24	Instrumentation	555

Ulrich Loeser

- 24.1 Introduction, 555
  - 24.1.1 General measurement tasks, 555
  - 24.1.2 Microbiological measurements, 555
  - 24.1.3 Use of data analysis, 556
  - 24.1.4 Use of data analysis to provide long-term production stability, 556
- 24.2 Production measurement technology in-/on-line, off-line, 557
  - 24.2.1 Recording time, 557
  - 24.2.2 Recording position (location), 557
  - 24.2.3 Recording by numbers, 561
  - 24.2.4 Recording "patterns", 562
  - 24.2.5 Recording the degree of filling (fill level), 562
  - 24.2.6 Recording by weighing, 562
  - 24.2.7 Measuring temperatures, 564
  - 24.2.8 Recording the degree of temper, 567
  - 24.2.9 Pressure measurement, 569
  - 24.2.10 Measuring moisture/relative humidity, 570
  - 24.2.11 Recording flow characteristics, 570
  - 24.2.12 Recording particle size, 574
  - 24.2.13 Production monitoring, 575
  - 24.2.14 Detecting foreign matter, 582
- 24.3 Laboratory analysis, 584
  - 24.3.1 Moisture measurement, 585
  - 24.3.2 Determination of fat content (Soxhlet), 587
  - 24.3.3 Solid fat content, 588
  - 24.3.4 Particle size measurement, 590
  - 24.3.5 Triglyceride (triacylglycerides) composition (vegetable fat content), 592
- 24.4 Summary of important analytical procedures in a typical quality assurance laboratory, 594
  - 24.4.1 General, 594
  - 24.4.2 Analysis, 594

Conclusions, 595

Acknowledgements, 596

References and further reading, 596

25 Food safety in chocolate manufacture and processing, 598

Faith Burndred and Liz Peace

- 25.1 Introduction, 598
- 25.2 The importance of food safety management in chocolate processing, 598

- 25.3 HACCP and prerequisite programmes, 599
- 25.4 Physical hazards, 599
  - 25.4.1 Physical hazards in incoming raw materials, 599
  - 25.4.2 Physical hazards during processing, 600
  - 25.4.3 Physical hazards from failures of prerequisite programmes, 602
  - 25.4.4 Equipment to prevent and detect physical hazards, 604
- 25.5 Chemical hazards, 604
  - 25.5.1 Chemical hazards in incoming ingredients, 605
  - 25.5.2 Chemical hazards occurring during processing, 607
- 25.6 Microbiological hazards, 607
  - 25.6.1 Salmonella, 607
  - 25.6.2 Salmonella in raw materials, 608
  - 25.6.3 Prevention of microbiological contamination during processing, 611
  - 25.6.4 Water control and cleaning practices, 612
  - 25.6.5 Microbiological monitoring, 613
  - 25.6.6 Escherichia coli 0157:H7 and other verocytotoxin-producing E. coli, 613
- 25.7 Allergen hazards, 614
  - 25.7.1 Allergens as ingredients, 615
  - 25.7.2 Allergens from cross-contacts at the factory, 616
  - 25.7.3 Control measures, 616

Conclusions, 617

References, 617

## 26 Packaging, 620

Carl E. Jones

- 26.1 Introduction, 620
- 26.2 Confectionery types, 620
  - 26.2.1 Moulded chocolate tablets and bars, 620
  - 26.2.2 Chocolate countlines, 621
  - 26.2.3 Bulk chocolate, 623
  - 26.2.4 Boxed chocolates, 623
  - 26.2.5 Twist wrapping, 626
  - 26.2.6 Easter eggs and other seasonal chocolate novelties, 628
  - 26.2.7 Shelf ready/retail ready packaging, 630
- 26.3 Flow wrap machinery and sealing, 631
- 26.4 Materials, 633
  - 26.4.1 Aluminium foil, 633
  - 26.4.2 Paper and board, 634
  - 26.4.3 Regenerated cellulose film, 637
  - 26.4.4 Plastic films, 638
  - 26.4.5 Cold seal, 642
  - 26.4.6 Biopolymers, 644