

Design for Manufacturing & Assembly (DFMA)

Problem

How to make products easy to construct?

Difficulty

Work with an SME

Design for Assembly (DFA)

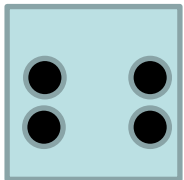
is concerned with **reducing product assembly cost**

Design for Manufacturing (DFM)

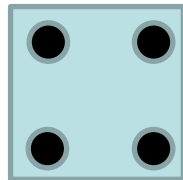
is concerned with **reducing overall part production cost**

DFMA has many benefits

- Minimizing the number of parts and extra sizes reduces inventory and confusion during assembly
- DFMA optimizes trade-offs between assembly, part, and life cycle costs.



Asymmetric part requires alignment



Symmetry part makes assembly easier

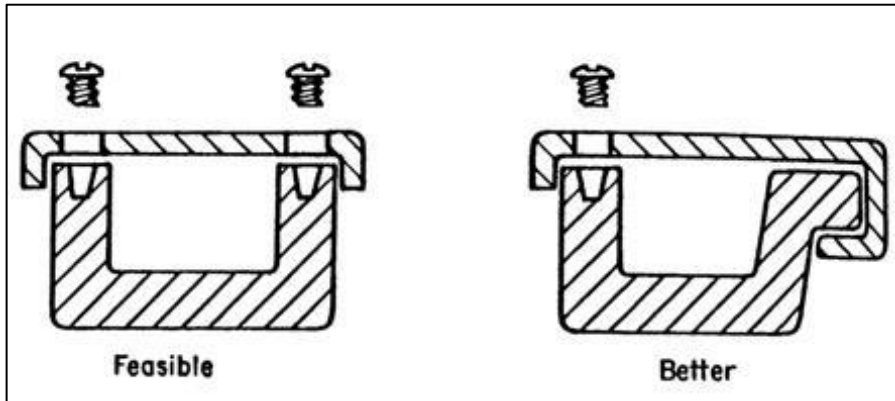
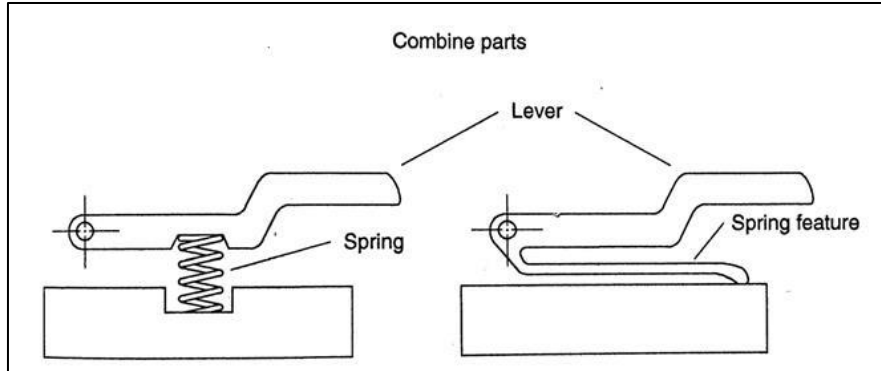


Methodically apply the DFMA principles

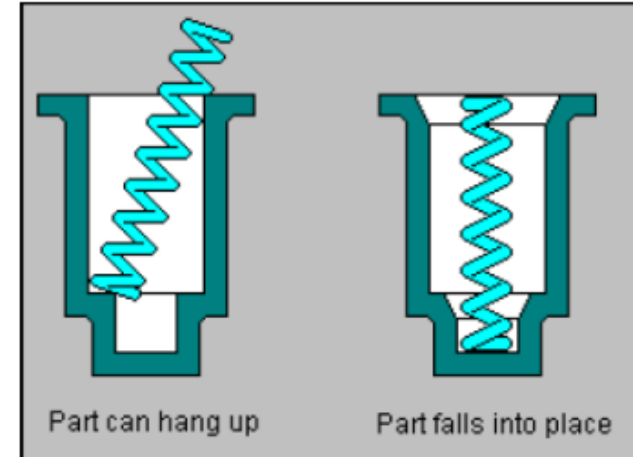
1. Minimize the number of parts
2. Minimize the use of fasteners
3. Standardize
4. Avoid difficult components
5. Use modular subassemblies
6. Use multifunctional parts
7. Minimize reorientations
8. Use self-locating features
9. Avoid special tooling
10. Provide accessibility
11. Minimize operations &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

DFMA – Examples

Reduce number of components



Make parts self-aligning



Improve access

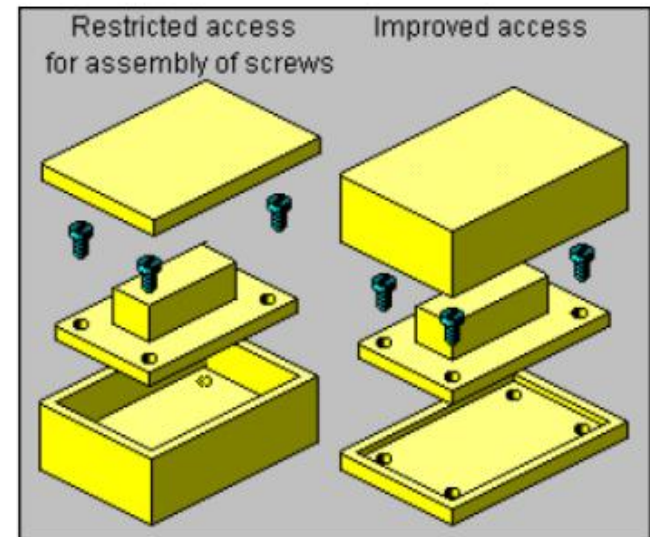


Figure credits

- <https://mae.ufl.edu/designlab/DFMA%20Tips/DFMA%20Tips.htm>
- <https://cpn-us-w2.wpmucdn.com/sites.gatech.edu/dist/2/334/files/2017/03/PD-DFMA.pdf>

DFMA – Notes

Slide 1

1. DFMA has a set of principles, each reduces the cost of a product's manufacturability and assembly.
2. DFMA can be key to profitability.
3. While the DFMA principles are all simple, and sound simple, seeing examples is the best way to understand their intent.
4. Asymmetric parts are bad since they may need to be re-aligned during assembly; symmetric parts do not have that issue.
5. While applying the DFMA principles is straightforward, having a DMFA SME review your improved design is always useful – you may have missed some improvement opportunities.

Slide 2

1. Several simple examples
2. *Reduce number of components*
 - Top left example: reduces number of parts and eliminates assembly step
 - Bottom left example: reduces number of parts and may improve assembly
3. *Make parts self-aligning*
 - Top right example: Self-aligning parts speed up assembly
4. *Improve access*
 - Bottom right example: Having an improved access when assembly will speed up assembly