



Figure 15.24 Schematic diagram of the operation of mouldless plant (Aasted, Denmark).
 (a) Deposit of chocolate on biscuit. (b) Cold pressing. (c) Removal of cold press.

15.8.4.4 The need for additional cooling for the cone/plunger

Additional cooling carries additional costs.

15.8.4.5 Possible difficulties with some larger products

Kniel (1997) indicated that Chocolat Frey had had difficulty in producing equal thickness edges when producing 100 g (3.5 oz) filled tablets.

15.8.4.6 Possible difficulties with some smaller products

For some systems the number of mould impressions is limited by the pitch of the tooling. Therefore it may not be economical to produce small products using this technology.

15.8.5 Cold forming variants

15.8.5.1 "Mouldless" system

With this technology the chocolate is deposited directly onto an existing steel or plastic belt line or onto other components such as biscuits, nuts, raisins and so on. A cold shaped pressing tool then descends upon the chocolate and moulds and sets it into the required shape (Figure 15.24). The tool can be made with a wide variety of shapes and designs and is able to put a high definition image onto the chocolate. All pistons are mounted individually and can be exchanged, so that different shaped articles can be made in one pressing operation.

The Aasted Company in Denmark make this system under the name FrozenConeMouldless™. It is relatively easy to fit such units to existing plant. The production speed can be high; the factory of the Danish manufacturer Carletti has two pressing devices, each with 75 closely arranged plungers. This plant produces 63 750 moulded 4 g (0.14 oz) articles per hour. The pressing time in each stroke is below 1 s. The chocolate is reported (Aasted, 2007) to be in Form V and so gives good bloom resistance.

15.8.5.2 Solidification on plunger

Chocotech GmbH manufactures a mouldless cold forming system which they market as Frozenshell®. A chilled former is dipped into a bath of tempered, liquid chocolate where a thin layer solidifies around the former. The former is removed and positioned over a conveyor belt before the shell is ejected from the former by air blowing through small holes in the former face. The system has the advantage over conventional cold forming of only having one forming part and so should be cheaper to purchase and easier to set up. It is, however, relatively slow and weight control, which is achieved by varying the time the former spends in the chocolate bath, is less accurate than with other systems.

15.9 Paste conching

Conventional conching (Chapter 10) is carried out on the (almost) complete chocolate mass following refining; but the last few years have seen several equipment manufacturers offer paste conching: a vigorous mixing of the raw ingredients prior to particle size reduction. Treatment of the mixture at this stage has several advantages:

- The process can be carried out at relatively low fat contents, making volatile and moisture removal much easier.
- The process can operate at relatively high temperatures, above the glass transition temperature, to crystallise the lactose in any milk powder used, as described in the Hershey (2003) patent. In conventional conching this would give rise to “grits” but this is not a problem here as the mass will subsequently be refined.
- The equipment can be designed specifically for this high-shear mixing operation rather than all three phases of conching (dry, pasty and liquid).

Such a process can only replace the “dry phase” of conching and a final liquefaction stage is still required; but this is a relatively simple mixing process and, again, the equipment can be designed specifically for this function. Some companies, for example Netzsch in their ChocoEasy™ process, include paste conching from necessity, as dry conching of a low viscosity mass emerging from a ball mill is clearly impossible. Others, such as Lipp Mischtechnik in their ECO2-CHOC®, make a feature of the reduced plant size and energy consumption that the process requires.

Conclusions

The chocolate industry is relatively young; eating chocolate has only been available for 150 years or so and might be considered a novel food. Even so, much of the basic technology was established in the first 100 years and most of