Design for Manufacturing and Design for Assembly (DFM/DFA/DFX)
3 Half-Day Live Interactive Webinar

Overview and Purpose
This 3 half-day workshop will provide you with fundamental knowledge and hands-on practice with Design for Manufacturing and Design for Assembly (DFM/DFA) and key tools. Topics addressed include the overview and application of DFM and DFA strategies, Design for Productivity, and Realistic Tolerancing. The program is designed for all levels of design, product engineering, and manufacturing personnel, as well as engineering management personnel. It can be tailored to fit special needs of new product and process development, or can focus on application for existing designs and manufacturing environments.

Why all these topics together?
DFM/DFA is really a collection of related tools that can be used for a variety of situations. Training that focuses only on one of these subjects at a time cannot show how these tools work together to analyze, simplify, and reinvent product and process designs to create higher quality, productivity, and profitability before, during, and after launch. Workshop participants apply the various tools in an integrated fashion to experience the start-to-finish effects of an effective DFM/DFA approach using actual product and process examples, drawings, and data.

Here are some of the things that you'll learn:
- Key DFx concepts including Design for Manufacturing, Design for Assembly, Design for Lean Design, and Design for Six Sigma
- Key elements of any component or assembly design that must be considered during DFM/DFA analysis and application.
- How to ensure that key stakeholders, including vendors and suppliers, are have input to the DFM/DFA activities.
- How to structure the DFM/DFA process to facilitate the engineering team through the process for both new products and or redesigned products/processes.
- Step by step guidelines for analyzing DFA including design for handling, presentation, orientation, insertion, fastening, and error proofing, mistake proofing, and poka yoke applications for design and process elements.
- General tolerancing recommendations on the most popular manufacturing processes, including injection molding, machining, metal forming, casting, etc.
- How to calculate and assign appropriate tolerances for new designs.
- Design for machining guidelines including milling and turning.

Who should attend?
This course is designed for individuals with minimal experience with the DFM/DFA and its related key tools. However, many experienced individuals attend the course to refresh their knowledge, gain advanced strategies, and practice development and application of these tools with an experienced facilitator. Program managers, design-responsible engineers or managers, and team members such as operators and technicians, quality personnel, and other product design and manufacturing personnel who are interested in applying DFA, DFM, Error Proofing, and realistic tolerancing to their products and processes will all benefit.

Course Outline

- Introductions
- Pre-Assessment
- Goals, Objectives, and Course Expectations

Introduction
- DFM/DFA Goals
- DFM/DFA Benefits
- Basic DFM/DFA Strategies
- Impact of Engineering Drawings
- Cost of Drawing Errors
- Key DFM/DFA Design Aspects
- Dimensional Management Tools
- Dimensional Management Process
- Roots and Evolution of DFM/DFA
- Myths and Realities
- DFM/DFA Repositories

- The DFx Application Process: Key DFM/DFA Activities, Tools, and Sequence
  - TMNP and PMNP
  - DFx Requirements and Simplified QFD
  - Part-to-Part Analysis and DFMEA
  - Part-to-Process Analysis and PFD, PFMEA
  - Model-Based DFM and DFA
  - Drawing-Level DFM
- Module Terms and Definitions
- Exercises

Module 2 – Design for Assembly
- DFA Principles and Guidelines
- DFA Benefits
- System Level Guidelines
  - Understanding All the Xs
  - Part Minimization Strategies
  - Combine and Eliminate Parts
  - Theoretical Minimum Number of Parts
  - Practical Minimum Number of Parts
- Snap Fits
- Integrated Features
- Create Modular Designs
- Ensure Open-Space Assembly
- Provide for Intuitive Assembly
- Standardize; Reduce Part Variety
- Error Proofing Concepts
- Design for One-Way or Multi-way Assembly
- Design for Easy Orientation
- Design for Automated Assembly
- Eliminate Tangling, Sticking Parts
- Color Code Similar Components
- Handling Considerations and Guidelines
- Insertion Guidelines
- Design for Insertion and Alignment
- Provide for Top-Down Assembly
- Eliminate or Reduce Fasteners
- Eliminate Adjustments
- Eliminate or Reduce Tools
- Electronics, PCBs, and Soldering
- Winding and Wiring Guidelines
- DFA Analysis Methods
- Exercises

Error Proofing, Mistake Proofing, and Poka Yoke
- Error Proofing Concepts
- Levels of Error Proofing
- Error Proofing Examples
- Product Design Error Proofing
- Error Proofing Steps
- Exercises

Design for Machining
- Module Objectives
- General Design for Machining Guidelines
- Design for Drilling and Reaming
- Design for Gun Drilling
- Design for Milling
- Design for Turning and Lathework
- Design for Grinding and Honing
- Design for Threading and Tapping
- Design for EDM
  - Wire EDM
  - Die Sink EDM
- Exercises

Small-Group Applications Projects
- Select candidate projects, including the following types of projects or programs:
  - New product design (pre-prototype or prototype)
  - New manufacturing or process design
  - Existing problems in performance, quality, manufacturing, etc. that consider design changes
  - Redesign or adaptation of existing product or process solution
  - Feedback from suppliers or manufacturing indicates improvement opportunity
  - New, changed, unknown, or historically problematic product or process elements
  - Form Project Teams with representation from:
  - Product Engineering/Design and Manufacturing
  - Quality, Supplier Quality, Purchasing, Project Management, Management, etc.
- Apply the DFM/DFA Process as appropriate to selected projects:
  - TMNP and PMNP
  - DFx Requirements and Simplified QFD
  - Part-to-Part Analysis and DFMEA
  - Part-to-Process Analysis and PFD, PFMEA
  - Model-Based DFM and DFA
  - Drawing-Level DFM
  - Propose JDI, Short-term, and Long-term recommendations and strategy
- Team Presentation of projects to Management
- DFM/DFA Deployment Review
  - Key projects or programs for implementation
  - Integration into design review and project management requirements
  - Required management support and intervention
- Course Review and Summary
- Course Evaluation