

# Paulson ProMolder 1™ – Seminar Outline

## Duration

4 Days

## Certification

Graduates will be Certified in the knowledge of Injection Molding “from the plastic’s point of view,” will understand the “why” behind the injection molding process, and confidently and safely use the right systems and data to make production floor decisions before changing settings on the molding machines.

**Paulson ProMolder 1™** is the hands-on injection molding seminar designed for anyone who wants to learn and understand the structure and application of scientific injection molding or who wants a scientific background of the injection molding process. All Paulson courseware and seminars are vendor neutral. Paulson teaches processing “from the plastic’s point of view.” Whether you use Scientific Molding or DeCoupled Molding™ or a hybrid system in your plant, this seminar will dramatically increase your results. **Pre-requisite:** None. There will be a short pre-assessment quiz before the class begins.

## Who should attend?

Technicians, Setup, Quality Personnel and anyone with a need to improve their skill and understanding of injection molding.

## Molding simulation and hands-on machine time.

In addition to class time, Paulson incorporates their innovative SimTech simulation software throughout the seminar with the 4<sup>th</sup> day including hands-on machine time, when machines are available. The injection molding machine demonstration reviews basic machine operation and application of the principles learned during class.

## What you will learn.

When you complete this course you will be able to:

- Understand the structure, application and science of injection molding.
- How to optimize control settings
- How to regulate plastic temperature
- Troubleshooting
- Fully prepared & pre-qualified to enroll in Paulson’s ProMolder™ 2 advanced seminar

## Why earn a Paulson Certification?

Paulson Training Programs has an industry-leading 35 year reputation for developing highly qualified injection molding personnel who are sought after by the top injection molding companies. To maintain this quality, we test each student at the end of the course with a written exam. Based on final scores, each participant earns one of three levels of Certification: **Paulson Gold Certificate of Achievement**; **Paulson Silver Certificate of Achievement**; and a **Paulson Certificate of Completion**.

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## ProMolder™ 1 Seminar - What You Will Learn

Here is a day-by-day outline of the topics that you will learn in Paulson's **ProMolder™ 1** injection molding seminar.

You will leave this class with a very thorough understanding of the injection molding process. You will have a firm foundation of knowledge on which you will build and share back at your plant. You are also fully prepared and pre-qualified to enroll in Paulson's **ProMolder™ 2** advanced seminar.

**ProMolder™ 1** will introduce you to the machine, the mold, the materials, the machine controls and the foundational concepts of injection molding from the *plastic's point of view* and the 4 primary processing variables – *heat, flow, pressure, and cooling*. This proven learning method was pioneered by Paulson in the 1970's and remain the industry standard today.

### The main topics covered during this intensive 4-day seminar include:

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#### Day 1

- Welcome and Introductions
- **ProMolder 1 Pre-Test**
- The Basic Principles of Injection Molding
  - The Materials
  - The Parts and Operation of the Injection Molding Machine
  - Injection Molds
  - Injection Molded Plastic Part Design Essentials
  - An Overview of the Injection Molding Process
- The Composition of Plastics
  - How Plastics are Made
  - Polymerization
- Basic Types of Plastic Structure
  - Thermoplastic
  - Thermoset
  - Copolymers
  - Blends
- Raw Material Issues Encountered When Molding Plastics
  - Contamination
  - Causes of Contamination
  - Moisture Contamination
  - The Drying Essentials of Plastic
  - Thermal Degradation
  - How to Use the Material Manufacture's Data Sheet
- Plastic Material Additives
- Plastic Material Reinforcements
- Understanding Plastic Regrind
  - Plastic Regrind – When is it bad? When is it acceptable to use? How much?
  - Understanding the Recycling History of Regrind
- Understanding the internal structure of molded part – Molecular Arrangement Overview
- Crystalline Structure
- Amorphous Structure
- Molecular Orientation

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# Paulson ProMolder 1™ – Seminar Outline

## Day 2

- Review of Day 1
- Inside the Molding Machine - Overview
- Components of a Typical Molding Machine - Overview
  - Injection Unit Components
  - Clamp Unit Components
  - Injection Mold Components
- Description of a Typical Injection Molding Cycle
  - Material Feeding System
  - Molding Machine Injection Screw and Barrel
  - Machine and Mold Interface
  - Plastic Flow into the Mold
  - Typical Injection Molding Cycle Sequence
- The Parts and Controls on the Injection Molding Machine – A Detailed Look
  - Screw Drive Motor
  - Hydraulic Injection Cylinder
  - Hopper / Feeding System
  - Heating Barrel
  - Different Zones of the Plasticating Screw
  - Non-Return Valves
  - Clamping Systems
- Typical Electric Injection Molding Machine
  - Servo Motor Drive Systems for Injection Unit
  - Ball Screw Drive Mechanism
  - Precision of Electric Molding Machines
  - Hydraulic Pressure vs. Plastic Pressure
- Common Types of Molds
  - a. Two-Plate Molds
  - b. Three-Plate Molds
  - c. Cold (Solid) Runner Terminology
  - d. Runnerless (Hot Runner) Mold
- Components of Molds
  - Locating Ring
  - Core and Cavity Plates
  - Support Plates and Support Pillars
  - Typical Sprue Puller Configurations
  - Ejector Pins and Ejector Plates
  - Insulation Plates
- Functions of the Mold
  - Provide Flow Passage for Plastic
  - Allow Air to Escape from Cavities
  - Cooling the Plastic
  - Ejection of the Molded Parts

# Paulson ProMolder 1™ – Seminar Outline

## Day 3

- Review Material from Day 2
- The Four Primary Plastic Processing Variables – Introductory Discussion
  - Plastic Melt Temperature
  - Plastic Flow Rate
  - Plastic Pressure
  - Plastic Cooling Rate
- Typical Molding Cycle – Graphical Discussion
- Machine Controls
  - Barrel Temperature Control
  - Fill Rate Control
  - Understanding VPT (Velocity Pressure Transfer Point)
  - Injection Pressure Control – pack/hold, multi-stage, back pressure
  - Mold Temperature Control
- Machine Mechanical Operation
  - Machine Timers
  - Injection Unit Controls
  - Clamp Controls
- Molding From the Machine Point of View
  - Machine Controls vs. Part Properties
- Molding From the Plastic Point of View
  - Plastic Processing Conditions vs. Part Properties
  - Using Machine Controls to Determine Plastic Process Conditions.
  - Processing Strategies
- Plastic Fountain Flow
- Cavity Pressure Loss in Plastic Parts
  - Cavity Pressure Loss in Thick Wall Parts
  - Cavity Pressure Loss in Thin Wall Parts
- How Plastic Cooling Rate Effects Mold Part
- Troubleshooting Plastic Parts – Basic Overview Using PPV
  - Flash
  - Short Shots
  - Sinks
  - Voids
  - Splay
  - Gas Burn
- Economics of Molding
  - What is Effective Throughput?
  - The Primary Cost Drivers that determine molding profit
- Review Material from Days 1 - 3

# Paulson ProMolder 1™ – Seminar Outline

## Day 4

- **SimTech™** – Injection Molding Machine Simulator Lab Lessons
  - Introduction to Systematic Problem Solving
  - How to Apply the Four Plastic Variables to Solve Problems
  - Practical Application of Lesson Learned Regarding Plastic Behavior
  - 4-hours of SimTech™ Simulator time

## Class Wrap-Up and Certification Exam

- **Introduce the 13-Step Process to Build an Optimized Process (taught in ProMolder™ 2 & 3)**
- **Final Class Review – Q & A with Full Class Participation**
- **Administer Final Test and Certification**
- **Graded Final Review with Full Class**

## Bring ProMolder 1™ to Your Plant

ProMolder 1™ is also available as a customized in-plant seminar. For more details visit:

[www.paulsonplasticsacademy.com/custom-on-site-seminars](http://www.paulsonplasticsacademy.com/custom-on-site-seminars) or call **800-826-1901**.

## About Paulson Plastics Academy

The **Paulson Plastics Academy (PPA)** is the division of Paulson Training Programs devoted to in-person, hands-on training. We offer expert instructor-led, vendor-neutral certification seminars that teach the fundamentals and advanced topics of injection molding, extrusion, and extrusion blow molding. The number of Plastics Academy graduates grows by hundreds each year. Whether you need a customized onsite seminar for your whole team or an instructor-led classroom experience for one or a few of your personnel, PPA can help you take the next steps on your journey to success. Contact us today to learn how we can help you get the most out of your training investment.