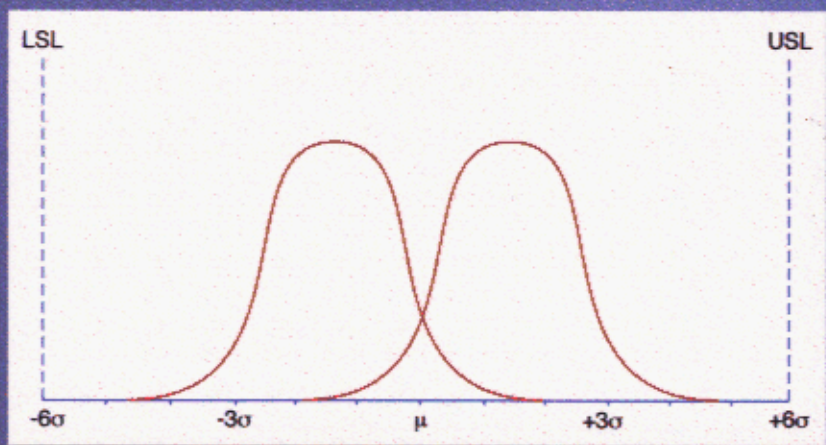


INTERNATIONAL EDITION

Quality Control

Seventh Edition



Dale H. Besterfield



CONTENTS

1	INTRODUCTION TO QUALITY	1
	Introduction 1	
	Responsibility for Quality 5	
	Chief Executive Officer 12	
	Computers and Quality Control 13	
2	TOTAL QUALITY MANAGEMENT— PRINCIPLES AND PRACTICES	23
	Introduction 23	
	Basic Approach 24	
	Leadership 26	
	Customer Satisfaction 35	
	Employee Involvement 39	
	Continuous Process Improvement 43	



Supplier Partnership 53
Performance Measures 54
Deming's 14 Points 72
Final Comments 72

**3 TOTAL QUALITY MANAGEMENT—
TOOLS AND TECHNIQUES**

75

Statistical Process Control 75
Acceptance Sampling 90
Reliability 90
Design of Experiments 90
Taguchi's Quality Engineering 90
Failure Mode and Effect Analysis 91
Quality Function Deployment 91
ISO 9000 92
ISO 14000 108
Benchmarking 109
Total Productive Maintenance 109
Management and Planning Tools 109
Quality by Design 110
Products Liability 110
Information Technology 111
Computer Program 111

4 FUNDAMENTALS OF STATISTICS

117

Introduction 117
Frequency Distribution 122
Measures of Central Tendency 136
Measures of Dispersion 143
Other Measures 148
Concept of a Population and a Sample 151
The Normal Curve 153
Tests for Normality 160
Computer Program 164

5 CONTROL CHARTS FOR VARIABLES

173

Introduction 173
Control Chart Techniques 181
State of Control 200
Specifications 209
Process Capability 218

Six Sigma 223
Different Control Charts 225
Computer Program 233

6 ADDITIONAL SPC TECHNIQUES FOR VARIABLES 241

Introduction 241
Continuous and Batch Processes 241
Multi-Vari Chart 247
Short-Run SPC 248
Gage Control 264
Computer Program 269

7 FUNDAMENTALS OF PROBABILITY 273

Basic Concepts 273
Discrete Probability Distributions 284
Continuous Probability Distributions 294
Distribution Interrelationship 296
Computer Program 297

8 CONTROL CHARTS FOR ATTRIBUTES 301

Introduction 301
Control Charts for Nonconforming Units 303
Control Charts for Count of Nonconformities 324
A Quality Rating System 334
Computer Program 338

9 LOT-BY-LOT ACCEPTANCE SAMPLING BY ATTRIBUTES 347

Fundamental Concepts 347
Statistical Aspects 355
Sampling Plan Design 375
Computer Program 383

10 ACCEPTANCE SAMPLING SYSTEMS 387

Lot-by-Lot Acceptance Sampling Plans for Attributes 388
Acceptance Sampling Plans for Continuous Production 421
Acceptance Sampling Plans for Variables 429

11	RELIABILITY	447
	Fundamental Aspects 447	
	Additional Statistical Aspects 453	
	Life and Reliability Testing Plans 463	
	Availability and Maintainability 470	
	Computer Program 471	
12	MANAGEMENT AND PLANNING TOOLS	475
	Introduction 475	
	Why, Why 476	
	Forced Field Analysis 476	
	Nominal Group Technique 477	
	Affinity Diagram 477	
	Interrelationship Diagram 477	
	Tree Diagram 480	
	Matrix Diagram 481	
	Prioritization Matrices 483	
	Process Decision Program Chart 485	
	Activity Network Diagram 486	
	Summary 489	
	APPENDIX	491
	Table A Areas Under the Normal Curve 492	
	Table B Factors for Computing Central Lines and 3σ Control Limits for \bar{X} , s , and R Charts 494	
	Table C The Poisson Distribution 495	
	Table D Random Numbers 500	
	Table E Commonly Used Conversion Factors 501	
	SELECTED BIBLIOGRAPHY	503
	GLOSSARY	507
	ANSWERS TO SELECTED PROBLEMS	511
	INDEX	517