



Designing for Product Launch Success

May 17, 2019

Jim Shaw (Fellow mHUB Member)



Jim Shaw:

mHUB Mechanical Engineer & Business Owner

NORTHROP GRUMMAN

Kodak



Rolling Meadows, IL

Wheeling, IL

Lake Zurich, IL

mHUB

2002-2007

Missile
Defense

2007-2011

Commercial
Products

2011-2013

Automotive
Aftermarket

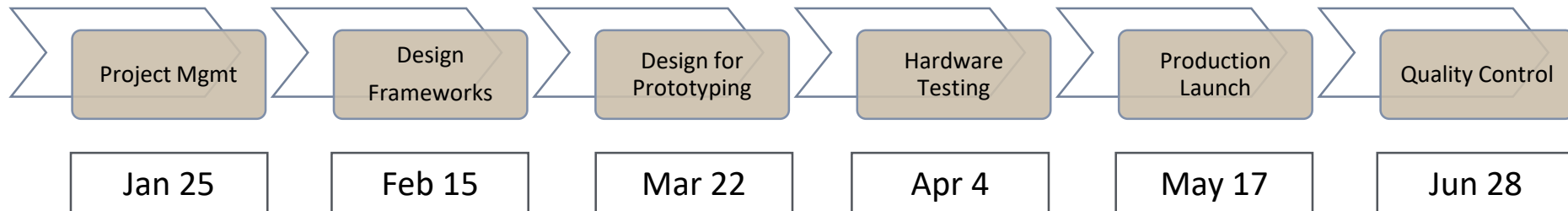
2013-now

CAD/CAE
Training





mHUB Programming: Product Development



- ▶ Monthly Classes that cover the Product Development Process
- ▶ Introductory (January – June)
 - ▶ Align with the stages of your product
 - ▶ Correspond to funding milestones
- ▶ Advanced (July – December)
 - ▶ Deeper Dives into the core topics
 - ▶ Guest visits from Real Experts



Designing for Product Launch Success



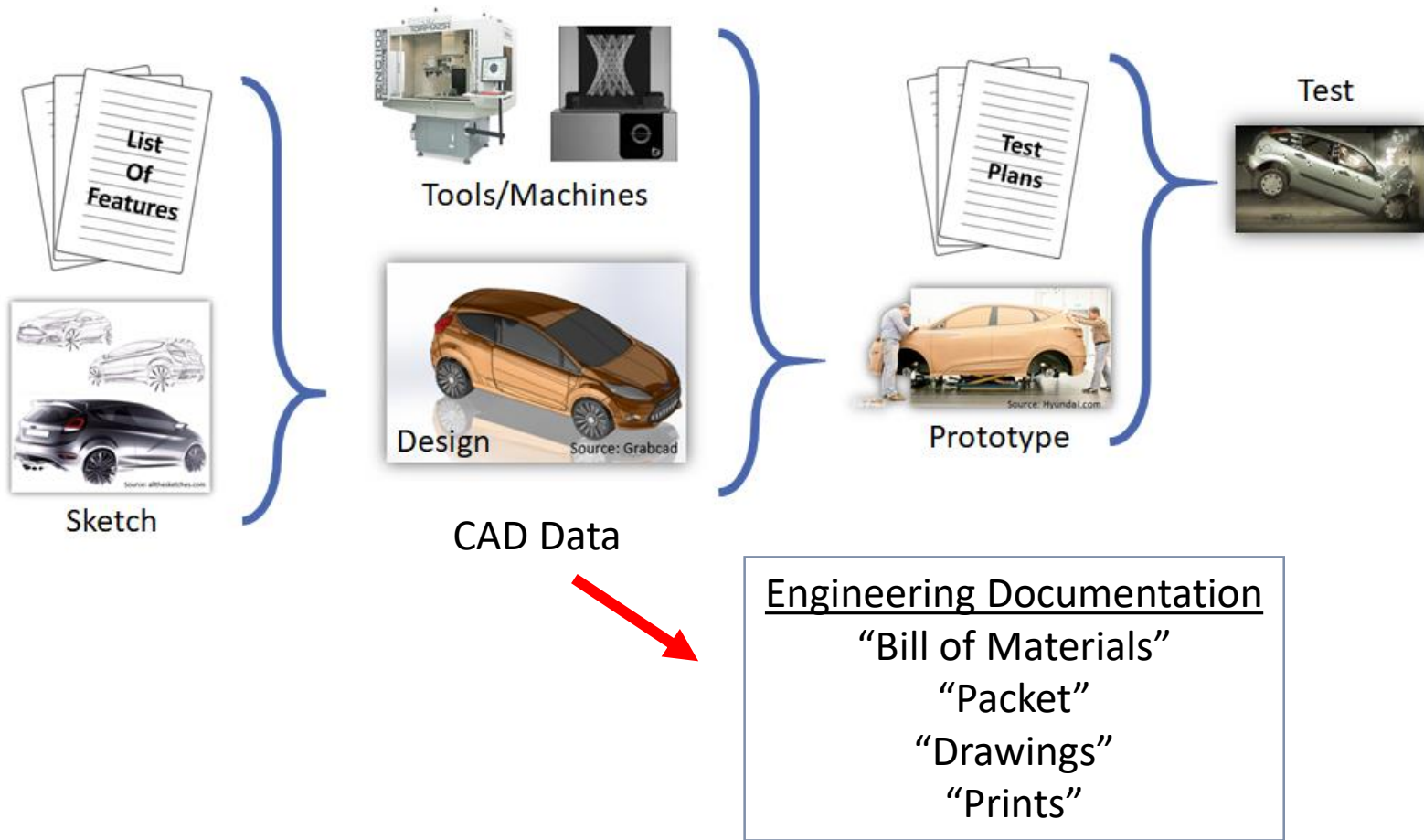
Today's Agenda

- ▶ Preparation/Documentation
- ▶ Process/Technology Overview
- ▶ Designing for Manufacturing
- ▶ Designing for Assembly
- ▶ Financing Tooling Costs
- ▶ Resources





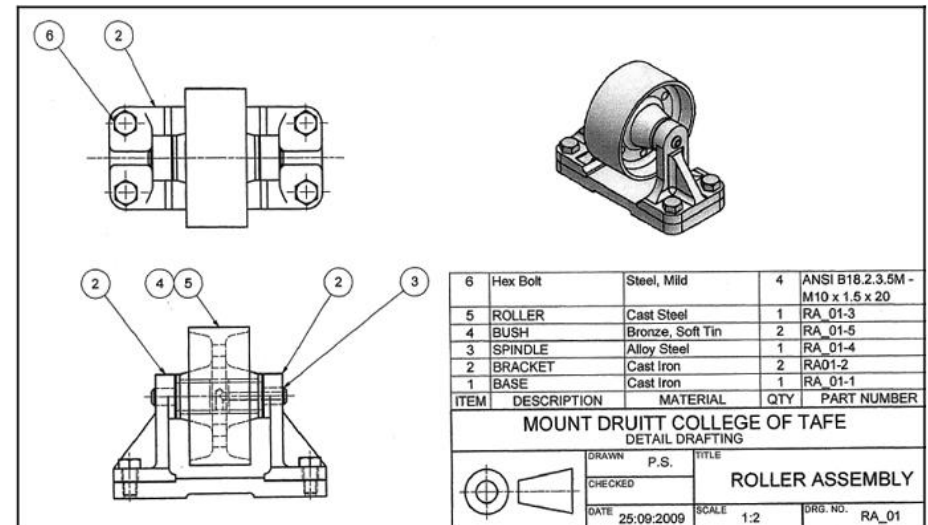
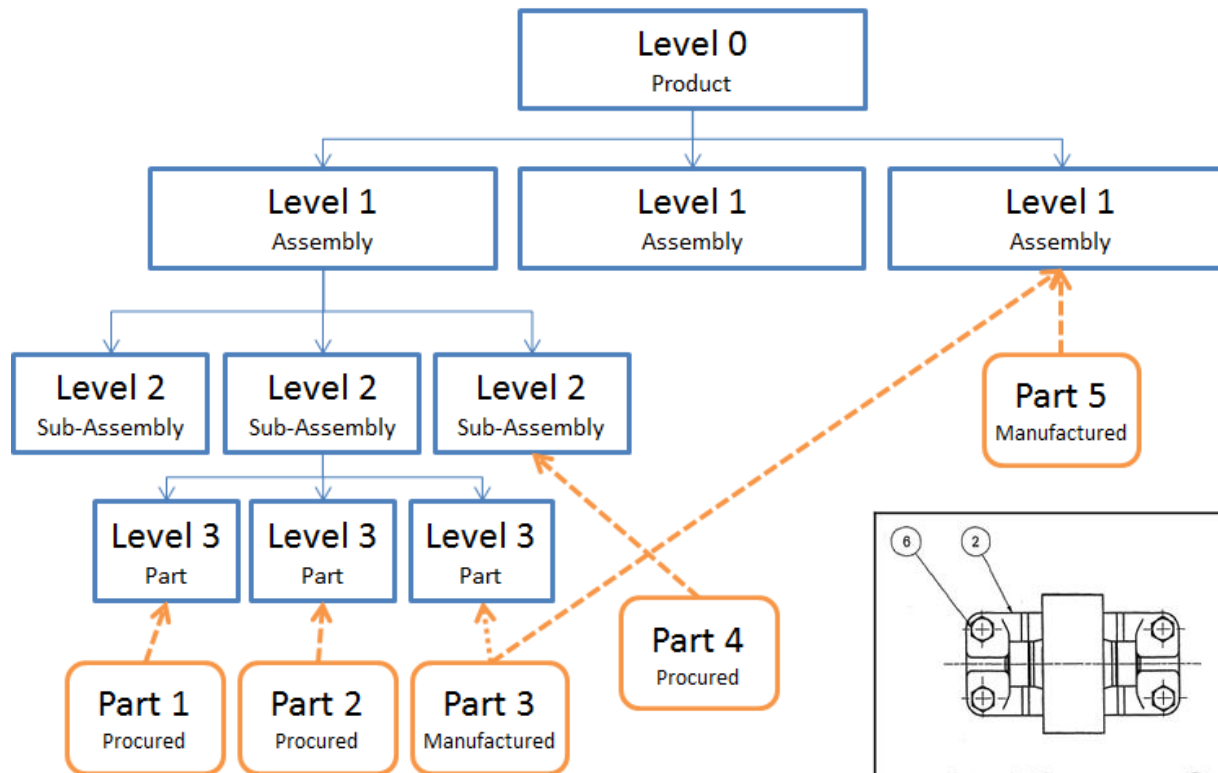
Production Launch: The Big Picture



“Everything needed to Fabricate, Assemble, and Deliver your product”



Production Launch: Bill of Material





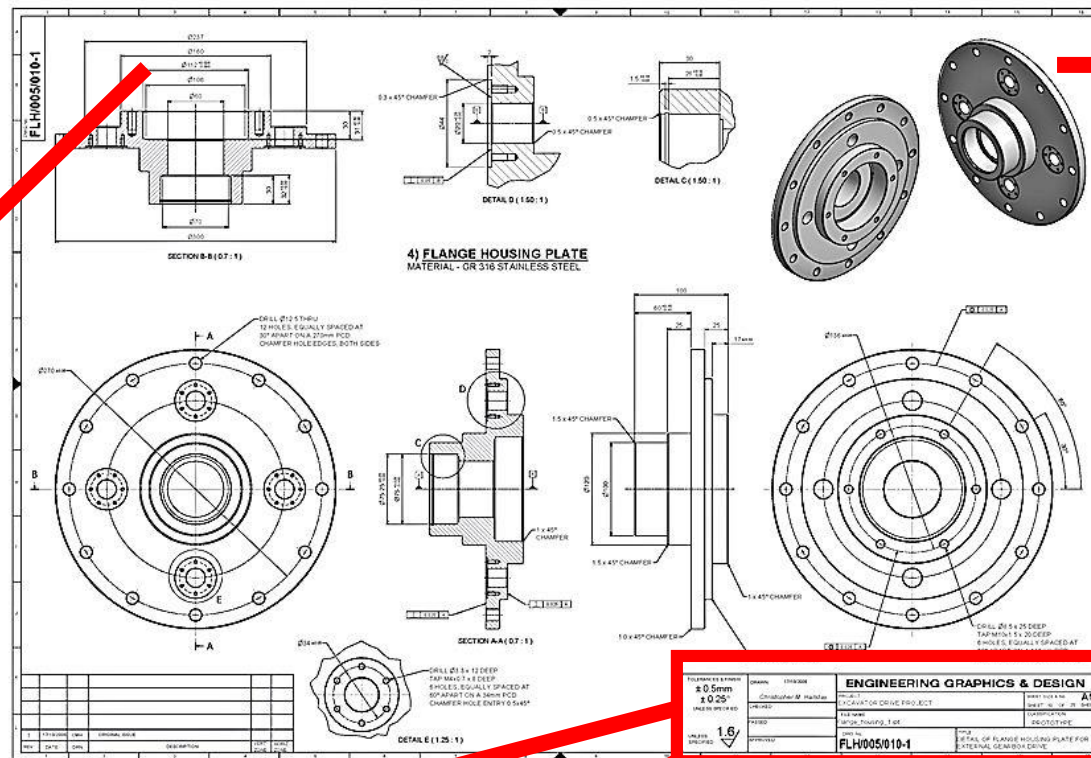
Production Launch: Bill of Material



Level	Part No.	Description	QTY	Unit
1	120-001	Trolley, 3 wheeled	1.0000	EA
2	110-001	Wheel Housing	3.0000	EA
3	100-001	MS Bolt, M10x70, Galv	1.0000	EA
3	100-002	M10, washer, Galv	2.0000	EA
3	100-003	M10, Nut, Galv	3.0000	EA
3	100-004	MS Bolt, M10x30, Galv	1.0000	EA
3	100-005	M10 Square Nut	1.0000	EA
3	102-108	Wheel, with tyre, 100mm	1.0000	EA
3	110-002	Top Piece	1.0000	EA
4	105-001	MS Flat 80x8	0.0500	LG
4	111-001	Galvanising	0.0010	KG
4	130-001	Labor	0.5000	HR
3	110-003	Side Piece	2.0000	EA
4	105-001	MS Flat 80x8	0.1000	LG
4	111-001	Galvanising	0.0010	KG
4	130-001	Labor	0.1000	HR
2	112-001	Plywood Platform	1.0000	EA
3	106-001	Plywood,12mm,2400x1200	0.1250	SH
3	111-006	Varnish, Semi Gloss	0.0500	l
3	130-001	Labor	0.6500	HR



Production Launch: The Engineering Drawing



Various Views
of the
Part

Dimensions
And Tolerances

Title Block:

Revision

Material

Author/Date

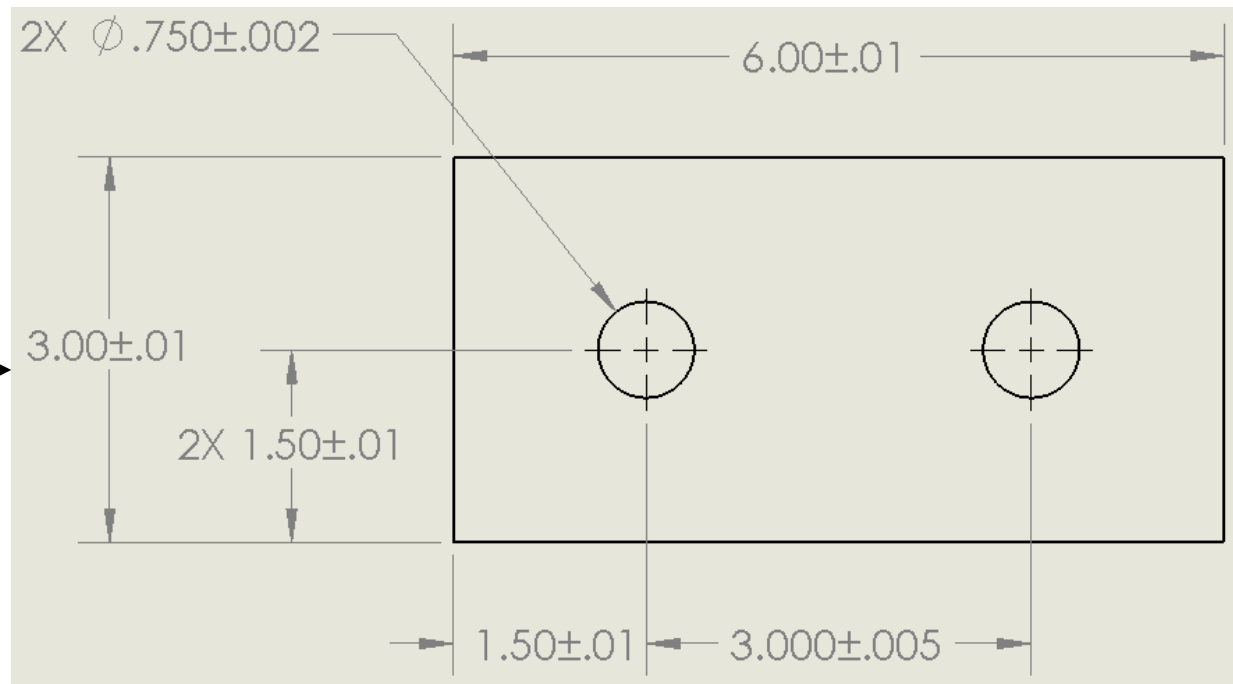
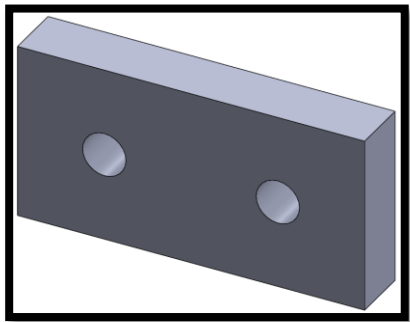
Part Number/Description

Company
Name/Logo

Production Launch: MHUB Dimensions & Tolerances



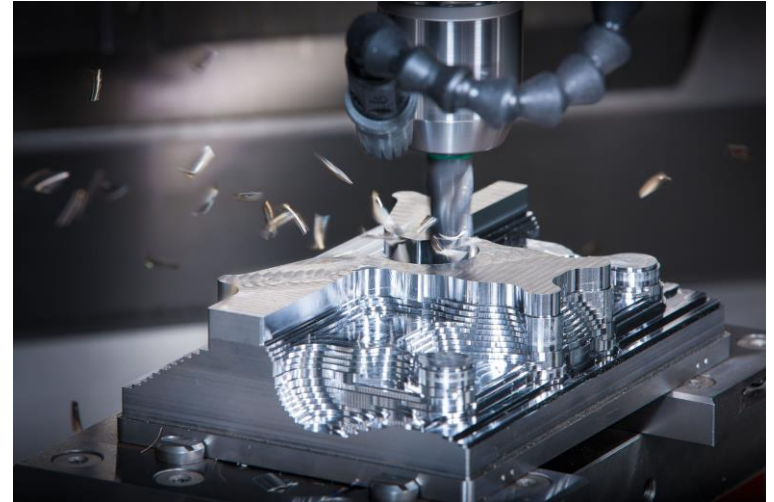
- ▶ No part is perfect
- ▶ Tolerance = Range of Acceptance
- ▶ Tolerance is DIRECTLY RELATED TO COST



Production Launch: **MHUB** Processes for Metals



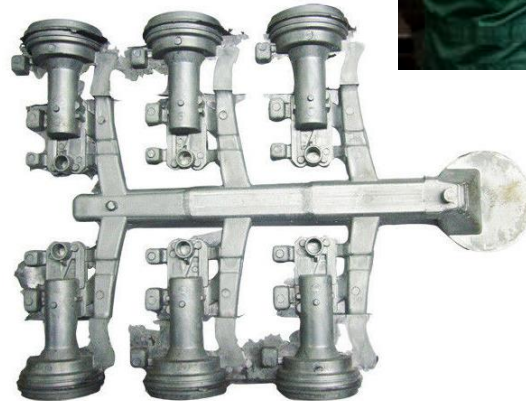
- ▶ CNC Machining
 - ▶ Can be highly Automated
 - ▶ Very precise, repeatable
 - ▶ Low tooling cost
- ▶ Good for Low volume (10's - 100's)
- ▶ Surface finish = excellent



Production Launch: Processes for Metals



- ▶ Casting & Forging
 - ▶ Less Automated than CNC Machining
 - ▶ Less Waste than CNC
 - ▶ Higher Tooling Costs
 - ▶ Cheaper Part Cost
 - ▶ Quicker to make, but more labor
 - ▶ Good for medium – high volume (1,000's – 10,000's)
 - ▶ Poor surface finish



Production Launch: Processes for Plastic



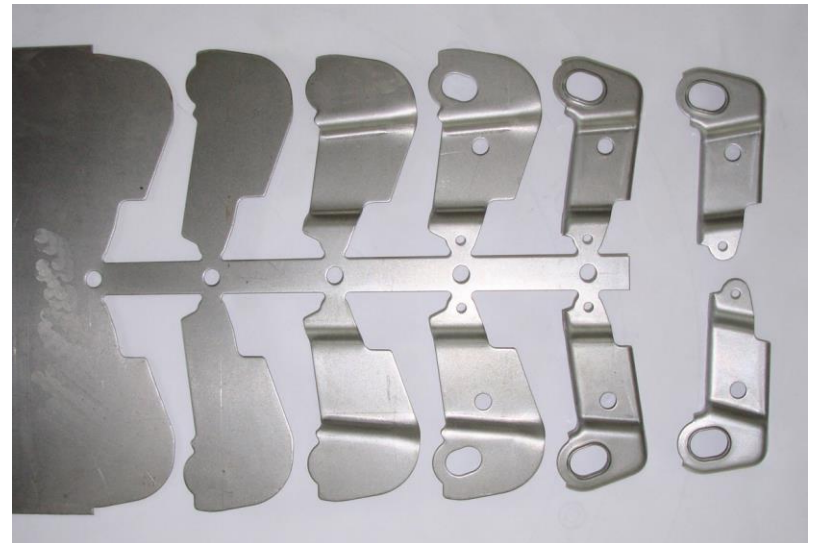
▶ Sheet Metal Forming

- ▶ Various levels of Automation
- ▶ Good Surface Finish
- ▶ Low Tooling Cost
- ▶ Medium Part Cost
- ▶ Medium Volume (100's – 1,000's)



▶ Sheet Metal Stamping

- ▶ Highly Automated
- ▶ Good Surface Finish
- ▶ Very High Tooling Cost
- ▶ Very Low Part Cost
- ▶ Very High Volume (1,000+)

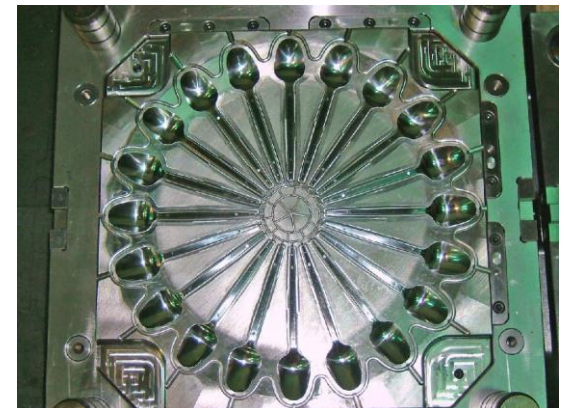


Production Launch: MHUB Dimensions & Tolerances



► Plastic Injection Molding

- Highly Automated
- Medium-High Tooling Cost
- Very Low Part Cost
- Very High Volume (1,000+)





Production Launch: MHUB Secondary Processes



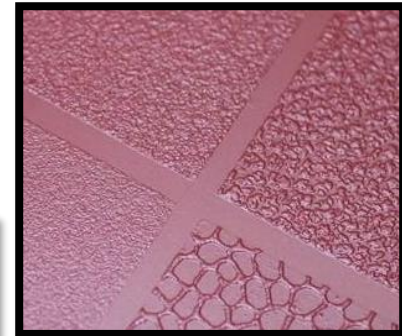
► Heat Treating

- Permanently altering the material properties (stronger, more reliable) after it is formed in its shape.
 - Hardening/Tempering
 - Annealing
 - Case Hardening
 - Inductive/Furnace



► Types of Finishes

- Decoration, Durability, Environmental
 - Texturizing
 - Plating
 - Grinding/Polishing
 - Painting/Powder Coating
 - Etching



- Find out if the CM does it in house or not
 - Keep an eye on “WIP Shipping costs”

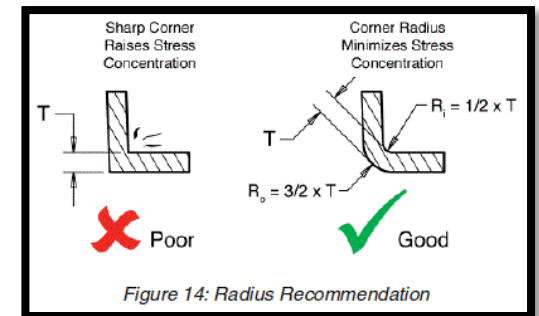
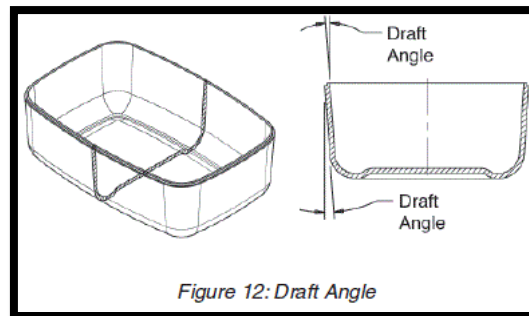
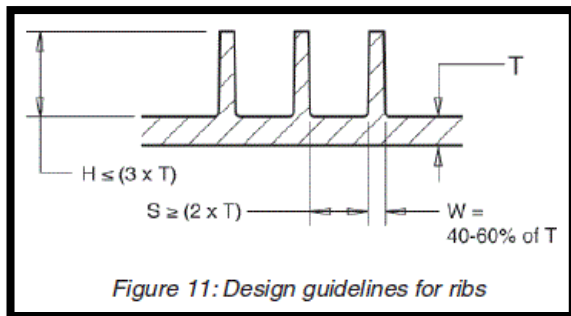




Production Launch: MHUB Designing for Manufacturing



1. Estimate the Yearly Production QTY/volume
2. Estimate the necessary part price/margin/cost
3. Estimate the Dimensions/Tolerances needed
4. Pick the Manufacturing Process
 1. Understand the Limitations
 2. Research Best Practices
 3. Consult an Expert
5. Multiple Quotes: Multiple Vendors, Multiple Volumes
6. Commit to a Mfg Partner before the design is done



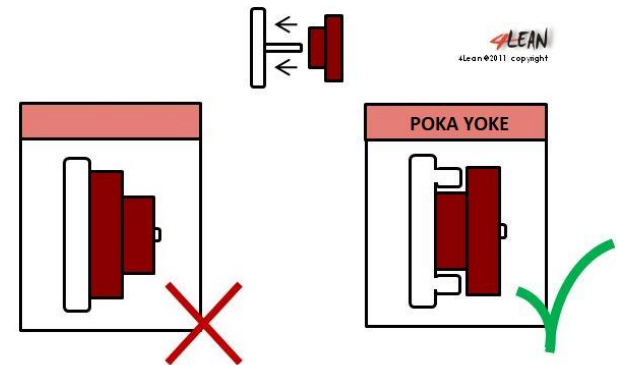
Examples of DFM for Plastic Injection Molding

Production Launch: MHUB Designing for Assembly



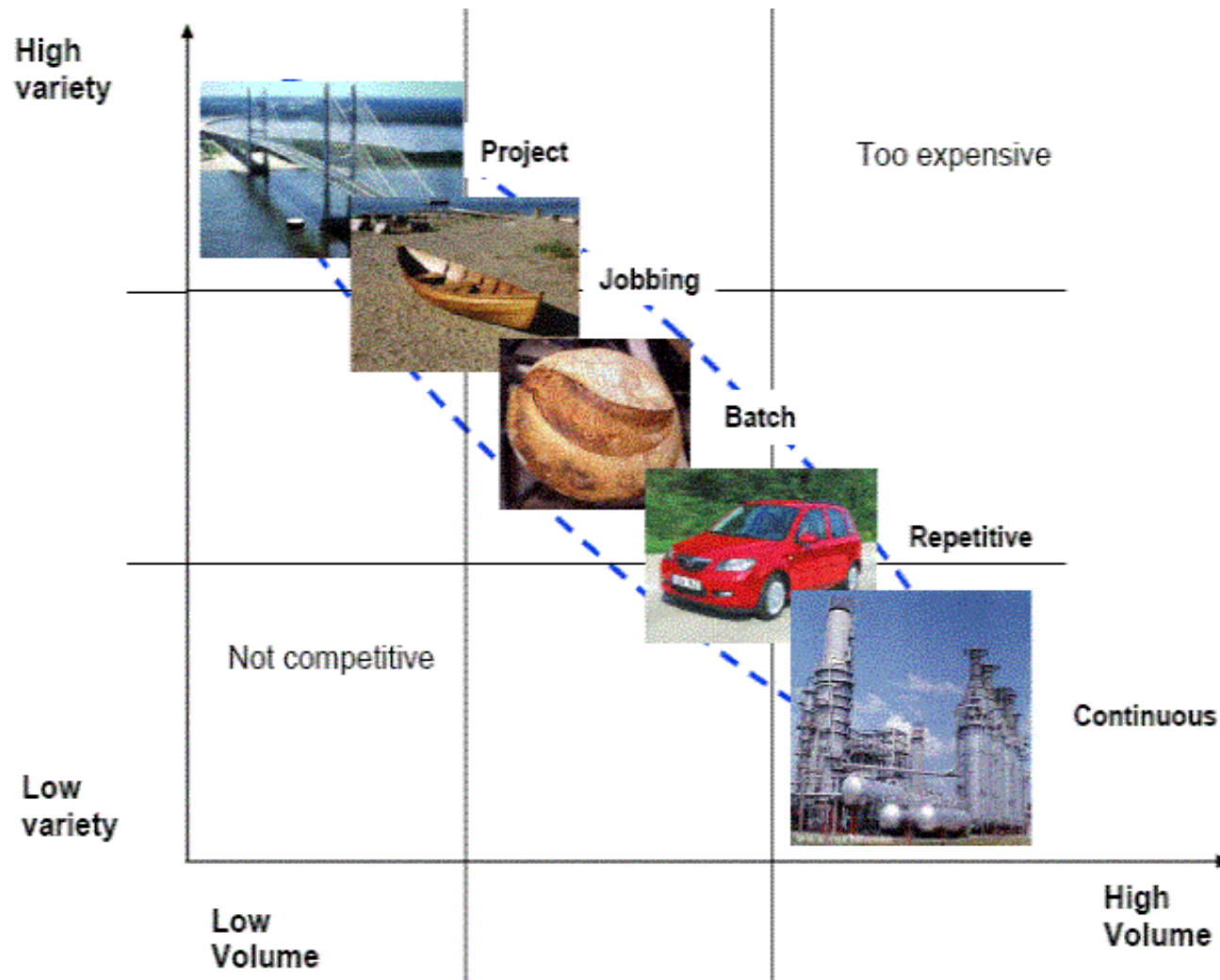
► Goal: To minimize the labor costs, reduce errors

- Vertical Assembly – Parts can be dropped on to each other
- Minimize the number of parts
- Minimize the number of fasteners
- Ensure tools/hands can fit inside if needed
- Add locating features (aligning pins)
- “Poka Yoke” – There is only one way to put it together
- Color Coding





Production Launch: Designing for Manufacturing



BOM and BOP



Production Launch: Financing Tooling Costs



- ▶ Tooling costs can be 100X-1,000X more expensive than your product
- ▶ It is very rare to just “cut a check” for production tooling.
- ▶ Rather, the cost is amortized through early production
 - ▶ Tooling Costs are divided by the # of parts shipped, and the part cost is increased accordingly (with interest of course)
 - ▶ Most of the terms are negotiable
 - ▶ Length of Amortization
 - ▶ Part Cost
 - ▶ Who pays for tooling changes/upgrades/maintenance
 - ▶ Make sure you understand
 - ▶ How long will it last?
 - ▶ When will you own it outright?
 - ▶ When can you move it to another supplier if needed?
 - ▶ Is the tool solely yours in the mean time?



Production Launch: mHUB More Resources

- ▶ DFM & DFA: <http://www.dfma.com/>
- ▶ DOE Slides on [mHUB Drop Box Link](#)
 - ▶ Great slide deck on DFM/DFA for Electronics
- ▶ Thank You!
- ▶ Next Class: June 28: Quality Management and Control Methodologies