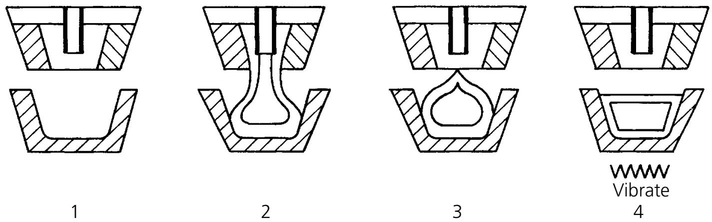

Figure 15.13 Schematic diagram of the principles of "single-shot" depositors.

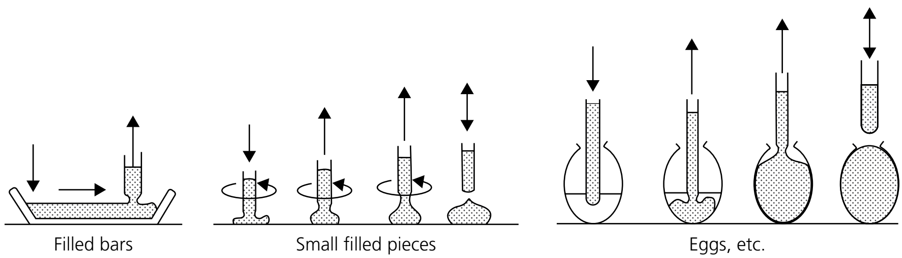

Figure 15.14 Illustration of some of the moulds used with "single-shot" depositors.

bars and egg shapes. The product is then cooled and demoulded ready for wrapping. Egg shaped products can be made by depositing into a book mould, that is one which consists of two moulds which are hinged at one edge (Chapter 14). The hinges open to release the product once the chocolate has set.

This process is obviously much quicker than the traditional process, with the whole product being formed in one depositing action, hence the name *single-shot*. Its big advantage is that it can greatly extend the range of products which can be produced on a standard moulding line at a low cost compared with a shell plant.

This principle was taken even further by Cadbury Ltd., who developed a triple-nozzle version to produced a double centre sweet, for example jam (jelly) inside fondant, surrounded by chocolate. The German company Winkler and Dünnebier has since produced a triple-shot machine for putting two centres into praline shells (Anon., 2005). The Awema company have taken this one stage further to produce a four-shot (Quadro) depositor. By using a mechanical nozzle plate and the specially designed hopper dividers, it is possible to produce products with two fillings in two component shells, as shown in Figure 15.15. The viscosity of the two fillings can be different.

15.6.3 Limitations of single shot depositing

15.6.3.1 Temperature of depositing

The process needs the temperature of the centre to be no higher than that of the enclosing tempered chocolate. If it is, the chocolate will detemper resulting in slow setting and poor contraction during manufacture and give a poor-textured, easily bloomed product. The actual temperature will depend upon the type of

Figure 15.15 Chocolate products with two components in the centre and shell (Awema A.G., Switzerland).

chocolate used, in particular its fat phase. In practice this is higher for dark chocolate at about 33–36 °C (91–97 °F) than for milk chocolate, which will be in the range 28–31 °C (82–88 °F). It is possible to have a temperature towards the top of this range by using a harder cocoa butter, for example one from Malaysia rather than one from Brazil. In milk chocolate the lower the proportion of dairy butter, the higher will be the tempered chocolate temperature, which then allows for a warmer centre material. Where it is possible to use vegetable fat in chocolate or for coatings, a high melting point cocoa butter equivalent fat (see Chapter 7; sometimes known as a cocoa butter improver) can be used to raise the operating temperature by a few degrees. Even this, however, is not enough for the process to be used to make hard toffee centres, as the toffee would require much higher temperatures to be able to flow at the correct rate through the central depositor. These sweets require a shell moulding or enrobing plant.

15.6.3.2 Matching viscosities of the chocolate and centre

The process operates best when the centre viscosity and density match as closely as possible those of the tempered chocolate, which surrounds it. The chocolate viscosity can be increased by lowering the temperature and/or increasing the temper. Typical Casson plastic viscosities lay in the range 10–80 Pa.s (100–800 Poise). Mechanically operated cam systems required very good viscosity matching, but programmable electronically controlled machines can tolerate bigger differences between the two (Watson, 1997).

15.6.3.3 Size of inclusions

The centre has to be forced through the inner depositing channel. Although it is normally possible to include small pieces, such as bits of nuts, the process cannot be used with whole nuts, cherries, raisins and so on. Even small pieces can cause the central channel to be blocked or break the outer chocolate "skin".