## CONTENT

Prefa	ace		xxi
Part	One	BUSINESS QUALITY MANAGEMENT	1
1.	The	Quality of Products and Services and Total Quality Control	3
	1.1	What Is the New Impact of Quality?	4
	1.2	What Is Total Quality Control and What Is Its Purpose?	5
	1.3	The Meaning of "Quality"	7
	1.4	The Meaning of "Quality" – Orientation to Customer Satisfaction	8
	1.5	The Meaning of "Control' in Industry	10
	1.6	What Is the Scope of Total Quality Control?	11
	1.7	Total Quality Control's Organizationwide Impact – Total Quality Management	12
	1.8	Systems Engineering and Management – Foundation for Total Quality Control	14
	1.9	The Evolution of Total Quality Control	15
	1.10	Quality – A Major Business Management Strategy	17
	1.11	The Place of Total Quality Control in the Modern Business Management Concept:	
		Profitability and Positive Cash Flow	19
	1.12	The Place of Total quality Control in the Modern Business management Concept :	
		Some Examples	20
	1.13	The Place of Total Quality Control in the Modern Business management Concept :	
		The Range and Timing of Results and Benefits	22
	1.14	The Place of Total Quality Control in the Modern Business Management Concept :	
		Return on Investment	24
	1.15	Quality : Responsibility to Society	24
	1.16	The Quality Challenge Facing Industry	24
2.	The	Buyer, the Producer, and The New Marketplace Demands for Quality	27
	2.1	The Buyer : A Profile	27
	2.2	The Buyer : A Profile (cont'd)	29
	2.3	The Buyer : consumerism	30
	2.4	The Buyer and the Service Industries	31
	2.5	The Producer : A Profile	32
	2.6	Product and Service Liability and the Producer	34
	2.7	The Warranty and the Producer	37
	2.8	Product Recall and the Producer	37
	2.9	The Marketplace : An Overview	38
	2.10	The Marketplace : An Example	39
	2.11	The Marketplace : Opportunity from Quality Leadership	42
3.	Prod	uctivity, Technology, and the Internationalization of Quality	43
	3.1	The Worker : A Profile	43
	3.2	Total quality and Total Productivity	44
	3.3	Total Quality and Total Productivity : An Example	46
	3.4	Total Quality and Product Development	47
	3.5	Quality, Mechanization, and Automation	49
	3.6	Quality Information Processing, Computer Technology, and Software Quality	
		Control	50
	3.7	Total Quality, standards, and Specifications	51
	3.8	Total Quality and Safety	52
	3.9	Total Quality and Liability Loss Prevention	53
	3.10	Total Quality and Internationalism	55
	3.11	Total Quality and Internationalism : The Role of Government	56

4.	What	Are the Factors in Controlling Quality and What Are the Jobs Quality Control?	58			
	4.1	The 9 M's : Fundamental Factors Affecting Quality	59			
	4.2	How Complicated Are Modern Quality Problems	61			
	4.3	Where Is Quality Control Used?	64			
	4.4	What Are the Jobs of Quality Control?	64			
	4.5	What Is New-Design Control?	65			
	4.6	What Is Incoming-Material Control?	67			
	4.7	What Is Product Control?	67			
	4.8	What Are Special Process Studies?	68			
	4.9	Does a Quality-Control Program Always Include These Four Jobs?	68			
	4.10	What Part Does Statistics Play in the Quality-Control Job?	70			
	4 1 1	What Part Does Other Methodology Play in the Quality-Control Job?	71			
	4 12	Do These Jobs Apply to Job Lot as Well as to High-Quantity Production?	72			
	4.13	How Are the Jobs of Quality Control Accomplished?	73			
Part	Two	THE TOTAL QUALITY SYSTEM	75			
5.	The S	vstems Approach to Quality	77			
	5.1	What Is Today's Systems Requirement?	77			
	5.2	Defining the Total Quality System	78			
	53	The Total Quality System and the Engineering Technology of Quality Control	79			
	5.5	The Systems Engineering and Systems Management Approach	81			
	5. <del>1</del>	The Organizationwide Scope of the Total Quality System and the Role of General	01			
	5.5	Management	87			
	56	Management	02 04			
	5.0	Characteristics of the Total Quality System	04			
	5.1	The Meaning of the Total Quality System	0J 07			
	5.0 5.0	When a Tetal Quality system An Energy la	00			
	5.9	Why a Total Quality system is Necessary – An Example	8/			
	5.10	Why a Total Quality System Is Necessary – An Example (Cont'd)	88			
6.	Establishing the Quality System					
	6.1	Controlling the Quality-Systems Activity	91			
	6.2	Total Quality-System Principles	93			
	6.3	Key Systems Activities for Total Quality Control	94			
	6.4	Preproduction Quality Evaluation	96			
	6.5	Product- and Process-Quality Planning	96			
	6.6	Purchased-Material Quality Planning, Evaluation, and Control	97			
	6.7	Product- and Process-Quality Evaluation and Control	97			
	6.8	Quality Information Feedback	99			
	6.9	Quality Information Equipment	100			
	6.10	Quality Training, Orientation, and Work Force development	100			
	6.11	Postproduction quality Service	101			
	6.12	Management of the Quality Activity	102			
	6.13	Special Quality Studies	102			
	6.14	Key Areas of Systems Measurement	102			
	6.15	Key Systems Activities for Quality Control – An Example	104			
	6.16	The Quality-Systems Manual	105			
	6.17	Ouality-Systems Management	106			
	6.18	Recognizing an Effective Quality System : A Summary	106			
7.	Qualit	y Costs – Foundation of Quality-Systems Economics	109			
	7.1	What Is the Scope of Ouality Costs?	110			
	7.2	What Are Operating Quality Costs?	110			
	7.3	How Are Quality Costs Reduced by Total Quality Control?	112			
	7.4	Ouality-Cost Establishment	114			
	7.5	Identifying Quality-Cost Items	114			
	7.6	Collecting and Reporting Quality-cost Information	110			
	77	Analysis of Quality Costs	122			
	78	Selection of Measurement Bases for Operating Quality Costs	124			
	70	Establishment of Quality_Cost Goals	124			
	1.1	Demonstration of Quarty Cost Oons	14)			

	7.10	Applications of Quality Costs	130
	7.11	Return on Investment and Quality Costs	134
	7.12	Other Quality-Cost Categories in quality-Systems Economics	135
	7.13	Indirect Quality Costs and Vendor Quality Costs	135
	7.14	Intangible Quality Costs and "Liability Exposure" Costs	136
	7.15	Equipment Quality Costs	136
	7.16	Life Cycle and Use-Oriented Quality Costs	138
	7.17	Life Cycle and use-Oriented Quality Costs – Structuring the Costs	139
	7 18	Life Cycle and Use-Oriented Quality Costs – Cost Input and Measurement Bases	140
	7 19	Other Measures for Decision Making in Quality Control	141
	7.20	Quality Costs and Economic Growth : A Summary	145
		<b>C</b>	
Part	Three	MANAGEMENT STRATEGIES FOR QUALITY	147
8.	Orgai	nizing for Quality	149
	8.1	What Are Today's Requirements for Quality Organization?	149
	8.2	Defining the Organizationwide Impact of Total Quality Control	150
	8.3	The Task of Quality Organization	152
	8.4	What Has Been the Formal Organization for Quality in the Past?	153
	8.5	What has Been the Status of Quality Responsibilities in These Organizations?	155
	8.6	What Issue Has Arisen from This Distribution of Responsibilities?	156
	8.7	What is the Process of "Control?"	157
	8.8	Organizing Principles	158
	89	The First Principle : Key Organizationwide Quality Responsibilities and Authoritie	-\$158
	8 10	The Second Principle : Key quality Control Responsibilities and Authorities	150
	8 11	Structuring Total Quality Organization General Management Responsibility	160
	0.11 Q 12	The Three Quality Control Subfunctions	162
	8.12 8.13	Organizing the Quality Control Function in a Company	162
	0.15	Diganizing the Quality-Control Function in a Company	165
	0.14	Basic Questions for Organization Structuring Should the Quality Control Experies De Controlized on Decentrolized?	10/
	8.15	Should the Quality-Control Function Be Centralized or Decentralized?	1/3
	8.16	How Should the Quality-Control Component Be Structured?	182
	8.17	Should the Quality-Control Function Itself Be Centralized or Decentralized –	100
	0.10	Quality Assurance and Quality Control?	190
	8.18	Location of the Function	190
	8.19	Organizing for Reliability and Other Product-Quality Parameters	192
	8.20	What Are Some Problems in Organizing for Quality Control?	193
	8.21	What Is a Broad Behavioral Science View of Quality-Control Organization?	194
	8.22	What Is the Size of the Quality-Control Component?	195
	8.23	The Special Quality Requirements Imposed by Internationalism	195
	8.24	Organizing for International Quality Control	197
9.	Achie	eving Total Commitment to Quality	200
	9.1	The Scope of Quality Commitment	201
	9.2	The Role of Quality Education	201
	9.3	Quality Education as a Process	202
	9.4	Analysis of the Existing quality-Education Process	203
	9.5	Use of Answers to the Questions	204
	9.6	Ouality-Mindedness	204
	97	Participative Approaches to Quality Commitment	207
	9.8	Participative Approaches to Quality commitment – Quality Circles Quality or	207
	2.0	Working Life (OWL), and Other Key Approaches	210
	99	Formalized Training in Quality Control	214
	9.10	The Range Covered by quality-Control Training Programs	214
	9.10	Alternative Resources for Quality-Control Training Programs	215
	0.12	Responsibility for Quality Control Training	210
	9.12 0.12	Motivation for the Development of Total Quality Control and Total Quality system	/12 10
	9.13	Sequence for Obtaining a Commitment to a Total Quality Control Dragony	1821ð 220
	9.14	Steps in Ashiguing a Widespread Quality Control Commitment	220
	9.15	Steps in Achieving a widespread Quality-Control Commitment	220
	9.10	Intercharing Operating Proponents Themselves	222
	9.17	introducing Quality Control in the Multiplant Company	223

	9.18	Communicating Quality commitment to Vendors	224
	9.19	Communicating Quality Commitment to Customers	226
	9.20	Communicating Quality Control Precisely	227
	9.21	Commitment to Quality : Growth of the Quality-Control Profession	228
	9.22	Commitment to Quality : Worldwide Growth of the Quality Field	229
Part	Four	ENGINEERING TECHNOLOGY OF QUALITY	231
10.	Qualit	y-Engineering Technology	233
	10.1	The Technological Triangle	234
	10.2	Quality-Engineering Technology	234
	10.3	The Techniques of Quality Engineering	237
	10.4	Quality Objectives and Quality Policy	237
	10.5	Approaches to Analysis Quality Engineering Analytical Techniques	241
	10.0	Delineation of Quality Requirements	242
	10.7	Designed Experiments	242
	10.9	Analysis of Product Reliability and Life Cycle	243
	10.10	Analysis of Environmental and End-Use Effects	244
	10.11	Analysis of Safety	245
	10.12	Review of Designs	246
	10.13	Evaluation of Effects of New Methods, New Processes, and New Materials	247
	10.14	Adjustment of Product and Process for Compatibility	247
	10.15	Vendor-Facilities Evaluation	248
	10.16	Quality-Cost Optimization	248
	10.17	Approaches to Planning	249
	10.18	Quality-Engineering-Planning Techniques	251
	10.19	Classification of Characteristics	253
	10.20	Acceptance Sampling	254
	10.21	Determination of Quality Measuring Equipment Paguirements	200
	10.22	Decumentation of Quality-Measuring Equipment Requirements	250
	10.23	Making Quality Requirements Understood by vendors	257
	10.25	Servicing of Vendors	259
	10.26	Material-Certification Plans	259
	10.27	Quality Information Feedback	260
	10.28	Liability Loss Control	262
	10.29	Data Processing and the Use of Computers	264
	10.30	Software Control	266
	10.31	Communication with Other Functions	268
	10.32	Feedback of Information from the Field	268
	10.33	Corrective Action	268
	10.34	Audit Planning – Product, Procedure, and System	270
	10.35	Quality Control in the Field	270
	10.50	Promotion of Quality to the Customer	212
	10.37	Configuration Control, Design Changes, Traceability	272
11	Proces	s-Control-Engineering Technology	775
11.	11 1	Process-Control-Engineering Technology	275
	11.1	Process-Control-Engineering Analytical Techniques	270
	11.2	Machine- and Process-Canability Analysis	278
	11.4	Quality-Measuring Equipment Capability and Repeatability Analysis	279
	11.5	Analysis of Pilot-Run Results	280
	11.6	Incoming-Material Testing, Inspection, and Laboratory Analysis	281
	11.7	Quality-Assurance Inspection	281
	11.8	Production Testing	282
	11.9	Process-Variation analysis	282
	11.10	Test-Data Analysis	283
	11.11	Field complaint Analysis	284

	11.12	Process-Control-Engineering Techniques Used for In-Process Control	284
	11.13	Vendor Rating and Vendor Performance Rating	285
	11.14	"Structure Table" Control	285
	11.15	Control Charts	286
	11.16	Work Sampling	287
	11.17	Process Engineering Techniques for Implementing the Quality Plan	287
	11.18	Use of Manuals and Standing Instructions	287
	11 19	Interpretation of Drawings, Specifications, and Quality Planning	288
	11.12	Temporary Quality Planning	289
	11.20	First Piece Inspection	207
	11.21	Disposition of Disgraphent or Nonconforming Material	209
	11.22	Disposition of Discrepant of Noncomorning Material	209
	11.23	Process Engineering Techniques – Quality Audit	290
	11.24	Product Audits	291
	11.25	Procedures Audits	293
	11.26	Quality-System Audits	295
	11.27	Other Areas of Quality Audit	296
	11.28	Use of the Technology by the Process-Control-Engineering Component	297
	11.29	Key checkpoints for Process Control	298
12.	Quality	Information Equipment Engineering Technology	300
	12.1	The Job of Modern Equipment	301
	12.2	Quality Information Equipment Engineering	302
	12.3	The Relationship Among Quality Information Equipment Engineering. Quality	
		Engineering, and Process-Control Engineering	304
	12.4	The Relationship among Quality Information Equipment Engineering Quality	
	12.1	Engineering and Process-Control Engineering – Some Examples	306
	12.5	Some Forms of quality Information Equipment	307
	12.5	Advanced Development Areas	209
	12.0	Auvalted Development Aleas	214
	12.7	Quality information Equipment Functional Concept	314
	12.8	Degree of Mechanization for the Control of Processes	316
	12.9	Computer-Aided Quality	316
	12.10	The Points of Process for Application of quality Information Equipment	319
	12.11	Preprocess measurement and Control	320
	12.12	In-Process Measurement and Control	321
	12.13	Postprocess Control Techniques	323
	12.14	Postprocess Control – Major Quality Information Equipment Requirements	325
	12.15	Combined Process Measurement and Control Techniques	326
	12.16	Integrated Process Control	327
	12.10	Information Recording Analysis and Feedback	327
	12.17	Evaluating and Analyzing the Measurement Operation	327
	12.10	Evaluating and Anaryzing the Measurement Operation	220
	12.19	Specifying the Equipment	332
	12.20	Getting the Equipment Built	333
	12.21	Getting the Equipment into Operation	337
	12.22	Summary of Quality Information Equipment – Basic Factor in Productivity,	
		Mechanization, and Electronicization	338
Part	Five S	TATISTICAL TECHNOLOGY OF QUALITY	343
13.	Freque	ncy Distributions	345
	13.1	The Universal Nature of Manufacturing Variation	347
	13.2	Recording Parts Variations	348
	13.3	Defining the Frequency Distribution	349
	13.4	A Frequency-Distribution Example	349
	13.5	The Analytical Use of This Frequency-Distribution Picture	351
	13.5	The Frequency Distribution as a Way of Thought	357
	13.0	The General Shape of Industrial Frequency Distributions	251
	12.7	The Constant Shape of Industrial Prequency Distributions	254
	13.8	Floodullity	330
	13.9	Algebraic Measures of the Frequency Distribution	336
	13.10	Measures of Central Tendency	357
	13.11	The Standard Deviation	359

	13.12	The Range	363
	13.13	Comparing the Standard Deviating and the Range	363
	13.14	The Normal Curve	364
	13.15	An Example of the Algebraic Analysis of the Frequency Distribution	366
	13.16	Algebraic Frequency-distribution Analysis	368
	13.17	Another Method for Calculating the Sheet-Steel Distribution	369
	13.18	Sample Size and the Frequency Distributions	370
	13.19	What Sample Size Should Be Used in Connection with Frequency-distribution	
		Calculations?	374
	13.20	Shapes of Industrial Frequency Distributions	375
	13.21	Skewness	375
	13.22	I Shapes and Bimodality	376
	13.23	100 Percent Inspection Curves	377
	13.24	"Normality" and the Frequency Distribution	378
	13.21	Frequency-Distribution Analysis of Nonnormal Distributions	380
	13.26	The Predictive Value of the Frequency Distribution	381
	13.20	Some Guides to the Use of the Frequency Distribution	382
	13.27	The Frequency-Distribution and the Quality-Control Jobs	385
	13.20	A Study of Regulating Equipments That Eailed at the Customer's Plant	386
	13.29	Predicting the Quality of an Incoming L of of Bronze Journal Boarings	380
	12.20	Derformance of a New Product	200
	12.21	Fertiliation of a New Floquet	201
	15.52	Establishing the Ship Tolerance for a Drining Operation	391
14.	Control	Charts	394
	14.1	The control Chart Approach	394
	14.2	Defining the Control Chart	396
	14.3	How Much Variation is Acceptable?	396
	14.4	Uses of the Control Chart	397
	14.5	Types of Control Charts	399
	14.6	Form of the Chart	401
	14.7	Measurements-Control Chart Limits	405
	14.8	Computing Control Limits	409
	14.9	The Calculation of Control Limits	410
	14.10	Measurements Control Charts : Differences in Detail	415
	14.11	Economically Satisfactory Control Limits : Relation of Range and Standard	
	1	Deviation	419
	14.12	Modified Control Limits in Relation to Specification Limits – Tool Wear and Tr	end
		Control	423
	14.13	Computing Control Limits Based on Specification Limits – Process-Capability	
		charts, Acceptance Control Charts	425
	14.14	Other Forms of Variables Control : Individual Reading Charts : Cusum Charts	428
	14.15	Measurements Control Charts : summary	431
	14.16	Percent and Fraction Control Limits	432
	14.17	Two Types of Percent control Charts	436
	14.18	Form of the Percent Chart for 100 Percent Inspection	436
	14 19	Establishing a 100 Percent Inspection Control Chart	439
	14.20	Control Charts for Number of Units Defective or Nonconforming	445
	14 21	Control Charts for count Number of Defects or Nonconformities	446
	14.22	Variations on Control Charts for Go and Not-Go Data	447
	14.22	Critical Major Minor and Incidental Classifications : Demerits per Unit: Qualit	v v
	11.25	Score	450
	14.24	Some Practical Aspects of Control Charts	452
	14.25	Summary of formulas for Computing Go and Not-Go Control Limits	453
	14.26	Practical Applications of control Charts	454
	14.27	Percent Nonconforming Chart for Electronic Measuring Equipments	455
	14.28	Measurements Chart to Control iewel-Screw Quality	457
	14.29	Measurements Chart for Control of Incoming Material	459
	14.30	A Nongraphical Control for Screw-Machine Parts	461
	14.31	Measurements Control Chart to study tool Wear	462
	. –		

15.	Sampli	ng Tables	464
	15.1	Acceptance Sampling	465
	15.2	Why Sample for Acceptance?	465
	15.3	Early Forms of Acceptance Sampling	467
	15.4	A Typical Spot-Check Procedure	468
	15.5	Features of Statistical Sampling Tables	470
	15.6	Defining the Statistical Sampling Table	475
	15.7	Types of Statistical Sampling Tables	476
	15.8	Lot-quality Protection	479
	15.9	Average Outgoing Quality Protection	479
	15.10	Single, Double, and Multiple Sampling	482
	15.11	Published Sampling Tables and Plans	483
	15.12	Normal, Reduced, adnTightened Inspection	492
	15.13	A Typical Acceptance plan : Attribute	494
	15.14	Tightened Inspection Sampling	497
	15.15	A Reduced-Sampling plan	499
	15.16	A Lot-Sensitive Sampling Plan	499
	15.17	When May Sampling Be Done?	503
	15.18	Uneconomical Use of Sampling Plans	506
	15.19	Sampling of Multiple Characteristics	507
	15.20	Sampling by Variables	509
	15.21	An Acceptance Plan : Variables	511
	15.22	Computer-Based Sampling Plans	515
	15.23	An Acceptance Plan: ANSI / ASQC Z1.9 Variables Sampling Symmetrical to MI	[L- 517
	15.24	The Approach to Sampling for Process Control	518
	15.24	Types of Process-Control Sampling Tables	519
	15.25	Process-Control Table for use When Output May be Segregated	521
	15.20	Process-Control Table for use When Output may be Segregated : Example	523
	15.27	Steps to Take in Application of This Process-Control Table	525
	15.20	Process Control When Output Is Not Easily Segregated	527
	15.20	The Relation of Process-Control Sampling to Accentance Sampling	529
	15.30	Some Practical Aspects of Sampling Tables	530
	15.31	Practical Applications of Sampling Tables	532
	15.32	Improving the Effectiveness of Incoming Material Inspection and Test Force	532
	15.33	Location of Unsatisfactory Vendors of Small Castings	535
	15.35	Reducing Rejects with Process Control	536
16	Special	Methods	541
10.	16 1	The Needs Satisfied by Special Methods	541
	16.2	The General Nature of Special Methods	543
	16.2	Graphical Presentation of Frequency-Distribution Data	543
	16.5	Prohability-Paper Granhing	545
	16.5	A Typical Probability Graph Example	549
	16.6	Graphical Regression for Two Variables	552
	16.7	Analytical Special Methods	554
	16.8	Statistical Tolerance Analysis	554
	16.0	Tests of Significance	557
	16.10	Design of Experiments	558
	16.10	Mathematics of Regression	560
	16.12	Sequential Analysis	562
	16.12	Practical Applications of Special Methods	562
	16.13	Analysis of a Lot of Questionable Quality : Graphical Regression	562
	16.14	Study of a Proposed Methods Change : Tests of Significance and Probability Pan	er 563
	16.16	Examination of Temperature Compensation : Graeco-Latin Square	566
17	Produc	t Reliability	570
1/.	17 1	The Increasing Emphasis on Product Reliability	570
	17.2	The Evolution of Formal Product Reliability	571
	17.3	Customer Requirements, Reliability, and Costs	572
	17.5	customer requirements, renuemely, and costs	512

	17.4	What Is Product Reliability?	574
	17.5	The Measurement of Reliability	575
	17.6	The Measurement of Reliability : Some Examples	576
	17.7	Other Reliability Patterns ; availability	581
	17.8	Reliability of Software	585
	17.9	Activities of Reliability	586
	17.10	Establishing the product-Reliability Requirements	587
	17 11	Developing the Reliability Program to Meet the Requirements Including Product	001
	1/.11	Developing the Kendolity Program to Weet the Requirements, menduling Product	580
	17 12	Design, Manufacturing 1 rocesses, and Transportation	501
	17.12	Design Margin	502
	17.13	Defailing	502
	17.14	The Manufacturing Dracesses An Integral Dart of the Delighility Draceson	502
	17.15	Declassing and Transportation Dispute An Ecoeptial Dart of the Delichility	393
	17.10	Packaging and Transportation Planning : An Essential Part of the Reliability	504
	17 17	Program	594
	17.17	Failure Mode, Effect, and Criticality Analysis	594
	17.18	Physics of Failure Research	595
	17.19	Maintainability; Human Engineering Design	595
	17.20	Evaluation of Reliability Plans by Tests	596
	17.21	Reliability Growth	598
	17.22	Continuing Control of Reliability	598
	17.23	Continuing Reliability Analysis	600
	17.24	Total Quality Control and Its Reliability Process	603
	17.25	New-Design control	603
	17.26	Incoming-Material Control	604
	17.27	Product Control	604
	17.28	Summary of Part 5	605
	17.29	Glossary of Important Symbols and Terms Used in Part 5	605
	17.30	Important Formulas Used in Part 5	607
Part 18.	Six AF New-De	PPLYING TOTAL QUALITY CONTROL IN THE COMPANY	613 615
10.	18.1	The Importance of the Control of New Designs	617
	18.2	The Needs for New-Design control	617
	18.3	The Needs for New-design Control – Influence During Product Planning	618
	18.5	The scope of New Design Control	610
	18.4	Defining New design Control	620
	19.5	Application of New Design Control	620
	10.0	Application of New Design Control	622
	10./	Diganizing for New Design Control	025
	18.8	Pattern for the New Design Control Routine The Fandemental Activities	025
	18.9	A Tradical New Design Control Routine – The Fundamental Activities	020
	18.10	A Typical New-Design Control Routine	628
	18.11	Operation of This New-Design Control Routine – Preliminary Design	631
	18.12	Operation of This new-Design Control Routine – Testing and Reliability	633
	18.13 18.14	Operation of This New-Design Control Routine – Intermediate Design Operation of This New-Design Control Routine – Final Design and Product qualification	636 638
	18 15	Quality Control Function's Technical Participation in New Design Control	644
	18.15	Techniques Used in New Design Control	644
	10.10	Telerence Analysis	651
	10.17	Discond Learner in a	051
	18.18	Planned inspection	053
	18.19	Statistical Analysis of 1001s Specially Purchased for the New Product	054
	18.20	Failure Mode, Effect, and Criticality Analysis	657
	18.21	Safety Studies	658
	18.22	Some Practical Aspects of New-Design Control	659
	18.23	Pilot Run to Determine Spring Specification	664
	18.24	An Example of Quality / Design Teamwork	664
	18.25	Testing New Products	667
	18.26	Reliability Testing	668

	18.27	Overall New-Design Control Program on a New Electromechanical Switch	671
19.	Incomi	ng-Material Control	677
	19.1	The Needs for Incoming-Material Control	678
	19.2	Defining Incoming-Material Control	681
	19.3	Principles of Vendor-Purchaser Relations in Ouality	682
	19.4	Organizing for Incoming-Material Control	683
	19.5	Pattern for the Incoming-Material Control Routine	686
	19.6	An Example of an Incoming-Material Control Routine	688
	19.7	An Example of an Incoming-Material control Routine (cont'd) – Purchase Ana	lysis690
	19.8	An Example of an Incoming-material Control Routine (Cont'd) –Vendor Selec	tion
		and Order Placement	698
	19.9	An Example of an Incoming-Material Control Routine (cont'd) - Material Rec	eipt,
		Material Examination	701
	19.10	An Example of an Incoming-Material Control Routine (cont'd) - Material Disp	osal 705
	19.11	An Example of an Incoming-material control Routine (cont'd) -Record keepin	g and
		Follow-Through ; Vendor Surveillance	707
	19.12	Techniques Used in Incoming –Material Control	712
	19.13	Vendor Relations	716
	19.14	Vendor Records an Information Processing	717
	19.15	Vendor Ratings	719
	19.16	Incoming Inspection Gage Control	723
	19.17	Study of Rejects on Incoming plastic Cases	725
	19.18	Integrated Vendor-Purchaser Control of Paint Treatments	726
	19.19	Control of Purchased Springs	727
	19.20	Control of Printed Circuit Requirements	730
	19.21	Instituting Improved Control over Incoming Material in a Going Business	732
	19.22	Vendor Rating Through Data Processing	734
20.	Produc	et Control	737
	20.1	The Needs for Product Control	738
	20.2	Defining Product Control	740
	20.3	Organizing for Product control	742
	20.4	The Role of Process-control Engineering in Product Control	477
	20.5	The Pattern	745
	20.6	Standards	746
	20.7	Manufacturing Control	747
	20.8	High quantities Versus Job Lots	748
	20.9	Job-Lot Machine Shop	749
	20.10	Process Sampling in a Machine Shop	754
	20.11	Characteristics Approach to Numerical Control	757
	20.12	High-Quantity Subassembly	759
	20.13	Assembly Techniques Used in Ducture control	/04
	20.14	Deckground	//0 977
	20.15	Dackground	770
	20.10	Concepts of Capability Studies	793
	20.17	Use of Process Capability Studies	705
	20.10	Background	707
	20.19	Product-Control Audits of Procedures Systems and Measurements	790
	20.20	Audit of Quality of Research and Development Work	800
	20.21	Product Traceability	802
	20.22	Software Product Control	803
	20.23	Quality Information Processing and Flow	803
21	Special	Process Studies	00 <i>6</i>
∠1.	21 1	Defining Special Process Studies	000 207
	∠1.1 21.2	The Elements of Special Process Studies	007 207
	21.2	Organizing for Special Process Studies	808
	21.3 21.4	Thermometal	808
	<u>~</u> 1.7	memoment	00)

21.5	Casting of Sintered Blocks	817
21.6	Summary of Part 6	820
The Principles	of Total Quality Control : A Summary	823
Index		831