



**Figure 10.27** Inner part illustration of Refiner conche vessel (MacIntyre Chocolate Systems, part of Hamburg Dresdner Maschinenfabriken GmbH). Source: Reproduced with permission of Hamburg Dresdner Maschinenfabriken GmbH.

take place simultaneously inside a single machine. Typically, the Refiner Conche consists of a horizontal cylindrical vessel with a ribbed inner wall. A shaft with paddles and scraper blades runs through the centre of the vessel and the grinding takes place as pressure is applied between the blades and the ribs (Figure 10.27). Ingredients are sheared between the blades and the wall, while the applied pressure is monitored and increased with time until the target particle size is reached. Throughout the grinding phase, a temperature profile is also applied in order to aid moisture reduction, reduction of undesirable volatile components and flavour development. A drawback of such a machine is the relatively long processing time.

Companies, such as Royal Duyvis Wiener Company, have decreased the long processing time by combining the Refiner Conche with bead mills and/or add-ons like Taste-Changers. Here the Refiner Conche is used as a pregrinder, the bead mill as a fine grinder and the Taste-Changer as the means to further optimise rheology and the flavour profile (Figure 10.28).



Figure 10.28 UniROTO. Source: Reproduced with permission of Royal Duyvis Wiener Company.

## Conclusion

As has been illustrated, there is a very wide variety of conches available to the chocolate manufacturer. There is, of course, no perfect all-purpose conche, so what criteria should be used when choosing a new machine?

The most important parameter is the ability to produce the required chocolate flavour and each design of conche tends to remove the volatile components in a different way. Strangely the same type of conche, in different factories, has been known to produce different flavours using the same recipe. This flavour matching may not be important if a new product is being launched, but it is critical for an established brand. Very often trials are carried out on small- or pilot-scale equipment. This can give very different results and unfortunately there are no robust rules for scaling to full-size production machines. The only certain way is to evaluate a full-size test machine on site. Where it is necessary to match a current process, a useful guideline is to try to maintain a similar temperature profile (time vs temperature curve).

Another important factor is the viscosity of the product. This will be related to the degree of shearing through the mixing elements. Powerful motors are required to produce a high shear rate. Although these use more energy per unit time, they frequently reduce conching time, which may result in an equivalent energy use per tonne of chocolate. High shearing systems also rapidly heat the product, so an efficient temperature control system is needed on the conche.

The space available for a conche may be the limiting factor. In this instance, a continuous system may be preferable to a batch one.