

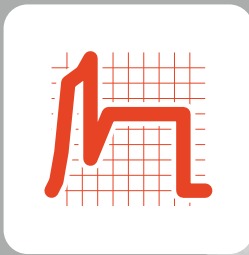
**2023**  
EDITION

# ONLINE TRAINING

for Injection Molders



**MOLDING  
FUNDAMENTALS**



**SCIENTIFIC  
MOLDING**



**MACHINE & MOLD  
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# COMPREHENSIVE ONLINE TRAINING FOR SCIENTIFIC INJECTION MOLDING

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# Introduction to Injection Molding

This course provides participants with a general introduction to the plastics industry. Its primary focus is the day-to-day operations of a typical injection molding facility.

**Introduction to Injection Molding** was created for newcomers to the injection molding industry or anyone that would like to learn more about plastics. We recommend that new hires take this course before participating in our **Injection Molding Basics**.

- ▶ An overview of plastics and the industry
- ▶ A typical molding facility
- ▶ General plant safety
- ▶ An introduction to the molding process
- ▶ Molding machine components
- ▶ Material handling
- ▶ Injection mold terminology
- ▶ Common part defects

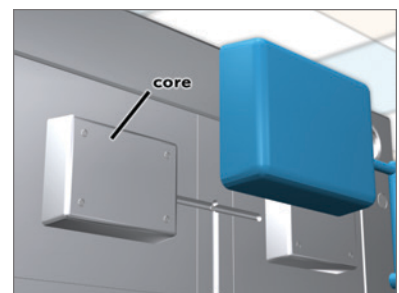
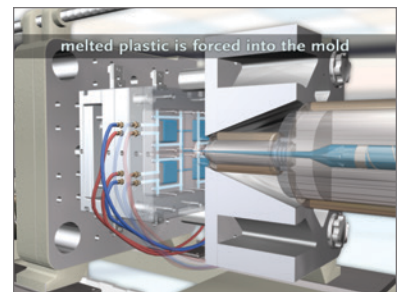
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# Injection Molding Basics

Our **Injection Molding Basics** series provides participants with a general understanding of the three major aspects of injection molding: the machine, the process, and the mold. These programs use 3D animation to demonstrate the inner workings of the machine and mold; to easily convey otherwise complex concepts.

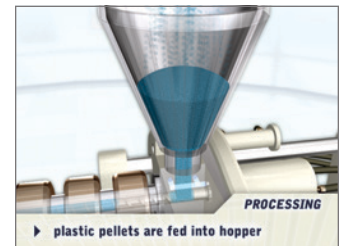
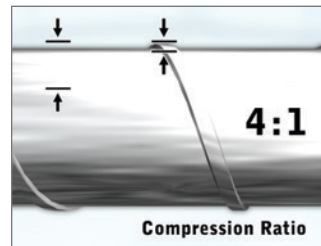
Important safety precautions are stressed throughout these training programs.



The three **Basics** courses are ideal for new hires, yet also serve as an excellent refresher course for any employee involved in plastics processing — from operators and technicians to management and setup personnel.

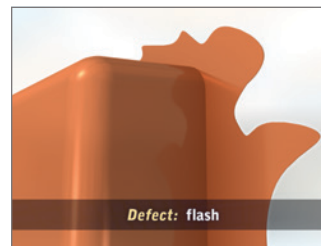
## Part 1 : Machine

- ▶ Cites important safety precautions for working around injection molding machines
- ▶ Gives an introduction to the molding process
- ▶ Introduces different injection molding machine types and the modes of operation
- ▶ Discusses injection molding machine components and their functions
- ▶ Outlines procedures for start up and shut down of a molding machine



## Part 2 : Process

- ▶ Discusses polymers and 3 different criteria used to classify them
- ▶ Covers some of the more common procedures for material preparation
- ▶ Introduces the injection, cooling and ejection phases
- ▶ Explains the need for an accurate process log
- ▶ Defines common part defects & explains their causes



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## Part 3 : Mold

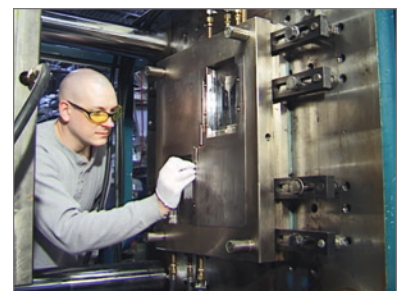
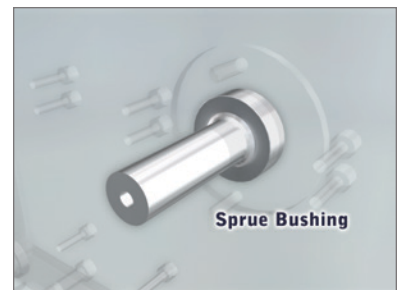
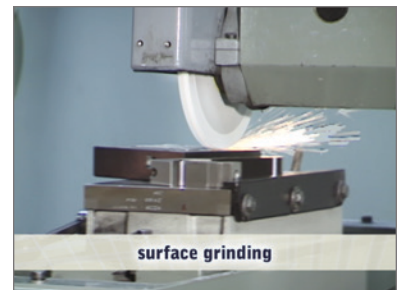
- ▶ Explains the specific functions that an injection mold must perform
- ▶ Introduces the various machining methods used to construct molds
- ▶ Discusses the three mold configurations used in the industry
- ▶ Covers common runner shapes and gate types used in injection molds
- ▶ Gives an overview of proper injection mold maintenance

🕒 3 Online Courses (3-6 hours)<sup>†</sup>

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# Understanding Plastics

This program explains how and why plastics are different and cites several different types of polymers and processing considerations.

**Understanding Plastics** emphasizes material handling, explains regrind, and covers the effects that moisture can have on molded part properties during processing.

- ▶ The definition of plastics
- ▶ Polymer classification
- ▶ Material properties affected by processing
- ▶ Proper material handling techniques
- ▶ Processing characteristics of virgin and regrind

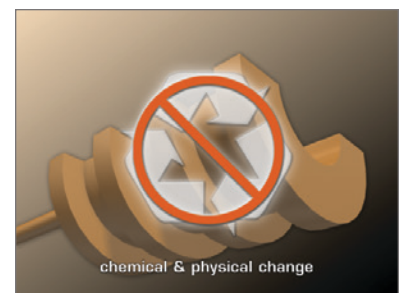
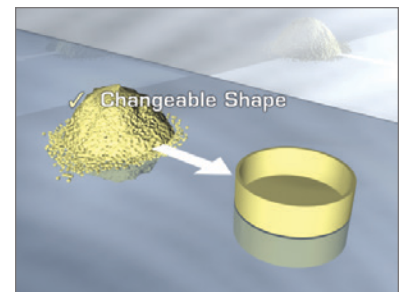
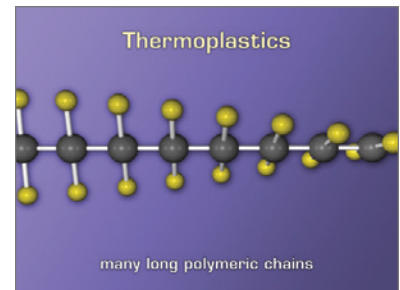
🕒 1 Online Course (1-2 hours)<sup>†</sup>

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# Establishing a Scientific Molding Process

This course provides participants with in-depth processing information to better prepare them for making appropriate and cost-effective decisions when establishing or improving a scientific injection molding process.

The course teaches a processing strategy that properly decouples 1<sup>st</sup> stage fill from 2<sup>nd</sup> stage pack — a strategy to develop processes with much higher repeatability.

The steps outlined in this course are intended to quickly establish a scientific injection molding process, reduce downtime and improve process efficiency.

- ▶ General Rules for Scientific Processing
- ▶ Scientific Process Optimization Strategies:
  - 1<sup>st</sup> Stage Filling
  - 1<sup>st</sup> Stage to 2<sup>nd</sup> Stage Transfer
  - 2<sup>nd</sup> Stage Pack
  - Screw Recovery, Screw Delay & Screw Decompression
  - Cooling Time
  - Clamping, Mold Opening & Mold Closing
  - Part Ejection

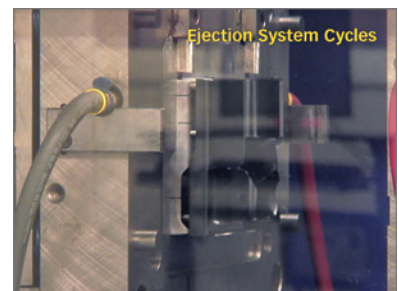
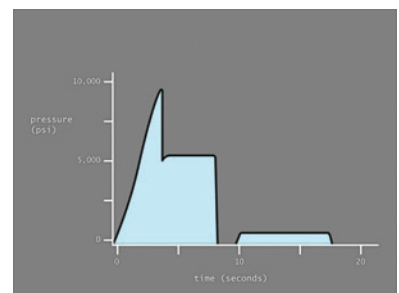
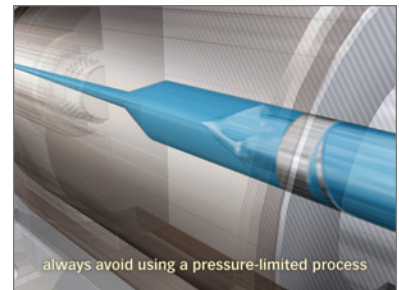
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# Process Documentation for Scientific Molders

Our **Process Documentation for Scientific Molders** course provides participants with a better understanding of proper documentation and the procedures associated with documenting a scientific molding process.

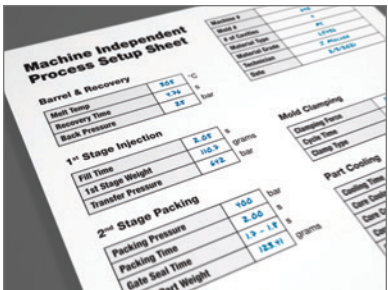
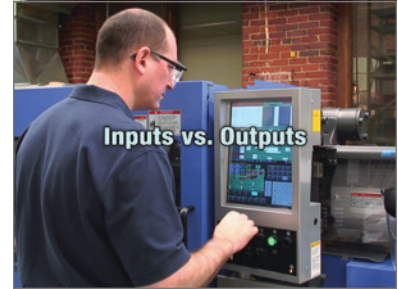
Participants learn the differences between machine-dependent and machine-independent process parameters — as well as the importance of proper documentation for each parameter.

Students will also learn the necessary procedures associated with documenting and maintaining a robust scientific injection molding process.

- ▶ Definition of Scientific Process Documentation
- ▶ Inputs vs. Outputs
- ▶ Machine-Dependent Documentation
- ▶ Machine-Independent Process Documentation
- ▶ Documenting Barrel & Recovery
- ▶ Documenting 1<sup>st</sup> Stage Injection
- ▶ Documenting 2<sup>nd</sup> Stage Packing
- ▶ Documenting Part Cooling
- ▶ Documenting Mold Clamping
- ▶ Hybrid Machine & Process Documentation
- ▶ Documenting All Process Changes

🕒 1 Online Course (1-2 hours)<sup>†</sup>

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| Machine Independent Process Setup Sheet |              |
|---|--------------|
| <b>Barrel &amp; Recovery</b>            |              |
| Fill Time                               | 2.05 s       |
| Recovery Time                           | 1.15 s       |
| Back Pressure                           | 2.5 bar      |
| <b>1<sup>st</sup> Stage Injection</b>   |              |
| Fill Time                               | 2.05 s       |
| 1st Stage Weight                        | 116.3 grams  |
| Transfer Pressure                       | 248 bar      |
| <b>2<sup>nd</sup> Stage Packing</b>     |              |
| Packing Pressure                        | 160 bar      |
| Packing Time                            | 2.00 s       |
| Gate Seal Time                          | 1.9 - 1.8 s  |
| Part Weight                             | 123.91 grams |
| <b>Mold Clamping</b>                    |              |
| Clamping Time                           |              |
| Cycle Time                              |              |
| Clamp Time                              |              |
| <b>Part Cooling</b>                     |              |
| Cooling Time                            |              |
| Cooling Time                            |              |
| Cooling Time                            |              |



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# Processing Parameters for Scientific Molding

This 3-part training program will provide participants with a better understanding of the parameters involved with a scientific injection molding process and the control panels of injection molding machines.

This course is beneficial to die setters, process technicians, machine operators, maintenance personnel, engineers, and anyone else using the control panel.

## Part 1 - Introduction

- ▶ Scientific Molding Overview
- ▶ 5 General Rules for Scientific Molding
- ▶ Understanding the Process Controller
- ▶ Common Units for Process Parameters

## Part 2 - Process

- ▶ Process Inputs versus Process Outputs
- ▶ 1<sup>st</sup> Stage Injection Inputs and Outputs
- ▶ 2<sup>nd</sup> Stage Packing Inputs and Outputs
- ▶ Cooling Inputs and Outputs
- ▶ Screw Recovery Inputs and Outputs
- ▶ Other Commonly Found Process Inputs

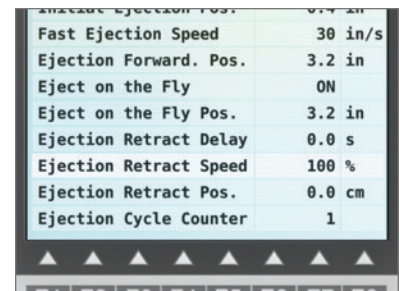
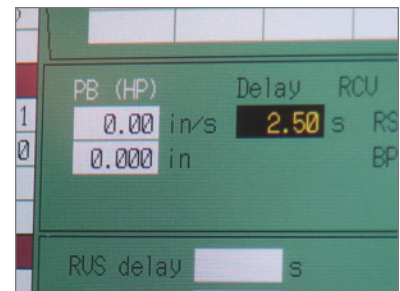
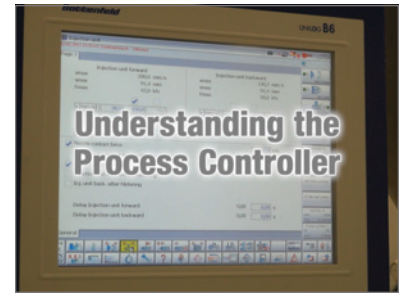
## Part 3 - Part Removal

- ▶ Mold Open Settings
- ▶ Part Ejection Settings
- ▶ Core Pull Settings
- ▶ Mold Closing Settings

🕒 3 Online Courses (3-6 hours)†

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# Injection Mold Setup

This comprehensive 2-part program provides participants with a better understanding of die setting — including safety preparation, documentation, mold removal & installation, and process startup. This is an excellent course for anyone involved in die setting, including process technicians and supervisors.

## Injection Mold Setup, Program 1

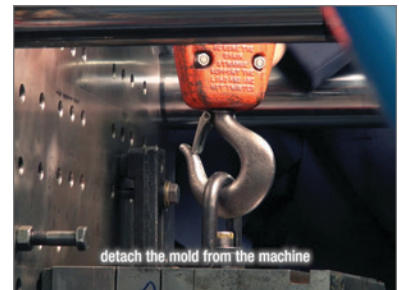
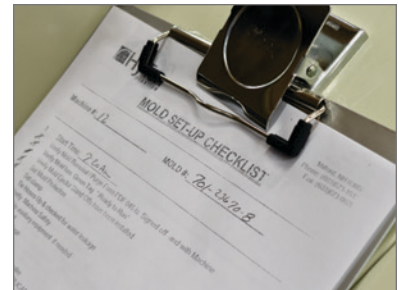
- ▶ Safety Concerns and Considerations for Die Setters
- ▶ Injection Mold Setup Scheduling and Preparation
- ▶ Machine Dependent and Independent Documentation
- ▶ Proper Injection Mold Preparation and Examination
- ▶ Safe and Effective Mold Removal Techniques

## Injection Mold Setup, Program 2

- ▶ Safe and Effective Mold Installation Techniques
- ▶ Setting Clamp Tonnage and Mold Protect
- ▶ Optimizing Clamp and Part Ejection Settings
- ▶ Establishing Consistent Screw Recovery
- ▶ Melt Temperature Matching Techniques
- ▶ Process Startup and Scientific Molding Principles

🕒 2 Online Courses (2-4 hours)<sup>†</sup>

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# Material Drying Technology

Routsis Training's two **Material Drying Technology** online courses provide participants with a better understanding of how different polymers are best dried and prepared for reliable processing. These courses show participants how proper plastics material handling and drying is critical to produce a consistent product and process.

**Course One** reviews polymer basics, as well as both hygroscopic and non-hygroscopic polymers — to better convey the importance of properly drying water-sensitive materials, while **Course Two** discusses material drying systems commonly used in industry, as well as common calculations to aid in proper material drying.

## Material Drying Technology, Course 1

- ▶ Polymer Basics
- ▶ Hygroscopic vs. Non-Hygroscopic Polymers
- ▶ Hydrolysis
- ▶ Purposes of Drying
- ▶ Dewpoint
- ▶ Dewpoint Measurement
- ▶ Dewpoint Sensors
- ▶ Drying Procedures

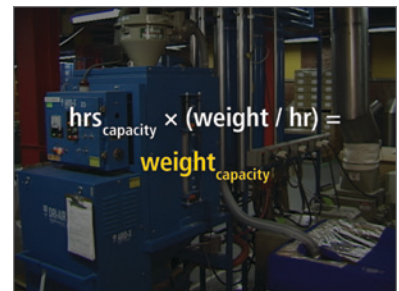
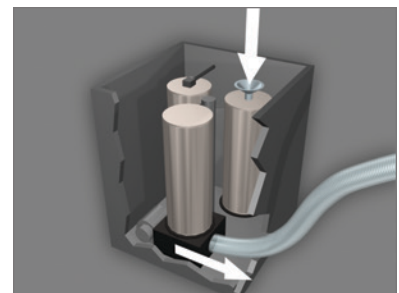
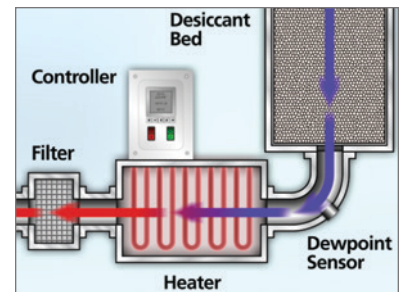
## Material Drying Technology, Course 2

- ▶ Hot Air Dryers
- ▶ Compressed Air Dryers
- ▶ Desiccant Dryers
- ▶ Vacuum Dryers
- ▶ Calculating Material Consumption
- ▶ Calculating Residence Time
- ▶ Calculating Dryer Capacity

🕒 2 Online Courses (1-3 hours)<sup>†</sup>

product id: [rt\\_0223\\_us](#)

<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



# Purging for Scientific Molders: Intermediate

Designed specifically for injection molders, Routsis Training's intermediate-level purging courses introduce a scientific approach to material purging.

These courses discuss important purging concepts and detail common procedures for purging plastic material from the injection screw, barrel, and nozzle — and techniques for cleaning hot runner systems and gate drops.

## Purging Techniques

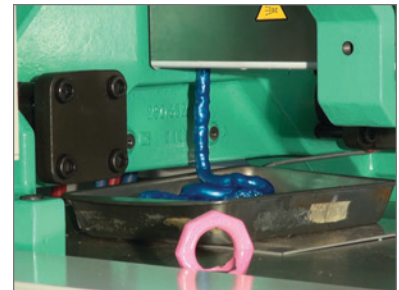
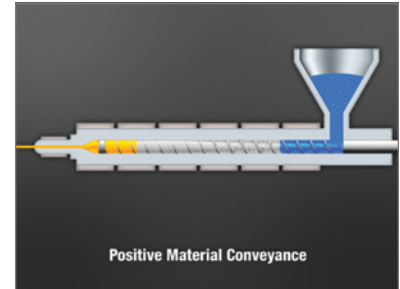
- ▶ Definition of Purging
- ▶ General Injection Molding Safety
- ▶ Injection Molding Machine Safety
- ▶ Plastic Purging Safety
- ▶ The Purpose of Purging
- ▶ Small and Large Shot Purging
- ▶ Continuous and Closed-Mold Purging
- ▶ Dry and Wet Purging
- ▶ Purging Heat Sensitive Materials
- ▶ Purging High Temperature Materials
- ▶ Hot Runner and Gate Drop Cleaning
- ▶ Nozzle and Screw Removal

## Purging Procedures

- ▶ Phase 1 – Preparation
- ▶ Phase 2 – Initial Purging
- ▶ Phase 3 – Final Purging
- ▶ Phase 4 – Production

🕒 2 Online Courses (1-3 hours)<sup>†</sup>

product id: **rt\_0227\_us**



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# Purging for Scientific Molders: Advanced

Building on the concepts outlined in the intermediate purging courses, these advanced online lessons continue with a detailed discussion of common purging compounds — including resin-based, mechanical, and chemical compounds.

In the final course, users are shown how to effectively compare different purging procedures and compounds – and guided through completion of the Purging Analysis Worksheet, which is included with the online course.

We've also developed a **Purging Cost Analyzer** app. This powerful, free tool complements the online training courses and allows users to quickly and easily compare the relative costs of various purging compounds and/or methods — and export the result data as a spreadsheet.

## Purging Compounds

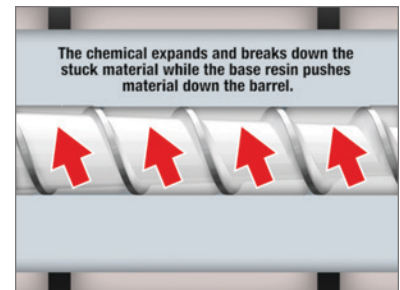
- ▶ Common types of Compounds
- ▶ Resin-Based Purging Compounds
- ▶ Mechanical Purging Compounds
- ▶ Chemical Purging Compounds

## Purging Cost Analysis

- ▶ Purging Compound Cost
- ▶ Machine Downtime Cost
- ▶ Purging Labor Cost
- ▶ Final Production Resin Cost
- ▶ Scrap and Rework Costs

🕒 2 Online Courses (1-3 hours)<sup>†</sup>

product id: **rt\_0229\_us**



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



# Automation & Robotics for Scientific Molding

These training programs will provide participants with a better understanding of how automation and robotics are used to streamline production within the injection molding industry.

## Automation & Robotics for Scientific Molding, Part 1

This training program will provide participants with a better understanding of the different options and capabilities associated with automation.

- ▶ Guarding and Safety Considerations
- ▶ Types of Automation Used for Injection Molding

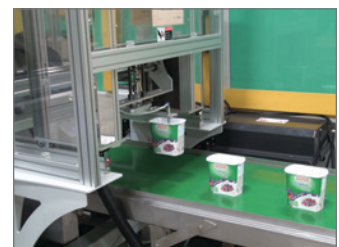
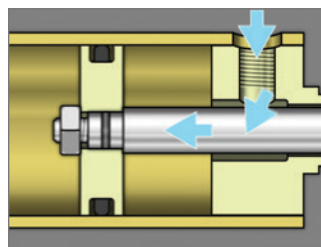
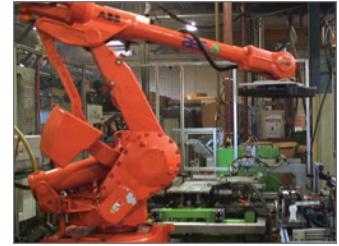
## Automation & Robotics for Scientific Molding, Part 2

This training program will provide participants with a better understanding of the different options and capabilities associated with robotics.

- ▶ Controllers and Movements of Robotics
- ▶ End-of-Arm Tooling
- ▶ Sprue Pickers
- ▶ Top-Entry Robots
- ▶ Side-Entry Robots
- ▶ Articulating Robots
- ▶ Examples of Robotics

🕒 2 Online Courses (2-3 hours)†

product id: [rt\\_0225\\_us](#)



† Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# Electric Injection Molding

Our **Electric Injection Molding** courses provide participants with a better understanding of the benefits and capabilities of modern all-electric injection molding machines. Safety concerns particular to electric molding machines are also covered.

## Part 1 : Understanding Electric Injection Molding Machines

The first course explains how electric injection molding machines function and outlines their benefits and typical uses.

- ▶ General Injection Molding Safety
- ▶ Electric Molding Machine Safety
- ▶ Machine Guarding
- ▶ Comparing Hydraulic and Electric Machines
- ▶ Basic Molding Machine Functions
- ▶ Efficiency, Accuracy and Repeatability
- ▶ Alternative Machine Designs
- ▶ Typical Uses for Electric Injection Molding Machines

## Part 2 : Processing with Electric Injection Molding Machines

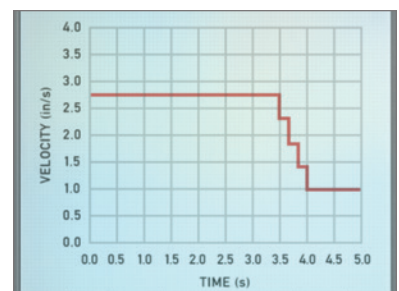
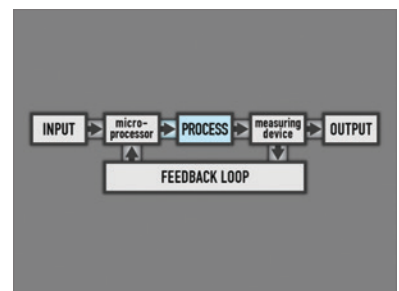
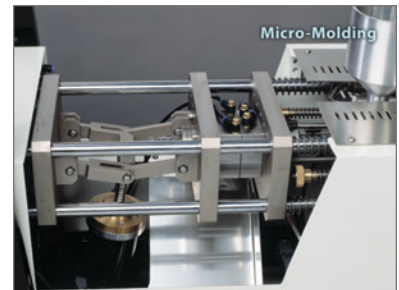
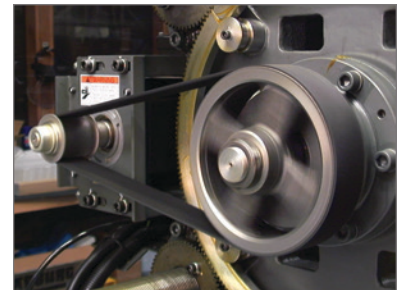
The second course prepares processors for making more appropriate and cost-effective decisions — and shows how to optimize any process running on an electric machine.

- ▶ Closed-Loop Process Controls
- ▶ Hydraulic vs. Electric Molding Machine Controls
- ▶ Process Optimization Strategies:
  - 1<sup>st</sup> Stage Filling
  - 1<sup>st</sup> Stage to 2<sup>nd</sup> Stage Transfer
  - 2<sup>nd</sup> Stage Pack
  - Screw Recovery, Screw Delay & Screw Decompression
  - Cooling Time
  - Clamping, Mold Opening & Mold Closing
  - Part Ejection

🕒 2 Online Courses (2-3 hours)<sup>†</sup>

product id: **rt\_0231\_us**

<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



# Math for Molders

These two courses were created for all personnel within the injection molding industry who would like to expand or fine-tune their math skills.

This training program will greatly benefit any participant of RJG's classroom-based Master Molder<sup>SM</sup> Certification Series either as a primer or as follow-up training.

## Part 1

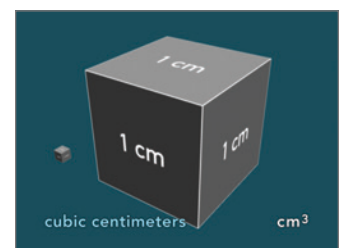
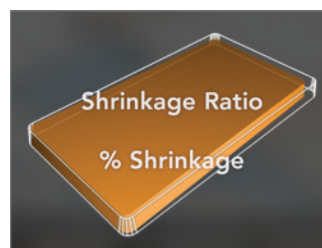
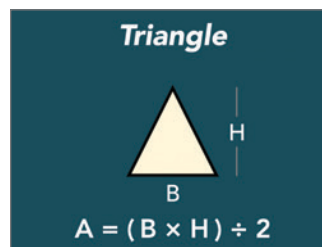
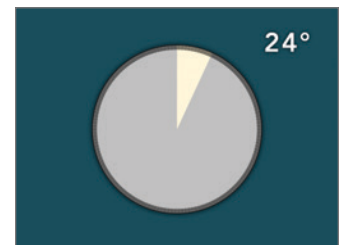
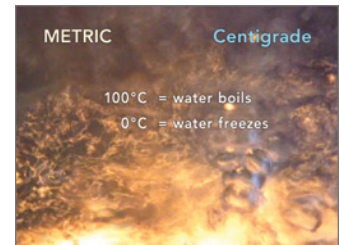
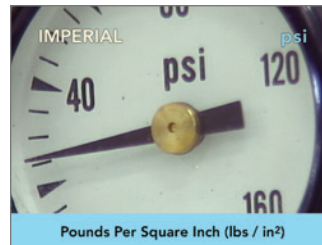
- ▶ Whole Numbers, Negative Numbers and Decimals
- ▶ Using a Calculator
- ▶ Addition, Subtraction, Multiplication and Division
- ▶ Rounding Numbers and Significant Figures
- ▶ Formulas, Equations and Order of Operations

## Part 2

- ▶ Metric and Imperial Units
- ▶ Length and Distance
- ▶ Area, Volume & Flow
- ▶ Weight, Mass and Force
- ▶ Conversions
- ▶ Understanding Percentages
- ▶ Calculating Plastic Pressure and Part Shrinkage
- ▶ Calculating Tolerances

🕒 2 Online Courses (3-4 hours)<sup>†</sup>

product id: **rt\_0241\_us**



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# Scientific Troubleshooting for Injection Molders

These four in-depth scientific molding training programs provide participants with the knowledge base required to identify and troubleshoot over twenty-five of the most common injection molded part defects. Users will also come away with a better understanding of how to best process, document and maintain a reliable scientific injection molding process.

## Introduction

This scientific molding training program focuses on the 7-step process to scientific troubleshooting. Participants are also presented with information and practices on how to best process, document and maintain a reliable scientific injection molding process.

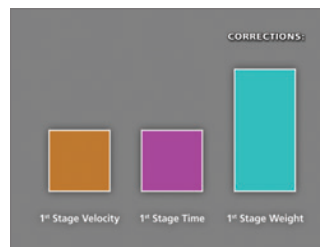
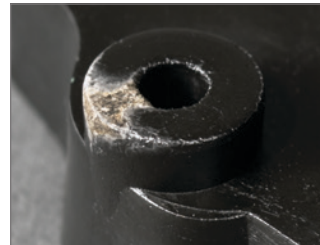
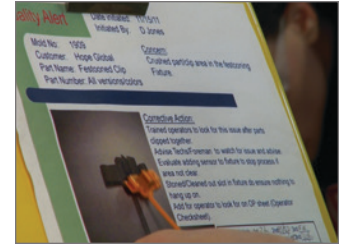
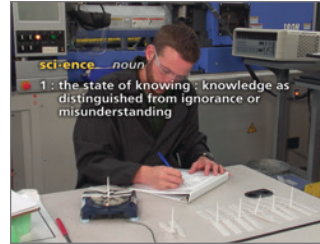
- ▶ Step 1 – Develop a Scientific Molding Process
- ▶ Step 2 – Properly Document the Process Outputs
- ▶ Step 3 – Examine the Defective Part and Rule Out Obvious Causes
- ▶ Step 4 – Compare the Current Process with the Documented Process
- ▶ Step 5 – Return the Process to the Documented Standard
- ▶ Step 6 – Verify the Part and Process
- ▶ Step 7 – Document all Changes Made

## Visual Defects

Nine of the most common visual defects encountered in injection molding processing are covered within this extensive scientific molding training program. Participants will be better prepared to troubleshoot these defects as each one will be defined and their respective causes and corrections will be explained in detail. Defects include:

- |                   |                       |
|-------------------|-----------------------|
| ▶ Flash           | ▶ Burning             |
| ▶ Sinks and Voids | ▶ Flow Lines          |
| ▶ Short Shots     | ▶ Weld and Meld Lines |
| ▶ Jetting         | ▶ Poor Surface Finish |
| ▶ Gate Blush      |                       |

*continued on next page...*



# Scientific Troubleshooting for Injection Molders

## Dimensional Defects

This scientific injection molding training program will provide participants with a better understanding of how to best troubleshoot five (5) of the most common dimensional defects encountered in injection molding. Each defect will be defined and their respective causes and corrections will be explained in detail. These dimensional defects include:

- ▶ Large Parts
- ▶ Small Parts
- ▶ Larger Parts at the Gate
- ▶ Smaller Parts at the Gate
- ▶ Warpage

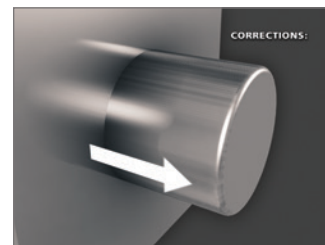
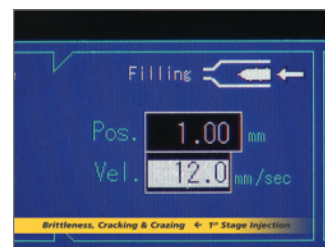
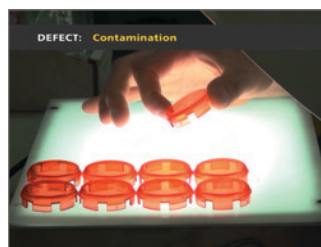
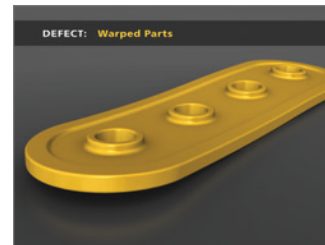
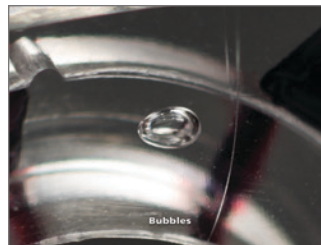
## Material and Cycle-Related Defects

After completing this scientific molding training program, participants will have a better understanding of how to best identify and troubleshoot many of the most common Material and Cycle-Related defects encountered in injection molding. Each defect will be defined and their respective causes and corrections will be explained in detail. The material and cycle-related defects discussed in this course include:

- ▶ Splay, Bubbles, and Blisters
- ▶ Brittleness, Cracking, and Cracking
- ▶ Delamination
- ▶ Contamination
- ▶ Poor Color Distribution
- ▶ Part Sticking and Ejector Pin Marks
- ▶ Occasional Part Hang-Up

🕒 4 Online Course (6-10 hours)†

product id: **rt\_0251\_us**



† Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

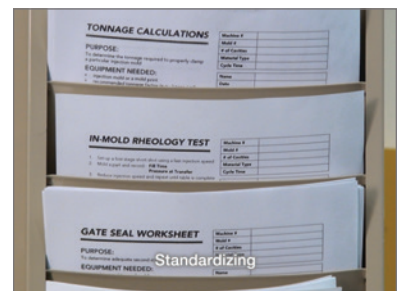
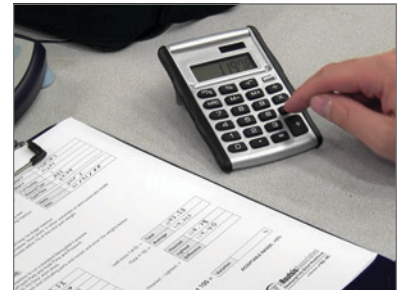
# Processing for Profit

Processing for Profit is intended to provide injection molding processors and technicians with industry-proven procedures and techniques which can be used to easily improve the efficiency and profitability of any molding application.

- ▶ Definition of Scientific Molding
- ▶ Scientific Process Optimization
- ▶ Part Removal
- ▶ General Rules for Efficient Processing
- ▶ Die Setting
- ▶ The 5S System

🕒 1 Online Course (1-2 hours)<sup>†</sup>

product id: **rt\_0261\_us**



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

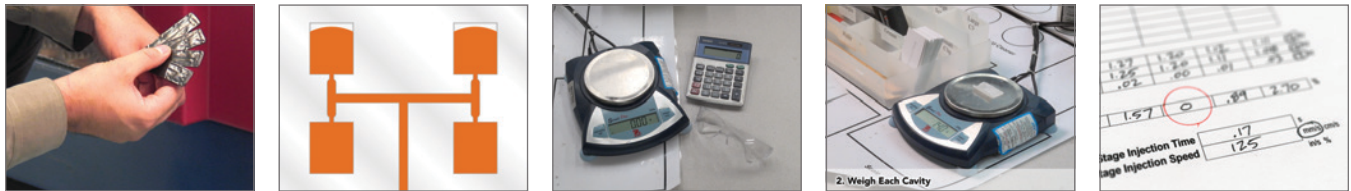
## Scientific SkillSet™ Labs: Intermediate

Our intermediate **Scientific SkillSet™ Labs** provide a unique and valuable learning experience for your setup technicians, processors, and engineers. Only from Routsis Training, these innovative courses combine detailed, step-by-step online instruction with practical hands-on training exercises and worksheets.

This exclusive training approach allows companies to perform the same type of classroom learning found in popular seminars in the comfort and convenience of their own production environment.

Each of the 13 course/worksheet combinations in this group focuses on developing an important processing-related skill — demonstrated on your production equipment.

These online labs are cross-platform and compatible with any modern web browser or handheld device. This provides exceptional flexibility, allowing technicians to train at their own pace on the production floor — without costly trainers or consultants.



Each unique training course is a blend of the following components:

|                   |  |
|-------------------|--|
| <b>BACKGROUND</b> | <i>Your technicians understand the goal of each Scientific SkillSet™</i>                 |
| <b>PURPOSE</b>    | <i>Technicians learn specifically how each Scientific SkillSet™ applies to their job</i> |
| <b>EQUIPMENT</b>  | <i>Items are detailed to ensure techs have the tools they need to succeed</i>            |
| <b>PROCEDURE</b>  | <i>Each step is demonstrated so your techs can proceed with confidence</i>               |
| <b>WORKSHEET</b>  | <i>Contains all the information your techs need to complete each lab</i>                 |

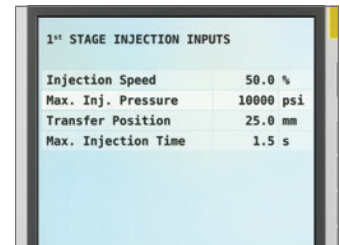
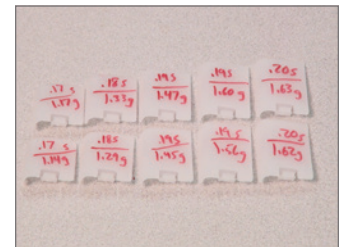
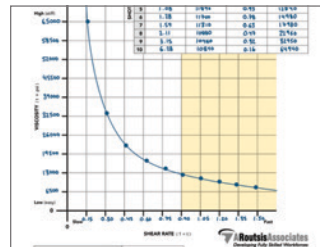
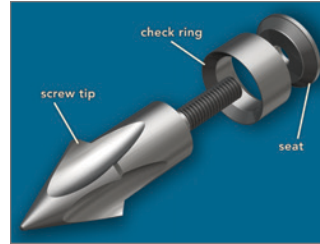
In addition to the U.S. English version, these training labs and worksheets are available in several other languages, including: Spanish, French, Portuguese, Mandarin, and Bahasa Malaysia.

*continued on next page...*

Your processors and technicians will receive over 9 hours of online **SkillSet™** instruction and hands-on labs to confidently develop the following abilities:

- ▶ **Melt Temperature Measurement**  
*Accurately measure & document the polymer temperature*
- ▶ **Mold Temperature Measurement**  
*Accurately measure & document the mold and coolant temperatures*
- ▶ **Process Documentation**  
*Document your process for easy duplication and scientific troubleshooting*
- ▶ **1<sup>st</sup> Stage Injection Speed**  
*Quickly find an acceptable injection rate for part quality*
- ▶ **1<sup>st</sup> Stage Injection Transfer**  
*Set 1st to 2nd stage transfer to accommodate for variation*
- ▶ **1<sup>st</sup> Stage Injection Pressure**  
*Determine a safe max. injection pressure to protect the mold*
- ▶ **1<sup>st</sup> Stage Injection Time**  
*Set maximum injection time and prevent excessive injection*
- ▶ **1<sup>st</sup> Stage Check Ring**  
*Evaluate the functionality of the check ring during injection*
- ▶ **2<sup>nd</sup> Stage Packing Pressure**  
*Find the optimal packing pressure between sinks and flash*
- ▶ **2<sup>nd</sup> Stage Packing Time**  
*Determine gate seal time and optimize your packing time*
- ▶ **2<sup>nd</sup> Stage Final Cushion**  
*Prevent bottoming-out while maximizing pressure transfer*
- ▶ **2<sup>nd</sup> Stage Clamp Force**  
*Set clamping to protect the mold & maximize venting effectiveness*
- ▶ **Screw Recovery Time**  
*Protect the quality & integrity of your polymer during melting*

† Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



🕒 **13 Online Courses + Worksheets (9-12 hours)†**

product id: **rt\_0401\_us**

🌐 **Multiple Language Versions Available:**

|            |                                   |
|------------|-----------------------------------|
| rt_0401_us | <b>American English</b>           |
| rt_0401_uk | <b>UK / International English</b> |
| rt_0401_sp | <b>Spanish</b>                    |
| rt_0401_fr | <b>French</b>                     |
| rt_0401_bp | <b>Brazilian Portuguese</b>       |
| rt_0401_mc | <b>Mandarin Chinese</b>           |
| rt_0401_my | <b>Bahasa Malaysia</b>            |

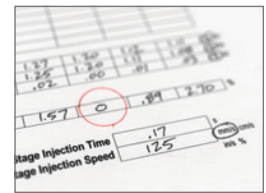
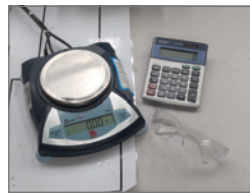
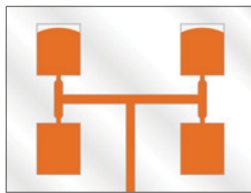


# Scientific SkillSet™ Labs: Advanced

Designed for advanced process techs and engineers, our **Advanced Scientific SkillSet™** courses build on the skills developed in the intermediate-level labs. In these advanced, hands-on courses, participants learn how to quickly and effectively optimize a scientific injection molding process.

Each video course/worksheet combination in this group builds an important processing-related skill. These skills are demonstrated on your production equipment — without costly seminars or the inconvenience of travel.

In addition to the U.S. English version, we also offer our **Scientific SkillSet™ Series** labs in several other languages, including: Spanish, French, Portuguese, Mandarin, and Bahasa Malaysia.



Each unique training course is a blend of the following components:

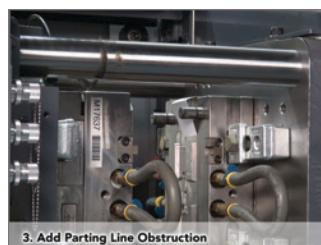
|                   |  |
|-------------------|--|
| <b>BACKGROUND</b> | <i>Your technicians understand the goal of each Scientific SkillSet™</i>                 |
| <b>PURPOSE</b>    | <i>Technicians learn specifically how each Scientific SkillSet™ applies to their job</i> |
| <b>EQUIPMENT</b>  | <i>Items are detailed to ensure techs have the tools they need to succeed</i>            |
| <b>PROCEDURE</b>  | <i>Each step is demonstrated so your techs can proceed with confidence</i>               |
| <b>WORKSHEET</b>  | <i>Contains all the information your techs need to complete each lab</i>                 |

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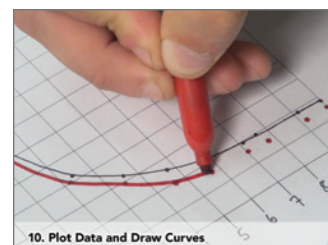
Your processors and technicians will receive over 9 hours of online **SkillSet™** instruction and hands-on labs to confidently develop the following abilities:

- ▶ **1st Stage Fill Progression**  
*Learn how the mold actually fills and identify problem areas*
- ▶ **1st Stage Rheology Curve**  
*Determine the speed at which shear thinning takes place*
- ▶ **1st Stage Cavity Imbalance**  
*Determine which speed provides the best filling balance*
- ▶ **Coolant Temperature**  
*Establish the optimal mold coolant temperature controller settings*
- ▶ **Cooling Time**  
*Determine an optimized cooling time while compensating for normal variation*
- ▶ **Rear Zone Temperature**  
*Optimize rear zone temperature to conserve energy & maximize melting capacity*
- ▶ **Mold Opening**  
*Optimize the clamp settings while protecting part quality*
- ▶ **Part Ejection**  
*Optimize part removal while maintaining overall part quality*
- ▶ **Mold Closing**  
*Optimize clamp settings while protecting the mold & actions*
- ▶ **Mold Protect Force**  
*Reduce the potential for mold damage when problems occur*
- ▶ **Comparative Rheology**  
*Compare materials, grades, lots, additives, temperatures, etc.*
- ▶ **Measuring Mold Deflection**  
*Benchmarking and troubleshooting mold deflection issues*
- ▶ **Measuring Platen Deflection**  
*Benchmarking and troubleshooting platen deflection issues*

† Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



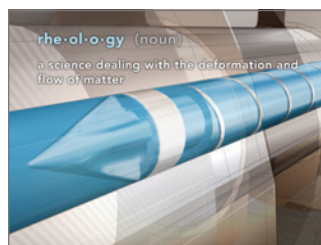
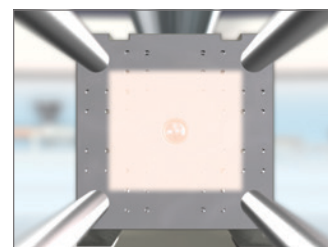
3. Add Parting Line Obstruction



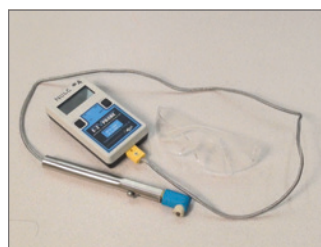
10. Plot Data and Draw Curves



4. Check Part Quality



rhe-o-l-o-g-y (noun)  
a science dealing with the deformation and flow of matter



5. Mold and Measure 5 Deflections

🕒 **13 Online Courses + Worksheets**  
**(9-13 hours)†**

product id: **rt\_0421\_us**

🌐 **Multiple Language Versions Available:**

rt\_0421\_us **American English**

rt\_0421\_uk **UK / International English**

rt\_0421\_sp **Spanish**

rt\_0421\_fr **French**

rt\_0421\_bp **Brazilian Portuguese**

rt\_0421\_mc **Mandarin Chinese**

rt\_0301\_my **Bahasa Malaysia**

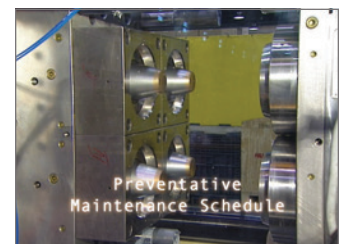
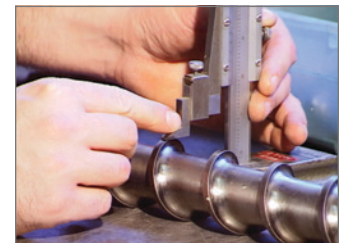
# Molding Machine Maintenance

This online course is designed to introduce the many maintenance considerations for molding machines. Participants are also shown newer technologies; such as laser leveling, ultrasonic tie bar stretch measuring, and portable machine process monitors.

- ▶ Basic machine maintenance and safety concerns
- ▶ Fluid maintenance
- ▶ Platen maintenance
- ▶ Screw and barrel maintenance
- ▶ Preventative maintenance and logging

🕒 1 Online Course (1-2 hours)<sup>†</sup>

product id: **rt\_0521\_us**



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# Injection Mold Maintenance

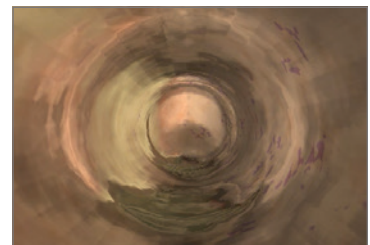
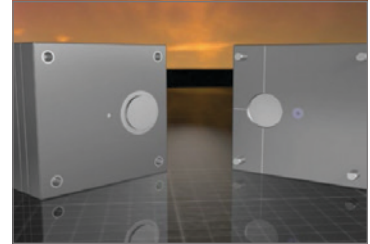
This program details procedures for proper mold care before, during, and after a production run - stressing important safety considerations for mold handling.

From mold storage to part removal, this course provides participants with good mold maintenance habits and aims to extend tool life and increase its productivity.

- ▶ Proper mold maintenance
- ▶ Mold storage and preparation
- ▶ Water line maintenance
- ▶ Techniques for extending tool life

🕒 1 Online Course (1-2 hours)<sup>†</sup>

product id: **rt\_0511\_us**



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# Molding Hydraulics

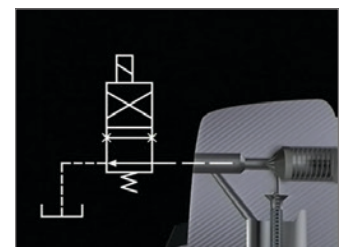
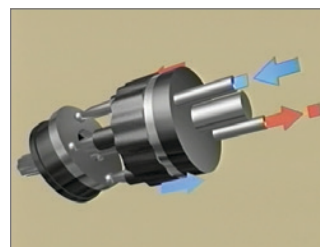
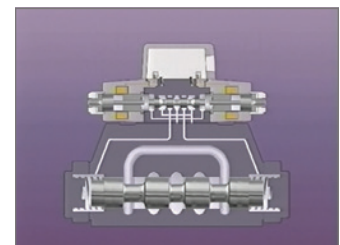
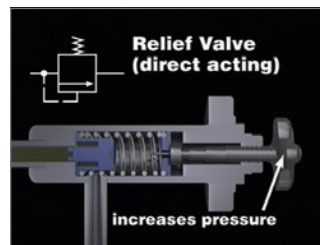
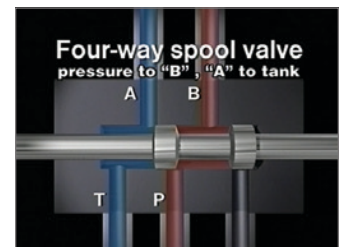
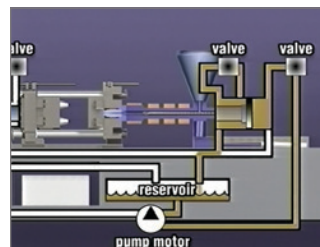
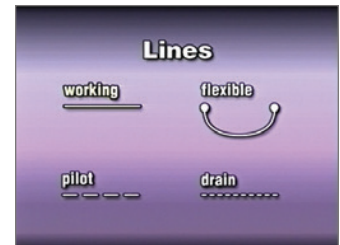
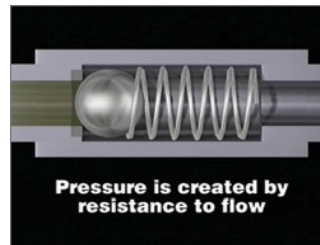
These courses demonstrate the importance of hydraulics and the proper maintenance of hydraulic components.

Machine operators will learn ways to reduce wear on hydraulic components, while more advanced employees concentrate on hydraulic print reading and theory.

- ▶ Basic hydraulic theory
- ▶ The role of hydraulics in molding plastic parts
- ▶ The function and purpose of hydraulic components
- ▶ Recognition of hydraulic symbols
- ▶ Directional valves and flow controls
- ▶ Hydraulic pumps and motors
- ▶ Proportional valves and servo valves
- ▶ Hydraulic fluid management

🕒 2 Online Courses (2-4 hours) †

product id: **rt\_0531\_us**



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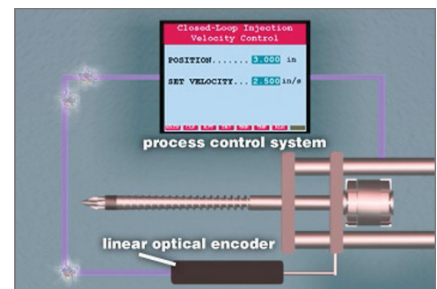
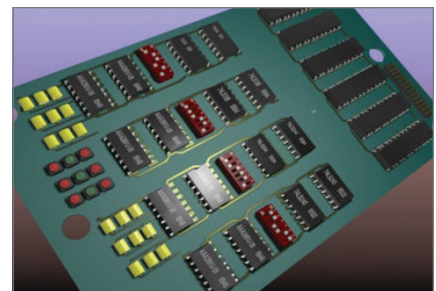
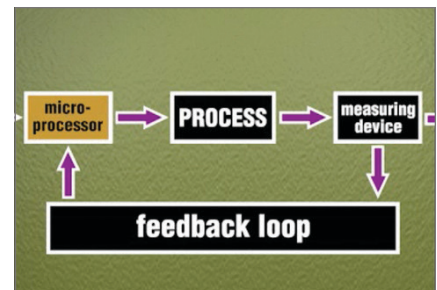
# Process Control Systems

This training program details process control systems and is designed to help molders make more educated choices. Process Control Systems is a must for any facility which employs (or plans to employ) closed loop process control.

- ▶ Open loop vs. closed loop process control
- ▶ How process control reduces variation
- ▶ Closed loop controllers
- ▶ Proper use of process control

🕒 1 Online Course (1-2 hours)<sup>†</sup>

product id: **rt\_0533\_us**



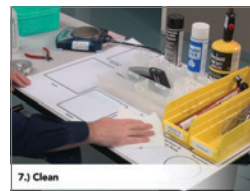
<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# The 5S System

5S is a critical component of Lean Manufacturing. The 5S system is used by successful manufacturing facilities worldwide. It consists of 5 simple and concise steps — Sorting, Straightening, Sweeping, Standardizing, and Sustaining — that can help your facility reduce clutter and waste and, ultimately, increase efficiency and productivity.

Our online **5S System** training courses are built on Routsis Training’s exclusive **SkillSet™** model. These courses combine clear online training videos and hands-on worksheets. This approach allows companies to perform the same type of classroom learning found in popular seminars in the comfort of their own production environment.

Like all our online training programs, the **5S System™** courses are cross-platform and are compatible with most modern web browsers and popular handheld devices, such as tablets and smartphones. This provides exceptional flexibility, allowing technicians to train at their own pace on the production floor.



Each unique training course is a blend of the following components:

|                   |  |
|-------------------|--|
| <b>BACKGROUND</b> | <i>Your personnel understand the goal of each Production SkillSet™</i>                 |
| <b>PURPOSE</b>    | <i>Employees learn specifically how each Production SkillSet™ applies to their job</i> |
| <b>EQUIPMENT</b>  | <i>Items are detailed to ensure participants have the tools they need to succeed</i>   |
| <b>PROCEDURE</b>  | <i>Each step is demonstrated so personnel can proceed with confidence</i>              |
| <b>WORKSHEET</b>  | <i>Contains all the information needed to complete each lab</i>                        |

*continued on next page...*

## Step 1: Sorting

In the 5S System, the Sorting step's goal is to eliminate all unnecessary items from the immediate workplace. This is done by sorting the workplace to determine what to keep, what to toss, and what to store. This helps prevent clutter from interfering with everyday production activities.

## Step 2: Straightening

At the end of the Straightening step, everything in the workplace is neatly organized; resulting in a more convenient and more efficient workplace.

## Step 3: Sweeping

In the Sweeping step, the best method for cleaning each selected area in the workplace is determined. A reasonable cleaning schedule should also be determined to ensure the workplace remains efficient, clean and organized.

## Step 4: Standardizing

The goal of the Standardizing step is to achieve consistency. A similar appearance and layout should be applied to all workstations whenever possible. This step is often performed after a similar workplace or area within the plant has already been straightened.

## Step 5: Sustaining

The purpose of the Sustaining step is maintenance. This is achieved by a review of the workplace and the existing Sorting and Straightening documentation — to ensure the workplace is efficient and up-to-date. This helps identify necessary materials or equipment that have been added to the workplace but have not yet been incorporated into the 5S documentation.

🕒 5 Online Courses + Worksheets (3-6 hours) †

product id: **rt\_1501\_us**

† Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.





# Measuring Tools: Basic

Our **Basic Measuring Tools** training labs teach participants the correct usage and procedures for verifying the accuracy of measuring devices commonly used at your facility, including Go/No-Go Gauges, Pin Gauges, Linear Indicators, Depth Gauges, and Height Gauges. These basic gauges are used by most quality, machining, & tooling departments.

Each video/worksheet combination focuses on a particular measuring tool. The steps outlined in each course ensure the tool is being used properly and providing reliable measurements. Users will learn best-practices for handling and storing measuring equipment, stabilizing tools and part features for improved accuracy, and how to perform a simplified verification (also known as a “Field Check”) for each tool covered in the training series.

Based on Routsis Training’s exclusive SkillSet™ training model, these labs combine online instructional videos with hands-on training exercises — covering the background, purpose, required equipment, and operating procedures required to use each tool properly. Participants will practice inspecting the compliance of particular part features and documenting the results of these inspections — useful skills for ensuring consistent delivery of high-quality parts to your customers.



This product consists of 7 essential training labs:

- ▶ **Using a Go / No-Go Gauge**  
*Determine whether a part is acceptable or not; using a go / no-go gauge*
- ▶ **Using Pin Gauges**  
*Determine if a part feature is within specification by taking pin gauge measurements*
- ▶ **Using a Linear Indicator**  
*Determine if a part feature is within specification; based on a linear indicator measurement*
- ▶ **Using a Depth Gauge**  
*Determine if a part feature is within specification; based on a depth gauge measurement*
- ▶ **Using a Height Gauge**  
*Determine if a part feature is within specification; based on a height gauge measurement*
- ▶ **Field-Checking a Depth Gauge**  
*Determine if a depth gauge is functioning properly by performing a field check*
- ▶ **Field-Checking a Height Gauge**  
*Determine if a height gauge is functioning properly by performing a field check*

⦿ **7 Online Courses + Worksheets  
(5-7 hours)<sup>†</sup>**

**product id: rt\_5101\_us**

<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

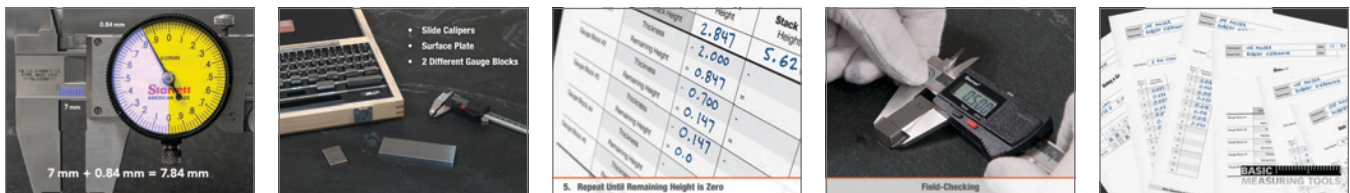
# Measuring Tools: Intermediate

Further developing the knowledgebase established the basic-level courses, **Intermediate Measuring Tools** introduces three additional measuring devices: Gauge Blocks, Slide Calipers, and Outside Micrometers. These intermediate tools are commonly used by quality, production, engineering, tooling, machining, and maintenance personnel.

These Intermediate Measuring Tools labs cover Slide Calipers in particular detail. Participants will practice using these tools for taking outside, inside, and depth measurements. An additional lab also demonstrates field-checking procedures that can be used to verify proper calibration and functionality — ensuring accurate slide caliper measurements of part features.

Micrometer techniques and field-checking procedures are also introduced. This series contains 2 labs dedicated to the correct usage of an outside micrometer.

Built on Routsis Training's exclusive SkillSet™ training model, these unique courses combine instructional videos with hands-on learning and skills-development worksheets.



This product consists of 7 essential training labs:

- ▶ **Using Gauge Blocks**  
*Create three specific heights using multiple gauge blocks — and then verify these heights through measurement*
- ▶ **Using Slide Calipers for Outside Measurement**  
*Determine if a part feature is within specification; based on an outside measurement taken with slide calipers*
- ▶ **Using Slide Calipers for Inside Measurement**  
*Determine if a part feature is within specification; based on an inside measurement using slide calipers*
- ▶ **Using Slide Calipers for Depth Measurement**  
*Determine if a part feature is within specification; based on a depth measurement using slide calipers*
- ▶ **Using an Outside Micrometer**  
*Determine if a part feature is within specification; based on an outside micrometer measurement*
- ▶ **Field-Checking Slide Calipers**  
*Determine if a slide caliper is functioning properly by performing a field check*
- ▶ **Field-Checking an Outside Micrometer**  
*Determine if an outside micrometer is functioning properly by performing a field check*

⦿ **7 Online Courses + Worksheets  
(5-7 hours)<sup>†</sup>**

**product id: rt\_5201\_us**

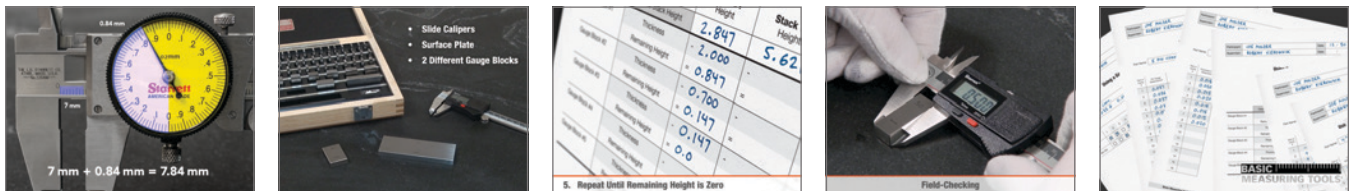
<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# Measuring Tools: Advanced

Expanding upon the measuring devices introduced in our basic and intermediate-level courses, **Advanced Measuring Tools** covers techniques for the proper usage of Thickness Gauges, Inside Micrometers, Depth Micrometers, Dial Bore Gauges, and Hole Gauges. These advanced tools are used by most quality, tooling, machining, and maintenance personnel.

Over the course of 7 intensive training labs, participants learn the background, purpose, required equipment, and procedures for the correct usage of various measuring devices. Proper handling and storage of these sensitive tools is stressed throughout the training. Several of these labs cover field-checking procedures, which can be used to ensure your facility's measuring devices are in proper operating condition.

These courses are built on Routsis's SkillSet™ training model, which combines instructional videos with hands-on learning and skills-development worksheets.



This product consists of 7 essential training labs:

- ▶ **Using Thickness Gauges**  
*Determine if a part feature is within specification by taking thickness gauge measurements*
- ▶ **Using an Inside Micrometer**  
*Determine if a part feature is within specification, based on an inside micrometer measurement*
- ▶ **Using a Depth Micrometer**  
*Determine if a part feature is within specification; based on a depth micrometer measurement*
- ▶ **Using a Dial Bore Gauge**  
*Determine if a part feature is within specification; based on a dial bore gauge measurement*
- ▶ **Using a Hole Gauge or Telescoping Gauge**  
*Determine if a part feature is within specification; based on a measurement taken with a hole gauge or telescoping gauge*
- ▶ **Field-Checking an Inside Micrometer**  
*Determine if an inside micrometer is functioning properly by performing a field check*
- ▶ **Field-Checking a Depth Micrometer**  
*Determine if a depth micrometer is functioning properly by performing a field check*

🕒 **7 Online Courses + Worksheets**  
**(5-7 hours)<sup>†</sup>**

**product id: rt\_5301\_us**

<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# Blueprint Reading

The six programs in our online **Blueprint Reading** training course develop workers' abilities to accurately locate and interpret dimensions on engineering drawings. These training programs are based on ANSI standards and incorporate input from a broad industrial cross-section.

The primary audience is production and inspection personnel, supervisors, group leaders, set-up personnel, and anyone who wishes to read engineering drawings.

## Course 1: Introduction to Engineering Drawings

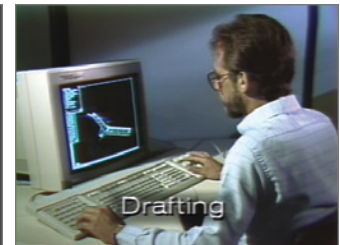
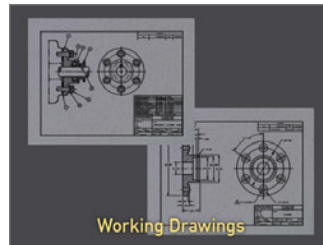
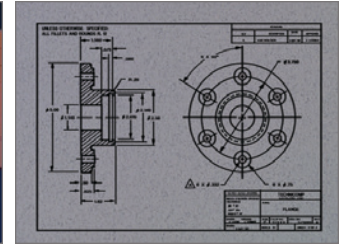
- ▶ Explains the purpose of an engineering drawing
- ▶ Distinguish between a detail drawing and an assembly drawing
- ▶ Interpret the drawing scale
- ▶ Explains the purpose of dimensions and tolerances

## Course 2: Multiview Drawings

- ▶ The six principal views of a third-angle projection
- ▶ Identify the ISO symbols for third-angle and first-angle projections
- ▶ Auxiliary views, partial views, and enlarged views
- ▶ Determine which line takes precedence over another

## Course 3: Sectional Views

- ▶ Determine which portion of the part is shown in section
- ▶ Explain the purpose of section lines and identify the ways in which they are used
- ▶ Identify and interpret the common drafting conventions applied to sectional views



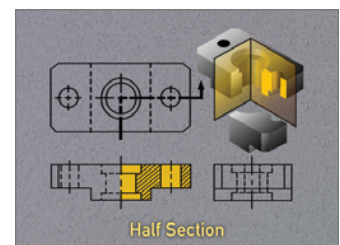
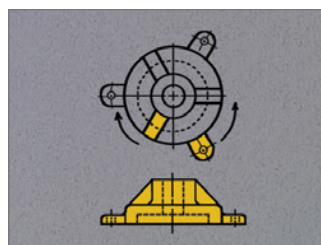
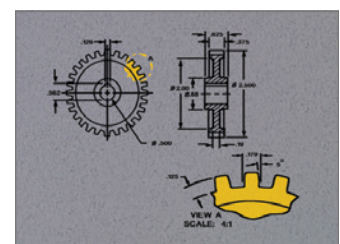
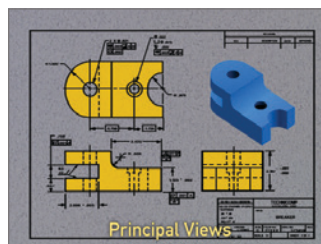
**American National Standards Institute (ANSI)**

|                   |                                   |
|-------------------|-----------------------------------|
| ANSI Y 14.1-1980  | Drawing Sheet Size and Format     |
| ANSI Y 14.2M-1979 | Line Conventions and Lettering    |
| ANSI Y 14.3-1975  | Multi and Sectional View Drawings |
| ANSI Y 14.5M-1982 | Dimensioning and Tolerancing      |
| ANSI Y 14.6-1978  | Screw Thread Representation       |
| ANSI Y 14.36-1978 | Surface Texture Specifications    |

| ITEM | QTY | DESCRIPTION    | MATERIAL | PART NO.          |
|------|-----|----------------|----------|-------------------|
| 8    | 1   | WOODRUFF KEY   | STEEL    | #308              |
| 7    | 1   | GASKET         | BRASS    | 573005            |
| 6    | 2   | WASHER         | STEEL    | 332 STANDARD      |
| 5    | 8   | HEX HD BOLT    | STEEL    | 312-90 X 1.50 LG. |
| 4    | 1   | RETAINING RING | STEEL    | 573004            |
| 3    | 1   | BALL BEARING   | STEEL    | 573003            |
| 2    | 1   | SPROCKET       | STEEL    | 573002            |
| 1    | 1   | HOUSING        | CL       | 573001            |

| DO NOT SCALE DRAWING                     |            | TECHNICOMP<br>CLEVELAND, OHIO |              |
|--|------------|-------------------------------|--------------|
| UNLESS OTHERWISE SPECIFIED<br>TOLERANCES |            |                               |              |
| TITLE                                    |            | FLANGE                        |              |
| XX 1/8"                                  |            | SIZE C 27XXXX                 |              |
| 3/8" X .001                              |            | DWG NO. 573001                |              |
| ANGLES 1/8"                              |            | REV A                         |              |
| DRAWN                                    | CHECKED    | SCALE 1:1                     | SHEET 2 OF 3 |
| ISSUED                                   | 6 SEPT 891 |                               |              |

**Federal Supply Code for Manufacturers**



continued on next page...

## Course 4: Dimensions and Tolerances, Part 1

- ▶ Identify the size and/or location for a given part feature
- ▶ Correctly calculate the tolerance specified for a given part feature

## Course 5: Dimensions and Tolerances, Part 2

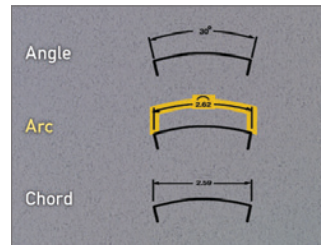
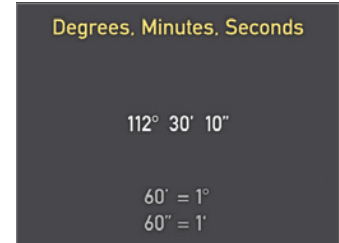
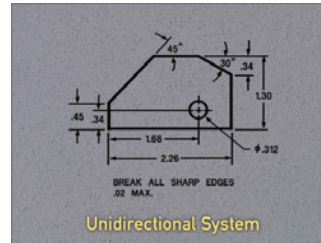
- ▶ Locate and interpret dimensions specified by chain, baseline and direct dimensioning methods
- ▶ Identify a datum feature and explain its purpose
- ▶ Explain how maximum material condition (MMC) and least material condition (LMC) apply to internal and external features
- ▶ Calculate allowance
- ▶ Identify a surface finish specification

## Course 6: Part Feature Specifications

- ▶ Identifies twelve of the most common part features on a drawing
- ▶ How to correctly interpret part specifications

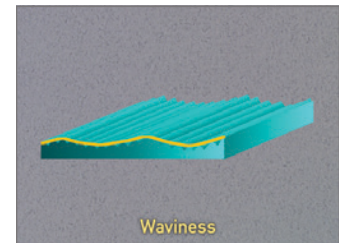
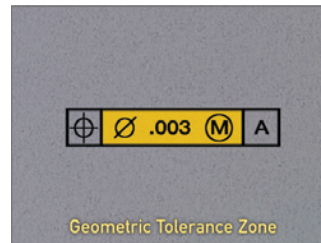
🕒 6 Online Courses (6-10 hours)<sup>†</sup>

product id: **rt\_1011\_us**



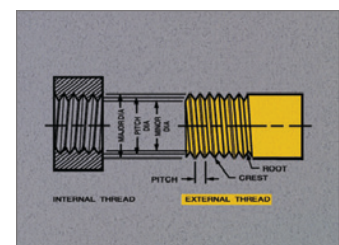
| Dimension (in.)     | Tolerance |
|---------------------|-----------|
| Up to 4.00          | ± .004    |
| From 4.01 to 10.00  | ± .010    |
| From 10.01 to 20.00 | ± .020    |
| Over 20.00          | ± .050    |

7.25 ± .010



**Tolerance Position**  
Defines max. limits of the major diameter

| EXTERNAL |                 | INTERNAL |                 |
|----------|-----------------|----------|-----------------|
| e        | large allowance | G        | small allowance |
| g        | small allowance | H        | no allowance    |
| h        | no allowance    |          |                 |



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# Geometric Dimensioning & Tolerancing

This four-course online training series builds the ability to read and interpret GD&T symbols.

Understanding the international engineering language of Geometric Dimensioning & Tolerancing is essential for communicating in the global marketplace.

## Course 1: Basic Principles

- ▶ Definition and benefits of GD&T
- ▶ Basic Terminologies
- ▶ Maximum and Least material condition
- ▶ Clearance, interference and transition fits

## Course 2: Interpreting GD&T Symbols

- ▶ Diameter symbol
- ▶ Coordinate vs. position system tolerance zones
- ▶ Effect of material condition on size of geometric tolerance

## Course 3: Form and Orientation Tolerances

- ▶ Flatness, straightness, circularity, and cylindricity
- ▶ Orientation tolerances; perpendicularity, angularity and parallelism
- ▶ Application of maximum material condition principle and inspection procedures

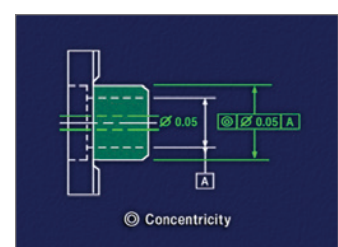
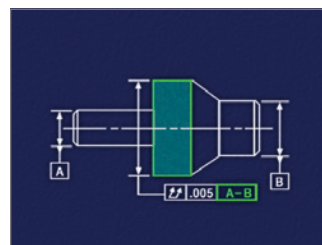
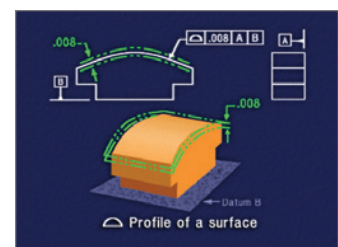
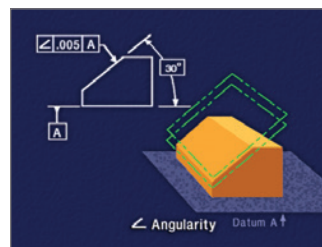
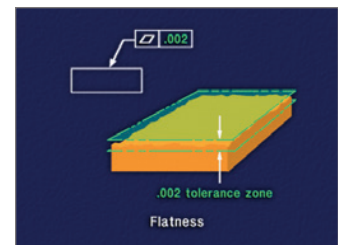
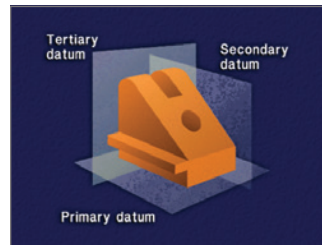
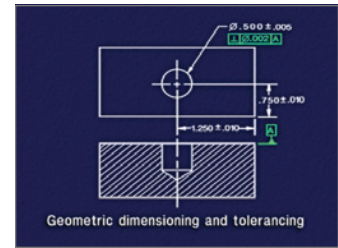
## Course 4: Profile, Runout and Location Tolerances

- ▶ Profile tolerances
- ▶ Runout tolerances; position, concentricity, and symmetry

🕒 4 Online Courses (4-8 hours)†

product id: **rt\_1021\_us**

† Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



# Plastic Part Design

**Plastic Part Design** provides part designers with an understanding of the plastic part design process. This extensive, interactive online training program also addresses many of the factors and concerns associated with part design.

Dr. Robert Malloy, a respected author and professor at the University of Massachusetts, Lowell, developed these comprehensive courses.



## Course 1: Product Development & The Prototype Process

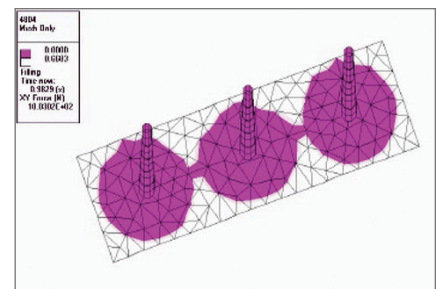
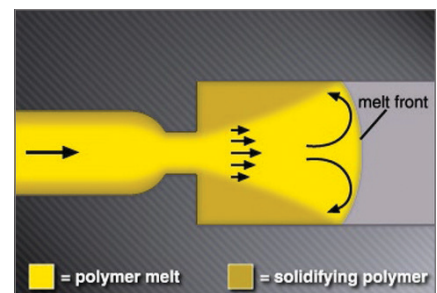
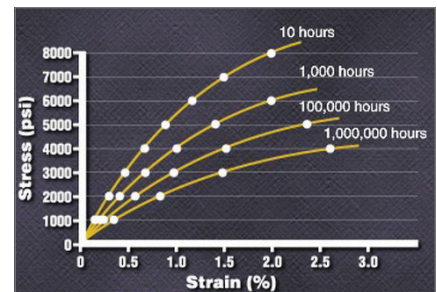
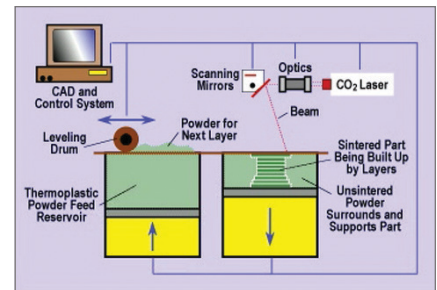
- ▶ The development & prototype process
- ▶ Product development steps
- ▶ Concurrent engineering
- ▶ Computer simulations for design
- ▶ Rapid prototyping and tooling processes

## Course 2: Mechanical Behavior of Polymers

- ▶ The mechanical behavior of polymers
- ▶ Stress/strain curves
- ▶ Visco-elastic behavior of polymers
- ▶ Creep and stress relaxation
- ▶ Fatigue and cyclic stress

## Course 3: Mold Filling, Gating & Weld Lines

- ▶ Gating & weld line considerations
- ▶ Mold filling processes
- ▶ Gate types, location, and importance
- ▶ Weld line occurrence and strength determination



*continued on next page...*

### Course 4: Shrinkage, Warpage, & Part Ejection

- ▶ How packing affects shrinkage and warpage
- ▶ The effects of part geometry
- ▶ Amorphous vs. semi-crystalline behavior
- ▶ Ejection systems for simple and complex geometry

### Course 5: Mechanical Fasteners, Press & Snap Fits

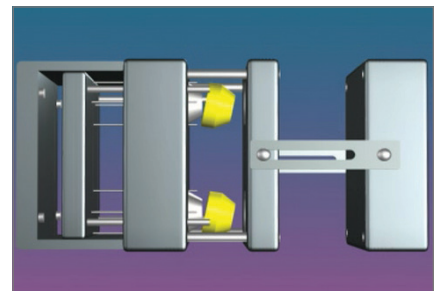
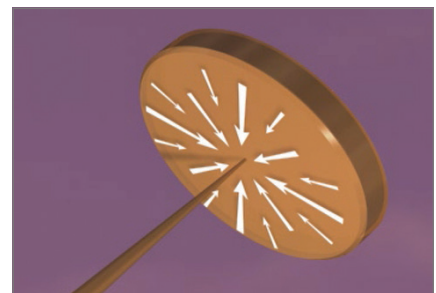
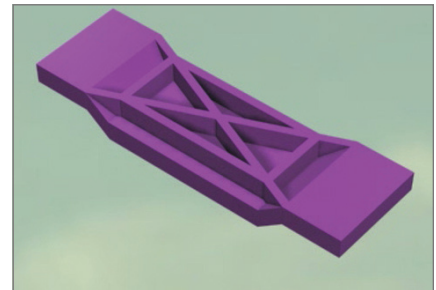
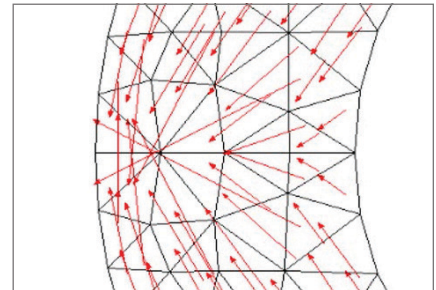
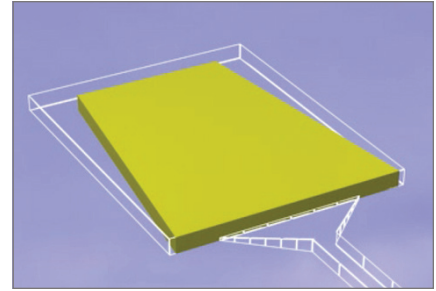
- ▶ Assembly techniques
- ▶ Snap fit design and considerations
- ▶ Design for assembly and disassembly
- ▶ Boss and screw design
- ▶ Press fit design and strength equations

### Course 6: Welding & Adhesives Bonding Technology

- ▶ Various part welding processes
- ▶ Joint design for injection molded parts
- ▶ Adhesive bonding applications & techniques
- ▶ Wetting, surface attraction and curing of adhesives

🕒 6 Online Courses (6-12 hours)<sup>†</sup>

product id: [rt\\_1331\\_us](#)



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



# Mold Design & Moldmaking

This comprehensive 9-part online training program was created with help from many of the world's leading tool manufacturers and suppliers and is intended for tool designers, mold makers, engineers, part designers, and anyone involved in the tool procurement process.

The **Mold Design and Moldmaking** series familiarizes participants with the different types of injection molds, contemporary machining methods, and many of the available mold components. This course also provides the participant with a tool design methodology and a sample mold specification guide for reference.

## Injection Mold Fundamentals

- ▶ The four basic functions of an injection mold
- ▶ Part design considerations
- ▶ Material considerations
- ▶ Molding machine considerations
- ▶ Initial mold design

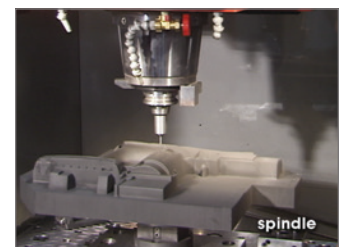
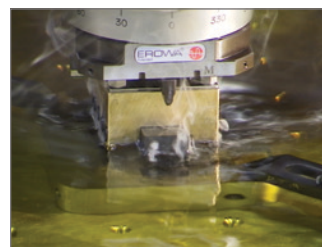
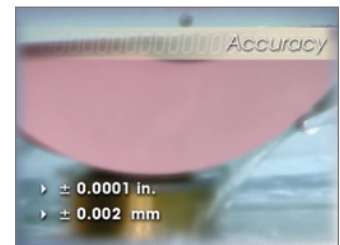
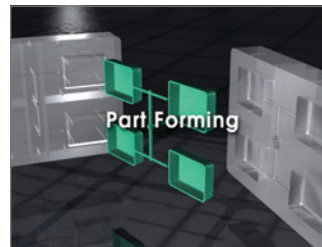
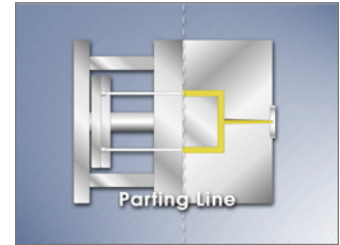
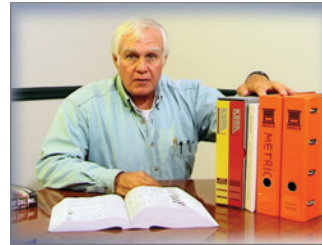
## Mold Machining Methods, Part 1

- ▶ Conventional and CNC milling
- ▶ Conventional and CNC lathe
- ▶ Conventional and CNC surface grinding
- ▶ The advantages and disadvantages to each machining method
- ▶ Finishes and stresses with each process

## Mold Machining Methods, Part 2

- ▶ Conventional and CNC die sinking EDM
- ▶ CNC wire EDM
- ▶ Polishing
- ▶ Inspection equipment
- ▶ Seal-offs

*continued on next page...*



## 2-Plate, 3-Plate, and Hot Runner Molds

- ▶ Explains the three basic mold designs and their construction
- ▶ Advantage and disadvantage to each design
- ▶ Common uses for each design
- ▶ Explains different hot runner systems
- ▶ Parting line locks
- ▶ Specialty molds

## Mold Bases, Tool Steels & Heat Treating

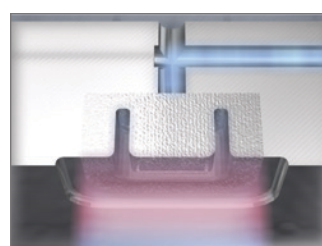
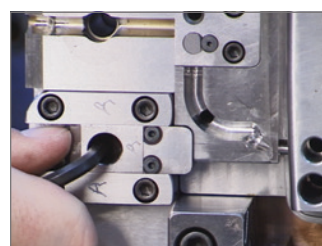
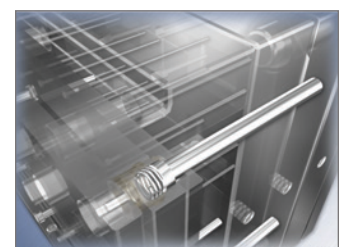
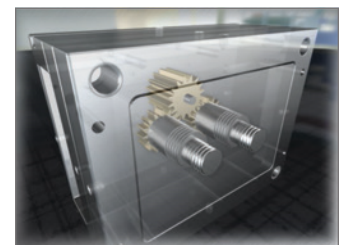
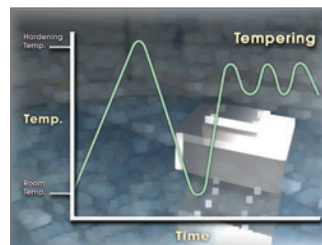
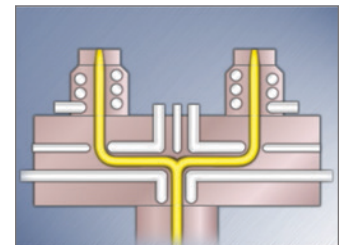
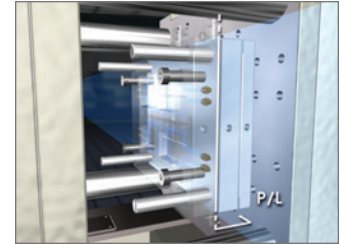
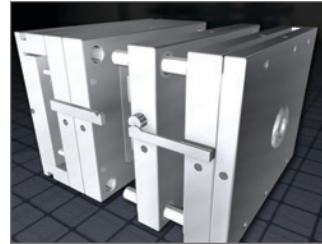
- ▶ Tooling materials and their properties
- ▶ Various heat treating methods
- ▶ Introduces alternative materials, such as Beryllium-copper
- ▶ Features DME standardized mold bases

## External and Internal Actions

- ▶ Slides, core pins, & lifters
- ▶ Unscrewing & expandable cores
- ▶ Inserts
- ▶ Dissolvable cores
- ▶ Preload and seal-offs

## Part Ejection, Venting and Cooling

- ▶ Ejector pins, sleeves, blades and lifters
- ▶ Stripper plates and pneumatic ejection
- ▶ Water lines, bubblers, baffles and conductive cooling rods
- ▶ Multi-stage ejection and ejection return
- ▶ Covers different forms of part venting



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## Gating Methods

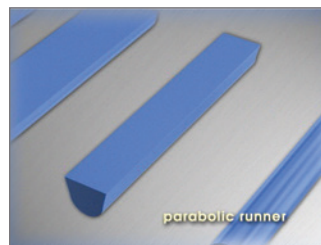
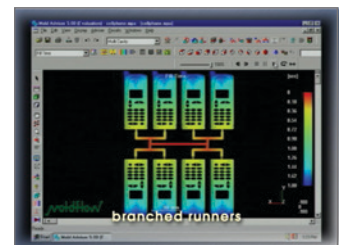
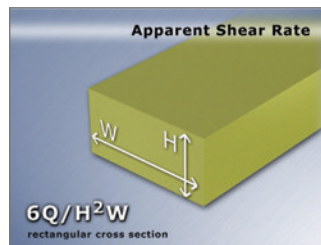
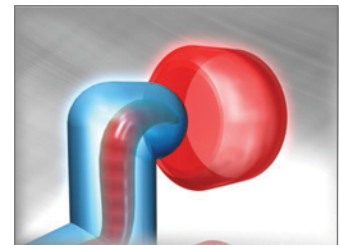
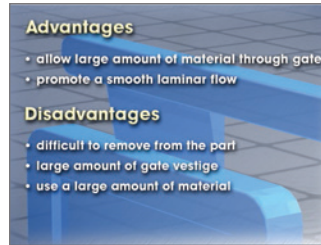
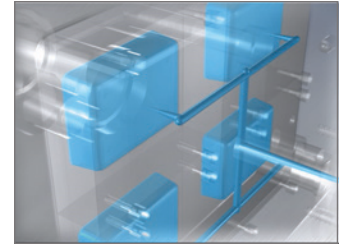
- ▶ Commonly used gates and their characteristics
- ▶ Introduction to hot runner gate design
- ▶ Introduction to cold runner gate design
- ▶ Explains manual and automatic gate removal
- ▶ Discusses gate location determination

## Runners, Filling Software & The Mold Design Process

- ▶ Parting line determination and considerations
- ▶ Core and cavity block configuration
- ▶ Cooling line and ejection layout
- ▶ Additional mold components
- ▶ Mold filling analysis capabilities

🕒 9 Online Courses (9-16 hours)<sup>†</sup>

product id: [rt\\_1311\\_us](#)



<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.

# RJG's Decoupled Molding<sup>SM</sup>

These online courses convey many of the concepts and theories covered within the **RJG Decoupled Molding<sup>SM</sup>** training seminars. This four-part training program starts with the major components of the molding process, and progresses to systematic troubleshooting.

## Part 1 - Introduction to Decoupled Molding<sup>SM</sup>

- ▶ Discusses polymerization, crystallinity, additives, regrind and degradation
- ▶ Lists necessary components of a proper part design
- ▶ Describes the injection molding process in depth; from filling to cooling
- ▶ Covers molding machine components and their functions in depth

## Part 2 - Decoupled Molding<sup>SM</sup> Techniques

- ▶ Compares traditional and Decoupled Molding<sup>SM</sup>
- ▶ Defines the three Decoupled Molding<sup>SM</sup> techniques
- ▶ Covers transducers and proper transducer placement
- ▶ Introduces signal conditioners and display devices

## Part 3 - Reading and Interpreting Data

- ▶ Provides participants with an understanding of graphs and scaling
- ▶ Explains how to identify different types of graphical curves
- ▶ Introduces the various integrals used in Decoupled Molding<sup>SM</sup>
- ▶ Compares ideal and inconsistent pressure curves

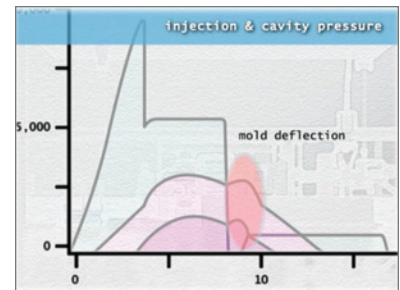
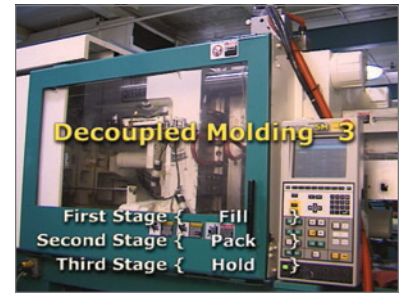
## Part 4 - Systematic Troubleshooting

- ▶ Discusses the importance of proper process documentation
- ▶ Explains the appearance and symptoms of defects
- ▶ Introduces logical steps involved in troubleshooting defects
- ▶ Describes common processing defects, their causes and corrective actions

🕒 4 Online Courses (4-6 hours)<sup>†</sup>

product id: **rt\_0811\_us**

<sup>†</sup> Course titles, descriptions, and images are provided for reference purposes only. Our courses are regularly updated and their contents may change without notice. The durations listed for courses are estimates only; actual completion time may vary. All text and images are the copyrighted property of Routsis Training.



# Intelligent Molder

These courses were produced for technicians and process engineers that want to thoroughly evaluate both the capability and repeatability of a given injection molding machine, injection mold, or injection molding process.

Each course references three in-depth tests and will greatly benefit any participant of RJG's classroom-based, Master Molder<sup>SM</sup> Certification Series – either as a primer or as follow-up training.

## Part 1 - Machine Evaluation

- ▶ Dynamic Check Ring Repeatability Test
- ▶ Load Sensitivity Test
- ▶ Platen Deflection Test

## Part 2 - Mold Evaluation

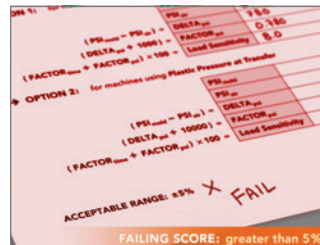
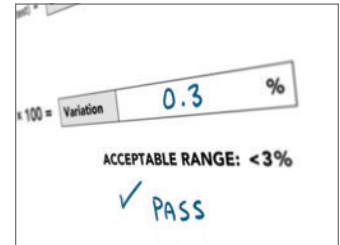
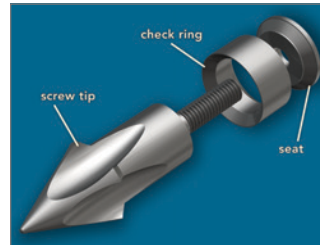
- ▶ Dynamic Cavity Imbalance Test
- ▶ Mold Deflection Test
- ▶ Tonnage Calculation Worksheet

## Part 3 - Process Evaluation

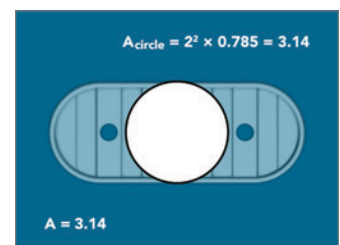
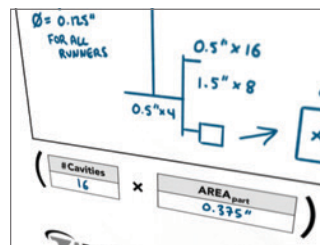
- ▶ In-Mold Rheology Test
- ▶ Gate Seal Worksheet
- ▶ DECOUPLED II<sup>SM</sup> Process Sheet

🕒 3 Online Course (3-6 hours)<sup>†</sup>

product id: [rt\\_0821\\_us](#)



|    | 1st Stage Fill Time (t) | Transfer Pressure (psi) | Shear Rate (1/s) |
|----|-------------------------|-------------------------|------------------|
| 1  | 0.68                    | 11500                   | 1.99             |
| 2  | 0.75                    | 11750                   | 1.33             |
| 3  | 0.95                    | 11910                   | 1.20             |
| 4  | 0.93                    | 11910                   | 1.08             |
| 5  | 1.08                    | 11890                   | 0.93             |
| 6  | 1.28                    | 11900                   | 0.78             |
| 7  | 1.59                    | 11310                   | 0.63             |
| 8  | 2.11                    | 10880                   | 0.49             |
| 9  | 3.15                    | 10460                   | 0.32             |
| 10 | 4.28                    | 10240                   | 0.16             |



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# RJG's eDART™

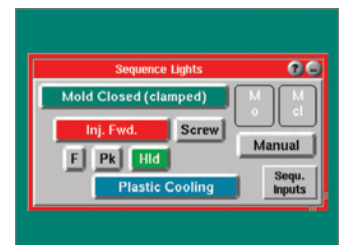
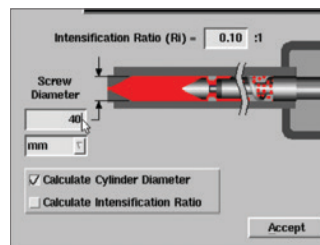
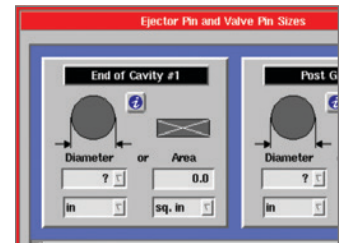
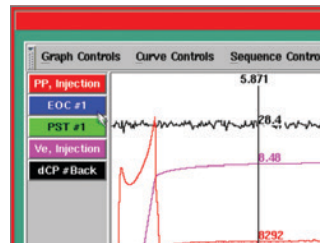
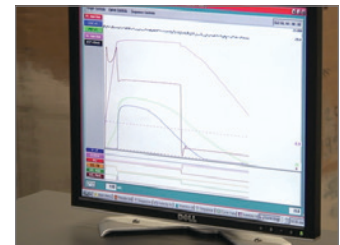
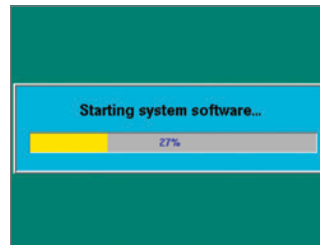
This course was created for production personnel that monitor and optimize injection molding processes equipped with RJG's eDART™ process controllers. This course will greatly benefit setup personnel, process engineers, machine operators, and managers that use, or plan on using, an eDART™ system.

Participants will be better prepared to establish the following:

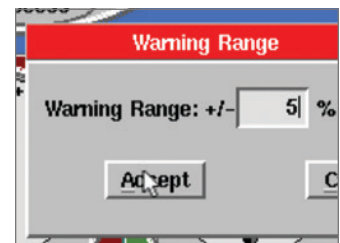
- ▶ Improved processing methods
- ▶ Increased operation efficiency
- ▶ Machine and process analysis
- ▶ Automated quality control
- ▶ Improved process stability

🕒 1 Online Course (1-2 hours)†

product id: [rt\\_0831\\_us](#)



| Cycle Values (Mold: M05794 - M) |        |          |
|---------------------------------|--------|----------|
| Template: Dc3 RND               |        |          |
| Cycle Value                     | Value  | Tpl. Val |
| Sequence Time, Cycle Time       | 31.2   | 29.0     |
| Efficiency, Cycle Time          | 0.00   | 0.00     |
| Peak, Injection Pressure        | 12000  | 15420    |
| Peak, End of Cavity             | 0.00 ? | 0.00     |
| Plastic Pressure, Injection     | 1001   | 0.00     |
| Effective Viscosity, Fill       | 16010  | 12360    |
| Sequence Time, Fill Time        | 1.63   | 1.03     |



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# Certification Exam for Injection Molding Professionals

Routsis Training's globally recognized Professional Certification demonstrates a broad understanding of the injection molding industry. To attain certification, candidates need a working knowledge of injection molding safety, machinery, processing, tooling, materials, quality, and industry best practices.

## Who Should Consider Professional Certification?

Machine operators, technicians, supervisors, engineers, managers... Anyone working in the injection molding industry should consider taking this exam. Certification can help individuals advance their careers and industry standing. For companies, having a certified workforce gives managers confidence that their team can rise to meet the challenges of a modern manufacturing environment.

## How to Get Certified:

This exam is conducted entirely online and requires about 1.5 hours to complete — with a time limit of 3 hours. Upon completion, participants are immediately notified whether they've passed or not, via email. Those who achieve a passing score will receive their certificate. Those who do not pass receive a detailed report indicating areas in which further improvement is needed, prior to retaking the exam.

## How the Exam is Structured:

A series of True/False questions are used to cover a wide range of topics. The exam also uses multiple choice questions to provide stronger indication of the candidate's understanding of common injection molding concepts. Finally, scenario-solving questions are used to gauge the participant's practical knowledge. The questions in this exam are divided into the following categories:

- ▶ Injection Molding Safety
- ▶ Basic 5S & Housekeeping
- ▶ General Molding Process
- ▶ Injection Mold Basics
- ▶ Molding Machinery Basics
- ▶ Plastics Material Basics
- ▶ Basic Scientific Molding
- ▶ Defect Troubleshooting
- ▶ Basic Quality & Mathematics

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## How to Prepare for this Certification Exam:

Although preparatory training is not necessary to achieve certification, participation in Routsis's structured Injection Molding training programs can greatly increase a candidate's chances of successfully completing the examination.

We offer an online training package specifically geared toward helping injection molders prepare for this exam. For small and mid-sized companies, our Professional Certification Portals provide a convenient, cost-efficient way to train, benchmark, and certify your employees. Larger companies should consider our exclusive RightStart™ in-house training system.

🕒 **Online Exam (1-3 hours) †**

**product id: rt\_1601\_us**

# Advanced Certification Exam for Scientific Processors

Moving beyond the foundational concepts covered in our Injection Molding Professional exam, this certification level requires an advanced understanding of Scientific Molding. Participants must also demonstrate hands-on skills in order to attain certification. The standards in this examination are determined by current industry best practices.

Passing the online exam requires a good understanding of scientific processing and documentation, as well as die setting, material handling, purging, troubleshooting, and tooling.

The skills-testing portion of the examination demands a functional demonstration of practical scientific injection molding, including: scientific process development, process documentation, and other critical skills.

## Who Should Consider Advanced Certification?

Advanced Certification is geared toward engineers and technicians. In short, anyone involved with developing and optimizing Scientific Molding processes can benefit from this enhanced certification. Individuals who get certified can further their careers and improve their standing with their company and the industry. Companies should strongly consider this certification exam to benchmark their employees — and to verify they have a confident, capable production team.

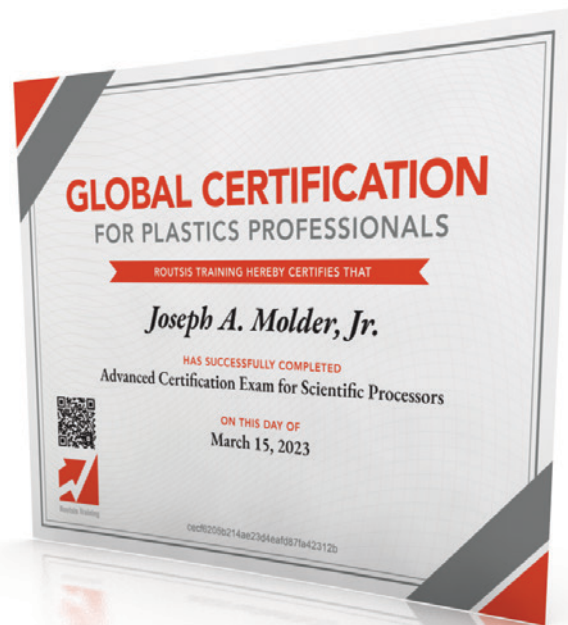
## How to Get Certified:

The first stage involves completing a comprehensive online test, which requires approximately 1.5 hours — with a total time limit of 3 hours. Upon completion of the exam, participants are immediately notified whether they've passed or not, via email. Those who do not pass receive a detailed report indicating areas in which further improvement is needed, prior to retaking the exam.

The skills-testing stage requires the completion of 13 different hands-on worksheets — performed at an injection molding machine. The completed materials are then uploaded to Routsis Training for individual review before certification is conferred upon the candidate.

Although preparatory training is not necessary to achieve certification, participation in Routsis's structured Injection Molding training programs can greatly increase a candidate's chances of successfully completing the examination.

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## Online Exam Topics:

- ▶ Basic Equipment & Machinery Maintenance
- ▶ Die Setting & Material Handling
- ▶ Scientific Molding Process & Documentation
- ▶ Scientific Purging
- ▶ Scientific Troubleshooting
- ▶ Tooling Fundamentals

## Hand-on Evaluations:

- ▶ Melt Temperature Measurement
- ▶ Coolant Temperature Measurement
- ▶ Scientific Process Documentation
- ▶ 1st Stage Check Ring Evaluation
- ▶ 1st Stage Injection Speed
- ▶ 1st Stage Injection Transfer
- ▶ 1st Stage Injection Pressure Setpoint
- ▶ 1st Stage Injection Time Setpoint
- ▶ 2nd Stage Packing Pressure Study
- ▶ 2nd Stage Packing Time Study
- ▶ 2nd Stage Final Cushion Setpoint
- ▶ 2nd Stage Clamp Force Study
- ▶ Screw Recovery Time

🕒 **Online Exam (1-3 hours) +  
Hands-on Worksheets (Upload Required) †**

product id: **rt\_1401\_us**

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# Certification Exam for Injection Mold Setters

To attain this certification, injection mold setters must have a working knowledge of injection molding safety, die setting, robotics, drying, machinery, materials, purging, processing parameters, and tooling. Successful candidates must also demonstrate a solid understanding of the injection molding industry's best practices.

## Who Should Consider Mold Setter Certification?

Advanced Certification is geared toward engineers and technicians. In short, anyone involved with developing and optimizing Scientific Molding processes can benefit from this enhanced certification. Individuals who get certified can further their careers and improve their standing with their company and the industry. Companies should strongly consider this certification exam to benchmark their employees — and to verify they have a confident, capable production team.

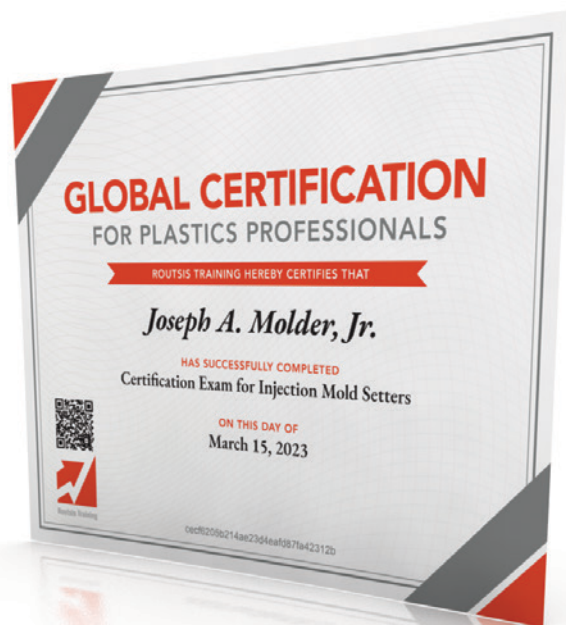
## How to Get Certified:

Our Certification Exam for Injection Mold Setters is conducted entirely online. This comprehensive test takes approximately 1.5 hours to complete — with a time limit of 3 hours. Upon completion, participants are immediately notified whether they've passed or not, via email. Those who attain a passing score will receive (and can share) their certificate. Those who do not pass receive a detailed report indicating areas in which further improvement is needed, prior to retaking the exam.

The questions in this exam cover critical concepts, divided into the following categories:

- ▶ Injection Molding Safety
- ▶ Basic 5S & Housekeeping
- ▶ General Molding Process
- ▶ Injection Mold Basics
- ▶ Molding Machinery Basics
- ▶ Plastics Material Basics
- ▶ Barrel Purging Basics
- ▶ Injection Mold Setting
- ▶ Material Drying
- ▶ Automation & Robotics

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## How to Prepare for this Certification Exam:

Although preparatory training is not necessary to achieve certification, participation in Routsis's structured Injection Molding training programs can greatly increase a candidate's chances of successfully completing the examination.

We offer an online training package specifically geared toward helping injection molders prepare for this exam. For small and mid-sized companies, our Professional Certification Portals provide a convenient, cost-efficient way to train, benchmark, and certify your employees. Larger companies should consider our exclusive RightStart™ in-house training system.

🕒 **Online Exam (1-3 hours) †**

product id: **rt\_1602\_us**

# Certification Exam for Injection Molding Quality

Delivering high-quality molded plastic parts to your customers is the main goal of any injection molding operation. In order to pass this exam, the candidate must demonstrate working knowledge of injection molding and quality assurance. The exam covers safety concerns, the molding process, injection mold basics, plastics materials and drying, plastic part quality, mathematics, print reading, and the use of measuring tools for quality inspection.

## Who Should Consider Quality Certification?

Quality inspectors, technicians, managers, and engineers should take this certification exam. Quality managers should strongly consider offering this certification as a means of benchmarking their personnel — ensuring they have a confident and capable quality assurance team.

## How to Get Certified:

This exam is conducted entirely online — requiring approximately 1.5 hours to complete, with a time limit of 3 hours. Upon completion of the exam, participants are immediately notified whether they've passed or not, via email.

Those who attain a passing score will receive their certificate. Those who do not pass receive a detailed report indicating areas in which further improvement is needed, prior to retaking the exam.

## How the Exam is Structured:

A series of True/False questions are used to cover a wide range of topics. The exam also uses multiple choice questions to provide stronger indication of the candidate's understanding of more complex concepts.

The questions in this exam cover the following categories:

- ▶ Molding Safety & Housekeeping
- ▶ Plastics Materials
- ▶ Material Drying Basics
- ▶ Scientific Molding Basics
- ▶ Process Documentation
- ▶ Basic Print Reading & Mathematics
- ▶ Measuring Tools
- ▶ Barrel Purging Basics
- ▶ Injection Mold Setting
- ▶ Material Drying
- ▶ Automation & Robotics

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## How to Prepare for this Certification Exam:

Although preparatory training is not necessary to achieve certification, participation in Routsis's structured Injection Molding training programs can greatly increase a candidate's chances of successfully completing the examination.

We offer an online training package specifically geared toward helping injection molders prepare for this exam. For small and mid-sized companies, our Professional Certification Portals provide a convenient, cost-efficient way to train, benchmark, and certify your employees. Larger companies should consider our exclusive RightStart™ in-house training system.

🕒 **Online Exam (1-3 hours) †**

**product id: rt\_5400\_us**

# Certification Exam for Injection Molding Maintenance

Routsis Training's globally recognized Injection Molding Maintenance Certification demonstrates a good understanding of important maintenance considerations, concepts, and procedures. In order to attain certification, candidates must have a working knowledge of injection molding safety, robotics, drying, machinery, materials, purging, robotics, parameters, hydraulics, and maintenance — and demonstrate a solid understanding of current industry best practices.

## Who Should Consider Maintenance Certification?

Maintenance technicians, managers, and engineers should consider taking this exam. Managers should offer this certification to benchmark their team — ensuring that maintenance personnel are confident, capable, and knowledgeable.

## How to Get Certified:

This exam is conducted entirely online — requiring approximately 1.5 hours to complete, with a time limit of 3 hours. Upon completion of the exam, participants are immediately notified whether they've passed or not, via email.

Those who attain a passing score will receive their certificate. Those who do not pass receive a detailed report indicating areas in which further improvement is needed, prior to retaking the exam.

## How the Exam is Structured:

A series of True/False questions are used to cover a wide range of topics. The exam also uses multiple choice questions to provide stronger indication of the candidate's understanding of more complex concepts.

The questions in this exam cover the following categories:

- ▶ Molding Safety & Housekeeping
- ▶ General Molding Process
- ▶ Injection Mold Basics
- ▶ Material Drying Basics
- ▶ Automation & Robotics
- ▶ Barrel Purging Basics
- ▶ Equipment & Machinery Maintenance
- ▶ Basic Print Reading & Mathematics
- ▶ Automation & Robotics

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## How to Prepare for this Certification Exam:

Although preparatory training is not necessary to achieve certification, participation in Routsis's structured Injection Molding training programs can greatly increase a candidate's chances of successfully completing the examination.

We offer an online training package specifically geared toward helping injection molders prepare for this exam. For small and mid-sized companies, our Professional Certification Portals provide a convenient, cost-efficient way to train, benchmark, and certify your employees. Larger companies should consider our exclusive RightStart™ in-house training system.

🕒 **Online Exam (1-3 hours) †**

**product id: rt\_1603\_us**

# Certification Exam for Injection Mold & Part Designers

This globally recognized certification from Routsis Training indicates a broad-based understanding of injection molded part and mold design. Successful candidates must demonstrate a working knowledge of mold and part design fundamentals, print reading, mathematics, basic scientific molding concepts, and plastics materials; and an understanding of current industry best practices.

## Who Should Consider Certification?

Design Certification is ideal for injection mold & part designers, process engineers, project managers, and quality engineers. Individuals can use this certification to help advance their careers and industry standing. Engineering managers can use this certification to benchmark their team's knowledge and capabilities. Certified engineers are more confident in their ability to meet the challenges of today's ever advancing designs and applications.

## How to Get Certified:

This exam is conducted entirely online — requiring approximately 1.5 hours to complete, with a time limit of 3 hours. Upon completion of the exam, participants are immediately notified whether they've passed or not, via email.

Those who attain a passing score will receive their certificate. Those who do not pass receive a detailed report indicating areas in which further improvement is needed, prior to retaking the exam.

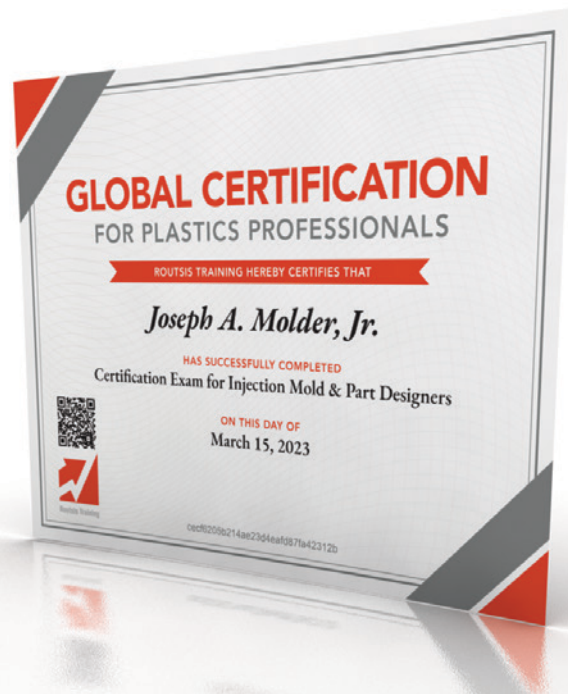
## How the Exam is Structured:

A series of True/False questions are used to cover a wide range of topics. The exam also uses multiple choice questions to provide stronger indication of the candidate's understanding of more complex concepts.

The questions in this exam cover the following categories:

- ▶ Basic Scientific Molding
- ▶ Injection Mold Basics
- ▶ Basic Dimensions & Mathematics
- ▶ Plastics Materials
- ▶ Plastics Part Design
- ▶ Tooling Design Fundamentals
- ▶ Barrel Purging Basics
- ▶ Equipment & Machinery Maintenance
- ▶ Basic Print Reading & Mathematics
- ▶ Automation & Robotics

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## How to Prepare for this Certification Exam:

Although preparatory training is not necessary to achieve certification, participation in Routsis's structured training programs can greatly increase a candidate's chances of successfully completing the examination.

We offer an online training package specifically geared toward helping individuals prepare for this exam. For small and mid-sized companies, our Professional Certification Portals provide a convenient, cost-efficient way to train, benchmark, and certify your employees. Larger companies should consider our exclusive RightStart™ in-house training system.

🕒 **Online Exam (1-3 hours) †**

**product id: rt\_9041\_us**