



# FIMMTECH, Inc.

Frontier Injection Molding and Material Technologies, Inc.

[www.fimmtech.com](http://www.fimmtech.com)

[Sahas@fimmtech.com](mailto:Sahas@fimmtech.com)

(760) 525 9053

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**Seminar Title:** SCIENTIFIC PROCESSING FOR INJECTION MOLDING

**Dates:** October 11<sup>th</sup> & 12<sup>th</sup> (Tuesday and Wednesday)

**Location:** Classroom: Hampton Inn San Marcos  
123 E. Carmel Street, San Marcos, California, 92078  
Tel: (760) 736-9249

Hands-On Class: Distinctive Plastics, 1385 Decision St., Vista CA 92081

**Cost:** \$795 per person for both days.

**Who Should Attend:**

*Process Engineers:* Learn how to establish an efficient and robust injection molding processes

*Material Manufacturers:* Learn how your customer can use your product efficiently via efficient processing.

*Product Development Engineers:* Learn how to shorten the time from first shots to final production.

*Quality Personnel:* Learn how a robust process can improve the Statistical Process Capability.

*Managers:* Learn how a robust process can improve the efficiency and reduce scrap.

*Mold Makers:* Learn how you can debug and qualify a mold before you send it over to your customer.

**Syllabus:**

The syllabus for the seminar is mentioned below. The content will be covered over the period of two days and will include 'Hands-On' experiments in the afternoon of every day. Please see the list of experiments at the end of the course syllabus.

*Classroom Syllabus:*

- 1) Introduction to Scientific Processing
  - What is Scientific Processing and Scientific Molding
  - The Five Critical Factors to Successful Injection Molding
  - Concurrent Engineering
  
- 2) Polymers and Plastics:
  - History and definition of Polymers
  - Crystalline and Amorphous Polymers – Morphology of Polymers
  - Role of Morphology in Injection Molding
  - Thermal transitions in plastics
  - Common Commercial plastics, additives and fillers.
  
- 3) Plastic Flow:
  - How is plastics flow different?
  - Newtonian and Non Newtonian fluids
  - Temperature dependence of viscosity

- Shear rate dependence of viscosity
  - Shear dependent rheology in Injection Molding
- 4) Injection Molding and Molding Machines
    - The molding machine, screw and barrel
    - Terminology of machine specifications
    - Selecting the right molding machine
  - 5) Drying of Plastics
    - Hygroscopic Materials
    - Need for Plastic Drying
    - ‘Overdrying’ of Plastics
  - 6) Scientific Processing
    - What is Scientific Processing and Scientific Molding?
    - In mold rheology or viscosity curves
    - Cavity Fill Balances
    - Pressure Drop Studies
    - Gate seal tests
    - Molding area diagram
    - Cooling study
    - Post Mold Shrinkage
  - 7) Design of Experiments (DOE) for Injection Molding
    - What are DOEs?
    - Factors, levels and responses
    - Balanced / Orthogonal arrays
    - Full and Partial Factorial experiments and other Design Types
    - Analysis of the results: Pareto Charts, Main Effect Plots and Contour Plots
  - 8) The Aesthetic, Dimensional and Control Process Window
    - The Aesthetic Process Window
    - The dimensional Process Window
    - The recommended Mold Qualification Procedure
  - 9) Trouble shooting and related topics
    - ‘Must Have’ list of accessories for trouble shooting
    - Common Molding Defects and their solutions
    - What to do when there is a problem – a Step by Step guide
  - 10) Regrind
    - Effect of regrind on the properties
    - Incorporating regrind – the batch and continuous process
    - Regrind calculations and tables
  - 11) Machine Validation
    - Shot to Shot Variation
    - Load Sensitivity Test

- Injection Speed Linearity Test
- 12) Implementation of the techniques learnt to your facility
- Coming up with a suitable plan for improvement
  - Implementation

'Hands-On' Experiments:

- 1) Scientific Molding:
  - a) Setting up the machine parameters
  - b) Developing a viscosity curve
  - c) Determining Cavity Balances
  - d) Determining the Pressure Drop
  - e) Determining the Process Window
  - f) Determining the Gate Seal Time
  - g) Determining the Cooling Time
- 2) Design of Experiments
  - a) Factor and response selection
  - b) Collecting the data
  - c) Analysis of the data
- 3) Determining the process windows
  - a) The Cosmetic Process Window
  - b) The Dimensional Process Window

**About the Instructor:**

Suhas Kulkarni is the President of FIMMTECH, a consulting firm that specializes in services related to injection molding. He earned his Masters in Plastics Engineering from the University of Massachusetts, Lowell and a Bachelors in Polymer Engineering from the University of Poona, India. He has 19 years of experience as a process engineer.

His main area of expertise is Scientific Processing for Injection Molding. Based on his experience, he has developed a custom software called Nautilus, that aids the complete process development routine to production release.

He has given numerous presentations on Injection Molding related topics and written several articles. Some of his presentations and articles are available on the IDES website at [www.ides.com](http://www.ides.com) He also teaches a plastics and molding course at the University of California, San Diego and is a contract faculty at the University of Massachusetts at Lowell.

He is also an author of the book 'Robust Process Development and Scientific Molding' to be published in October 2010.

**Websites:**

[www.fimmtech.com](http://www.fimmtech.com)

[www.InjectionMoldingOnline.com](http://www.InjectionMoldingOnline.com)

**Contact Information:**

Phone: 760 – 525 – 9053

Email: [suhas@fimmtech.com](mailto:suhas@fimmtech.com)

**Please turn over to the next page for the registration forms.**