

changing gap provides stress relief in the melt which, in turn, has a beneficial effect on die swell and the weight of the parison. The total included angle of the die should not exceed 40 degrees.

The trumpet die enables production of large, thin parisons, particularly suitable for blowing from below.

Parison Programming

Most blow moulded products have varying cross section which leads to varying stretching of a uniformly thick parison. Consequently, the wall thickness of the product is less at sections of higher stretching and vice versa. A product with varying wall thickness is prone to be weaker at thinner points. It also suffers from internal stresses due to uneven shrinkage. The remedy is to make a sectional adjustment in the wall thickness of the parison according to the degree of expansion.

All modern blow moulding machines are equipped with the so-called system of parison control, that is, of varying the thickness of a parison at predetermined junctures during extrusion. It consists of an arrangement to change the position of the core with respect to that of the die, usually with the help of a pneumatic cylinder, regulated electronically (Fig.12.4). With the dies and cores as described before, this leads to an increase or decrease of the annular gap between the two, which determines the thickness of the parison.

The method varies the parison thickness around the circumference at predetermined sections and is quite effective with round, symmetrical containers. But oval or unsymmetrical objects require thicker walls on one or more sides longitudinally. Several methods have been developed to this end.

a) Die Profiling

The orifice of the die is widened at required points to increase

along, the dynamic ring is manipulated during the extrusion so that the wall thickness is influenced only on predetermined sections.

In conclusion, it may be remarked that the standard method of parison programming viz. The relative axial movement of the core with respect to the die can be coupled with all other systems described above.

Material for Dies and Cores

Dies and cores for non-corrosive materials are generally fabricated out of prehardened steels like P 20. This facilitates minor alterations and profiling. These can be hard chrome-plated for corrosive polymers such as PVC and POM etc. However, it is preferred to employ hardenable stainless steels for longer life.

Case hardening steels must be used for dies and cores when the plastics being processed contains abrasive additives.

All surfaces coming in contact with the melt must be smooth, free of machining marks and well polished.

The die swell

A very important but elusive feature, which influences the size of the parison besides the dimensions of the die and core, is the die swell. Macromolecules of the visco-elastic melt, being forced through the cross head and subsequently through the annular gap between the die and the core, get oriented in the direction of flow and experiences stress relief as it emerges. The molecules tend to revert to their initial state, causing expansion. Consequently, the diameter of the parison is bigger than the bore in the die. As the parison gains in length, its own weight exerts a pull on it, which decreases its diameter. In extreme cases, where the length of the parison and its weight exceed a certain limit and the parison is left sagging for long, the pull exerted by the weight of the hanging parison may result in “necking”, decreasing the diameter and the wall thickness of the

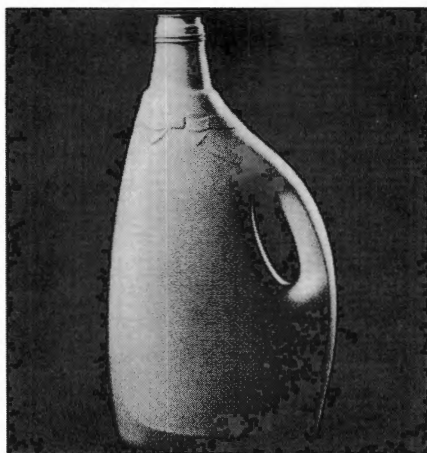


Fig. 16.7.

harmony with the shape of the product (Fig. 16.7). The walls of the handle vertical to the parting line must be sufficiently tapered to facilitate ejection. The whole section of the handle should be generously rounded. It will, of course, be obvious that such handles have to be located symmetrically about the mould parting line.

Large drums generally require handling devices on two sides, diametrically opposite to each other. For occasional lifting, shell shaped depressions on walls suffice. (Fig. 16.8). Unless they must be situated opposite to the parting line of the mould, the proper location for depression on the walls with undercuts is the mould parting line as the demoulding can be accomplished without additional devices.

Should it be necessary to provide separate plastics or metallic handles, solid lugs to fix the handles can be blow-moulded integrally. These lugs, situated on the mould-parting line can be twice as thick as the parison. It is obvious that the parison has to be sufficiently large to cover the lugs unless the part of the container having the lugs has been narrowed down. With

A base, domed inwards, provides not only a firm stand to round containers but proves instrumental in releasing the stresses also. The concavity should start right after the corner radius. The camber height depends upon the diameter and volume of the container, wall thickness, stiffness and shrinkage of the material. A height of 1,5-2,5 mm. is quite common for bottles of upto 1 litre capacity (Fig. 16.11).

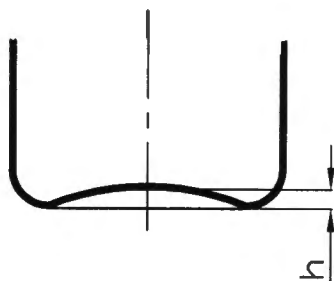


Fig. 16.11.

A roof shaped base serves the same purpose, but is generally employed for rectangular containers (Fig. 16.12). Here again, the camber height is decided by the factors mentioned already. For a 5 litre can, the following figures can be taken as guide values: flexible materials, 4-8 mm., semi-rigid materials, 3-6 mm. and rigid materials, 2-4 mm.

Camber heights exceeding these values pose difficulties during ejection. The base insert with the dome forms an undercut,

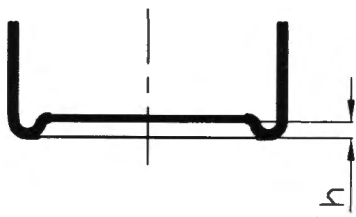


Fig. 16.12.