Ejector positioning

Tampere University of Technology – Tuula Höök

Ejectors are mould and die components with which the casting is extracted from the cavity. Ejector places leave round, rectangular or similar clearly visible marks to the casting surface. For this reason the side of the casting, from which the ejection takes place, should be non-visible in the final product. This sets some challenges. See the images below and next page.

Image 1. It is important to place the part to the mould so that it will fasten to the ejection side. This situation occurs when the core side of the part model is towards the ejection side and the cavity side towards the fixed side of the mould. Moulded part shrinks around the core and fastens it to the ejection side. In this part there is a clear distinction between the hidden and visible surfaces and also clear core and cavity sides.

Image 2. Flat moldings may cause some trouble, but usually there are at least some core surfaces. In this part, the visible surface would be the best surface to face towards the ejectors because of the chamfered screw holes. If the ejector marks are not allowed on the visible surface, there will be only a very small core surface to use for fastening in the ejection side. Plastic mould maker can use pulling ejectors or some other similar technique, but HPDC die maker does not have this option.

Image 3. Cores from both sides. This option leaves the visible surface with nice and smooth surface, but the cores in the ejection side are very small and may cause trouble. It is possible that the part does not fasten properly. If there is automation in use, it is very important that the part is in the right place each time the die opens. If the part is just dropped through the machine, fastening is not a very important issue.
Selecting the core and cavity side and also the placing of the fixed cores has an influence on rounding the moulded part edges. Mould cavity inner corners - including the bottom edges of the fixed cores - must have at least small rounding, because there is no easily adopted machining method with which it would be possible to produce sharp corners to the mould or die cavity. Die sink EDM method produces a small corner radius and a milling cutter a little larger corner radius.

Image 4. Ejection and fixed halves of a part with which it was necessary to place the parting surface in the middle of the part. With this arrangement there are rounded corners in the visible side of the casting and cores to fasten the part to the ejection side on the other side. Each core has a rounded bottom edge. The core pin in the fixed half of the mould is an exception. There are no rounded corners in the core pin, because it is a separate part. It is not machined directly to the mould plates.

It is important to place the ejectors to avoid distortion and to improve the part release. Typical places to place ejectors are (See also images.):

- on top of the cooling or strengthening ribs
- either near outside of a small core or on top of a small core
- on the sides of large flat surfaces
- on top of large area core near the sides
- not in the middle of large surfaces

Image 5. Ejecting a ribbed part with blade ejectors. Best place for ejectors are on top of the ribs. Sometimes it is necessary to follow the rib shapes to hide the ejection marks. Blade ejectors are over ten times more expensive than common round ejector pins. Ejectors are wearing parts that need constant replacement. If possible design the structure shown in the next image.
Image 6. Bosses to place round ejectors to top of the ribs. With this structure it is also possible to avoid trimming ejector heads.

Image 7. Ejectors around core pins, around high shapes and in the sides of large flat areas.

Image 8. One half of the molded part. Ejector positioning relative to the part shapes.

The idea is to make sure that each part of the casting or moulded part surface releases from the cavity surface exactly at the same time. Some plastic materials are flexible and the distortion is reversible. In some cases it is possible to take advantage of this quality. For example it is possible to eject parts with snap fit system without any moving core mechanisms.

HPDC materials are not flexible. If the part distorts, the distortion is final. In some cases it is possible to fix the problem with badly placed ejectors by extending the solidification time, but it may cause different problems. The part shrinkage increases with increased solidification time and the ejection may need more force.

It is possible to place ejectors both on flat surfaces and on shaped surfaces. The cheapest and easiest option is to use as many flat surfaces as there are available. Trimming the ejector heads to follow non-flat mould cavity surfaces is more expensive than just cutting the ejectors. (See image next page.)
There are different shape ejectors. The cheapest and most common type is round. Another common, but more expensive type is flat rectangular ejector. These are commonly used on top of ribs if ejection bosses are not allowed. If there is a need to hide ejection marks as invisible as possible or solve some special ejection problems, the designer may select a sleeve ejector or ejection plate. The cost of these different ejector types is approximately the following:

- Common round ejector 3 mm x 200 mm, 3 euros
- Blade ejector, 7.5 mm x 2 mm x 200 mm, 40 euros
- Sleeve ejector, inner diameter 3 mm, length 150 mm, 50 euros

Common round ejectors are cheap, easiest to manufacture and assemble and easily maintained. They should always be the first choice and any other option only the second choice.