

optimize the deposit are the depositing speed and suck-back (pistons are slightly pulled back at the end of a deposit cycle to create a suction effect that helps in avoiding tailing and dripping of chocolate outside the mould cavities).

Many modern depositors can be slid away from the line to allow cleaning, whilst the line itself is still running, resulting in a significant reduction in down-time during changeovers. Other improvements are the development of quick-changeover kits where not only the depositor plates are easily interchangeable, but also the whole piston block can be easily and quickly replaced with spare units that have the required special size pistons (Roncato, 2011).

14.2.5 Adding inclusions

Depending on the type of product, the depositing plate can be designed for spot depositing (also called point depositing) or ribbon depositing. In spot depositing, small-diameter nozzles are generally fitted to a depositor plate for dosing liquids, whether it is chocolate or a product centre. There can be one nozzle or multiple nozzles per cavity depending on the size of the cavity. However, this approach does not work when there are inclusions, such as nut pieces or crispies (cereals) mixed into the liquid masse. In this case ribbon depositing is the preferred choice where instead of nozzles the depositor plate has long narrow openings that cover almost the width of the cavity. The openings must be large enough to let two inclusions travel through side by side. If the inclusion is 3 mm (0.1 in) long then the outlet needs to be at least 6–8 mm (0.25–0.3 in) diameter. With such a large opening dripping can occur, so a shut-off knife or valve is usually fitted to the underside of the depositor plate to physically close the outlet after depositing is completed.

Figure 14.6 shows a typical worm conveyor/mixer for inclusions, which can be mounted on a swivel to allow for cleaning whilst the plant continues to run.



Figure 14.6 Screw mixer conveyor system. Source: Aasted. Reproduced with permission of Aasted Denmark.

Alternatively double hopper systems make it possible to change very easily between different types of inclusions. There are in fact many machines that can be used to add nuts and fruit accurately. With all of them however accurate weighing, good temperature control and homogeneous mixing mean better weight control. Adding inclusions to the chocolate in a mixer before pumping to the depositor hopper gives a more homogeneous result and allows better deposit and weight control.

Defects from incorrectly adding inclusions include:

- Grey marks over inclusions: due to poor temper or inclusions being too warm.
- Badly shaped bars: inclusions should ideally be near to the temperature of the chocolate, and should at least be stored in a warm room for several hours before use.
- Poor weight control: non-homogeneous mixing either of inclusions with chocolate or, if using more than one inclusion, of the inclusions themselves.

14.2.6 Removal of air bubbles

Air bubbles can spoil the appearance of a chocolate tablet and in extreme circumstances may give rise to weight variations. They can be minimised by choosing the correct mould temperature prior to depositing. Some mould designs will inherently trap bubbles, and this must be addressed during their design.

It is important to begin vibrating to remove trapped air bubbles as quickly as possible after the chocolate is deposited into the moulds. Most vibrators act vertically; the mould is pushed a set distance (amplitude) at a given frequency by an eccentric cam or an air cylinder. Ideally both the frequency and amplitude should be adjustable. Particular attention should be paid to one-shot deposited products or products with inclusions, as excessive vertical vibration could push the centre or inclusion towards the bottom of the piece.

Horizontal vibration can be used to spread a small amount of chocolate over a large distance in a thin piece. Orbital shaking is a special application used to ensure even coverage of a chocolate shell during traditional shelling method, once the mould has been inverted.

Vibrating times should be a minimum of 30 s and are ideally 55–60 s. The moulds must make sufficient contact with the shaker rails to allow effective transfer of energy between the two: if they are not well restrained, they will bounce and little energy will transfer.

14.2.7 Shell forming

In the traditional method of forming a shell, that will later be filled and backed off, the mould cavities are filled almost to the top, the moulds are vibrated to remove air bubbles and are then inverted. The inverted moulds are vibrated immediately to drain out all but a thin shell of chocolate. The drained chocolate is pumped back to the feed tank to undergo the de-tempering, tempering and depositing cycle again. The viscosity of the masse must be controlled so as to make