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Investment Casting Institute

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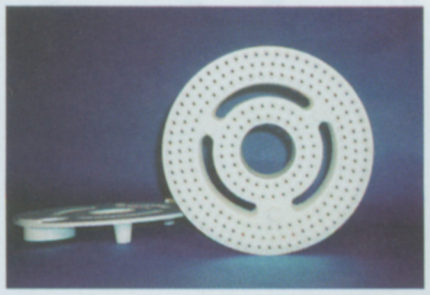
Tempo Plastic Co. Offers Pattern Niche for Investment Casters

Investment casters and suppliers are constantly making themselves aware of potential niche markets. And Tempo Plastic, an Institute member and exhibitor for the past several years, has been quietly seeking its patternmaking niche in the investment casting industry.

Tempo President Douglas Rogers notes the company's foam patterns can fulfill a particular need for investment casters, especially where wax patterns are large, heavy, and difficult to handle. He notes foam patterns offer the opportunity to produce large, near investment quality castings with net weights to 600 pounds without restrictions on section thickness.



Tempo's foam patterns have been used for complex applications, left. The Bollard Cap for the U.S. Capitol perimeter security, shows good cast detail in the Eagle emblem, right.

"Expanded polystyrene patterns typically weigh 90% less than a wax pattern and shell weights using this process are 30-50% less than standard investment shells," Rogers said.

Tempo's foam molded technology began in 1960 with cup production and has evolved to custom thin-wall molding today.

Tempo developed a thin wall molding technique known as "DRY molding. " Its first product was foam cups. Patents for this technique, which solved the problem of brittle molded parts, were granted in 1965. Tempo adapted DRY molding to numerous other product applications where a glazed surface finish is desired. The glazing process also results in good internal material fusion. Originally, this surface and material fusion met a "No-Leak" quality standard for foam cups. The company is one of the few remaining cup molders in the world to adapt cup molding techniques to serve modern engineered applications.

Tempo's smooth molded surface finish lends itself to patterns for rubber, ceramic and metal casting processes. The first pattern job was coremaking for cured hollow custom rubber "pillows" for nut tree harvesters to hold the tree trunk without damage during shaking. The foam core is removed with heat during the rubber curing process.

A variety of "direct-pour" lost foam pattern applications for aluminum truck mount brackets were Tempo's next efforts in patternmaking. Tempo's self contained mold design allows retracting cylinders and collapsible cores to be used in molding complex parts with no draft angle and undercuts.

In the 1980s, development efforts centered on producing steel castings without first removing the foam pattern. The U.S. Bureau of Mines in Albany, OR (now Department of Energy) worked with Tempo on two pioneering projects demonstrating success in "direct pour" steel castings with use of argon baths and vacuum pulled on the flask to reduce carbon pickup from the burning polystyrene.

New expandable bead materials to address the carbon pickup problem found a ready test molding site in Tempo equipment. The company has produced patterns with innovative new and developmental materials, and is capable of inserting soluble cores into the foam molding process to create internal passageways without gluing foam pieces together.

Armor retrofit for the Bradley fighting vehicle during the first Gulf war required a set of cast low allow steel bustles, with 60° angled thin webbing to deflect projectiles. Tempo delivered thin-wall patterns, which eliminated weld repair on the castings.

A number of U.S. steel foundries purchased the license from what is now Castings Technology International (CTI) in the 1990s, and Tempo built molding equipment to run the "open back" steamchest molds built by CTI. Patterns previously shipped from Sheffield, England were molded in the States to save considerable freight costs. For new parts, Tempo made self-contained molds to produce a variety of valve components for CF8 castings with no finish machining. These castings were made using the Ceramic Shell casting process. The CTI idea combines reduced ceramic shell with fluidized bed of sand for shell support allowing reduced process steps.

Ceramic shell casting method provides the opportunity to produce large near investment quality castings without section thickness restrictions. Ceramic cores may be set into foam patterns to create complex internal geometries and reducing dry times typically associated with complex parts.

Rogers noted reduced lead times for finished products can be attained because foam patterns are dimensionally stable at elevated temperatures. This means that heat and circulating air accelerate drying of ceramic in the shell building process. The autoclave step for wax pattern removal is eliminated by two-stage oven burnout of foam pattern.

Since shells are poured cold, increased thermal gradients produce high-integrity castings. The unique polymer binders used in the process break down more easily than typical investment ceramic, making castings easier to clean and virtually eliminating leaching. Foam patterns can also be molded complete on the ingate system, thus saving assembly labor.