energy into the mass and is said to remove unwanted volatiles, reduce moisture, round particles, reduce viscosity, promote flavour development, reduce agglomeration and reduce acidity and bitterness (see Chapter 10).

Conching temperatures range from 45 to 75 °C for milk chocolates and 55–90 °C for dark chocolates. Temperature adjustments will aid in the degree of caramelisation. Conching time may vary from a few hours to several days. A conched chocolate flavour will be more rounded, with smooth chocolatey notes and have a more fine taste. An unconched chocolate may have flavour spikes, not be rounded, with hints of raw notes.

23.9.4 Standardising

Standardising is a very important step to fine tune the product with emulsifiers and flavourings and prepare it for final usage. Once the conching process is complete, the emulsifiers and flavourings will be added to the chocolate mass. Additional cocoa butter may also be added at this stage to bring the chocolate to the desired viscosity and yield value. Strict laboratory control and analytical equipment is used to evaluate the chocolate and determine the viscosity, particle size, fat content, colour and moisture content. The product will also be tested microbiologically to make sure product is safe for consumption. Once approved, it will be pumped through large fine screens to remove any agglomerates, through magnets and on to tank storage.

Viscosity is a measurement used to describe the flow properties of a product – specifically its resistance to flow (see Chapter 11). Some ways of measuring viscosity are using MacMichael, Brookfield and Haake instruments. All of these methods are used in industry today, with Brookfield being the most common in the United States.

The MacMichael is a single-point system. The product is measured at a specific temperature, using a specific cylinder diameter and depth. It gives a number indicating how thick or thin a product is, but does not tell a lot about the flow characteristics of the product. This is not commonly used today, but the original numbers generated from this method are still referred to when selecting a specific coating. For example, a 65 viscosity refers to a chocolate for hollow moulding; a 145 viscosity might be used for enrobing or moulding with inclusions and a 200 viscosity for solid moulding.

The Brookfield viscometer can be used to measure MacMichael numbers, but it can also show a more complete measurement of the chocolate performance or flow properties. Using a Brookfield, at a specific temperature, one can take readings at increasing rates of shear ranging from 1 to 50 rpm, followed by similar readings at decreasing speeds. Using Casson's calculations, viscosity can be determined (see Chapter 11).

A lower yield value is desired for moulding so product will flow evenly into a mould, especially with inclusions, so proper shakeout can occur and removal

of air pockets is successful. A higher yield value is desired in enrobing to prevent decorations from collapsing and to avoid feet formation on the bottom of pieces.

Emulsifiers also influence flow properties of chocolate. Lecithin is the most typical emulsifier utilised in chocolate manufacturing. Lecithin has both lipophilic (fat-loving) and hydrophilic (water-loving) properties. This surface active agent greatly affects chocolate fluidity (see Chapter 11). The addition of 0.1–0.3% lecithin has the same viscosity reducing effects as over 10 times this amount of cocoa butter. Polyglycerol polyricinoleate is an approved emulsifier for the chocolate manufacturer that greatly reduces and can even eliminate yield value of chocolate. Actual values for yield value and plastic viscosity need to be determined based on what will work best in a specific application and equipment.

23.9.5 Particle size

A particle is any object having definite physical boundaries in all directions without respect to size. Traditionally, fineness (how coarse or fine) is determined by handheld micrometers measuring only the largest particle in the sample (Figure 23.8).

Example procedure:

- Calibrate micrometer to read 0.
- Open the surfaces up and add a small amount of sample to the anvil.
- Close slowly until the anvil and spindle barely start to touch.
- Use ratchet to close and stop after a minimum of three gentle clicks (too much pressure gives a lower particle size reading). Note: a micrometer reads in microns and inches.

The micrometer does not measure the distribution of the particles, only the largest particle, but it is a great tool to use on-line in the production process or for a quick check as products are received in to the manufacturing plants.

Laser-light scattering measuring equipment has been developed and is widely used to look at all the particles of a mass today (see Chapter 24). This unit can identify the size and amount of all particles within the determining

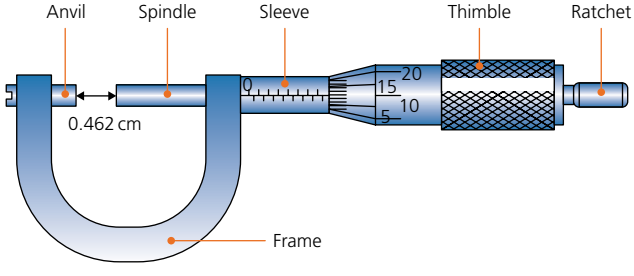

Figure 23.8 Hand held micrometer (schematic provide by www.tutorvista.com).