Contents

Preface /xiii

| 1. | Establishing a Strategic Plan for Becoming a World-Class | | | |
|-----------------|---|-----|--|--|
| Manufacturer /1 | | | | |
| | 1.1 World-Class Manufacturing: Characteristics and Components | /2 | | |
| | 1.1.1 Definition of World-Class Manufacturing /2 | | | |
| | 1.1.2 Components and Relationships /9 | | | |
| | 1.2 Planning for Implementing Excellence /15 | | | |
| | 1.2.1 Getting Organized for Change /16 | | | |
| | 1.2.2 Summary and Resolution /25 | | | |
| 2. | Employee Involvement and Development /26 | | | |
| | 2.1 Communication and Employee Involvement /28 | | | |
| | 2.1.1 The Vision of a New Company Culture /28 | | | |
| | 2.1.2 Sharing Common Goals and Efforts /30 | | | |
| | 2.1.3 Scope and Responsibility for EI /33 | | | |
| | 2.2 How to Achieve EI /36 | | | |
| | 2.2.1 Creating the Conditions for EI /37 | | | |
| | 2.2.2 Starting EI Pilot Programs /39 | | | |
| | 2.2.3 Evaluating the Results /43 | | | |
| | 2.2.4 Extending the EI Program to the Rest of the Company | /44 | | |
| | 2.2.5 Common Pitfalls of EI Programs /44 | | | |
| | 2.2.6 Team Approaches /46 | | | |
| | 2.3 Why and How to Educate the Work Force /53 | | | |
| | 2.3.1 Investing in Human Resources /54 | | | |
| | 2.3.2 Planning Training Programs /56 | | | |
| | 2.3.3 Common Pitfalls of Training Programs /63 | | | |
| | 2.4 Summary and Management Guidelines /65 | | | |
| 3. | Total Quality /68 | | | |
| | 3.1 The Role of Senior Management in Quality /69 | | | |
| | 3.1.1 Redefining Responsibilities for Quality /69 | | | |
| | 3.1.2 Quality Management by Committee /71 | | | |
| | 3.1.3 Defining Objectives for Total Quality /72 | | | |

| | 3.2 | Establi | ishing A TQ Program /74 |
|----|------|----------|--|
| | | | Employee Involvement /75 |
| | | | Customer Relations /79 |
| | | 3.2.3 | Product Design and Development /80 |
| | | | Materials Control /84 |
| | | 3.2.5 | Process Control and Evaluation /85 |
| | | | Quality-Systems Audit /88 |
| | 3.3 | Statisti | cal Methods for Process Control and Improvement /89 |
| | | 3.3.1 | Problem Identification /89 |
| | | 3.3.2 | Statistical Process Control /92 |
| | | | Process Capability /97 |
| | 3.4 | | l Quality Improvement /100 |
| | | | Establishing a Strategy for Success /102 |
| | | | Defining AQI Objectives and Projects /102 |
| | | | Implementing AQI Projects and Measuring Results /105 |
| | | | er Summary /107 |
| 4. | Stan | dardiza | ation and Simplification via Group Technology /108 |
| | 4.1 | The Ro | ole of Group Technology in Discrete Parts Manufacturing /108 |
| | | 4.1.1 | Definition of Group Technology /109 |
| | | 4.1.2 | Applications in Design, Manufacturing, |
| | | | and Management /109 |
| | | | Part Families /110 |
| | 4.2 | | ication and Coding /111 |
| | | | Code Structures /111 |
| | | | Selection and Justification of a GT Coding System /113 |
| | | 4.2.3 | Group Technology in Small Companies /115 |
| | 4.3 | Focuse | d Facilities and Operations /116 |
| | | | Types of Layout Configurations /117 |
| | | | Advantages of Workcells /119 |
| | | | Limitations of Cells /122 |
| | 4.4 | | prmation /123 |
| | | | Visual Methods /124 |
| | | | Classification and Coding /124 |
| | | | Production Flow Analysis /125 |
| | | 4.4.4 | Key-Machine (Clustering) Approach /127 |
| | 4 = | 4.4.5 | Developing Flow-Line Workcells /128 |
| | 4.5 | Examp | le of Cell Formation Using the WUBC Algorithm /129 |
| | 4.0 | Evoluti | onary Implementation of GT /132 |
| | | 4.0.1 | Phase one: Recognition and Organization /133 |
| | | 4.0.2 | Phase two: Planning and Implementation /134 |
| | | 4.0.3 | Phase three: Refinements and Synergy /136 |

| | 4.6.4 Phase four: Strategic Operations /137 |
|----|--|
| 5. | Design and Implementation of Manufacturing Workcells /138 |
| | 5.1 Cell Layout and Capacity Measures /138 |
| | 5.1.1 Cell Layout Configurations /139 |
| | 5.1.2 Workstation Capacity and Work loads /140 |
| | 5.2 Operator Levels and Assignments /143 |
| | 5.2.1 Effects of Operators /144 |
| | 5.2.2 Effects of Operator Assignment /148 |
| | 5.3 Buffer Levels and Transfer Batch Sizes /149 |
| | 5.3.1 Workstation Blocking and Starving /151 |
| | 5.3.2 Transfer Batch Effects /154 |
| | 5.4 Implementation Issues /155 |
| | 5.4.1 Establishing a Team Approach /155 |
| | 5.4.2 Obsolete Incentive Systems /156 |
| | 5.4.3 Performance and Labor Reporting /158 |
| | 5.4.4 Education and Training /161 |
| 6. | Setup-Time Reduction /163 |
| | 6.1 The Role of Setup-Time Reduction In WCM Companies /164 |
| | 6.1.1 Definition of Setup Time /165 |
| | 6.1.2 Conventional Wisdom on Setup /166 |
| | 6.1.3 Fallacy of Economic Lot Sizing /168 |
| | 6.1.4 The Importance of Setup-Time Reduction /170 |
| | 6.1.5 Illustrative Example of the Importance of Setup-Time |
| | Reduction /171 |
| | 6.2 Organizing for Setup Time Reduction Projects /172 |
| | 6.2.1 Defining the Objectives of the Setup Project /173 |
| | 6.2.2 Forming Setup Project Teams /175 |
| | 6.2.3 Informing the Work Force and Training Setup Teams /177 |
| | 6.2.4 Showing Management Support /178 |
| | 6.3 How to Achieve Setup-time Reduction /179 |
| | 6.3.1 Selecting Machines and Setups /179 |
| | 6.3.2 Adopting a Systematic Approach /181 |
| | 6.3.3 Identifying Internal and External Activities /192 |
| | 6.3.4 Strategies and Techniques /195 |
| | 6.3.5 Adjustments /200 |
| | 6.3.6 Clamping /203 |
| | 6.3.7 Problems and Solutions /205 |
| | 6.5 Summary and Strategies for Getting Started /207 |
| 7. | Lot-Size Reduction /211 |
| | 7.1 Why, When, and How to Reduce Lot Sizes /212 |
| | 7.1.1 Defining the Different Types of Lot Sizes /213 |

Maintenance /317

9.2.1 Information Management /321 9.2.2 First-Level Maintenance /325 9.2.3 Preventive Maintenance /327

9.2 Strategies for TM /320

| 712 Podysing the Size of Production Orders (214 | |
|---|----|
| 7.1.2 Reducing the Size of Production Orders /2147.1.3 Reducing the Size of Purchase Orders /218 | |
| 7.1.3 Reducing the Size of Furchase Orders 7218 7.2 Predicting the Effect of Lot-Size Reduction 7220 | |
| 7.2.1 Evaluating the Effect of Lot-Size Reduction on Inventory | |
| Reduction /220 | |
| 700 7 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | 25 |
| 7.2.2 Relating Lot-size Reduction to Setup-Time Reduction /2 7.2.3 Modeling the Effect Of Lot-Size and Setup-Time | 23 |
| Reductions /227 | |
| 7.3 Summary and Strategies for Getting Started /234 | |
| 8. Production Planning and Control /236 | |
| 8.1 Push Systems versus Pull Systems /237 | |
| 8.1.1 Illustrative Example of each Type of System /238 | |
| 8.1.2 Kanban Systems /244 | |
| 8.1.3 Controlling Cellular Flow /261 | |
| 8.2 Modifying Manufacturing Resources Planning (MRP II) | |
| Systems /266 | |
| 8.2.1 Adjusting the MPS Policy /267 | |
| 8.2.2 Modifying Bills of Materials /270 | |
| 8.2.3 Simplifying Part Routings /277 | |
| 8.3 Simplified Planning and Scheduling Systems /284 | |
| 8.3.1 Planning Capacity /284 | |
| 8.3.2 How To Simplify Scheduling /289 | |
| 8.3.3 How to Coordinate Final Assembly to Upstream | |
| Operations /295 | |
| 8.4 Simplified Information and Shop-floor Control /300 | |
| 8.4.1 Physical Performance Measures /301 | |
| 8.4.2 Eyeball Control Systems /305 | |
| 8.4.3 Dismantling Computerized Complexity /307 | |
| 8.5 Summary and Management Guidelines /3119. Total Maintenance /314 | |
| 9.1 TM: A Necessity for WCM Companies /315 | |
| 9.1.1 The Need for a Different Maintenance in WCM | |
| Operations /315 | |
| 9.1.2 The Need for Measuring Savings Generated | |
| by Improved Maintenance /316 | |
| 9.1.3 What has to Change to Evolve Towards Total | |
| | |

| | 9.2.4 | Employee Involvement /330 | |
|-----|--------------------------------|---|--|
| | 9.2.5 | The New Maintenance Organization /332 | |
| | 9.2.6 | Predictive Maintenance /334 | |
| | 9.2.7 | Design for Dependability and Maintainability /335 | |
| | 9.3 Change Implementation /337 | | |
| | 9.3.1 | Planning the TM Project /337 | |
| | 9.3.2 | Implementation Steps /338 | |
| | 9.3.3 | Continuous Improvement /339 | |
| | 9.4 Summa | ry and Management Guidelines For Success /340 | |
| 10. | . Supplier Development /344 | | |
| | 10.1 Develop | ping Partnership-Like Vendor Relationships /344 | |
| | 10.1.1 | Why Suppliers Are Critical for Success /345 | |
| | 10.1.2 | New Criteria for Purchasing: QDC /346 | |
| | 10.1.3 | Identifying Common Goals /349 | |
| | 10.2 A Syste | matic Approach To Vendor Selection And Certification /350 | |
| | | Vendor Selection /350 | |
| | 10.2.2 | Vendor Qualification /352 | |
| | 10.2.3 | Vendor Certification /354 | |
| | | Multiple Source versus Sole Source /356 | |
| | 10.3 Quality | -Systems Survey /357 | |
| | 10.3.1 | Management Systems /358 | |
| | 10.3.2 | Design, Specifications, and Change Control /363 | |

10.3.3 Incoming Purchased Materials /364

10.3.4 In-Process Operations, Control, and Practices /366

10.3.5 Finished Goods /367

10.3.6 Measurement and Test Systems /368

Index /371