CONCEPT

Design for Manufacturing and Assembly (DFMA): Part Count Reduction and Should-Cost



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Introduction:

Products released without a manufacturing and assembly review carry surplus parts, loose fasteners, awkward insertions and tolerances that production must absorb as cost and delay. This Core Concept course trains engineers to apply Design for Manufacturing and Assembly DFMA from concept onwards: scoring assemblies for handling and insertion, challenging every part against minimum part count criteria, applying process design rules, relaxing non-functional tolerances and estimating should-cost before tooling is committed. Participants redesign a real product and produce a DFMA Redesign Report with a before-and-after design efficiency and cost comparison.

Course Objectives:

- Apply DFMA principles at concept stage to locate the design decisions that commit manufacturing and assembly cost
- Analyse an assembly with a DFA worksheet to estimate assembly time, theoretical minimum part count and design efficiency
- Redesign parts to process-specific design rules for machining, sheet metal, injection moulding, casting and additive manufacturing
- Specify functional tolerances and read GD&T callouts so drawings demand only the precision the function needs
- Build an early should-cost estimate comparing material, process, tooling and assembly labour across design alternatives
- Lead DFMA reviews in concurrent engineering teams that also cover maintainability, testability and part standardisation

Target Audience:

- Product design engineering staff who create concepts, 3D models and drawings for mechanical and electromechanical products
- Manufacturing engineering staff who plan assembly lines, fixtures and work instructions for new products
- Industrial engineering staff who measure assembly time, labour content and workstation balance
- New product introduction staff who run design reviews and stage-gate transitions
- Cost engineering staff who estimate part and assembly cost for sourcing decisions
- Supplier development and sourcing engineering staff who relay supplier manufacturability feedback to design teams

Course Outline:

Day 1: DFMA Foundations, Cost Drivers and Baseline Product Review

- Cost Commitment Versus Cost Incurred Curve Across Product Development Stages
- DFM and DFA Definitions and the Combined DFMA Analysis Sequence
- Assembly Evaluation Methods Compared: Hitachi AEM, Boothroyd DFA, Lucas and Westinghouse
- Concurrent Engineering Teams and DFMA Checkpoints in Stage-Gate Design Reviews
- Product Teardown Protocol and Baseline Assembly Chart of Parts, Fasteners and Operations

Day 2: Design for Assembly Analysis and Design Efficiency

- Theoretical Minimum Part Count: Applying the Three Elimination Criteria Part by Part
- Manual Handling Analysis: Symmetry, Size, Thickness, Nesting and Grasping Difficulty
- Insertion and Fastening Analysis: Alignment, Resistance, Holding Down and Restricted Access
- DFA Worksheet Build: Estimated Assembly Time and Design Efficiency Index
- Automated and Robotic Assembly Considerations: Part Feeding, Orienting and Top-Down Insertion

Day 3: Process-Specific Design Rules for Component Parts

- Machined Part Rules: Setup Count, Part Flips, Tool Access and Feature Simplification
- Sheet Metal Part Rules: Bend Relief, Hole-to-Edge Distance and Blank Nesting Economy
- Moulded Plastic Part Rules: Uniform Walls, Draft, Ribs, Bosses and Snap-Fit Joints
- Cast Part Rules: Parting Line Placement, Cored Features, Fillets and Machining Stock
- Additive Part Rules: Support Reduction, Overhang Limits and Multi-Part Consolidation

Day 4: Tolerancing, Should-Cost and Lifecycle Design Considerations

- Tolerance-Cost Relationship and Functional Tolerance Allocation Worksheet
- GD&T Awareness: Datums, Feature Control Frames and MMC Under ASME Y14.5 and ISO GPS
- Early Should-Cost Build-Up: Material, Process Time, Tooling Amortisation and Assembly Labour
- Design for Maintainability and Testability: Service Access, Modular Replacement and Test Points
- Part Standardisation, Fastener Rationalisation and Common Platform Components

Day 5: Product Redesign Workshop and the DFMA Redesign Report

- Redesign Brief: Product Selection, Teardown Data and Cost and Part Count Targets
- Part Consolidation Concept Alternatives and Weighted Concept Selection
- Before-and-After DFA Worksheet and Should-Cost Comparison Model
- Mock Design Review Using a DFMA Checklist and Action Log
- DFMA Redesign Report Presentation and Peer Challenge

Skills You Will Gain:

- Assembly Efficiency Analysis
- Part Count Reduction
- Process-Specific Design Rules
- Functional Tolerance Allocation
- GD&T Interpretation
- Should-Cost Estimating
- Design Review Facilitation
- Product Teardown Analysis

Why Attend This Course:

- Return with a DFMA Redesign Report for a real product showing before-and-after part count, design efficiency and should-cost
- Give designers evidence-based manufacturing and assembly feedback before tooling orders and supplier quotes lock in cost
- Remove fasteners, separate parts and over-tight tolerances that add labour and inspection without adding function
- Compare redesign practice with engineers from automotive, appliance, electronics enclosure, medical device and industrial equipment products

Conclusion:

Much of a product's manufacturing cost is fixed by decisions taken on the drawing board, so DFMA pays off only when it is applied early and repeated at every design review. The one week move from cost drivers and assembly evaluation methods, through DFA worksheets and design efficiency, to process design rules, functional tolerancing, should-cost estimating and lifecycle considerations. The final day applies every method to a product redesign and closes with a DFMA Redesign Report ready to table at the next design review.