



**P.O. Box 921**  
**Durham, New Hampshire 03824 USA**  
**Ph: (603) 868-1754 Fax: (603) 868-3623**  
**E-Mail: [ITM@ITMConsulting.org](mailto:ITM@ITMConsulting.org)**

## **ADVANCED SMT MANUFACTURING COURSE**

**Course Title:**                   **Advanced SMT Manufacturing - Equipment, Processes and Practices**

**Course Instructor:**           **Phil Zarrow and Jim Hall, ITM Consulting**

**Duration:**                       **1 Day**

### **Objectives of the Course:**

This advanced course is intended to provide the experienced participant with a thorough yet practical overview of Surface Mount Technology manufacturing. High manufacturing yield can best be attained by understanding and successfully implementing the appropriate process considerations. This workshop will give the participant a true comprehension of the SMT assembly processes and associated materials. The SMT assembly process will be covered, step by step including Screen/Stencil Printing, Component Placement, Reflow and Inspection as well as the various aspects of solder paste, design considerations, inspection and rework. The impact of lead-free and RoHS compliance will also be examined for all processes. Numerous case studies based upon the instructor's experience will be presented. Most important, particular attention will be paid to the sources of problems that occur within the assembly process.

**Advanced SMT Manufacturing Course**  
**Topics Covered:**

***I. Introduction: The SMT Concept***

- SMT Process Philosophy
- Lead-Free and RoHS

***II. Design for Manufacturability Considerations (Overview)***

- Manufacturing Concerns for PCB Design

***III. Solder Paste***

- Solder Paste Composition and Behavior:
- Fluxes: RMA, Water Soluble, No-cleans
- Specification Development
- Lead-Free Issues and Concerns

***IV. Solder Paste Printing and Deposition***

- Deposition Basics
- Screen and Stencil Engineering
- Control and Variables
- Machine Elements and Parameters
- Machine and Operator Interaction
- Lead-Free Issues and concerns

## **V. *Component Considerations***

- Types of Components
- Moisture Sensitive Devices (MSD)
  - Classification
  - Handling
  - Tracking

## **VI. *Automatic Component Placement***

- Categorization of Automatic Placement Equipment (Levels I through V)  
Flexibility versus Throughput
- Feeders
- Peripheral: Vision
- Fine Pitch Issues
- Variables and Control

## **VII. *SMT Soldering***

- Wave Soldering
- Selective Soldering
- Principles and Methods of Reflow Soldering
- Reflow Process Considerations
- Profiling
- Atmospheric Soldering (Nitrogen)
- Reflow Specification Development
- Variables and Controls
- Secondary Operations Considerations
- Reflow Process Trouble-shooting

## **VIII. *Inspection***

- • Solder Joint Quality and Reliability
- • Inspection Methodology and Equipment
- In-Process Inspection
- Automated Optical Inspection (AOI)
- X-Ray and X-Ray Laminography Inspection
- AOI vs. ICT

## **IX. *Recognizing Failure Mechanisms***

- PCB related
    - Black Pad
    - Embrittlement
  - Design Related
- Soldering Related