

Processing I: Control Utilization

MOSAIC CONTROL

Two-Day Outline

Mosaic Operator Controls

- The push-button assembly
- Soft key usage
- Direct menu access keys
- Manual and single cycle
- Manual operation keys

Clamp Setup Control Menu

- Toggle vs. hydraulic clamps
- The mold closing sequence
- Setting the mold touch point
- The mold protection pressure
- The mold opening sequence
- Slow breakaway set up

Ejection Control Menu

- The ejector forward sequence
- Dwell and pulse settings
- Ejecting during mold opening
- The ejector retract sequence
- Setting up retract override
- The air eject sequence

Temperature Control Menu

- Hydraulic oil temperature control
- Setting the feed throat temperature
- Barrel temperature profiles
- Setting temperature alarm bands
- Nozzle temperature control

Process Timer Control

- Components of a molding cycle
- Position controlled filling
- Pack and hold time division
- Cooling timer set up
- Fill time readings
- Cycle time readings

Injection Velocity Control Menu

- Setting a single injection velocity
- Establishing the shot size
- Setting max. injection pressure
- Setting an injection speed profile
- Monitoring the velocity shot trace
- Establishing a Transfer position

Evaluating Mosaic Shot Traces

- Shot traces over screw position
- Superimposed graphing techniques
- Velocity plots and traces
- Fill pressure traces
- Shot traces over time
- Holding pressure plots and traces

Transfer Mode Options

- The position transfer mode
- Optimizing the transfer position
- The hydraulic transfer option
- Hydraulic transfer principles
- Establishing a cut-off pressure
- Applications for hydraulic transfer
- The cavity pressure transfer option

The Packing and Holding Menu

- Packing and holding principles
- Setting up the packing and holding
- Determining the gate freeze time
- Establishing dimensions
- Profiling the holding pressures
- Holding pressure shot traces

Processing I: Control Utilization - MOSAIC CONTROL

Extruder Control Menu

- The plastication process
- Back pressure principles
- Machine back pressure ranges
- Optimizing the screw speed
- Profiling the back pressure

Solutions for Packing Related Defects

- Packing out sinks and voids
- Improving surface defects
- Defects due to molded-in stress
- Controlling dimensions
- Hold pressure profiling applications

Process Monitoring Menus

- Key processing parameters
- Causes of process variation benchmarks
- Process variation benchmarks
- Setting alarm limits
- The production monitor

Alarm and Fault Menus

- Common alarms conditions
- Accessing the alarm menu
- Common fault conditions

Specialty Menu Usage

- Moving cores set up
- Mold data storage
- Auto die height set up procedures
- Lube status menu

Velocity Controlled Filling

- Setting the max. injection pressure
- Advantages of fast filling rates
- Maximizing the filling rate
- Monitoring fill time variations

Machine Considerations

- Clamp tonnage and projected area
- Screw diameter options
- The amplification ratio
- Injection pressure capability
- Non-return valves
- Open vs. closed loop control

Plastic Materials and Their Behavior

- Commodity vs. engineering plastics
- Crystalline vs. amorphous plastics
- Molecular weight and viscosity
- Thermal stability
- Moisture absorption
- Material grades and lots
- Surface defects
- Fill related defects
- Process monitoring
- Dimensional control

Process Troubleshooting

- Sources of molding variation
- Troubleshooting procedures
- Packing related defects

Solutions for Fill Related Defects

- Fountain flow principles
- Procedures to minimize short shots
- Solutions for blush and jetting
- Solutions for flash and burn marks

Course conducted by Polymer Training Resources®

MILACRON Processing I Seminar

Xtreem, CAMAC 486, or VSX Machine Controller Utilization

Course Outline for 2-Day Seminar

Xtreem or 486/VsX Operator Controls

- The push-button assembly
- Soft key usage
- Direct menu access keys
- Manual and single cycle
- Manual operation keys

Clamp Setup Control Menu

- Toggle vs. hydraulic clamps
- The mold closing sequence
- Setting the mold touch point
- The mold protection pressure
- The mold opening sequence
- Slow breakaway set up

Ejection Control Menu

- The ejector forward sequence
- Dwell and pulse settings
- Ejecting during mold opening
- The ejector retract sequence
- Setting up retract override
- The air eject sequence

Temperature Control Menu

- Hydraulic oil temperature control
- Setting the feed throat temperature
- Barrel temperature profiles
- Setting temperature alarm bands
- Nozzle temperature control

Process Timer Control Menu

- Components of a molding cycle
- Position controlled filling
- Pack and hold time division
- Cooling timer set up
- Fill time readings
- Cycle time readings

Injection Velocity Control Menu

- Setting a single injection velocity
- Establishing the shot size
- Setting the fill pressure high limit
- Setting an injection speed profile
- Monitoring the velocity shot trace
- Establishing a Transfer position
- Adaptive shot control applications

Evaluating Xtreem or 486/VsX Shot Traces

- Shot traces over screw position
- Superimposed graphing techniques
- Velocity plots and traces
- Fill pressure traces
- Shot traces over time
- Holding pressure plots and traces

Transfer Mode Options

- The position transfer mode
- Optimizing the transfer position
- The hydraulic transfer option
- Hydraulic transfer principles
- Establishing a cut-off pressure
- Applications for hydraulic transfer
- The cavity pressure transfer option

The Packing and Holding Menu

- Packing and holding principles
- Setting up the packing and holding
- Determining the gate freeze time
- Establishing dimensions
- Profiling the holding pressures
- Holding pressure shot traces

Extruder Control Menu

- The plastication process
- Back pressure principles
- Machine back pressure ranges
- Optimizing the screw speed
- Profiling the back pressure

Solutions for Packing Related Defects

- Packing out sinks and voids
- Improving surface defects
- Defects due to molded-in stress
- Controlling dimensions
- Hold pressure profiling applications

Process Monitoring Menus

- Key processing parameters
- Causes of process variation benchmarks
- Process variation benchmarks
- Setting alarm limits
- Defective part signal applications
- The production monitor

Alarm and Fault Menus

- Common alarms conditions
- Accessing the alarm menu
- Common fault conditions

Specialty Menu Usage

- Moving cores set up
- Mold data storage
- Feature select menu options
- Printer set up menu
- Auto die height set up procedures
- Lube status menu
- Configuration menus
- Quick set section menus

Overview of the SPC Menus

- Applications for SPC
- Sample data charts
- Analysis charts
- Plotting charts
- Capability charts
- Overview menu

Velocity Controlled Filling

- Setting the fill pressure high limit
- Advantages of fast filling rates
- Maximizing the filling rate
- Monitoring fill time variations

Machine Considerations

- Clamp tonnage and projected area
- Screw diameter options
- The amplification ratio
- Injection pressure capability
- Non-return valves
- Open vs. closed loop control

Plastic Materials and Their Behavior

- Commodity vs. engineering plastics
- Crystalline vs. amorphous plastics
- Molecular weight and viscosity
- Thermal stability
- Moisture absorption
- Material grades and lots
- Surface defects
- Fill related defects
- Process monitoring
- Dimensional control

Process Troubleshooting

- Sources of molding variation
- Troubleshooting procedures
- Packing related defects

Solutions for Fill Related Defects

- Fountain flow principles
- Procedures to minimize short shots
- Solutions for blush and jetting
- Solutions for flash and burn marks

For more information contact: Milacron Training Administration at (513) 536-2265

4165 Half Acre Road * Batavia, OH 45103

Course conducted by Polymer Training Resources®

MILACRON Processing II Seminar

Injection Molding Process Optimization

Course Outline for 2-Day Seminar

Day 1:

Set-up and Processing Considerations

- Milacron Inc. A, B and C screw sizes
- Effect of screw size on pressure and shot size capability
- Optimizing the match between mold and press
- Optimizing the dry cycle and clamp tonnage
- Integrating information from the Mosaic, Xtream or other process monitors
- Techniques for duplicating a process on another machine

Tooling Considerations

- Runner and gate optimization techniques
- Optimal cavity venting principles
- Part design features that influence processing
- Evaluating the mold cooling system

Controlling the Cavity Fill Rate

- Filling with velocity as a control principle
- Milacron Inc. closed loop velocity controls
- Fountain flow principles and melt flow front development
- Setting and optimizing the injection speed profile controls
- Evaluating velocity and pressures traces and fill time variation

Controlling the Fill to Pack Transfer

- Operating principles for velocity to pressure control
- Setting up and optimizing position based transfer processes
- Setting up in hydraulic transfer on the Mosaic, Xtream or other controllers
- Specialized cavity pressure transfer applications

Shot Size and Cushion Control

- Types of non-return valves and their effectiveness
- Effects of check ring and barrel wear on cushion control
- Processing solutions to control cushion variation
- Adaptive shot control on the Mosaic, Xtream or other controllers

Day 2:

Packing and Hold Pressures

- Packing & holding phase separation on Mosaic, Xtream or other controllers
- Monitoring transfer & holding pressures
- Processing techniques for better dimensional control
- Hold pressure profiling strategies and case studies

Melting Mechanisms and Temperature Control

- Techniques for optimizing the barrel heat zone profiles
- Screw plastication and shear heating principles
- Back pressure control techniques on Mosaic, Xtream or other controllers
- Balancing the conductive heat with the shear heat input
- Measuring and controlling melt temperature

Controlling the Cooling Rate and Cooling Time

- Principles of plastic part solidification and crystallization
- Effects of the melt and mold temperatures on cooling time
- The effects of cooling time and temperature on part dimensions
- Optimizing and controlling mold coolant flow

Plastic Materials and Their Behavior

- Effects of molecular weight and crystallinity on processing
- Molding plastics with additives, fillers and reinforcements
- Causes and effects of orientation and molded-in stress
- Processing case studies with specific plastics

Troubleshooting Molded Part Defects

- Fill related defects and their solutions
- Pack related defects and their solutions
- Surface defects and their solutions
- Causes of part warpage and distortion
- Post molding part problems and solutions

SPC Setup on the Mosaic, Xtream or other Controllers

- Relating SPC data to the molding process
- Identifying key process parameters for SPC
- SPC sample data and analysis chart interpretation
- Interpreting the X-bar and R charts

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Processing III: “Find-The-Solution”

XTREEM / VSX / 486 CONTROL - Process Utilization & Troubleshooting

Two-Day “Hands-On” @ Machine Site

This seminar is designed to further develop skills previously established in Processing I and/or II for your experienced personnel. Processing III increases analytical ability for troubleshooting processing related part defects.

Students setup a process then optimize each portion of the process, such as Injection Rate, Packing, Cooling, etc. to achieve an optimum cycle and defect-free parts. Utilizing a series of interactive learning exercises, students are guaranteed to acquire the highest learning gain possible at the machine site, in this 100% “hands-on” learning environment.

Due to course curriculum, this seminar is currently available at Milacron’s Headquarters for the Plastics Technologies Group, Batavia, Ohio facility only utilizing our injection molding machinery and molds. Processing I is the minimum requirement for attendance in Processing III.

DAY ONE:

Review Mold Installation

- Discuss proper mold lifting technique
- Discuss establishing the number of clamps required for particular mold & location of clamps

Water Hook-Up of Mold

- Type of water hook-up for best results such as Series or Manifold type
- Set proper mold temperature for material processed
- Pre-Heat the mold

Establish Proper Machine Settings

- Set clamp opening stroke
- Establish Mold Touch point
- Set clamp slow down position for clamp close & open
- Set ejector stroke
- Set Start of Eject (Eject-on-the-fly)
- Establish proper heater band temperature settings for material processed

Optimize the Mold Opening and Closing Speed

- Set the clamp opening and closing speeds to optimize the cycle time

Setting the Proper Clamp Tonnage

- Calculate the proper clamp tonnage required for the mold used and material processed.

Auto Die Height Adjustment (applies to toggle clamp machine)

- Set proper tonnage on toggle clamp machine from previous calculation
- Set machine to check Auto Die Height to compensate for mold expansion

Establish Proper Melt & Mold Temperatures

- Check actual melt temperature of material using a pyrometer
- Check actual temperature of mold after pre-heating and after cycling material through mold

Set up the Molding Process for Mold Installed

- Start-up using short shot start-up procedure

Continued on next page....

Processing III: “Find-The-Solution”
XTREEM / VSX / 486 CONTROL - Process Utilization & Troubleshooting

DAY TWO:

Optimize the Molding Process

- Optimize the Injection Speeds & Speed Profiling if required for correcting defects
- Optimize the Pack & Hold Pressures and use Pressure Profiling if necessary
- Evaluate Velocity and Pressure traces
- Review and/or determine possible causes for fill time variations

Hydraulic Transfer Control

- Establish Hydraulic Transfer setpoint
- Switch machine into Hydraulic Transfer Control
- Determine if Hydraulic Transfer Control would be more beneficial than position transfer for particular mold used

Establishing the Gate Freeze

- Establish Gate Freeze using part weight

Optimizing the Cooling

- Optimize the cooling using a pyrometer and HDT (Heat Distortion Temperature)

Set Up SPC on Machine

- Determine variables to set up for monitoring with SPC
- Evaluate *process* for stability from SPC data
- Evaluate *machine* for stability from SPC data

Establish Melt Front on Injection into Cavity (Optional)

- Determine if material established melt front (Fountain Flow) after going through gate
- Determine at what point the melt front was established

Troubleshooting Molded Part Defects

- Defects will be set up on parts molded when applicable, for students to correct, example:
 - Correct burn marks molded into part
 - Correct sink marks molded into part / various troubleshooting exercises

Stress Analysis – Orientation Shrinkage Test (Oven Required)

- Determine oven temperature for material molded
 - Example: ABS may show best results at 250°F
- Measure overall length of part molded
- Bake part for 45 minutes/1 hour
- Cool part & re-measure part calculating shrinkage
- Determine amount of molded in orientation

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Processing IV: Cavity Filling and Cavity Pressures XTREEM / VSX / 486 CONTROL

Two-Day Outline

Material Fill Rate & Flow Characteristics

- Effects of Fill Speed on Melt Viscosity
- Effects of Fill Rate on Orientation
 - Exercise Evaluating Orientation with Polarized Plates
 - Exercise Machine Operation - Orientation Shrinkage Test
- Material Viscosity & Flow Length Characteristics
 - Exercise - Material Flow Rate Data
 - Exercise - Machine Operation Exercise Flow Length Comparison Test

Filling The Cavity

- Short Shot Development
 - Exercise - Machine Operation, Exercise Short Shot Development with Position Cut-off.
- Filling Thin Walled Parts
 - Exercise - Parts with Different L/T Ratios
- Developing High Fill Speeds or Pressures
 - Exercise - Identifying Machine Injection Capacities

Setting Up for Injection Speed Profiling

- Types of Speed Profile Controllers
 - Exercise - Speed Profiling Controllers
 - Exercise - Speed Profiles & Reference Plots
- Matching Cavity Fill Points with Screw Stroke Position
 - Exercise - Gate Flow Calculation for Speed Profiling
 - Exercise - Machine Operation Exercise Systematized Short Shot Development
- Filled Related Defects
- Defects Influenced by Fast Filling Speeds

Injection Speed Profiling Case Studies

- Fill Speed at the End of Flow
- Injection Speed Through the Gate
 - Exercise - Machine Operation Exercise Tissue Paper Test
 - Exercise - Machine Operation Exercise Speed Profiling Through the Gate Area
- Flow Past Intersecting Walls and Obstruction
 - Exercise - Machine Operation Exercise Optimizing the Injection Speed Profile
- Limitations of Injection Speed Profiling
 - Exercise - Monitoring the Injection Speed Profile

Understanding Pressures in the Cavity

- Pressure Effects in the Cavity
- Measuring Cavity Pressure
- Cavity Pressure Curves
- Relating Hydraulic Pressure to Cavity Pressure
- Containing Cavity Pressure with Clamp Force
 - Exercise - Converting Hold Pressures
 - Exercise - Clamp Tonnage Calculation
 - Exercise - Minimizing Clamp Tonnage
 - Exercise - Determining the Average Pressure in the Cavity

Continued on next page....

Processing IV: Cavity Filling and Cavity Pressures XTREEM / VSX / 486 CONTROL

Controlling the Packing Process

- Evaluating Melt & Hydraulic Pressures
- Controlling Hydraulic Pressures
- Machine Parameters Which Affect Packing
 - Exercise - Survey of Hydraulic Pressure Readout Capability (of Microprocessor Controlled Machines)
 - Exercise - Pressure Readability
 - Exercise - Effect of Machine Parameters on Packing (Interactive Machine Exercise)
 - Exercise - Nozzle Orifice Check

Packing Effects on the Part

- Effects of Mold Design on Packing
- Effects of Material Type on Packing
- Packing - Related Defects
 - Exercise - Runner Diameter Calculations
 - Exercise - Tooling Evaluation of Runner and Gates
 - Exercise - Packing - Related Defect Evaluationw

Controlling the Hold Pressure Over Time

- Determining the Gate Freeze Time
- Establishing the Holding Time
- Profiling the Hold Pressure Over Time
- Types of Hold Pressure Profile Controllers
 - Exercise - Determining the Gate Freeze Time (Interactive Machine Exercise)
 - Exercise - Hold Time Evaluation
 - Exercise - Profiling the Hold Pressure (Interactive Machine Exercise)
 - Exercise - Determining the End of the Packing Phase
 - Exercise - Machine Hold Pressure Control Survey

Controlling Part Dimensions

- Understanding the Effects of Materials Shrinkage
- Dimensional Process Capability
- Controlling Dimensions
 - Exercise - Determination of Differential Shrinkage Rates
 - Exercise - Process Capability Evaluation
 - Exercise - Improving the Cpk Value with Hold Pressure Profiling (Machine Exercise)
 - Exercise - Determining Transfer Pressure Limits (Interactive Machine Exercise)

Special Exercises

- Identification of Inadequately Vented Molds
- Survey of Tooling with Gating Related Defects
- Basic Runner Optimization Calculation
- Survey of Inadequate Sprue Sizes

NOTE: Not all exercises will be used because of time constraints

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Roboshot #1: Control Utilization

Two-Day Outline

Menus

- Machine Description
- Operator Panel & LCD/MDI Controls
- Temperature Control Menu
- Clamp Set Up Menu
- Ejection Control Menu
- Extruder Control Menu
- Process Monitoring
- Process Monitor Graph
- Product Management Setting
- Injection Profile Monitor (Menu 32)
- Injection/Pack Settings Menu
- Velocity Controlled Filing
- Process Timers
- Automatic Die Height Adjustment
- Sprue Break Menu
- Automatic Purging Menu
- Process Relation Graph
- Process Management Setting

The above Menus include subtopics not shown

Operator Panel LCD/MDI Controls

- The push-button assembly
- Soft Key Usage
- Direct menu access keys
- Manual and Single Cycle
- Manual Operation Keys

Temperature Control Menu

- Setting the Feed Throat Temperature
- Barrel Temperature Profiles
- Setting Temperature Alarm Bands
- Nozzle Temperature Control

Process Timer

- Components of a Molding Cycle
- Position Controlled Filling
- Pack and Hold Time Division
- Cooling Timer Set Up
- Fill Time Readings
- Cycle Time Readings

Velocity Controlled Filling

- Setting the Fill Pressure High Limit
- Advantages of Fast Filling Rates
- Maximizing the Filling Rate
- Monitoring Fill Time Variations

Clamp Setup Control Menu

- Automatic Die Height Adjustment
- The Mold Closing Sequence
- Setting the Mold Touch Point
- The Mold Protection Pressure
- The Mold Opening Sequence
- Slow Breakaway Set Up

Ejection Control Menu

- The Ejector Forward Sequence
- Dwell and Pulse Settings
- Ejecting During Mold Opening
- The Ejector Retract Sequence
- Setting up Retract Override
- The Air Eject Sequence

Continued on next page....

Roboshot #1: Control Utilization

Injection / Pack Settings

- Setting a Single Injection Velocity
- Establishing the Shot Size
- Setting the Fill Pressure High Limit
- Setting an Injection Speed Profile
- Monitoring the Velocity Shot Trace
- Establishing a Transfer Position

Evaluating Shot Traces

- Shot Traces Over Screw Position
- Superimposed Graphing Techniques
- Velocity Plots and Traces
- Fill Pressure Traces
- Shot Traces Over Time
- Holding Pressure Plots and Traces
- Sprue Break Settings
- Auto Purging
- Process Monitoring & Production Management

Optional Screens or Menus

- AI Extruder Control (Menu 14)
- Clamp/Ejector Settings (Menu 21)
- AI Mold Protection (Menu 23)
- AI Ejector Protection (Menu 24)
- AI Extruder Control (Menu 14)
- Die Height Adjustment (Menu 25)
- Mold File (Menu 51)
- Date/Time Menu (Menu 84)
- Servo Diagnostic (Menu 72)
- Velocity Controlled Molding

The Molding Machine

- Clamp Tonnage & Projected Area
- Screw Diameter & Amplification Ratio
- Shot Size Evaluation
- Non-return Valves

Plastic Materials

Process Troubleshooting

Hands-On Exercise: Short-shot Start Up & Troubleshooting Exercises

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Roboshot #2: Process Optimization

Two-Day Outline

DAY ONE:

ROBOSHOT Controllers

- Key process set-up & configuration menus
- Optional features & their set-up

Set-up and Processing Considerations

- Melt Pressure on Roboshot
- Effect of screw size on pressure and shot size capability
- Optimizing the match between mold and press
- Optimizing the dry cycle and clamp tonnage
- Integrating information from the Roboshot process monitor
- Techniques for duplicating a process on another machine

Tooling Considerations

- Runner and gate optimization techniques
- Optimal cavity venting principles
- Part design features that influence processing
- Evaluating the mold cooling system

Controlling the Cavity Fill Rate

- Filling with velocity as a control principle
- Milacron Inc. closed loop velocity controls
- Fountain flow principles and melt flow front development
- Setting and optimizing the injection speed profile controls
- Evaluating velocity and pressures traces and fill time variation

Controlling the Fill to Pack Transfer

- Operating principles for velocity to pressure control
- Setting up and optimizing position based transfer processes
- Setting up in melt pressure transfer on the Roboshot controller
- Specialized cavity pressure transfer applications

Shot Size and Cushion Control

- Types of non-return valves and their effectiveness
- Effects of check ring and barrel wear on cushion control
- Processing solutions to control cushion variation

Continued on next page....

Roboshot #2: Process Optimization

DAY TWO:

Packing and Hold Pressures

- Packing on Roboshot controller
- Monitoring transfer & packing pressures
- Processing techniques for better dimensional control
- Pack pressure profiling strategies and case studies

Melting Mechanisms and Temperature Control

- Techniques for optimizing the barrel heat zone profiles
- Screw plastication and shear heating principles
- Back pressure control techniques on Roboshot controller
- Balancing the conductive heat with the shear heat input
- Measuring and controlling melt temperature

Controlling the Cooling Rate and Cooling Time

- Principles of plastic part solidification and crystallization
- Effects of the melt and mold temperatures on cooling time
- The effects of cooling time and temperature on part dimensions
- Optimizing and controlling mold coolant flow

Plastic Materials and Their Behavior

- Effects of molecular weight and crystallinity on processing
- Molding plastics with additives, fillers and reinforcements
- Causes and effects of orientation and molded-in stress
- Processing case studies with specific plastics

Troubleshooting Molded Part Defects

- Fill related defects and their solutions
- Pack related defects and their solutions
- Surface defects and their solutions
- Causes of part warpage and distortion
- Post molding part problems and solutions

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Roboshot Processing #3: “Find-The-Solution” Process Utilization & Troubleshooting

Two Day “Hands-On” @ Machine Site

This seminar is designed to further develop skills previously established in **Roboshot** Processing #1 and/or #2 for your experienced personnel. **Roboshot** Processing #3 increases analytical ability for troubleshooting processing related part defects.

Students setup a process then optimize each portion of the process, such as Injection Rate, Packing, Cooling, etc. to achieve an optimum cycle and defect-free parts. Utilizing a series of interactive learning exercises, students are guaranteed to acquire the highest learning gain possible at the machine site, in this 100% “hands-on” learning environment.

Due to course curriculum, this seminar is currently available at Milacron’s Headquarters for the Plastics Technologies Group, Batavia, Ohio facility only utilizing our injection molding machinery and molds. **Roboshot** Processing #1 is the minimum requirement for attendance in Roboshot Processing #3.

DAY ONE:

Review Mold Installation

- Discuss proper mold lifting technique
- Discuss establishing the number of clamps required for particular mold & location of clamps

Water Hook-Up of Mold

- Type of water hook-up for best results such as Series or Manifold type
- Set proper mold temperature for material processed
- Pre-Heat the mold

Establish Proper Machine Settings

- Set clamp opening stroke
- Establish Mold Touch point
- Set clamp slow down position for clamp close & open
- Set ejector stroke
- Set Start of Eject (Eject-on-the-fly)
- Establish proper heater band temperature settings for material processed

Optimize the Mold Opening and Closing Speed

- Set the clamp opening and closing speeds to optimize the cycle time

Setting the Proper Clamp Tonnage

- Calculate the proper clamp tonnage required for the mold used and material processed.

Auto Die Height Adjustment

- Set proper tonnage on toggle clamp machine from previous calculation
- Set machine to check Auto Die Height to compensate for mold expansion

Establish Proper Melt & Mold Temperatures

- Check actual melt temperature of material using a pyrometer
- Check actual temperature of mold after pre-heating and after cycling material through mold

Set up the Molding Process for Mold

- Start-up using short shot start-up procedure

Continued on next page....

Roboshot Processing #3: “Find-The-Solution” Process Utilization & Troubleshooting

DAY TWO:

Optimize the Molding Process

- Optimize the Injection Speeds & Speed Profiling if required for correcting defects
- Optimize the Pack & Hold Pressures and use Pressure Profiling if necessary
- Evaluate Velocity and Pressure traces
- Review and/or determine possible causes for fill time variations

Hydraulic Transfer Control

- Establish Hydraulic Transfer setpoint
- Switch machine into Hydraulic Transfer Control
- Determine if Hydraulic Transfer Control would be more beneficial than position transfer for particular mold used

Establishing the Gate Freeze

- Establish Gate Freeze using part weight

Optimizing the Cooling

- Optimize the cooling using a pyrometer and HDT (Heat Distortion Temperature)

Establish Melt Front on Injection into Cavity (Optional)

- Determine if material established melt front (Fountain Flow) after going through gate
- Determine at what point the melt front was established

Troubleshooting Molded Part Defects

- Defects will be set up on parts molded when applicable, for students to correct, example:
 - Correct burn marks molded into part
- Correct sink marks molded into part / various troubleshooting exercises

Stress Analysis – Orientation Shrinkage Test (Oven Required)

- Determine oven temperature for material molded
 - Example: ABS may show best results at 250°F
- Measure overall length of part molded
- Bake part for 45 minutes/1 hour
- Cool part & re-measure part calculating shrinkage
- Determine amount of molded in orientation

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