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CHAPTER 9
Particle size reduction

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9.1 Introduction

Cocoa nib grinding, chocolate refining and kibble milling are all mechanical size reduction processes that may be observed in chocolate manufacturing factories. Grinding processes should not be considered in isolation, but evaluated in the context of the entire chocolate making system. Kuster (1991) considers the mixing, refining and conching stages of chocolate production as a single process with several steps.

Chocolate refining is affected by product type (milk, dark or compound), the process (crumb vs milk powder) and the ingredients (granulated or powdered sugar). Ingredients may be mixed and then ground (combined grinding) or ground then mixed (separate grinding). The latter allows for the optimisation of size reduction processes for each component individually, but may not produce the same flavour or texture as when the components are ground together. Nib grinding is influenced by (i) pretreatment of the nibs and (ii) the required end fineness dependent on whether the cocoa mass will be pressed or used in chocolate manufacture.

Grinding operations may be evaluated on the basis of their costs (capital, maintenance and energy) or by the product characteristics they produce (particle size distribution, particle shape and minimisation of contamination). Fine grinding of cocoa nibs is used to produce an "optimum" particle size distribution, which is commonly defined in terms of final product characteristics such as flavour, texture, appearance or flow properties. For chocolate, grinding operations may affect product cost through their influence on cocoa butter requirements. Very often the relationship between the size distribution of the ground material and the end-product quality is poorly understood. The outcome of a grinding operation is a particle size distribution, while the real objective is to control the performance of downstream operations or final product quality. The importance of relating particle characteristics to product quality cannot be over-emphasised.

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