install such equipment. However, better quality chocolate compounds are achieved using this methodology, particularly when using cocoa mass as an ingredient. As with the manufacturing of chocolate, all the ingredients requiring particle size reduction must be added to the mixer along with sufficient free fat (20–22% if using granulated sugar) to ensure an efficient refining process. The refined flake is then added to the conche to be liquefied and for some degree of flavour development. Unlike chocolate, if cocoa mass is not used, there is very little evaporation of volatiles during the conching process because the moisture content of the raw materials is already likely to be in the 0.5% region. Hence there is little to be gained from forced ventilation of the conche or from unnecessarily long conching times. The three phases of conching (dry, pasty and liquid) still occur and during the pasty phase the particles will be sheared and coated with fat, although additional fat or emulsifier may need to be added as there is often little bound fat to be liberated to achieve this coating of particles. During the pasty phase the temperature can be elevated to manipulate the flavour profile. The manufacture of chocolate compounds, particularly those using cocoa powder as the source of cocoa, lends itself to continuous conching. The limitations of moisture, volatile removal and flavour development often experienced when manufacturing chocolate in continuous conches is not the case when manufacturing chocolate compounds using cocoa powder.

An alternative method is to use a refiner conche of the type manufactured for many years now by MacIntyre Chocolate Systems (Scotland) and Lloveras (Spain) and more recently by Varsha (India) and Skywin (China). This requires a much lower capital investment and space as the mixing refining and conching processes all occur within the one machine. Although the investment is less, it can take considerable time to achieve the required particle size. This needs to be considered when one calculates the desired production outputs.

Refiner conches can be used in conjunction with a bead/ball mill (Figures 19.1 and 19.2). This obviously requires a greater initial investment cost but reduces the processing time as the ball mill assists with the particle size reduction. The component parts can be purchased individually or as a complete system such as supplied by Royal Duyvis Wiener (Netherlands) or Lloveras (Spain).

Bead/ball mills can also be used in conjunction with a mixer or conche. The raw materials are fed into the mixer or a conche, where they can go through a conching cycle if desired, but this is done prior to the reduction of particle size so that all the particles remain coarse. This has the disadvantage that not all of the surface area will be available at this stage to be coated in fat. Once mixing/conching is complete the liquid masse is passed through the bead/ball mill to reduce the particle size and then into a storage tank. The reduction in particle size and its creation of more, new surface area will cause a large increase in viscosity. Further addition of emulsifier may be required after the bead/ball mill to ensure good flow properties. Again the component parts can be purchased and assembled individually or as a complete system such as supplied by Netzsch.

Figure 19.1 Lloveras Unicom system combining a refiner conche with a ball mill. Source: Aasted. Reproduced with permission of S.A. Martin Lloveras.

Figure 19.2 Duyvis Royal Wiener Uniroto system, combining a ball mill and refiner conche. Source: Royal Duyvis Wiener. Reproduced with permission of Royal Duyvis Wiener.