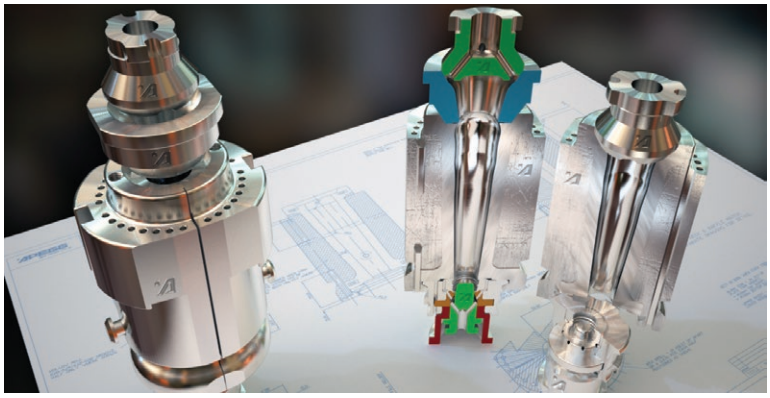
Mould equipment life - A vital topic

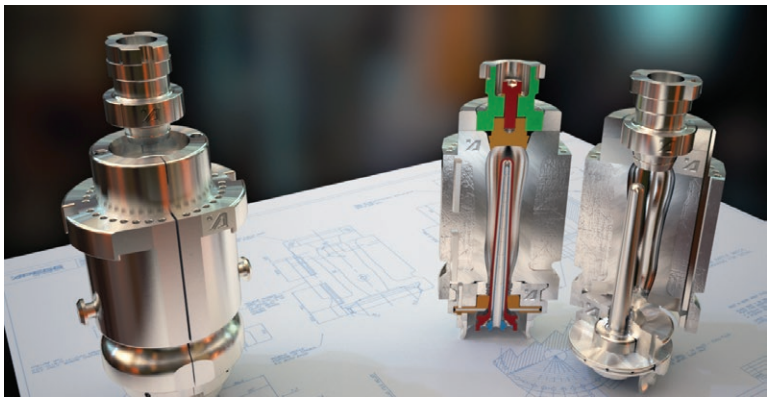
Is mould equipment really cared for and do glassmakers really achieve the maximum benefits for the investment made? How often is mould equipment just seen lying around the factory or being used as doorstoppers or weights? Mould equipment must be treated like the 'crown jewels', not just a piece of metal, says Barry Holstead.

Like any other piece of equipment or machinery, mould equipment has a specific purpose, which is to produce as many high quality containers as possible. Mould equipment is often overlooked when it comes to manufacturing and investment costs, however.

The initial cost of this equipment, along with ongoing maintenance and repair costs, significantly adds to the overall manufacturing cost of each container produced. In addition, the actual condition of the mould equipment used is directly reflected in the final quality of the glass container delivered to the customer. It must always be remembered that without good quality mould equipment, there will be no good quality glass containers. Surely, this fact alone should beg the question 'How is the equipment actually designed, manufactured, used, repaired and stored?'



Blow-blow (BB) blank side equipment.



Narrow-neck-press-and-blow (NNPB) blank side equipment.

THE DESIGN

Starting at the beginning of a glass container's life, a set of mould equipment can be designed once the specification drawing for a container has been made and agreed. The mould design engineer, production specialist and container designer should all work closely together when a container is designed. This ensures that all factors are taken into account and a quality container can be manufactured. Obvious questions need to be considered, such as 'Will the mould equipment fit onto the forming machine?' and 'Does the mould design actually meet the new container specification?'

A typical mould set contains 12 different parts per cavity (for each container). All of these parts must work together harmoniously in order to produce a good container.

A successful set of mould equipment should be designed to a 'design standard', with additional consideration given to the particular plant and/or forming machine in question.

Working to a 'design standard' ensures conformity of the detail drawings. This helps with the manufacture of the equipment and aids the ease of repairability, all of which contributes to the impact of the mould life and container quality.

Typical design mistakes include:

- Engraving on the base centre of an NNPB produced container, ie in a similar manner to that of a BB produced container. As NNPB is just another form of PB, it is important to remember that base scanning is of paramount importance.
- Undercutting or wrong placement of engraving, which can cause quality issues and a reduction in equipment lifetime.
- Insufficient height of the 'heel in sweep', which can lead to contact and scuffing of the engraving on the finished container.
- Hot seams are often caused through incorrect mould design, which can create sunken seams or thin glass around the seam area.

Mould side equipment.

- Tapered mould bottom plates or tapered guide plates are good in theory for alignment and release. In practice, however, this can cause glass defects (prominent seams) due to rolled edges on the matching seams.
- Thin sections on moulds should be avoided wherever possible, in order to reduce hot spots and thermal shock.

These examples show how quickly errors can be designed into the equipment, which result in reduced mould life, increased costs through excessive repair and unwanted glass defects. Set 'design standards' eliminate mistakes from the first day of production; this improves mould life and ensures improved production quality.

The mould design process takes time and is often underestimated. When a new container concept is developed, a date for the product launch is normally fixed. If the project is mismanaged from the beginning, however, errors and unnecessary mistakes can occur. This can reduce the timescale for mould design, mould manufacture and production, which causes additional pressures and added costs.

MOULD MANUFACTURER

The mould manufacturer must follow the mould design drawings exactly. Choosing the correct mould material also plays an important part of mould life. By selecting the correct grade material for each piece of mould equipment, its life can be extended by a substantial amount.

USAGE

Forming machines are often not set correctly, which causes interference of mould equipment parts. This quite quickly causes component damage and glass defects. An example of this is 'sticking guide plates'. When this happens, it is common for the production department to complain to the mould shop and ask for equipment modifications to be performed, when really it is the machine set up that needs attention. This generates additional unnecessary work for the mould department and starts a decline in the equipment's life span. Incorrect machine settings can greatly reduce the life of mould equipment.

Excessive doping of mould equipment is another reason for its deterioration. Too much dope can become burnt onto critical areas that reduce operating tolerances of the precision-machined mould equipment, invariably causing crossed joints and seams. The removal of 'burnt-on' dope in the mould repair shop also reduces mould life, which ultimately increases production costs.

If mould equipment is exposed to excessive heat - either in the repair workshop or on the production machine - the mould material will quickly deteriorate, reducing its lifetime.

JOB CHANGES - A MOULD EQUIPMENT KILLER

A great deal of damage to mould equipment can take place during the job change. The greatest amount of mould damage occurs when equipment is being removed from the forming machine at the end of the production run. The equipment is hot and dirty and is usually difficult to handle. Even in these difficult situations, the mould equipment must be treated with respect; mishandling can cause damage.

More damage to mould equipment occurs at a job change than during the whole of the job run!

REPAIR

Reduced mould life can occur as a result of obsessive cleaning and polishing, especially when the material is cast iron. Cast iron is a very heavy but relatively soft material and prolonged or heavy repair to localised areas will destroy the cavity and edges, which again will incur further repair. If Colmonoy welded seams are used, over-polishing along the seam area will cause undercutting and a step will be created between the cavity and the seam. This can be seen on the finished article as 'tram lines'.

The only area on a blank or blow mould that should show any sign of polishing is where the seam has been repaired; no other area needs to be polished. Blanks are usually precoated prior to production, so polishing is unnecessary.

Using the wrong cleaning material, or incorrect abrasive powders and cloths, also reduces mould life and causes more damage rather than helping to fix a problem. The amount of time equipment spends in cleaning machines, often with the wrong cleaning chemicals, also causes damage and reduces the life of the mould equipment.

Mould equipment must be stored correctly to avoid mechanical damage and keep dust and rust away.

Mould life is influenced by many factors that at first may seem difficult to understand or comprehend. However, if standards are adopted and care is applied, some great results can actually be achieved.

APEGG believes that mould equipment deserves more attention, not just because there are many hidden costs but also because mould equipment has such a strong impact on the overall quality of the container. Having read this article, it is hoped that glassmakers will look at mould equipment through different eyes; it is more than just a piece of metal - it is the 'crown jewels'. ■

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