

into the bowls and has a high thermal conductivity, giving excellent heat transfer. On the other hand, it can act as a catalyst in promoting fat oxidation and will react with some of the more acidic coatings. Shapes range from almost disk-like, with large diameter to depth ratio, which is ideal for sugar coating with its deep bed, to elongated tulip-shaped pans, which are preferred for chocolate coating applications. Tulip pans, as they are called, have a relatively larger load capacity, in spite of having little mechanical friction against the back wall and a relative shallow bed depth. Engrossing pans should be smooth on the inside to avoid pockets where product can easily stick and build up. If the product is expected to slide, as it should towards the end of the polishing cycle, then a ribbed pan must be used to assist the product to roll. The angle of the shaft is normally between 18° and 22° to the horizontal, depending upon the relative amounts of mixing action and friction that are required. Pan turning speed is normally in the range 20–28 rpm. The actual speed is dictated by the pan size and the desired peripheral speed. As a guideline, the product should be about three-quarters of the way up on the pan wall. Foot-operated start and stop switches are very beneficial, because they give the operator easy manipulation of the product during start-up and unloading.

Belt coaters are based on an endless slate or wire belt. The pocket for the product is created with the help of two large disks on both sides (Figure 16.3). This type of coater is very easy to use and can be equipped with computer controls. Their open design makes them very easy to load and unload. Unloading is performed by simply reversing the belt and the product is discharged into any means of transportation available. Large dropping doors isolate the process from the room environment. The product pieces tumble well, although there is very little lateral mixing. These systems are relatively inexpensive, have a short process time and are ideal for the medium-sized production plant. Several pan manufacturers have recently also marketed belt coaters.

Automatic panning systems have been built for large capacity production facilities (see Adele, 2005). These machines can contain up to 3 t (6600 lb) per charge and several configurations are available (see Figure 16.4). The

Figure 16.3 Schematic diagram of Belt coater.

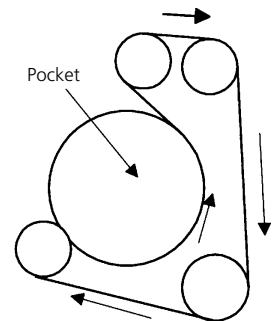




Figure 16.4 Drum coating machine for chocolate coating, polishing and varnishing. Reproduced by permission of Dumoulin.

manufacturer should be fully informed about the intended product to be produced on the machines, in order to obtain a well tailored piece of equipment.

The drum diameter can range from 1.5 to 2.0 m (5.0–6.5 ft), with the load capacity being controlled by changing the drum depth. (Wider diameters relatively reduce the product's exposure to spray and to the air.) Baffles are used to move the product backwards and forwards to get an even mix and counteract the regional variances resulting from localised spray systems, powder applicators and air supplies. As the drums grow in length, however, it becomes an engineering challenge to build manifolds supplying >40 spray nozzles and to ensure that each supplies the same amount of fluid.

Two drum types are available: solid drums with all the auxiliaries entering from the back (opposite end from the operator) and perforated drums (side vented), where the air enters from the drum sides and is pushed through the product bed. Perforated drums work well with a process where evaporation takes place, for example sugar coating. Loading, unloading and the coating process can be controlled by a programmable logic controller, and minimal supervision is required. All pan manufacturers offer automated cleaning systems (clean in place). Being self-contained, automatic panning systems are virtually independent of the panning room's atmospheric conditions. Such fully automated systems remain, however, very expensive.

The names and addresses of some of the manufacturers who are able to supply panning equipment and advice on its operation are given in the Appendix at the end of this chapter.