

Pattern Design and Manufacture

WHAT IS PATTERN MAKING?

In casting, a pattern is a replica of the object to be cast, used to prepare the cavity into which molten material will be poured during the casting process.

DESIGN AND MANUFACTURE OF A PATTERN

The master pattern is usually made as an exact replica of the article required and a number of production moulds are formed from it. Unfortunately patterns made from wood, Plaster of Paris, etc. tend to be fragile and if the number of production moulds required is large, may not last long enough. There are also problems in storage due to warpage and shrinkage, etc., so that when it becomes necessary to manufacture new production moulds from the pattern they may not be dimensionally correct.

These two problems can be overcome by making the master pattern the reverse of the required article and manufacturing from this a master mould of robust construction. From this master mould the production moulds are made as required.

THE MANUFACTURE OF A MASTER MOULD OR PRODUCTION MOULD FROM THE MASTER PATTERN

At this stage the following points must be stressed

- i) **The quality of finish of the final article depends upon the surface finish of the pattern**
- ii) **Good mould making is a slow and careful process. Attempts at short cuts usually lead to an inferior product**

Before the master pattern can be laminated on, it has to be given a surface coating of wax to act as a barrier between pattern and mould to effect a good release or separation when required. The application of the wax coating is very critical. A common mistake is not letting the precious layer of wax harden sufficiently before the application of the next layer (specific times as per manufacturer's instructions).

This results in 5 or 6 coats of semi-hard wax with a hard outer layer. This will give good mouldings and good release for a while, but eventually styrene from the gelcoat could migrate through the layers of wax and cause sticking problems and dulling of the surface finish. The application of a Polyvinyl Alcohol (PVA) release film is often used as a secondary release barrier on top of the wax coating for production runs, but this is not recommended for the pattern.

However carefully the liquid PVA is applied whether by brush, cloth or sponge, upon drying brush marks or streaks can appear thus lowering the quality of surface finish. These marks are, of course, transferred to the moulds and hence from the moulds to production articles. It is far better to rely upon an effective wax barrier using a fresh top layer for every subsequent mould taken from the pattern.

The stage has now been reached where the construction of the mould upon the pattern can take place and a fundamental decision has to be taken, i.e., once the mould has been fabricated could we physically separate the two components.

For example the answer to the above question for pattern profiles (A & B) would be Yes and No respectively. Shape B is said to be undercut and requires the use of a two piece or split moulding as below in C with a flange at 'x'. If there is more than one undercut there will have to be a split for each undercut.

LAMINATING TECHNIQUES

Consider a simple open mould for hand lay up or spray up, a trough or drainage channel made with a profile similar to shape C Which requires the use of a split moulding. The techniques will of course, apply to a simple one piece moulding. It is recommended that experience is gained with simple moulds before split moulds are attempted. The presence of an undercut is not the only reason why a split moulding is required, eg. if large surface areas are involved, the separation of product and mould may be difficult and also the mould will be very heavy. An 11ft dinghy mould, for example, will probably be split along the keel (where the join will not show) both for ease of handling of the mould and easy product release.

Before laminating a split mould such as (i) a flange must be made along the split line x---x. This could take the form of a sheet of thick self adhesive pattern makers wax applied as shown in (ii). The sheet wax (6mm thick minimum) is placed adhesive side down and pressed firmly down extending past the moulding say 5cm depending on the dimensions of pattern.

The pattern should have been made larger than required along x---x and y---z. The mould will therefore be larger along these dimension than required and so will the subsequent production articles which can be trimmed back to size with a cutting tool thus giving neat even edges. Very often a trim line is scribed on the production mould or patterns themselves which results in a line being transferred onto the products as a trimming guide. Lamination of the area x---x to z---z can now commence via the following stages.

Cover the area of pattern not being laminated on (y-x) with a layer of PVA release agent. This can be washed off later and in the meantime will help protect the pattern from accidental spillage of resin etc.

Turn the pattern round and support in a jig so that area x is uppermost, with the wax sheet supported.