

50 Design Best Practices: Table 1.1, *The Mechanical Design Process*

Chapter 1 – Introduction to the Mechanical Design Process

1. Develop mechanical, electronic and other systems concurrently.

Chapter 2 – Understanding Mechanical Design

2. Benchmark existing products to understand how they are made, assembled and function.

Chapter 3 - Designers and Design Teams

3. Assemble product design teams with diverse, specific expertise
4. Make positive use of team members' problem solving behaviors.

Chapter 4 – the design process

5. Recognize that the design process is a series of decisions.
6. Document all concepts and decisions for reuse, patent application and defense, and regulatory requirements
7. Build product and project history with a PDM/PLM system.

Chapter 5 – Planning for design

8. Ensure you have good reasons for beginning a project.
9. Make rational product portfolio decisions.
10. Have a clear design process reflected in the Project Plan.
11. Use models and prototypes as learning opportunities.
12. Plan tasks around deliverables.

Chapter 6 – Understanding

13. Identify Product customers.
14. Capture customers' requirements.
15. Determine what is important to customers.
16. Generate clear and measurable engineering specifications.
17. Determine how the engineering specifications relate to the customers' requirements.
18. Establish targets, thresholds and inter-dependence of engineering specifications.

Chapter 7 Concept Generation

19. Generate multiple concepts.
20. Reverse engineer to understand function.
21. Build functional models as a basis for form generation.
22. Generate concepts using brainstorming.

23. Generate concepts using analogies with nature and devices in other fields
24. Generate concepts using prior patents.
25. Generate concepts using contradictions.
26. Generate concepts using TRIZ.
27. Generate concepts using morphologies.
28. Develop product architectures using Design Structure Matrices.
29. Complete provisional patent applications.

Chapter 8: Concept Evaluation

30. Use a Design-Test-Build sequence when possible.
31. Know each system's technology readiness.
32. Use Decision Matrices to evaluate concepts and support decision-making.
33. Understand the product, project and decision risks.
34. Make robust decisions – decisions insensitive to noise.

Chapter 9 Product generation

35. Use Bills of Materials to manage the evolution of products.
36. Develop products from constraints to configuration to connections to components.

Chapter 10 Product Evaluation for Performance

37. Use P-diagrams to manage product performance evaluation.
38. Use Factor of Safety as a design variable.
39. Develop tolerances consistent with needed function, fit and manufacturing methods.
40. Support trade-offs with sensitivity analysis.
41. Test products using Design of Experiments/Robust Design methods.

Chapter 11: Product Evaluation

42. Design for Cost.
43. Design For Manufacture.
44. Design For Assembly.
45. Design For Reliability
46. Assess and Manage Risks
47. Design For Test And Maintenance.
48. Design For Sustainability.

Chapter 12: Wrapping up the design process and supporting the product

49. Manage post-release engineering changes.
50. Apply for design and utility patents as good design and business practice.