

1. Record Nr.	UNINA9910298652003321
Titolo	Process Analytical Technology for the Food Industry // edited by Colm P. O'Donnell, Colette Fagan, P.J. Cullen
Pubbl/distr/stampa	New York, NY : , : Springer New York : , : Imprint : Springer, , 2014
ISBN	1-4939-0311-X
Edizione	[1st ed. 2014.]
Descrizione fisica	1 online resource (301 p.)
Collana	Food Engineering Series, , 2628-8095
Disciplina	54 543.2-543.8 641.3 664
Soggetti	Food science Spectrum analysis Food Science Spectroscopy
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Contents; Contributors; Chapter 1; Benefits and Challenges of Adopting PAT for the Food Industry ; 1.1 Introduction; 1.1.1 Evolution of PAT; 1.1.2 Learning From Other Process Industries; 1.1.3 PAT Drivers in the Food Industry; 1.1.4 Technology Advances; 1.1.5 Challenges; References; Chapter 2; Multivariate Data Analysis (Chemometrics); 2.1 Introduction; 2.1.1 Definition of Chemometrics; 2.1.2 PAT and Chemometrics; 2.2 Design of Experiments; 2.2.1 Problem Formulation; 2.2.2 Screening Designs; 2.2.2.1 Full Factorial Designs (2k); 2.2.2.2 Fractional Factorial Designs (2kp) 2.2.2.3 Other Screening Designs2.2.3 Optimisation Designs: Response Surface Methodology; 2.2.3.1 Central Composite Designs; 2.2.3.2 Other Optimisation Designs; 2.2.3.3 Mixture Designs; 2.3 Exploratory Analysis; 2.3.1 Data Preprocessing; 2.3.1.1 Classical Preprocessing Methods; 2.3.1.2 Signal Correction Methods; 2.3.1.3 Dimensionality Reduction Methods; 2.3.2 Principal Component Analysis; 2.3.2.1 Introduction-Objective of PCA; 2.3.2.2 Geometrical Interpretation; 2.3.2.3 Mathematical Computation; 2.3.2.4 Interpretation of PCA; 2.3.3

Outlier Detection and Handling

2.3.3.1 Outlier Detection in Exploratory Analysis; 2.3.3.2 Outlier Detection in Predictive Analysis; 2.3.3.3 Robust Statistics; 2.4 Quantitative Predictive Modelling; 2.4.1 Introduction; 2.4.2 Linear Modelling; 2.4.2.1 Linear Regression Principle; 2.4.2.2 Multiple Linear Regression (MLR); 2.4.2.3 Principal Component Regression (PCR); 2.4.2.4 PLS Regression; 2.4.2.5 Model Optimisation and Validation; 2.4.2.6 Science-Based Calibration; 2.4.3 Non-Linear Modelling; 2.4.3.1 Non-Linear PLS; 2.4.3.2 Local Modelling; 2.4.3.3 Least-Squares Support Vector Machines; 2.4.3.4 Artificial Neural Networks; 2.4.4 Robustness Issue and Calibration Transfer; 2.4.4.1 Models Using a Standardisation Set; 2.4.4.2 Models Using a Small Experimental Design; 2.4.4.3 Models When Only a Few Reference Control Points are Available; 2.5 Classification; 2.5.1 Clustering Techniques; 2.5.1.1 Introduction; 2.5.1.2 Hierarchical Clustering Analysis; 2.5.1.3 Non-hierarchical Clustering Methods; 2.5.2 Supervised Discrimination; 2.5.2.1 Introduction; 2.5.2.2 Linear Supervised Discrimination; 2.5.2.3 Non-linear Supervised Discrimination; 2.5.2.4 A Particular Case: k-Nearest Neighbours (k-NN); 2.6 Multivariate Process Monitoring; 2.6.1 Multivariate Statistical Process Control; 2.6.1.1 Introduction; 2.6.1.2 Process Analysis; 2.6.1.3 Process Monitoring and Fault Diagnosis; 2.6.1.4 Process Control; 2.6.2 Multivariate Curve Resolution; 2.7 Multi-block and Multi-way Analyses; 2.7.1 Multi-block Analysis; 2.7.1.1 Definition of Multi-block Data Sets; 2.7.1.2 Exploratory Multi-block Analyses; 2.7.1.3 Predictive Multi-block Analyses; 2.7.2 Multi-way Analysis; 2.7.2.1 Definition of Trilinear Data Sets; 2.7.2.2 Exploratory Multi-way Analyses; 2.7.2.3 Predictive Multi-way Analyses; 2.8 Conclusion
Annex: Figures of Merit

Sommario/riassunto

The Process Analytical Technology (PAT) initiative aims to move from a paradigm of 'testing quality in' to 'building quality in by design'. It can be defined as the optimal application of process analytical technologies, feedback process control strategies, information management tools, and/or product-process optimization strategies. Recently, there have been significant advances in process sensors and in model-based monitoring and control methodologies, leading to enormous opportunities for improved performance of food manufacturing processes and for the quality of food products with the adoption of PAT. Improvements in process efficiency, reduced product variability, enhanced traceability, process understanding, and decreased risk of contamination are some of the benefits arising from the introduction of a PAT strategy in the food industry. Process Analytical Technology for the Food Industry reviews established and emerging PAT tools with potential application within the food processing industry. The book will also serve as a reference for industry, researchers, educators, and students by providing a comprehensive insight into the objectives, challenges, and benefits of adopting a Process Analytical Technology strategy in the food industry. About the Editors Professor Colm O'Donnell is Vice Principal (Teaching & Learning) in the College of Engineering and Architecture at University College Dublin. He leads a research team working on a range of PAT and Novel Processing Technology research projects in the UCD School of Biosystems Engineering. He has published widely in the area of PAT for dairy processing and holds two patents in this area. Dr. Colette Fagan is a Lecturer in Food Processing Science and Director of the Food Processing Centre at the University of Reading. Her research focuses on PAT, in particular its application to dairy processing. She has published over 40 journal papers and book chapters and holds two patents for

novel sensing technologies used in the control of dairy processing. Dr. PJ Cullen teaches process engineering at the School of Chemical Engineering, University of New South Wales, Sydney, Australia. His current research interests include the development of novel hyperspectral, multipoint spectroscopy and particle imaging systems for process control. He initiated the "Food Quality, Safety & Analysis" sessions at IFPAC, the world's leading PAT conference, and is a member of its organizing committee. He has published over 100 journal papers and book chapters. .
