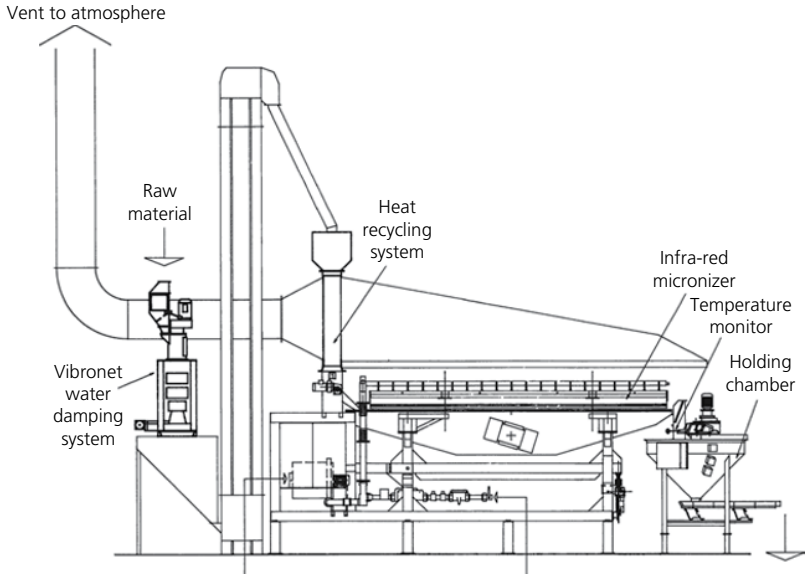

Figure 3.2 Schematic representation of the flat bed micronising unit (Micronising Company UK).

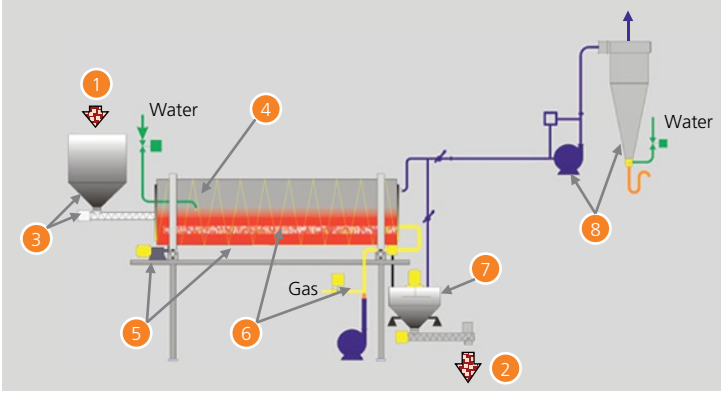

Figure 3.3 Schematic representation of the operating principles of a Barth IR system (Bühler AG). (1) Inlet – raw cocoa beans; (2) outlet – treated cocoa beans; (3) pre-hopper with dosing screw; (4) integrated water spraying system; (5) rotating drum with gear drive unit; (6) gas-fired infrared radiators; (7) weighing hopper; (8) aspiration system with venting fan and cyclone. Reproduced with permission of Bühler AG, Switzerland.

3.4 Breaking and winnowing

Beans are generally broken by a swing-hammer type of breaker. Centrifugal force is used to break the beans against an impact plate from where they leave the breaker due to gravity. The rpm of the wheel providing the centrifugal force,

together with the throughput, determine the particle size distribution for a given quality of beans. This distribution should be as homogeneous as possible for optimum separation of shell and nibs. After breaking, the shell and nibs are separated by winnowing and unbroken beans are returned for re-processing.

During winnowing the broken beans are divided into a number of fractions by means of sieves and an air classifier (or sifter) separates the shell from the nib particles. Each section (sifter) has its own optimal air flow, which depends upon the size fraction being treated (see Figure 3.4). The shell itself is used for animal feed, horticultural purposes or energy generation.

3.5 Alkalisation

Alkalisation is predominantly used for the production of cocoa powder (see Section 3.9) where it is used to produce powders of different colours and flavours. The process is generally regarded as an added value step which is proprietary to each supplier. Sometimes, alkalised cocoa mass or alkalised cocoa powder is used in chocolates to introduce specific flavours.

Nib alkalisation can be carried out in a drum, reaction vessel and/or in a screw conveyor. If appropriate, the system can be pressurised. Basically, nibs are mixed with an alkaline solution, for example potassium carbonate and water although other alkalis can be used. This mixture is heated for sufficient time for colour changes to take place. Depending upon the cocoa beans used and the process conditions (i.e. time, percentage alkaline solution, pressure etc.), a specific colour will be produced. After alkalisation the mixture is dried and subsequently roasted. It is also possible, however, to alkalise and roast in a roasting drum, although this may significantly increase the processing time.

Cocoa mass and cocoa cake can also be alkalised, but this is rather limited in terms of colour formation. The addition of the alkaline solution to cocoa mass may result in a high viscous (sticky) product, which is not easy to handle. In this case the removal of excess moisture is very difficult and needs specific equipment. Off-flavours can also easily be formed due to the long heating times required.

The pH of non-alkalised cocoa cake can also be increased by adding dry alkali to it. This results in a higher pH powder after pulverising, but usually there is little effect on the colour and the intrinsic colour of the product is poor. This characteristic is better when alkaline solutions are used.

3.6 Bean and nib roasting

Roasting develops the flavour in the beans from the precursors formed during fermentation and drying. For example, the Amadori compounds, which are extremely reactive, produce a large number of flavours. This subject is dealt with in more detail in Chapter 8.