Investment or lost wax casting

LMC-Couplings stainless steel cam & groove couplings and stainless steel cam & groove handles are produced using the investment casting process. The basic concept of investment casting is the creation of a sacrificial wax or plastic mould, which is then coated with refractory material to form the casting mould.

2000 years ago, the sacrificial mould was carved painstakingly from wax. Sprues and risers would be added to the wax mould to create a completely wax pattern, which would then be covered with clay or plaster, allowed to set, and baked. The baking process would melt the wax, leaving a one-time pattern in the plaster mould. Modern investment casting involves one more step. Skilled model makers create metal dies containing the primary patterns. Wax or plastic is then injected into these dies to create the wax pattern. Typically, the wax pattern contains many different patterns gated together by sprues and risers.

The wax pattern is then covered with a refractory material by dipping in ceramic slurry, or coating with refractory moulding material. The mould is then baked, and the wax or plastic allowed to drain out or vaporize. Molten metal is then poured into the mould.

Removing the cast metal from the mould is more difficult with investment casting than with other casting methods, because the mould material (typically refractory) is often resistant to removal. Chemicals, high-pressure water jet washing and sand blasting are some of the methods used to remove moulds.

Die casting

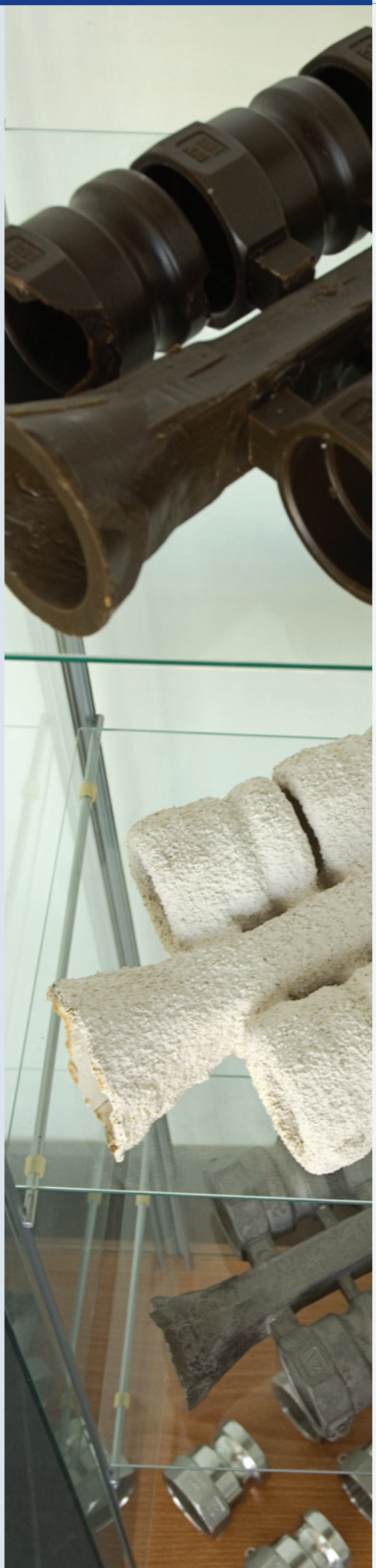
The basis of the method is to force molten metal into a reusable mould under high pressure. The metal then cools (often assisted by water cooling of the die), opened and the casting ejected.

Moulds for die-casting are quite complex, and are usually made from steel alloy in two sections (the cover and ejector). The die must be able to withstand high temperatures and pressures, and so is typically made from steel alloys containing chromium or tungsten. To increase die life and improve throughput, dies are normally cooled using water, air or nitrogen.

There are two major types of die-casting machines. Hot chamber die-casting machines are used for low melting point materials.

Aluminium, magnesium, brass and bronze die-castings are all produced using cold chamber machines. In cold chamber die-casting, the metal is fed from the holding furnace into a chamber, from where a plunger forces it into the die. Cold chamber machines are typically rather slower than hot chamber machines

Materials best-suited for die casting are zinc, aluminium, magnesium, copper, lead and tin. High pressure die-casting is generally limited to non-ferrous metals, due to the difficulty of making refractory moulds capable of withstanding the high temperatures and pressures involved.



Sand casting

Sand casting is used to produce brass, bronze and aluminium cam & groove couplings.
Sand casting is one of the most widely-used industrial casting processes, and is the technique used to produce over 90% of all metal castings. The process begins with the fabrication of a pattern of the finished component, which is often in two pieces due to the mould construction method. The pattern can be made from virtually any material, including wood, foam, clay and plastic.
The mould containing the sand is called a flask, and is in two pieces: the top (or cope) and the bottom (or drag) which is separated by the centre line. Holes called sprues are used to feed the molten metal into the flask, whilst holes called risers allow any air bubbles to escape. To begin the casting process, the flask is divided into its two parts.

The pattern is then inserted, and the flask reassembled. Sand is then packed very tightly around the pattern, the flask opened and the pattern removed. The sand imprint is checked carefully, and any additional risers and sprues added where necessary (if not included in the original pattern). The flask is then closed and molten metal poured into the sprues until it emerges from the risers.

Once the metal has cooled, the flask is broken open and the casting removed. The sand is cleaned and recycled for future casting operations.
The sprues and risers are removed and the part is cleaned.
Either 'green' sand (actually black in colour) or dry sand is used for the casting process. In green sand casting, the sand binder is kept moist with water, and the component is cast as quickly as possible after the pattern is removed. In dry sand casting, the binder is organic, and the mould is baked after the pattern is removed. Green sand casting is cheaper, but dry sand casting can achieve closer dimensional tolerances.
A baked sand core is inserted into the mould after the pattern has been removed in order to create a hollow casting. The core is then destroyed and removed after casting to leave a hollow component.

Drop forging

A heated work piece is formed by the rapid closing of a punch and die, forcing the work piece to conform to a die cavity. A work piece may be forged by a series of punch and die operations (or by several cavities in the same die) which gradually change its shape. The structure of the basic material remains intact, which means that drop-forged components retain excellent mechanical properties, like LMC-Couplings TW couplings in brass. Forged components are highly elastic, ductile and very strong. As a result, components are not brittle and, when subject to sudden overload do not break, but reduce maximum tension through plastic flow off without imposing unreasonable loads. These already-excellent mechanical properties can be further improved by heat treatment. This production method creates components that are very well-suited to subsequent machining operations.