

Engineering Design For Manufacturability Volume I



Written by Kelly L. Bramble

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Design for Machining Design for Manufacturability

Edited by:

Kelly Bramble (Engineers Edge), et al. Frank Sattler (Schlumberger), Mike Heath (Schlumberger), Jason Jonas (Schlumberger), Alain Dorel (Schlumberger), Alan Schroder (SLB), Kevin Forst (Lockheed Martin), Diane Matthews (Lockheed Martin), Ken Kendrick, K.J Kendrick Associates.

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Revision AC

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Preface

This book is directed primarily toward engineers who design and manufacture machinery, appliances, mechanical equipment, and other engineered products.

The presentation of each subject and concept attempts to give the engineer or designer a quick grasp of the essentials of the field, together with pertinent technical data and concepts in a condensed form. The data consists of; basic descriptions of manufacturing processes; Design Guidelines: mechanical tolerance where applicable; working charts; illustrations; and engineering culture and business overview.

This book is not intended to be a comprehensive manufacturing guide or reference book. References throughout the book suggest that the design engineer consult with cognizant manufacturing personnel for all manufacturing related design criteria and guidance.

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What is DFM & DFA?

DFM/DFA is ultimately about designing individual components, assembly or processes to be more cost effective, better quality, and meeting schedule requirements. Utilizing proven DFM practices will ensure quality, reduce delivery lead-times and provide a reduction in the product cost. In this day of overbearing global competition where cost, quality and speed to market are the key to a successful product and organization, we often fall victim to simple mistakes that are costly to our organization and our customers that could have been easily corrected during the design phase.

DFM/DFA is also about business culture and practices. Designing the perfect part and assembly is an ultimate goal, however a business environment that fails to execute optimally can be much more costly.

There is not a "one size for all" or one approach to DFM/DFA within industry verticals or organizations. Volume, end-item costing, competitive business environment, industry, end-item complexity, product scope are just a few of the variables that may change the formulae for an organizations DFM/DFA utilization.

- Lower end-product costs.
- Reduced development costs (NRE).
- Smoother transition to production manufacturing.
- Reduced part count.
- Simplified Assemblies.
- Higher Quality.
- Shorter design and development cycle.
- Greater product and process reliability.
- Lower service and maintenance costs.
- Reduction in manufacturing lead time.
- Fewer schedules slips.
- Ability to use common parts - economies of scale.
- Faster prototype and/or first article.
- Reduced errors in fabrication and assembly resulting in fewer engineering change notices.
- More suppliers capable of producing outsourced components and assemblies.
- Improved vertical or industry competitiveness.
- Improved design-manufacturing communication (concurrent engineering).
- Promotes teamwork.
- Improved ownership throughout organization.

Culture-nomics

Culture-nomics is my word to describe the industrial-cultural differences between the major manufacturing countries throughout the world. As a GD&T, DFM/DFMA trainer and consultant I have seen first hand the differences in how organizational and cultural approaches in engineering, design, manufacturing and quality effects an organizations competitive position in their perspective market. These differences, coupled with national and political ambitions ultimately shape how an well an organization competes within their local and the world market.

International Management Strategies

The 20th century witnessed the development of manufacturing strategies typical to certain continents, countries, and even some specific regions within federalist countries. Current multinational companies, however, must develop manufacturing strategies tailored to local markets as well as have an overall business strategy to compete globally. Prior to a brief review of several key economic engines in the world, it would be appropriate to define manufacturing strategy as a plan to design, produce, and market a well engineered product with a long-range vision. Competitive priorities in this context can be identified as quality (highest ranked), service, cost, delivery, and product variety. Thus a comprehensive strategy would require design and manufacture of a superior product (backed by an excellent service team) produced at lower costs than the competitor's and delivered in a timely manner.