
DESIGN FOR MANUFACTURABILITY

BUSINESS ENVIRONMENT

COST CONTROL FACTORS

DESIGN FOR MANUFACTURABILITY

DFM INPUTS

PROBLEMS WITHOUT DFM

TRADITIONAL RELATIONSHIPS

TIME-TO-MARKET ISSUES

CONCURRENT ENGINEERING DEFINED

MULTIFUNCTIONAL TEAMS

EARLY SUPPLIER INVOLVEMENT

TIME-BASED PROGRAM MANAGEMENT

APPROACHES

PROJECT MANAGEMENT

TECHNOLOGY TOOLS

CAM

DESIGNING WITH SOFTWARE

3D PLASTIC ANALYSIS SOFTWARE

PART DESIGN OPTIMIZATION

TECHNOLOGY TOOLS IN PERSPECTIVE

PART FACTORS

 PART FUNCTION

 PART FEATURES

ENVIRONMENTAL DESIGN

BASIC RULES AND GUIDELINES

CONTACT THE VENDOR

MATERIAL AND DESIGN CONSIDERATIONS

DESIGN CONSIDERATIONS

WALL THICKNESS

THE RIB

BOSSES

SHAPING THE PART

HOLES AND IMPRESSIONS

MASS PRODUCTION

RAPID PROTOTYPING

CNC VERSUS RAPID PROTOTYPING
TYPES OF RP SYSTEMS

COMMON MISTAKES

CREEP

STRESS

SHRINKAGE

COLOR VARIANCE

GATE MARKS

INADEQUATE DRAFT

SINK MARKS

UNANTICIPATED USE

SUMMARY

CHAPTER SUMMARY

TECHNOLOGY ISSUES

MANAGEMENT AND SYSTEM ISSUES

MATERIAL SELECTION

INTRODUCTION

WHY USE PLASTIC?

CONSIDERATIONS

SELECTION CRITERIA
MANUFACTURING CRITERIA
SUMMARY OF MATERIAL SELECTION
GUIDELINES

OVERVIEW

POLYMER FEATURES
UNIQUE QUALITIES
MELT VISCOSITY
COPOLYMERS
THERMOPLASTICS AND THERMOSETS
BULK PROPERTIES
CRYSTAL STRUCTURES

FUNDAMENTALS OF PLASTICS AND POLYMERS

DIFFERENCES
POLYETHYLENE
POLYESTER

APPLICATIONS OF PLASTICS TO PRODUCT TYPES

POLYMERS
MARKETS

INTRODUCTORY CHEMISTRY OF PLASTICS AND POLYMERS

ATOMIC STRUCTURE
PERIODIC TABLE
IONIC BONDS
COVALENT BONDS

METALLIC BONDS
RULES OF BONDING
SECONDARY BONDS
AMORPHOUS OR CRYSTALLINE
MOLECULAR WEIGHT
POLYMER REACTIONS

THERMOSETS

CROSS-LINKING METHODS
DIFFERENT TYPES OF THERMOSETS
SILICONES
THERMOSETS AS FILLERS AND COPOLYMERS

THERMOPLASTICS

THERMOPLASTIC TYPES
OVERVIEW OF COMMODITY PLASTICS
POLYETHYLENE
POLYPROPYLENE
POLYVINYL CHLORIDE
POLYSTYRENE
OTHER TYPES OF THERMOPLASTICS
BLOCK COPOLYMERS
RIGID-ROD POLYMERS
BLENDS

STRENGTHENING AND ENHANCING PLASTICS AND POLYMERS

CHAIN LENGTH
COPOLYMERIZATION
CROSS-LINKING
FIBER REINFORCEMENT
OTHER ADDITIVES
ALLOYS AND BLENDS

BIOMEDICAL POLYMERS

CLASSIFICATIONS

SYNTHETIC PROCEDURES

ADDITION POLYMERIZATION
CONDENSATION OR STEPWISE
POLYMERIZATION
COLOR IN PLASTICS
BASIC RULES FOR SELECTING A
COLORING METHOD

FACTORS IN CHOOSING A COLORANT
COLORANT TYPES
CALCULATING FOR COLORANT RATIOS

COATINGS FOR PLASTICS

REASONS FOR COATING PLASTIC
SUBSTRATES
ADHESION OF COATINGS
NATURE OF SUBSTRATE SURFACE
PLASTIC SURFACE PRETREATMENTS
ADHESION PROMOTERS
CLEANING PLASTICS
COATING TYPES

MEASURING PROPERTIES

MECHANICAL PROPERTIES
OTHER PROPERTIES
TESTS AND THEIR SIGNIFICANCE

SUMMARY OF MATERIAL SELECTION GUIDELINES

KEY MECHANICAL PROPERTIES
KEY THERMAL PROPERTIES
KEY CHEMICAL PROPERTIES
FINAL PRODUCT APPEARANCE
SUPPLIERS

SELECTION OF MANUFACTURING METHODS

INTRODUCTION

POLYMER BEHAVIOR

CHEMICAL REACTIONS

BLENDING AND MIXING

ADDITIVES

SHAPING POLYMERIC MATERIALS

FILMS, SHEETS, AND SLABS

MOLDED PARTS

FOAM PROCESSING

EXTRUSION OF PIPE, TUBING, AND PROFILES

FOAM PROCESSING

MANUFACTURE OF FIBER-REINFORCED COMPOSITES

HAND LAY-UP

SPRAY-UP

VACUUM BAG MOLDING

PRESSURE BAG MOLDING

AUTOClave MOLDING

FILAMENT WINDING

PULTRUSION

CENTRIFUGAL CASTING

PROCESSING LIQUID POLYMERIC SYSTEMS

PROCESSING OF POLYMER SOLUTIONS

PROCESSING OF POLYMERIC LATEXES
AND SUSPENSIONS

PROCESSING OF LIQUID POLYMERS
AND PREPOLYMERS

THE VINYL DIP MOLDING PROCESS

THE PROCESS

SELECTION CRITERIA/ALTERNATE
PROCESSES

SECONDARY MANUFACTURING PROCESSES

DEFLASHING

MACHINING

CUTTING

CALIBRATION (OR SIZING)

SLITTING

STRETCHING

SURFACE FINISHES

ASSEMBLY

PROCESSES FOR ALTERING MATERIAL
PROPERTIES

DIES, MOLDS AND TOOLING

MOLD DESIGN CONSIDERATIONS

PLASTIC PART DESIGN BASICS
MOLD DESIGN BASICS
MOLD QUALIFICATION
MOLD OPERATION AND OPTIMIZATION
PREVENTIVE MAINTENANCE
MOLDING PRESS INFORMATION
OTHER CONSIDERATIONS
HEAT TRANSFER
METALLURGICAL ASPECTS
MOLD MATERIAL

MOLD PLATING

CHROMIUM
ENGINEERING NICKEL
TUNGSTEN NICKEL
ELECTROLESS NICKEL
CHROME POLYTETRAFLUOROETHYLENE
NICKEL PTFE
ELECTROLESS NICKEL CHROMIUM

RECORDKEEPING

FLOW ANALYSIS

THREE-DIMENSIONAL ANALYSIS
TWO-DIMENSIONAL ANALYSIS

MOLDMAKING IMPROVEMENTS

AREAS THAT NEED IMPROVEMENT
CONCLUSION

EXTRUSION EQUIPMENT AND PROCESSING TECHNIQUES

PRINCIPLES OF EXTRUSION

EXTRUDER DESCRIPTION

SCREW
THE HEAD ZONE
EXTRUSION DIES
BARREL
FEED THROAT
DRIVE AND MOTOR
GEARBOX

SMOOTH-BORE EXTRUDER

EXTRUDER SCREW
SCREW COMPRESSION RATIO
MIXING ELEMENT
COOLING SYSTEM
BARREL ZONES
BREAKER PLATE
RUPTURE DISK

GROOVED-FEED EXTRUDER

NO ADDED HEAT
FLIGHT DEPTHS

BLOWN-FILM PROCESS

AIR RING
MONOLAYER DIES
COEXTRUSION
COEXTRUSION BLOWN-FILM DIES
DIE ASSEMBLY
THE BLOWN-FILM DIE AND ADAPTER
A-FRAME ASSEMBLY
SYSTEM OPERATION
COOLING RING

INTERNAL BUBBLE COOLING
SLITTING AND WINDING
CORONA DISCHARGE
RELAXATION PLENUM
BLOWUP RATIO

FILM WINDERS

HAUL-OFF ASSEMBLIES
SURFACE WINDER

CENTER-TYPE WINDERS
OTHER TERMS

WINDER DESIGN CONSIDERATIONS
DRIVE CALCULATIONS

ELECTRONIC CONTROLLERS AND
FEEDBACK LOOPS
TENSION CONTROL SYSTEMS

BLOWN-FILM EQUIPMENT AND OPERATING COST

CAST FILM AND SHEET

CHILL ROLLS
ADVANTAGES AND DISADVANTAGES

PROFILE EXTRUSION

POLYETHYLENE PIPE AND FITTINGS
MANUFACTURING
TUBING AND HOSE
WIRE COATING AND FIBER-OPTIC SHEATHING

MATERIAL CONSIDERATIONS

COMPOUNDING AND PELLETIZING
POWDER AND PELLETS
ABRASIVE THERMOPLASTICS
CORROSIVE POLYMERS
TOLERANCES

AUXILIARY EQUIPMENT

PROCESS CONTROL
GENERAL EQUIPMENT

OPERATION AND MAINTENANCE OF EQUIPMENT

BASE
MOTOR
REDUCTION GEAR
THRUST BEARING
HEATING/COOLING
BARREL
SCREWS
HEAD
DIES
TAKE-OFFS
SPARE PARTS
RECORDS
CLEANING SMALL PARTS
WARM UP
INITIAL START-UP STAGE
SYSTEM SHUTDOWN

PROCESS DESIGN CONSIDERATIONS

GEAR PUMPS
GROOVED FEED COMPARED TO
SMOOTH BORE

TROUBLESHOOTING

MATERIALS
GENERAL PROCESSING
FILM EXTRUSION PROBLEMS
POLYETHYLENE FILM EXTRUSION
MECHANICAL
ELECTRICAL
MAINTENANCE

SAFETY

HEAT
ELECTRICITY
MOVING PARTS
WEIGHT
INSIDE THE EXTRUDER
OUTSIDE THE EXTRUDER
PRESSURE
PROCEDURES

NEW DEVELOPMENTS

INJECTION MOLDING

TRADITIONAL INJECTION MOLDING

INDUSTRY OVERVIEW
EVOLUTION OF THE INDUSTRY
THE MOLDING MACHINE
MOLDING PROCESS PARAMETERS
DETERMINING INJECTION MOLDING COSTS
MELT FLOW AND PROCESSIBILITY
MINIMIZING MOLDED-IN STRESS
MATERIAL SELECTION

TROUBLESHOOTING THE MOLDING PROCESS

BLACK SPECKS OR STREAKS
BLISTERS
BLUSH
BOWING
BRITTLENESS
BUBBLES (VOIDS)
BURN MARKS
CLEAR SPOTS
CLOUDY APPEARANCE
CONTAMINATION
CRACKING
CRAZING
DELAMINATION
DISCOLORATION
FLASH
FLOW LINES
LOW GLOSS
JETTING
KNIT LINES (WELD LINES)
NONFILL (SHORT SHOTS)
EXCESSIVE SHRINKAGE
SINK MARKS
SPLAY (SILVER STREAKING)
WARPAGE
TROUBLESHOOTING TIPS

REACTION INJECTION MOLDING

RIM ADVANTAGES

RIM LIMITATIONS

RIM MATERIALS AND APPLICATIONS

RIM PROCESS

STRUCTURAL FOAM MOLDING

MATERIALS

MACHINES

MINIMIZING SWIRL PATTERNS

RUNNERLESS MOLDING

CATEGORIES OF RUNNERLESS MOLDING

SPRUELESS MOLDING

CONCLUSIONS

NONTRADITIONAL TECHNOLOGIES

GAS-ASSIST INJECTION MOLDING
WITH NITROGEN

LIQUID GAS-ASSIST INJECTION MOLDING

LAMELLAR INJECTION MOLDING

AUXILIARY EQUIPMENT

CAVITY PRESSURE SENSORS
BARREL TEMPERATURE CONTROLLERS AND
THEIR REPLACEMENT

INSULATOR SHEETS

RUNNERLESS TEMPERATURE
CONTROL SYSTEMS

BLOW MOLDING

INTRODUCTION

BLOW MOLDING TERMS

HISTORY

TYPES OF BLOW-MOLDING PROCESSES

INJECTION BLOW MOLDING
EXTRUSION BLOW MOLDING
EXTRUSION STRETCH BLOW MOLDING

MATERIALS

INJECTION BLOW-MOLDING EQUIPMENT

TOOLING

EXTRUSION BLOW-MOLDING EQUIPMENT

SCREW DESIGN
PARISON-FORMING SECTION
MACHINE TYPES
HEAD TOOLING SIZE
THE BLOWING SECTION
TRIMMING SECTION
AUXILIARY EQUIPMENT
MOLD DESIGN AND CONSTRUCTION
MAINTENANCE

DESIGN CONSIDERATIONS

PARTING LINE AND DRAFT ANGLE
BLOW RATIO
NONSYMMETRICAL PARTS OR DETAILS
ON PARTS
DIMENSIONAL CONTROL
MOUNTING TABS, INSERTS, HINGES,
AND INTERLOCKS
STRUCTURAL AND COSMETIC
CONSIDERATIONS

MANUFACTURING CONSIDERATIONS

PRODUCT COST

SAFETY

NEW DEVELOPMENTS

COEXTRUSION

FLASHLESS BLOW MOLDING

PET BLOW MOLDING

DEEP-DRAW BLOW MOLDING

CONCLUSION

THERMOFORMING

THERMOFORMING BASICS

ADVANTAGES

DISADVANTAGES

THERMOFORMING MATERIALS

TYPES OF THERMOPLASTICS

THERMOFORMING METHODS

CONTINUOUS ROLL-FED PROCESS

FEATURES OF A ROLL-FED
THERMOFORMING MACHINE

HOW DIE CHOICE CAN DICTATE THE
EQUIPMENT USED

SECONDARY OPERATIONS PERFORMED ON
INDIVIDUAL CUT PARTS

SHEET-FED THERMOFORMING

SHEET-FED MACHINERY

POSTOPERATIONS ON
VACUUM-FORMED PARTS

SECONDARY OPERATIONS ON
PRESSURE-FORMED PARTS

PART PRICING PARAMETERS

LAMINATION

COATINGS

PAINTING PLASTICS
START-UP CHECKLIST FOR PAINT SPRAY LINES
TRANSPARENT COATINGS
HOT STAMPING
DECORATION

METAL DEPOSITION

PLATING PLASTICS
SPUTTERING
VACUUM-METALLIZED PLASTICS

MULTILAYER PROCESSES

DRY ADHESIVE FLAT BED LAMINATION
FILM AND SHEET FORMING

ROTATIONAL MOLDING

THE BASIC PROCESS

APPLICATIONS
ADVANTAGES AND LIMITATIONS
MATERIALS TESTING AND PREPARATION

MOLDS AND SPECIAL CONSIDERATIONS

CONSTRUCTION
MULTILAYER MOLDINGS
CROSS-LINKED MOLDINGS
INSERTS
DECORATIONS

EQUIPMENT

GRINDING
MIXING
DRYING
MATERIAL LOADING

MACHINE TYPES

CLAMSHELL MACHINES
TURRET MACHINES
SHUTTLE MACHINES
SWING MACHINES
VERTICAL WHEEL MACHINES
ROCK AND ROLL MACHINES
OPEN-FLAME MACHINES

PROCESS FACTORS

SINTERING
MOLD ROTATION
CONTROL SYSTEMS
TRIMMING
MOLDS
CAST ALUMINUM MOLDS
CLAMPING
INSERTS
MOLD ARMS
MOUNTING

VENTING
DROP BOX
MOLD RELEASE AGENTS

MATERIALS

POLYETHYLENES
LLDPE
LDPE
HDPE
NYLON
POLYCARBONATE
POLYPROPYLENE
VINYL
ADDITIVES

DESIGN GUIDELINES

ANGLES
CORNERS
DRAFTS
FLATNESS
HOLES
INSERTS
MULTIWALL PARTS
RIBS/BOSSES
TEXTURED SURFACES
THREADS
TOLERANCES
UNDERCUTS
WALL THICKNESS

SECONDARY FINISHING

DECORATING/PAINTING
ELECTRON BEAM CROSS-LINKING
FOAM FILLING
MACHINING
WELDING

TROUBLESHOOTING

BLOW HOLES AT PARTING LINE
BLOW HOLES AROUND INSERTS
BLOW HOLES IN OTHER AREAS OF PART
BUBBLES ON SURFACE OR IN PART
DISCOLORATION OF PART

FLASHING AT PARTING LINE
INCOMPLETE MOLD FILL
INCOMPLETE FUSING OF MATERIAL
LOW-IMPACT STRENGTH
LOW-PART STIFFNESS
LONG-OVEN CYCLE
MOLD BULGING
PART STICKS IN MOLD
PLATE-OUT
POCK MARKS ON PART
UNEVEN COLORING
WALL THICKNESS UNEVEN
WARPING OF PART

INDUSTRY ASSOCIATION

CASTING

ACRONYMS

GLOSSARY

THE CASTING PROCESS

WHAT CAN BE CAST

CASTING ACRYLICS

THE OLD METHOD

ACRYLICS CASTING TODAY

MAKING AN ACRYLIC SHEET

TUBES AND RODS

AUTOCLAVES

POLISHING

POLYSTYRENE CASTINGS

POLYESTER CASTINGS

CATALYSTS

CATALYSTS AND HEAT

CALCULATE THE WEIGHT

CATALYZATION CONSIDERATIONS

POLYESTER CASTING CASE STUDY

EMBEDMENT/CASTING CASE STUDY

CORPORATE LOGO CASE STUDY

SYNTHETIC STONE

PRODUCTION STEPS

GRANITES

EMBEDMENT AND CULTURED MARBLE

ADDING FILLERS TO POLYESTER

REINFORCED POLYESTER

EPOXY CASTINGS

FEATURES

TYPES

DILUENT EFFECTS

CROSS-LINKING

HARDENERS

EPOXY CASE STUDY

SILICONES

CHARACTERISTICS

USES

POLYURETHANES

TYPES

CURING

APPLICATIONS

PHENOLICS

COLD MOLDING

CASTING MOLDS

MOLD MATERIALS

POSITIVE MOLD MAKING

FOAMS

FOAM PROCESSING

INTRODUCTION

BASIC CHEMISTRY

CHAIN EXTENSION

GAS FORMATION

CROSS-LINKING

FOAM PRODUCTION METHODS

OPEN POUR

FROTH

CLOSED POUR

FOAM EQUIPMENT

RAW MATERIAL SUPPLY

METERING UNITS

MIX HEADS

TEMPERATURE CONTROL

PROCESS CONTROL SYSTEMS

FOAM MACHINES

SLAB STOCK FOAM MACHINES

BLOCK FOAM MACHINES

MOLDED FOAM MACHINES

FOAM CONFIGURATION

CONVEYING SYSTEMS

FOAM MOLDS

MOLD CARRIERS

FIXTURING

MOLD TEMPERATURE

CRUSHING

MOLD RELEASES

RIGID FOAM LAMINATE BOARD LINES

PRODUCTION CYCLE

FOAM FABRICATION

TRIMMING, SLITTING AND CUTTING

LAMINATION

ADHESIVE TYPES

DIELECTRIC SEALING

CARPET UNDERLAY

PRIME FOAM

BONDED FOAM

FOAM TYPES

RETICULATED FOAM

RECYCLING FOAM

TROUBLESHOOTING FOR CONVENTIONAL SLAB STOCK FOAM

COMPRESSION AND TRANSFER MOLDING

THERMOSET PLASTICS MOLDING

PRINCIPLES OF PLASTICS MOLDING

COMPRESSION MOLDING

TRANSFER MOLDING

MOLDING PROCESS COMPARISON

COMPRESSION MOLDING

PRINCIPAL COMPRESSION MOLDING

PARAMETERS

TROUBLESHOOTING

TRANSFER MOLDING

PRINCIPAL TRANSFER MOLDING

PARAMETERS

TROUBLESHOOTING

FIBER REINFORCED PROCESSING

GLOSSARY OF TERMS

INTRODUCTION TO REINFORCED PLASTICS

POLYESTER RESINS
VINYL ESTER RESINS
EPOXY RESINS
PHENOLIC RESINS
AMINO RESINS
THERMOPLASTIC POLYESTERS
THERMOPLASTIC NYLON RESINS
THERMOPLASTIC POLYESTERS
OTHER THERMOPLASTIC REINFORCED
ENGINEERING POLYMERS

PROPERTY DESIGN BY COMPOUNDING

REINFORCING AGENTS
REACTIVE REINFORCING MATERIALS
FILLERS AND EXTENDERS

METHODS OF FABRICATING REINFORCED PLASTICS

HAND LAY UP
RESIN INJECTION MOLDING
SPRAY UP
PREFORM MOLDING
RESIN TRANSFER MOLDING
SHEET MOLDING COMPOUND
COMPATIBILITY WITH STEEL BODY ASSEMBLY
BULK MOLDING COMPOUNDS
THICK MOLDING COMPOUND
VACUUM BAG, PRESSURE BAG AND
AUTOCLAVE MOLDING
PULTRUSION PROFILES FOR CONSTRUCTION
MATERIALS
CURED-IN-PLACE REINFORCED PLASTICS
PLASTIC PANELS IN AUTOMOTIVE AND
CONSTRUCTION APPLICATIONS
POLYMER CONCRETE UNDERGROUND
PRODUCTS

ENGINEERING PHENOLIC COMPOSITES
SEMIRIGID AND RIGID POLYURETHANES
THERMOPLASTIC INJECTION MOLDING
COMPOUNDS
THERMOPLASTIC COMPOSITES
RECYCLING OF WASTE-REINFORCED
PLASTIC MATERIALS

PULTRUSION

THE BASIC PROCESS

RESIN

REINFORCEMENT

OTHER RAW MATERIALS

CYCLE TIME

COMPOSITE SELECTION

COST ESTIMATING

DESIGN CONSIDERATIONS

TOLERANCES

TROUBLESHOOTING

CONTINUOUS IMPROVEMENT STRATEGIES

SAFETY

NEW DEVELOPMENTS

PULFORMING

STRUCTURAL REACTION INJECTION MOLDING

PROCESS DESCRIPTION

MOLDING CYCLE

SRIM APPLICATIONS

COMPARISON OF SRIM TO OTHER PLASTIC
PROCESSES

COMPARISON OF COST

IMPACT RESISTANCE

EQUIPMENT

PREFORM EQUIPMENT AND PROCESSES

SLURRY PROCESS

BINDERS/ADHESIVES

FEATURES AND DESIGN CONSIDERATIONS

MOLDS

TROUBLESHOOTING

MAINTENANCE

SAFETY

CONTINUOUS IMPROVEMENT/NEW
DEVELOPMENTS

RESIN TRANSFER MOLDING

CHARACTERISTICS

ADVANTAGES AND LIMITATIONS

PREFORM SELECTION AND FABRICATION

TOOL SELECTION AND DESIGN

RESIN SELECTION AND REQUIREMENTS

RESIN DELIVERY SYSTEMS

PROCESSING FUNDAMENTALS

**PROCESS IMPROVEMENTS AND
DATA COLLECTION**

TROUBLESHOOTING

SAFETY AND MAINTENANCE

SUMMARY

DIP MOLDING

THE PROCESS

SELECTION CRITERIA

GENERAL DESCRIPTION
OF THE PROCESS

MATERIALS

METAL TOOLS

PROCESS SUMMARY

APPLICATIONS

ADVANTAGES

LIMITATIONS

WHEN TO USE THIS PROCESS

PRODUCTION EQUIPMENT

OPERATING PARAMETERS

MACHINE CONTROLS

ORDER OF OPERATIONS

ADVANTAGES OF AUTOMATED DIP
MOLDING SYSTEMS

SPECIFICATIONS

PROCESS CYCLE TIME

AUXILIARY EQUIPMENT

CYCLE TIME AND COST ESTIMATION

MATERIAL REQUIREMENTS

DESIGN CONSIDERATIONS

TOLERANCES

TROUBLESHOOTING

SURFACE IMPERFECTIONS IN THE FINISHED
DIP MOLDED PART

MATERIAL PICKUP

BELL TOPPING

MOISTURE OR AIR

DRIP

MAINTENANCE

SAFETY

IMPROVEMENTS AND NEW DEVELOPMENTS

FORMULATION

MACHINE DESIGN AND CONTROLS

FINISHING

FINISHING, FABRICATION AND ASSEMBLY

PREPARATION AND FINISHING

MACHINING PLASTICS

BUFFING PLASTICS

CUTTING WITH LASERS

ASSEMBLY

PLASTIC WELDS

WELDING PLASTICS

ULTRASONIC PLASTIC WELDING

ELECTROMAGNETIC WELDING

FASTENERS

REQUIREMENTS CHECKLIST

QUALITY CONTROL, ASSURANCE AND IMPROVEMENT

INTRODUCTION

WHAT IS QUALITY?
WHY IMPROVE QUALITY?
CHAPTER OVERVIEW

PLANNING

VOICE OF THE CUSTOMER
BUSINESS PLAN/MARKETING STRATEGY
PRODUCT ASSURANCE PLAN
MANAGEMENT SUPPORT

PRODUCT DESIGN AND DEVELOPMENT

INFORMATION REQUIREMENTS
DESIGN ACTIVITY
OUTPUTS BY PRODUCT QUALITY
PLANNING TEAM

PRODUCT AND PROCESS VALIDATION

PRODUCTION TRIAL RUN
CALIBRATION
EQUIPMENT CERTIFICATION
MEASUREMENT ASSURANCE
INCOMING INSPECTION
NONSTATISTICAL CONTROL
DIMENSIONS

STATISTICAL METHODS FOR DESCRIBING DATA

KEY CHARACTERISTICS AND PROCESS
CAPABILITY
CONTROL PLAN
STATISTICAL PROCESS CONTROL CHARTING
CALCULATING C_p AND C_{pk}

DESIGN OF EXPERIMENTS

TYPES OF EXPERIMENTAL DESIGNS

LOSS FUNCTION

DERIVATION OF THE LOSS FUNCTION

CALCULATING PROCESS POTENTIAL

COMPUTING C_{pk}
SUMMARY

CONTINUOUS QUALITY IMPROVEMENT OUTLINE

BROAD CONCEPT OF CONTINUOUS
IMPROVEMENT

APPROACH FOR IMPROVEMENT

DEFINITIONS AND TOOLS FOR CONTINUOUS
IMPROVEMENT

PLANT ENGINEERING AND MAINTENANCE

RECYCLING PLASTIC MATERIALS

CHEMISTRY OF PLASTICS
SOURCES OF PLASTIC WASTE
ENVIRONMENTAL CONSIDERATIONS
LIFE CYCLE OF PLASTICS
RECYCLING
THE PLASTIC INDUSTRY'S VISION AND STRATEGY FOR THE FUTURE

EQUIPMENT MAINTENANCE

ORGANIZING EQUIPMENT
BASIC BUILDING BLOCKS FOR PLANNING
PREVENTIVE MAINTENANCE
EVALUATING THE MAINTENANCE PROGRAM
DEVELOPING THE TASK
MAINTENANCE RECORDS CONTROL
TRACKING THE SYSTEM
DIAGNOSTIC TOOL NEEDS
LUBRICATION CONSIDERATIONS

TOOL SURFACE ENHANCEMENTS

THE SURFACE ENHANCEMENT DILEMMA
REVIEWING THE CHOICES

CLEANING, PRESERVATION, AND STORAGE OF METAL MOLDS AND MOLD PARTS

CORROSION
MECHANICS OF CORROSION
BASIC CHEMISTRY
HOW TO IDENTIFY TOXIC AND HAZARDOUS MATERIALS
GOVERNMENT STANDARDS FOR WASTE DISCHARGED INTO SEWERS
METHODS FOR CLEANING STEEL MOLD PARTS
TREATMENT AND DISPOSAL OF SPENT ACID AND NEUTRALIZING SOLUTIONS

MANAGEMENT

MODERN MANAGEMENT AND ISO 9000

MANAGEMENT RESPONSIBILITY AND THE
COST OF QUALITY
QUALITY SYSTEM

CONTRACT REVIEW

DESIGN CONTROL

DOCUMENT CONTROL

PURCHASING AND SUPPLIER QUALITY
MANAGEMENT

PURCHASER-SUPPLIED PRODUCT

PRODUCT IDENTIFICATION AND
TRACEABILITY

PROCESS CONTROL

INSPECTION AND TESTING

INSPECTION, MEASURING, AND EQUIPMENT

CORRECTIVE ACTION

PACKAGING, STORAGE, HANDLING,
AND DELIVERY

QUALITY RECORDS

INTERNAL QUALITY AUDITS

SERVICING

STATISTICAL TECHNIQUES

OTHER PROGRAMS

TRAINING

UNDERSTANDING PLASTICS

TRAINING METHODS

PERSONNEL SKILLS

MOTIVATION

LEADERSHIP

PLANNING AND ORGANIZATION

TIME MANAGEMENT

DELEGATION

COMMUNICATION

MEASURING PERFORMANCE

DECISION MAKING

TEAM BUILDING AND EMPOWERMENT

OPERATIONS MANAGEMENT

INVENTORY SYSTEMS

FORECASTING

MANUFACTURING/PROCESSING FACILITY LAYOUT

PLANT REQUIREMENTS

CONFORMANCE TO NEEDS

PRODUCT-HANDLING EQUIPMENT

RAW MATERIAL STORAGE AND HANDLING

SUPPORT AREAS

BUILDINGS

SAFETY

EFFECTIVE SAFETY PROGRAM

SAFETY TEAM/COMMITTEE

DIRECT ACCIDENT COSTS

SAFETY SURVEY

SAFETY HANDBOOK

PREPAREDNESS, PREVENTION, AND
CONTINGENCY PLAN

PROPER HANDLING METHODS

FIRE BRIGADE AND FIRST AID TEAM

RULES AND REGULATIONS

EQUIPMENT SELECTION AND MATERIAL HANDLING

SERVICE EQUIPMENT

MISCELLANEOUS EQUIPMENT

SIZE OF EQUIPMENT

SAFETY AND ENVIRONMENTAL
CONSIDERATIONS

MATERIAL HANDLING AND RECYCLING

PLASTIC PROCESS CHANGES

MECHANICAL, ELECTRICAL, AND
BUILDING SERVICES

PROCESS- AND PRODUCTION-MONITORING
SYSTEMS

REDUCING MAINTENANCE COSTS

COMPUTERS AS MANAGEMENT TOOLS

PRODUCTION MANAGEMENT SYSTEMS

PROCESS MANAGEMENT SYSTEMS

PROCESS CONTROL SYSTEMS

CONCLUSIONS