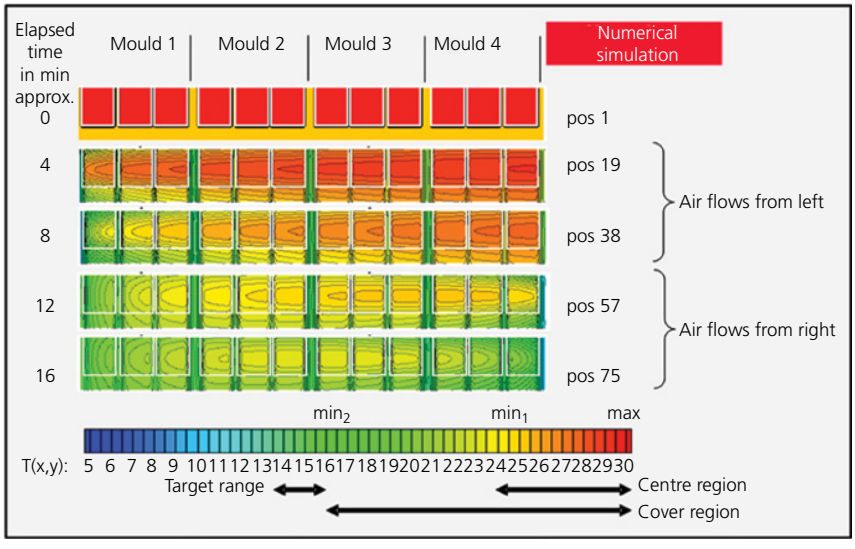

Figure 24.29 Qualitative result of a 2D heat transfer simulation of filled moulds while travelling through a cooling tunnel, simulation by Dr.-Ing Thomas Demmer. Reproduced with permission of Kraft Foods R&D Inc. Munich, Germany.

required within the confectionery industry and not to cover the huge range of methods actually available or indeed the recent technological advances that are currently taking place.

24.3.1 Moisture measurement

As was noted in Chapters 10 and 11, a very small amount of moisture can greatly increase the viscosity of chocolate and indeed the presence of an extra 0.3% water needs approximately another 1% of fat to compensate for it. Any analysis used must be repeatable to better than about 0.2%. Two methods are often used within the industry, namely oven drying and Karl Fischer titration. The former measures of "free" moisture that affects the flow properties, whereas the titration also measures "bound" moisture for example that in crystalline lactose monohydrate (in milk) that has little, if any, effect on viscosity.

Oven drying involves mixing a small sample of chocolate with a weighed quantity of dried sand in a metal tray. This is then reweighed to determine the weight of the chocolate before being placed in a hot oven for a set time and temperature. Typically this is about 98 °C (208 °F) for about 12 h and, provided a strict regime is followed within a laboratory, results can be obtained with a good enough repeatability to monitor factory production. Karl Fischer titration is based upon the reaction between sulfur dioxide, iodine and water shown in equation (24.1).

$$I_2 + SO_2 + H_2O = SO_3 + 2HI \qquad (24.1)$$

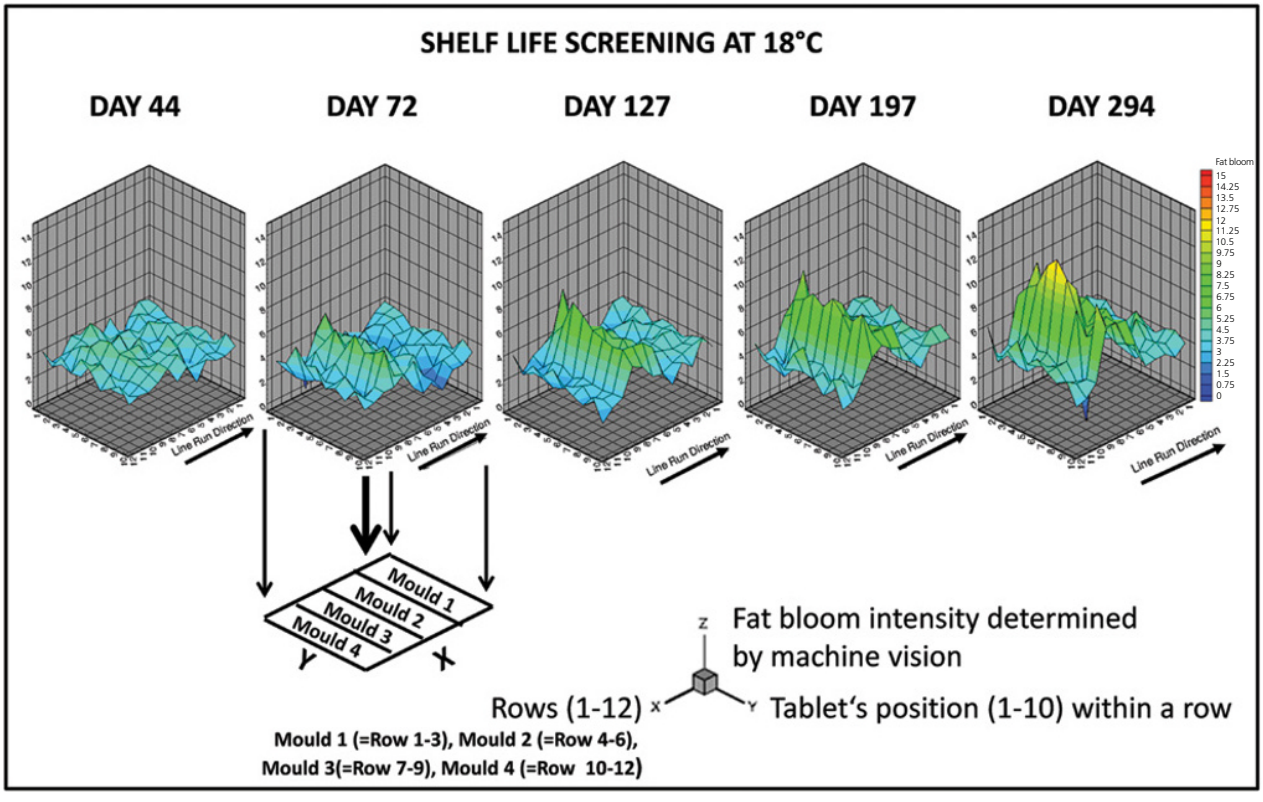

Figure 24.30 The intensity surfaces above visualise the evolution of fat bloom depending on the mould position in a cooling tunnel, see also Figure 24.28. Reproduced with permission of Kraft Foods R&D Inc. Munich, Germany.