CHAPTER 10
Conching

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10.1 Introduction: the reason for conching

10.1.1 Flavour development

The flavour of a piece chocolate depends upon a series of processes being carried out correctly. Conching is the final one of these and is the last opportunity for a manufacturer to obtain the taste required for a particular product. It cannot, however, correct previous errors, for example off-flavours from smoke or mould due to poor drying of beans, nor can it make an inferior cocoa taste like a perfect one.

This leaves us to look at what a conche actually does. Cocoa mass, even when the beans have been fermented, dried and roasted correctly, has a very acidic flavour which most people find objectionable. It is the function of conching to remove the more distasteful of these flavours and yet retain the more desirable ones. It is possible to "over conche" and produce a very bland product. The actual required flavour, and hence the conching time, will depend upon the initial cocoa flavour intensity and the product in which it is being used. In order to shorten conching times, the cocoa mass may be pre-treated to remove some of the acidic components (see Section 10.4.10), which leaves the conching process essentially to one of liquefying the material from the previous milling procedure. Alternatively, if the chocolate is being used in a product containing a strong flavour, such as peppermint, it may be necessary to retain some of the acidic notes so that the chocolate flavour is not completely overwhelmed.

The actual physico-chemical changes which take place, as described in Chapter 8, are very complicated and not fully understood. However, the objective of conching is essentially the removal of undesirable flavours, the transter of flavour components between the ingredients and in certain circumstances the development of more desirable ones to match the final product. The former is particularly important for dark chocolate and is largely dependent upon conche ventilation and conching time. The development of flavour in milk chocolate, will also depend upon the ingredients being used. Those manufactured from

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milk powder may be heated to obtain a more cooked flavour, whereas those starting from crumb (see Chapter 6) already contain a cooked note, although this can be strengthened during conching. This type of flavour development is largely related to conching temperature.

10.1.2 Flow property optimisation

In the majority of chocolate manufacturing plants, the conche is preceded by a roll refiner or a hammer mill. These grind the chocolate mass to produce a crumbly paste or powder. It is the function of the conche to treat this and turn it into a flowable liquid, which can be poured into a mould or over the product centre.

Fat (both cocoa and cow's butter) makes up less than one-third of the weight of the chocolate in a majority of recipes. It is this fat that melts when warm and enables the chocolate to flow into moulds or through an enrober and to have a smooth texture in the mouth. The ground chocolate mass, although containing the majority of this fat, cannot flow as most of the surfaces of the sugar (and non-fat milk solids, when present) are freshly broken and uncoated by fat. The conching process is required to smear the fat over these surfaces, so that the particles can flow past one another. In addition some of the particles form loosely connected agglomerates, perhaps due to the presence of moisture or amorphous sugar on the sugar surface (Niediek, 1970). These too must be broken up by the mixing action of the conche. Some of these agglomerates contain droplets of fat, which must be freed from the surrounding particles and smeared thinly over their surface.

10.2 The principles of conching

10.2.1 Removal of volatiles and temperature control

As explained in Section 10.1.1, it is necessary to remove some of the undesirable acidic flavours from the cocoa during conching. It has been shown (Dimick *et al.*, 1999) that the boiling point of many of these components is very much higher than the temperature of the conche, so what is actually happening is very hard to fully explain.

Another volatile that it is necessary to reduce during conching is moisture. Water has a severe thickening effect upon chocolate and, very approximately, for every 0.3% of moisture left in the mass (above a level of 1%) a further 1% of fat must be added to compensate for it in viscosity terms. Therefore although water may at first sight appear as a "free" ingredient, in actual practice, because of the relatively high cost of fat, its removal is frequently economically very worthwhile. Much of the moisture, below the 1% level, however, is bound into the ingredients for example as water of crystallisation in lactose and so is much less likely to affect the flow properties.