Introduction to Design For Manufacturing and Assembly (DFMA)

DFMA Principles
1. Minimize the number of parts
2. Minimize use of fasteners
3. Standardize
4. Avoid difficult components
5. Use modular subassemblies
6. Use multifunctional parts
7. Minimize reorientation's
8. Use self-locating features
9. Avoid special tooling
10. Provide accessibility
11. Minimize operations & process steps
What is DFMA?

A proactive product design process that focuses on meeting customer requirements while balancing among cost, quality and performance. It is a concurrent engineering team approach that involves engineering, manufacturing and suppliers early in the design cycle. The best results occur when DFMA is used in the product conceptual stage. The cross-functional team work towards minimizing the number of components, manufacturing steps and operations while designing to proven manufacturing capabilities. Optimal Thinking® is the core of all activities.
Design Philosophy

“The best design is the simplest one that works.”

Albert Einstein
Design Complexity
(Components through Systems)
How to Attack Complexity?

One Bite at a Time

• Apply Design Simplification Rules
• Challenge “Old” Beliefs
• Take a “New” look at Current Design
• Work as a Team
• Use a Facilitated Process
DFMA Methodology

DFMA PLANNING/TRAINING

EVALUATION OF CURRENT DESIGN

• REVIEW OF CUSTOMER NEEDS & DESIGN REQUIREMENTS

• EVALUATION OF ASSEMBLY FLOW, INTEGRATION, TEST

• EVALUATION OF FABRICATION PROCESSES & MATERIALS

• IDENTIFICATION OF CONCERNS, DEFICIENCIES

• IDENTIFICATION OF COST, QUALITY, AND SCHEDULE DRIVERS

BRAINSTORMING

RISK/BENEFIT/COST ANALYSIS

SELECTION OF BEST IDEAS / DESIGN OPTIONS

COST ESTIMATING

- PRODUCT
- IMPLEMENTATION

SUMMARY & TEAM PRESENTATION

IMPLEMENTATION AND CONTINUOUS OPTIMIZATION

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DFMA Basic Principles

1. Minimize the number and types of parts used in the assembly
2. Minimize the use of fasteners (number & types)
3. Standardize (e.g. material, finishes, parts, processes, tooling, etc.)
4. Avoid difficult components (e.g. open-ended springs, small/loose HW, etc.)
5. Use modular subassemblies
6. Use multifunctional parts
7. Minimize reorientation & assembler awkward movements
   (e.g. stooping, bending, reaching, tugging, balancing, etc.)
8. Use self-locating features (e.g. molded shapes, keying, chamfers, dimples)
9. Avoid special tooling/test equipment
10. Provide accessibility for assembly, test/inspection and rework
11. Minimize operations & process steps (including excess handling, etc.)

Eliminate...Minimize...Standardize...”Productionize”
Typical Participants

Systems Eng
Electrical Eng
Mechanical Eng
Material & Process Eng
Manufacturing
Manufacturing Eng
Supply Chain Management
Key Suppliers
Program Office
Customer
Quality
Subject Matter Experts (Outside of the design team)
Typical Workshop Agenda

- Introduction to DFMA
- Objectives, programatics, commonality
- DFMA Overview
- Scope, deliverables, decision criteria, rules
- Baseline design overview
- Design ground rules and requirements
- Identify issues on cost, schedule and performance
- Brainstorm, evaluate and select best alternatives
- Define optimal assembly process
- Review assumptions, action items and parking lot
- Next steps
Decision Criteria

- Cost (Implementation)
- Cost (Recurring)
- Schedule
- Risk (Technical, schedule, cost)
- Performance

↑: Better than baseline  ➔: Same as baseline  ↓: Worse than baseline
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