airflow require a much higher temperature differential and this can result in condensation inside the cooler, which could lead to sugar bloom and, in extreme cases, can cause moulds to start to grow on the chocolate surface. All coolers require some sort of periodic defrosting unless supplied with dehumidified air. Traditionally this has been done during shift changes or during a forced stop for the purpose. Some more modern units are equipped with hot-gas defrosting systems, which can defrost the coils without production being interrupted.

The position of the air temperature control probes in a cooler should also be checked. To give the correct value, they must be fully in the airflow they control and in a position that is not affected by outside conditions, that is adjacent hot rooms or strong sunlight. Older coolers and those moved around at various times are prone to suffer from this problem. Check where the cooling air is drawn from and ensure that it is not from a humid or hot zone, nor from a process area with strong aromas as these can taint the products.

14.2.10.3 Cooler layouts

Single-level coolers with a residence time of 15–20 min are adequate for most enrobed products (see Section 14.3.12), but would be impracticably long for larger moulded products which require much longer cooling times. This has led to multi-level designs which are used in most moulding and shell plants (Figure 14.9). The multi-level (or multi-tier) coolers are designed where moulds enter from one side and in groups are raised to the top of the tower and then lowered to the bottom on the other side towards the exit. The different temperature zones in the cooler are maintained by having several chillers with separate control and by controlling the airflow with a variety of guides, baffles and so on.

All tiered coolers require turning points or star wheels to guide the moulds and keep them upright as they are conveyed into the next layer. Such mechanisms are frequently a cause of jams and so need to be regularly cleaned and carefully maintained.

Other multi-tier cooler designs are in the form of a spiral (Knobel, 2014). These allow the use of loose moulds with no attachments and are claimed to provide a jam-free transportation and better temperature control for the individual moulds, since every single mould travels exactly the same path.

14.2.10.4 Cooling of compound coatings

Non-cocoa butter-based systems can be cooled at faster cooling rates because their polymorphism is less complex. Here the constraint is to avoid cooling into a glassy amorphous state or having water condensation at the exit of the tunnel (see Chapter 19). Lauric coatings require shock cooling in the tunnel with very low entry and middle zone temperatures, typically about 6–8 °C (43–46 °F). This ensures that small crystals are produced to enhance the gloss of the coating and to provide sufficient contraction for easy demoulding. Advice for non-lauric coatings varies, with some recommendations being to shock cool as in lauric

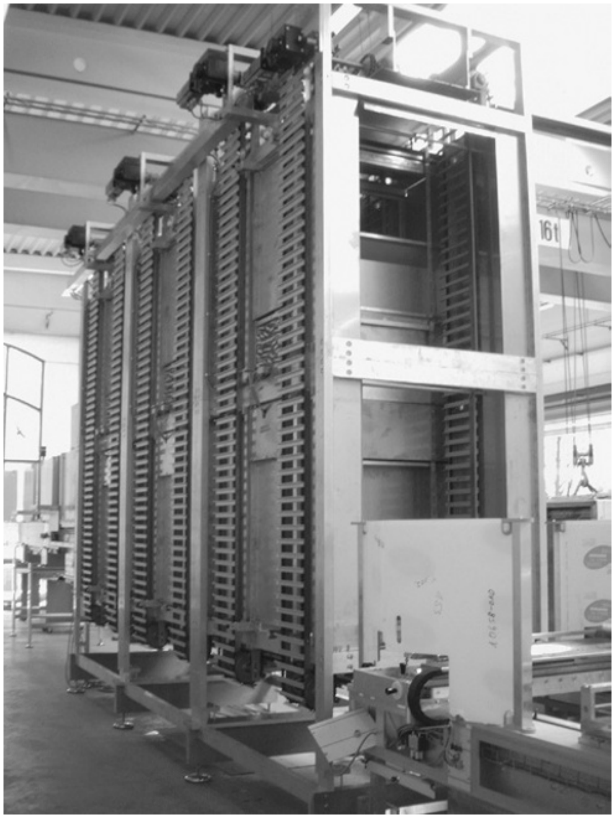

Figure 14.9 Multi-tier cooler.

coatings and others being to follow the more gentle type of cooling given to chocolate. Talbot (2009) recommends temperatures in between that of chocolate and lauric coatings (an entry temperature of about 12 °C (54 °F) and a middle zone of about 8–10 °C (46–50 °F) to provide a good compromise between crystallisation speed and good gloss.

14.2.11 Demoulding

If tempering and cooling have been optimised, then demoulding is a minor part of the process, with good quality product cleanly leaving moulds that are returned to the start of the process. As any user can testify, life is not always that simple!

A small amount of force is normally needed to part the product from the mould and this is usually supplied by a hammer, possibly aided by a mechanism that twists the moulds. The product is demoulded onto either plaques or a belt, depending on subsequent packing arrangements. Detectors are available to identify moulds containing sticking sweets (see Figure 14.10).