Table 24.4 Examples of the units used for temperature-based measurements.

Temperature as basic variable	Dimension as example	Typical examples
in Kelvin, in degrees Celsius, in Fahrenheit	K °C °F	Usually in °C: masse temperature, air temperature in refrigerator, Surface temperature Internal (core) temperature of the finished product during cooling in a refrigerator
Tempermeter application Rise from the inflection point of temperature over time under isothermal measurement conditions	Scale divisions	Determining the degree of tempering of tempered masses
Amount of heat in Joules Specific amount of heat	J J/kg	Example: amount of heat released during crystallization
Heat capacity Specific heat capacity	J/K J/(kg*K)	Material property
Entropy Specific entropy	J/K J/(kg*K)	Entropy change in a systom
Heat flow Heat flow density	W = kcal/h W/m^2 = kcal/m^{2}h	Process variable
Heat transfer coefficient Heat transmission coefficient	W/m^2*K W/(m*K) = Kcal/(m*h*K)	Material and process condition
Thermal conductivity		Material property
Thermal diffusivity	m^2/s	Material property

know the accuracy of measurement. Digital converters operate in conjunction with Pt100 sensors with an accuracy of ±0.3 °C. Older devices can often only achieve accuracies of ±0.7 °C. This must always be kept in mind when reading temperature displays.

Apart from measuring the temperature at individual locations by thermometers, it is also important to monitor the temperature distribution over a mould area for example a mould surface to detect hot and cold spots. This can give rise to sticking of the bars in the mould, the so-called cooling stress marks or cooling spots, or bloom in the final product. Pyrometers are often employed to record such surface temperatures. Images of two production situations in the visible and infra-red regions are compared in Figures 24.8 and 24.9. Such measurement systems can record individual mould positions over time and, as individual images are available in digital form, it is possible to monitor the changes in surface temperatures at specific locations. The emission coefficient (emissivity) of different materials should be taken into account.

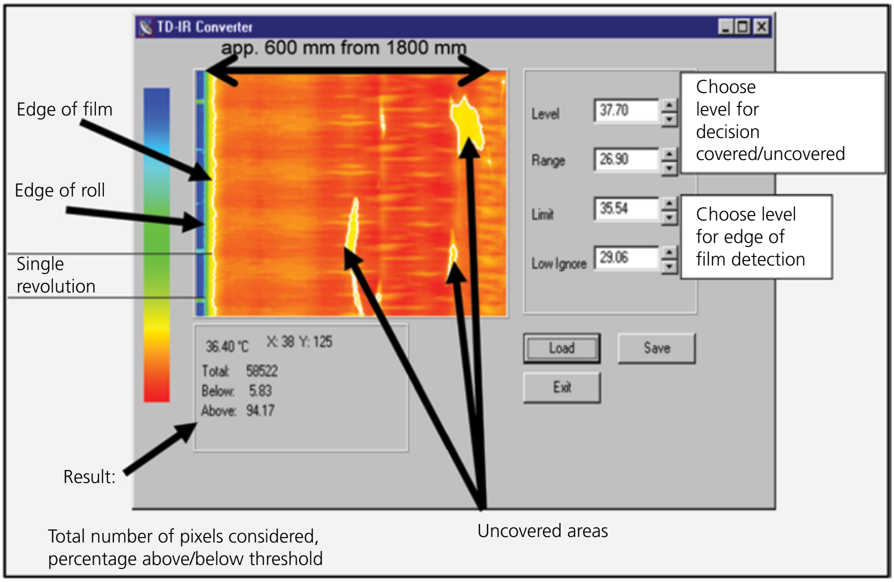

Figure 24.8 Imaging of fifth top roll in real time motion within several singular revolutions across roll length displayed in infra-red light range coded as false colours. Reproduced with permission of Kraft Foods R&D Inc. Munich, Germany.

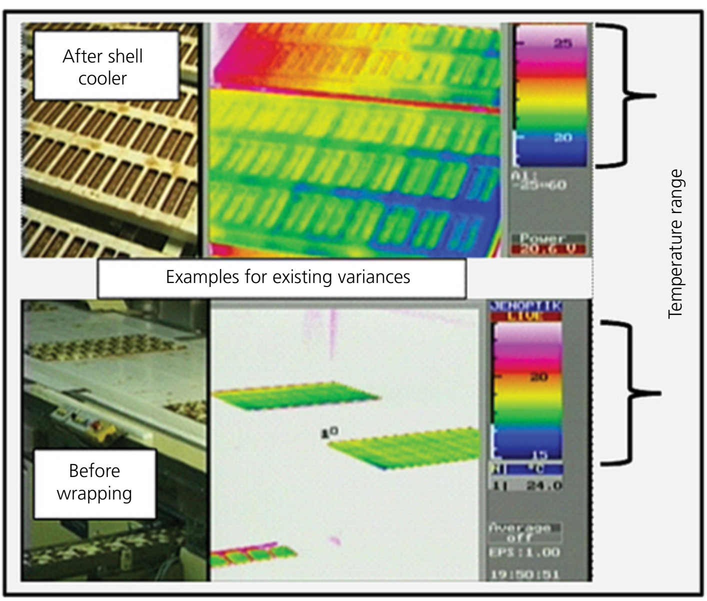

Figure 24.9 Imaging in the visible and infra-red light regions. Through false-colour imaging, the surface temperature becomes visible. Reproduced with permission of Kraft Foods R&D Inc. Munich, Germany.