minutes. The set mass is stripped from the pattern, treated with a liquid stabilizer and then heat-cured in a high temperature furnace at about 1850°F (1000C). The cured molds are then transferred to the melting furnace for pouring of metal. Ceramic molds can be cast at any temperature, permitting wide metallurgical control to release maximum physical characteristics of the alloy.

A Unicast ceramic molded core set into a Furane mold. The combination of the two technologies allows for a precision internal cavity without the need for high precision on the exterior. Finished casting is 105 kg.
What’s your application?

Cast to size coreboxes for sand, or shell molding.
Aerospace, marine, and industrial castings.
Molds for plastic injection, vacuum forming, blow molds.
Dies for forging, stamping, extrusion, die-casting.
Intricate cored parts—impellers, valve bodies, pump housings.

A large Francis Runner cast in stainless steel using Unicast. Mold size is only limited by the shop’s capability of handling and processing the large molds. The process itself has no actual size limitations.

A typical ceramic core as used for an impeller casting. Cores are made quickly and inexpensively in-house and can be used with most traditional casting processes.

A detailed mold cast in stainless steel using the Unicast Process. Savings over machined cavities are exceptional as the cast surface only requires light polishing prior to use. Vapor blasting was the only finishing done to this mold used for making fine chocolates.

A sculpture of three different alloys molded directly from human hands without the use of any waxes. Every detail is reproduced and transmitted into the final casting.