

Part B Process Monitoring and Improvement

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10 Statistical Methods for Quality and Productivity Improvement

Wei Jiang, Hoboken, USA
Terrence E. Murphy, New Haven, USA
Kwok-Leung Tsui, Atlanta, USA

11 Statistical Methods for Product and Process Improvement

Kailash C. Kapur, Seattle, USA
Qianmei Feng, Houston, USA

12 Robust Optimization in Quality Engineering

Susan L. Albin, Piscataway, USA
Di Xu, New York, USA

13 Uniform Design and Its Industrial Applications

Kai-Tai Fang, Kowloon Tong, Hong Kong
Ling-Yau Chan, Hong Kong,

14 Cuscore Statistics: Directed Process Monitoring for Early Problem Detection

Harriet B. Nembhard, University Park, USA

15 Chain Sampling

Raj K. Govindaraju, Palmerston North, New Zealand

16 Some Statistical Models for the Monitoring of High-Quality Processes

Min Xie, Singapore, Singapore
Thong N. Goh, Singapore, Republic of Singapore

17 Monitoring Process Variability Using EWMA

Philippe Castagliola, Carquefou, France
Giovanni Celano, Catania, Italy
Sergio Fichera, Catania, Italy

18 Multivariate Statistical Process Control Schemes for Controlling a Mean

Richard A. Johnson, Madison, USA
Ruoja Li, Indianapolis, USA

Part B focuses on process monitoring, control and improvement. Chapter 10 describes in detail numerous important statistical methodologies for quality and productivity improvement, including statistical process control, robust design, signal-to-noise ratio, experimental design, and Taguchi methods. Chapter 11 deals with Six Sigma design and methodology. The chapter also discusses decision-making optimization strategies for product and process improvement, including design of experiments and the response-surface methodology. Chapter 12 describes the two widely used parameter-optimization techniques, the response-surface methodology and the Taguchi method, and discusses how to enhance existing methods by developing robust optimization approaches that better maximize the process and product performance. Chapter 13 introduces the concept of uniform design and its applications in the pharmaceutical industry and accelerated stress testing. It also discusses the methods of construction of uniform designs for experiments with mixtures in multidimensional cubes and some relationships between uniform designs and other related designs, while Chapt. 14 focuses on the development and applications of cumulative score statistics and describes the generalized theoretical development

from traditional process-monitoring charts as well as how can they be applied to the monitoring of autocorrelated data. Chapter 15 provides a comprehensive review of various chain sampling plans such as acceptance sampling two-stage chains, dependent sampling, and chain sampling with variable inspection, and discusses several interesting extensions of chain sampling, including chain sampling for mixed attribute/variable inspection and deferred sampling plans. Chapter 16 surveys several major models and techniques, such as control charts based on the zero-inflated Poisson distribution, the generalized Poisson distribution and the time-between-event monitoring process, that can be used to monitor high quality processes. Chapter 17 introduces the basic concept and the use of the exponentially weighted moving-average statistic as a process-monitoring scheme commonly used for processes and maintenance in industrial plants. The chapter also discusses some recent innovative types of control charts. Chapter 18 provides a brief review of major univariate quality-monitoring procedures including Crosier's cumulative sum and exponentially weighted moving-average schemes and discusses various multivariate monitoring schemes for detecting a change in the level of a multivariate process.