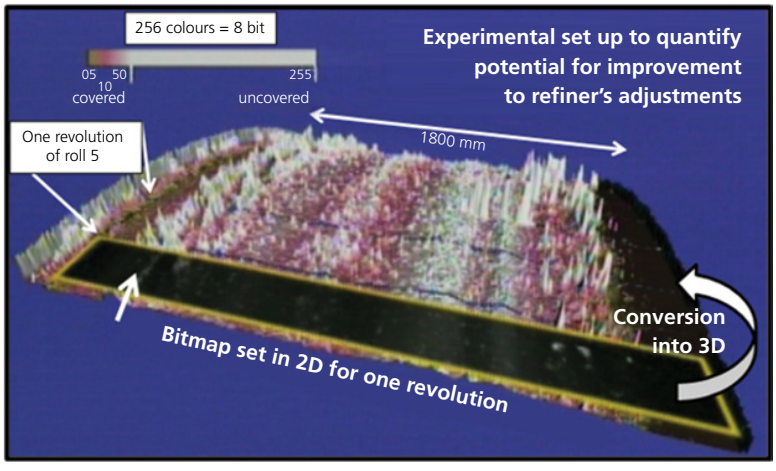


Figure 24.22 Image of computer illustration (degree of coverage of the refiner roll) generated from the results obtained with the experimental pilot rig shown in Figure 24.21. Reproduced with permission of Kraft Foods R&D Inc. Munich, Germany.

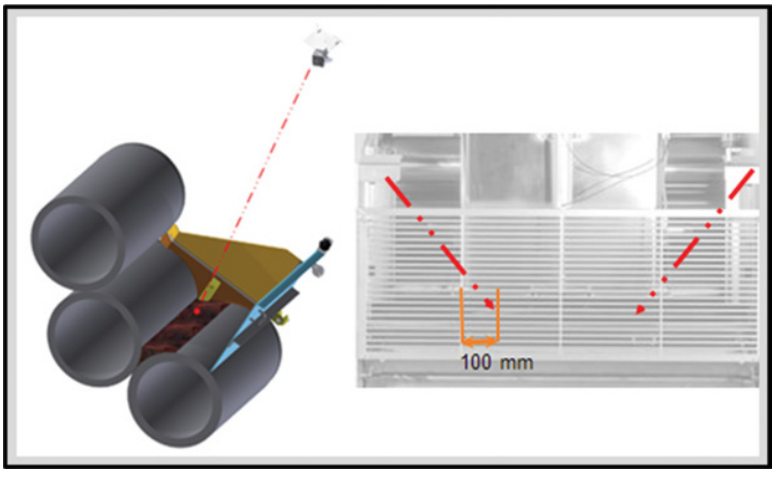
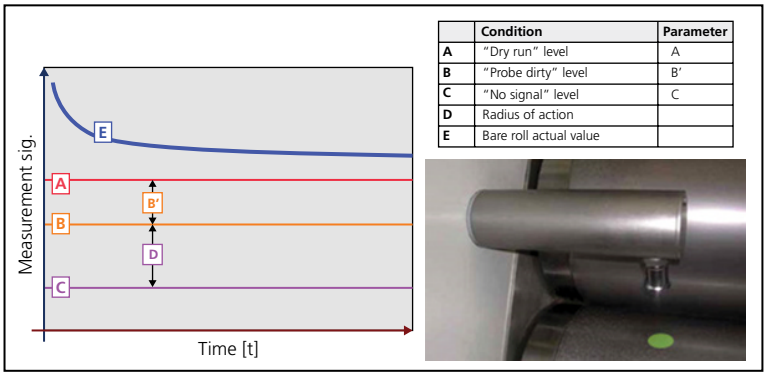


Figure 24.23 Refiner trough level control. Reproduced with permission of Bühler, Uzwil, Switzerland.

over a long period of time. (see Figure 24.23 for a three roll refiner). The level in the trough is detected using a digital infrared distance probe (two points) and controlled by the opening level of the dosing hopper flap.

If the minimum level is not exceeded for a pre-set time, the machine shuts down to prevent the rollers from running dry.

Dry running protection If there are a lot of stripes or even no product at all, the rolls could touch each other and run dry. If this happens the rolls get damaged



	Condition	Parameter
A	"Dry run" level	A
B	"Probe dirty" level	B'
C	"No signal" level	C
D	Radius of action	
E	Bare roll actual value	

Figure 24.24 Contrast levels and position. Reproduced with permission of Bühler, Uzwil, Switzerland.

at least with burned strips on each roll. The product transfer between the rolls then gets worse and the life of the rolls is shortened.

With a contrast sensor the level of the reflection can be detected and produces information about the coverage status of the roll (Figure 24.24). This difference in the transmitted signal enables machine parameters to be automatically set for different products under a wide range of conditions.

The sensors are placed on the left and right of the third or fifth roll about 250–300 mm from the roll edge. As the optical sensor only has a detection spot diameter of about 30–50 mm the dry run detector is of limited but sufficient accuracy. This is because most dry runs occur at these positions on the roll.

Newer technology uses a camera system to detect dry runs. Dosing techniques and imaging software can calculate the contrast difference from the pictures. These systems are able to detect a dry spot of about 30–40 mm diameter on each side of the roll. It is also possible to use the roll coverage detectors – described above – to prevent dry runs. These work along the entire roll length and are the best solution.

24.2.13.2 Moulding technology

Product variation during cooling Monitoring cooling processes is a very complex task (see also Chapter 14). Besides controlling conditions within the actual cooling chambers, there are none obvious factors such as those caused by the attached packaging machines which can significantly disturb the moulding line and reduce its output. Here the use of buffer elements between moulding and packaging area and/or before the packaging machine can only damp or delay slightly the losses and shorten the length of line downtime. Inconsistent cooling conditions remain and have the potential to influence the product quality (increased breakage, bending, formation of hair cracks, cooling spots,