2014 International Forum DFMA Boothroyd Dewhurst

Using DFM to Improve Purchase Price Variance Within the Supply Chain

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DFMA and Value Engineering Manager

Agenda

- Supply Chain Parts List
- DFM Analysis
- Design For Manufacture
- Supplier Engagement
- Results

DFMA Application

Late 80's

- Design for Assembly
- Producibility
- Integration / Implementation
- Simultaneous / Concurrent

Early 90's

- Benchmarking
- Modular
- Rapid
- Six Sigma

Late 90's

- FEA
- Cost Management
- Lean

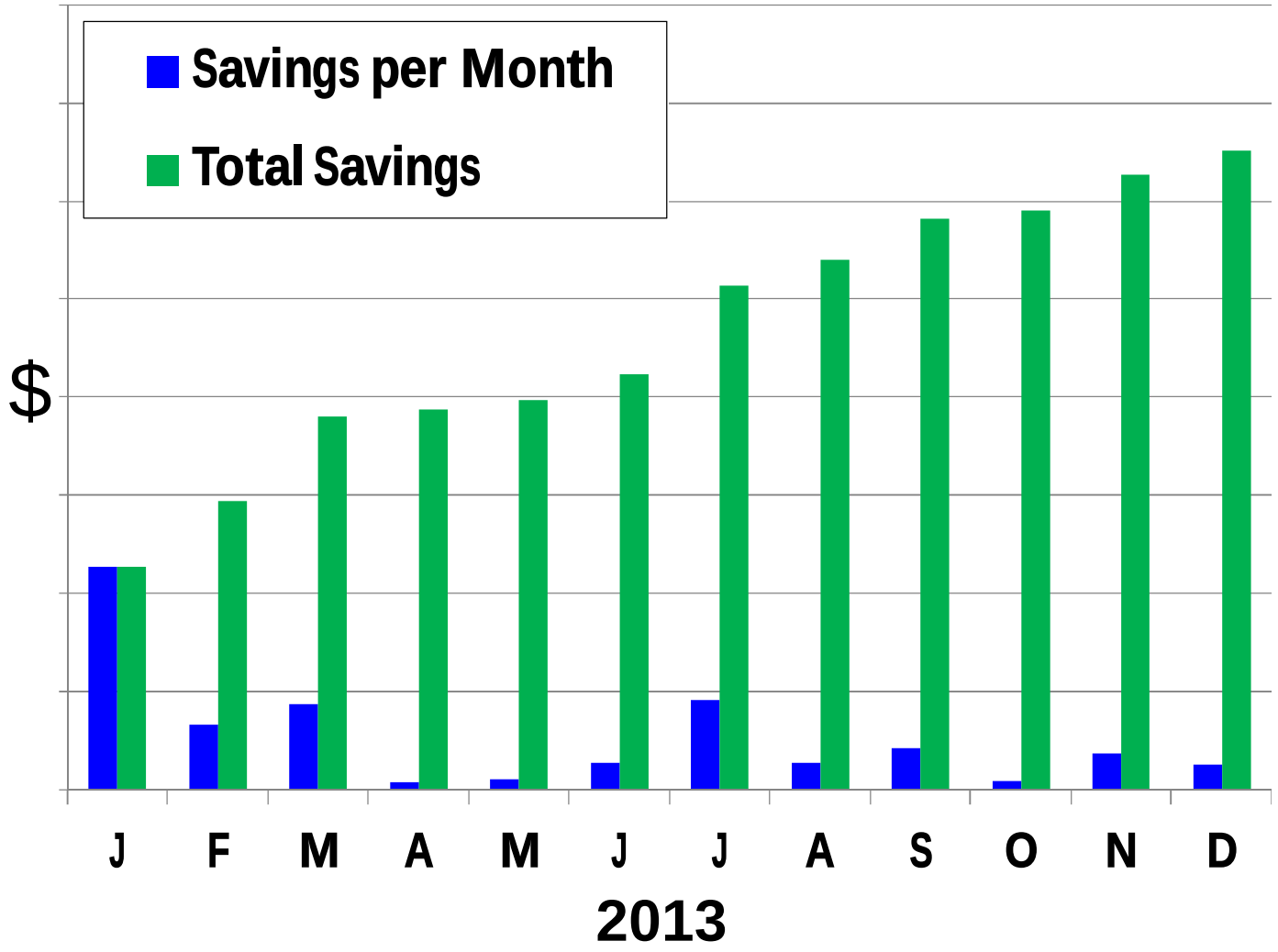
2000 - 2009

- Optimization
- Product Life Cycle
- Design for Value
- Value Stream

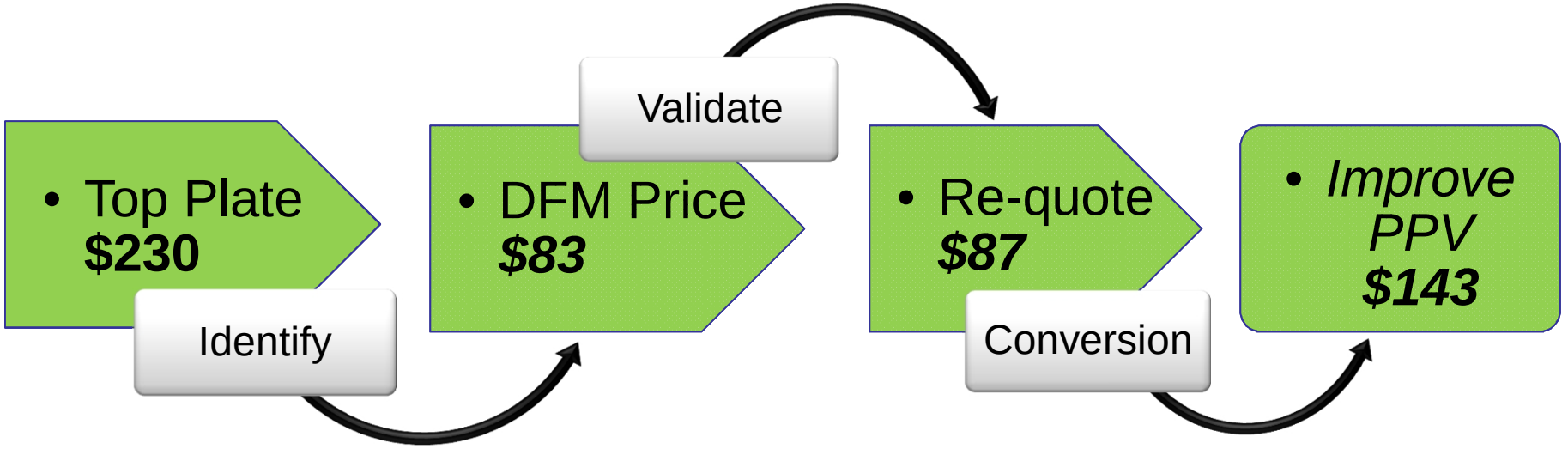
Last 4 Years

- Product / Process
- TCO
- Value Engineering
- Function

Cost Savings



DFM Process Example



- Identify – Size the opportunity, Std. Price vs. DFM Price
- Validate – Accuracy of the DFM model & design cost drivers
- Conversion – Engage suppliers

Supply Chain

- Where to start?
  - Released/Legacy Parts within Supply Chain
  - Pareto Principle – 80% of your spend comes from 20% of your parts
- Part Numbers: Standard Price x Volume = Total Spend

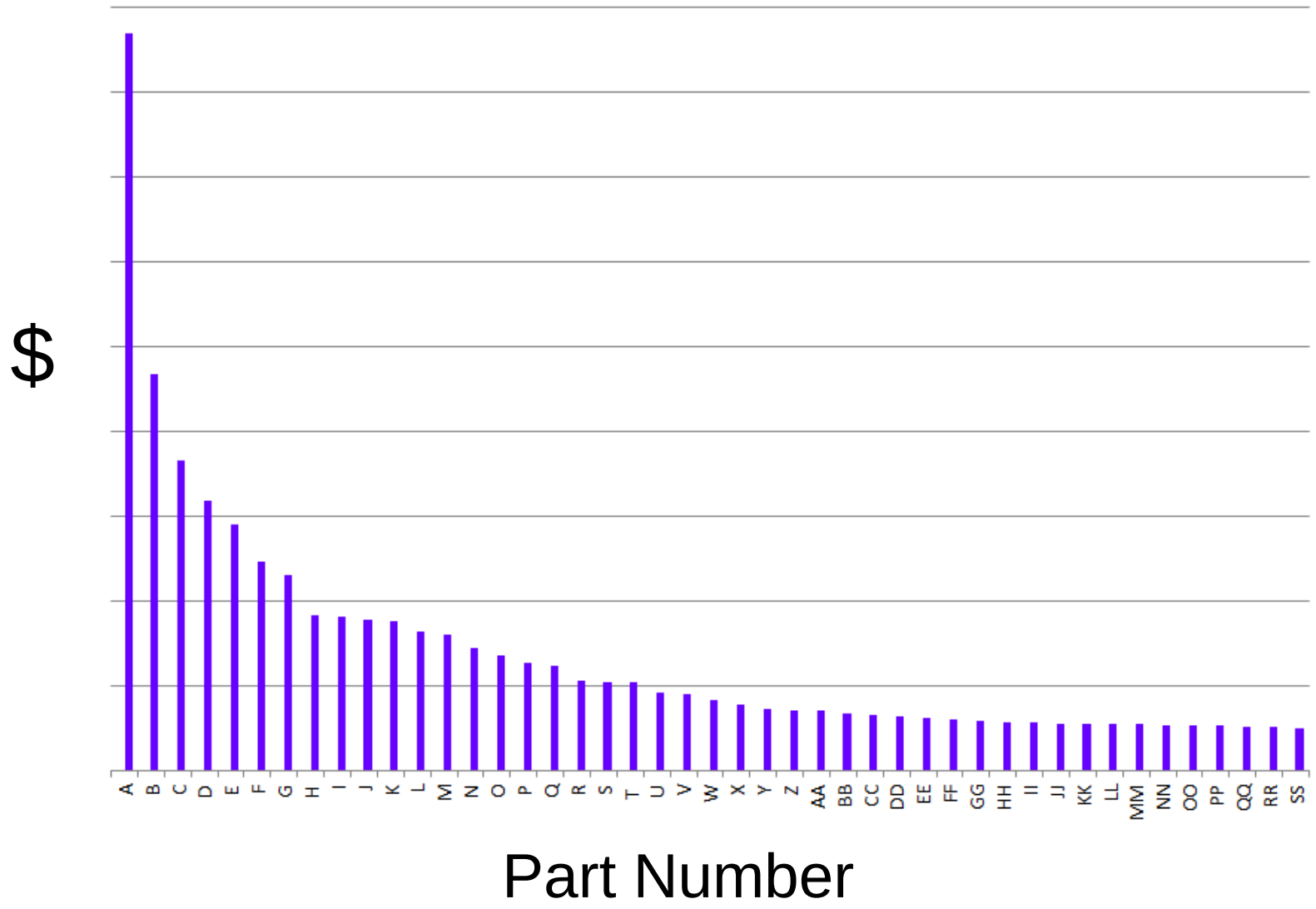
<u>For each Part</u>:

- Standard Price
- Yearly Volume
- Batch / Lot size
- Dwg / Model

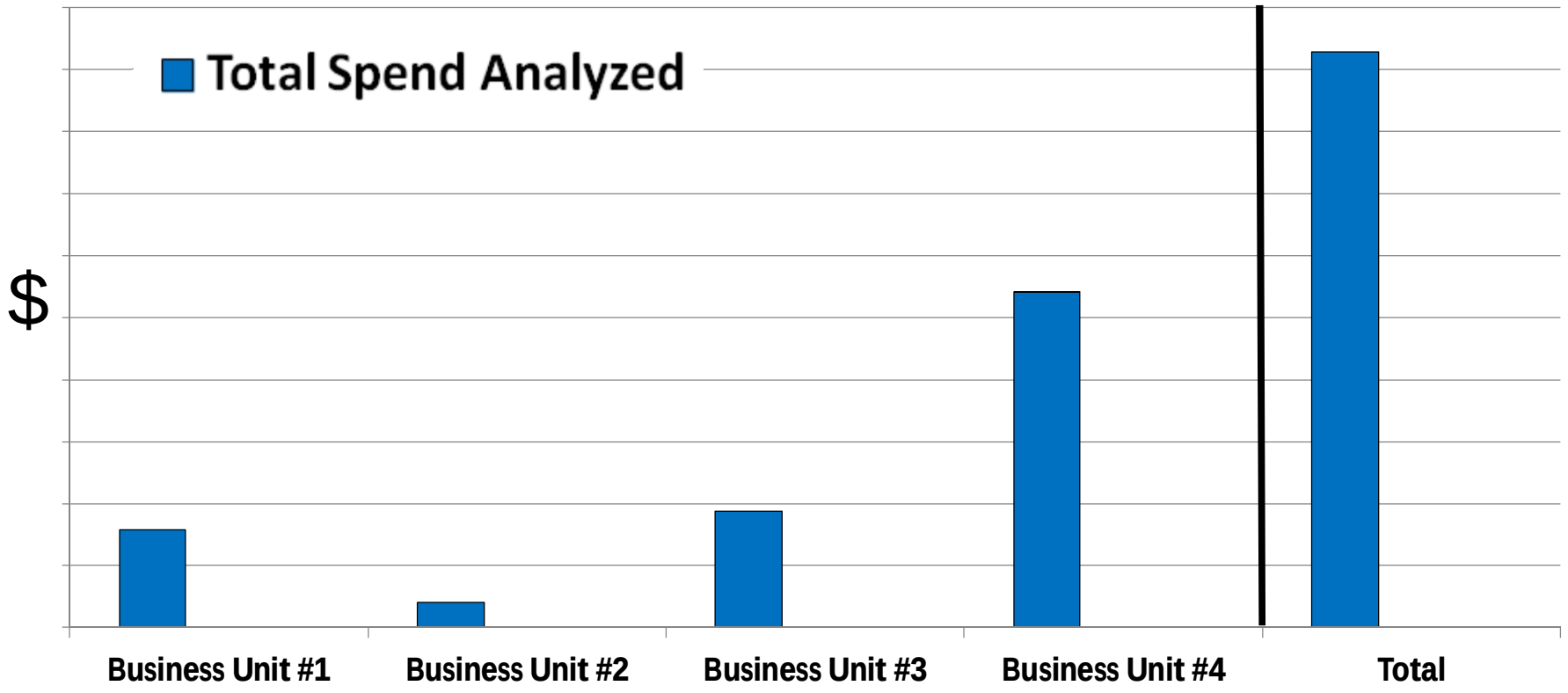
<u>For each DFM Analysis</u>:

1. Identify cost drivers
2. Suggestions to reduce cost (VE Process)
   - What else would do the job?
   - What would that alternative cost?

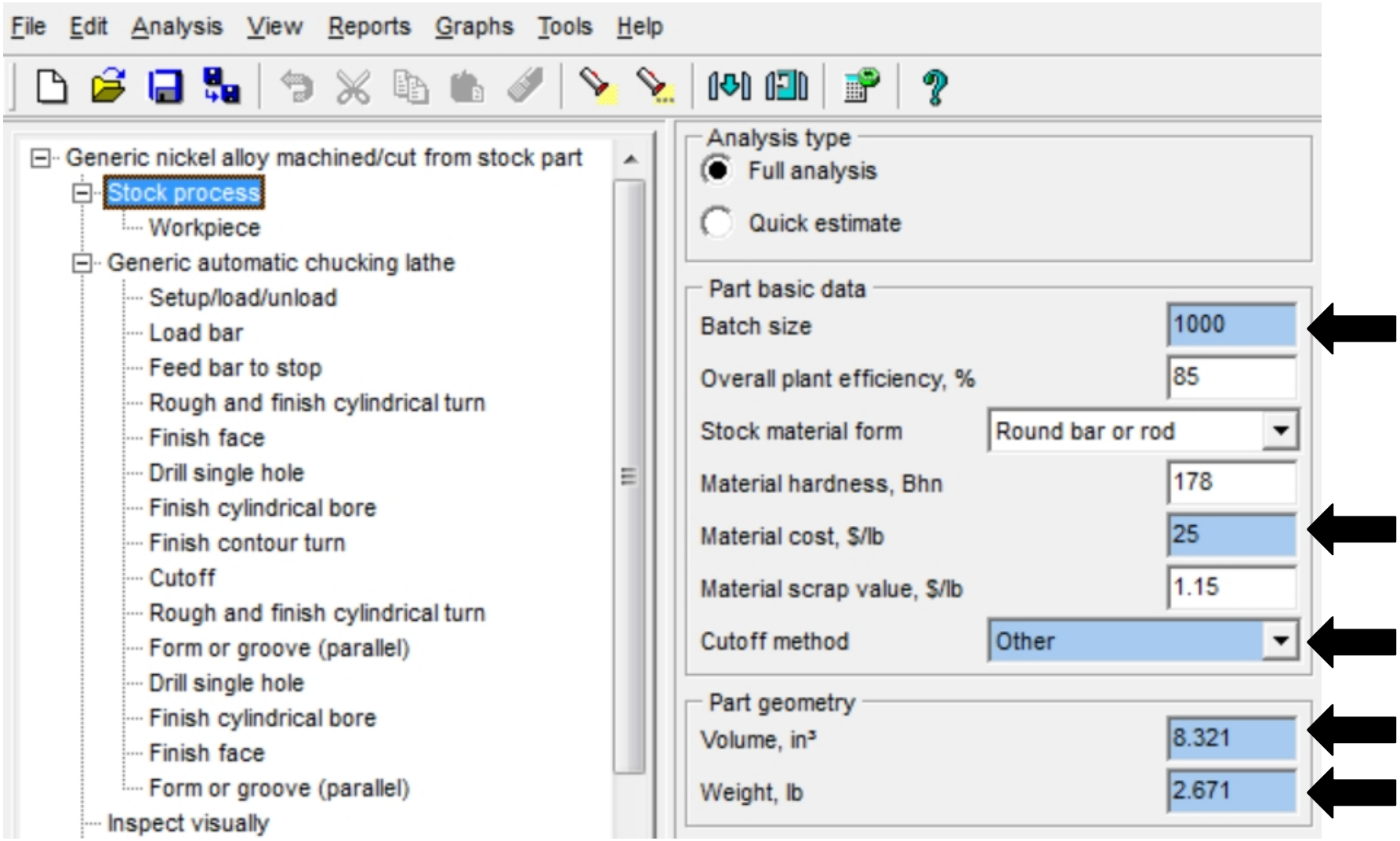
Supply Chain Parts List



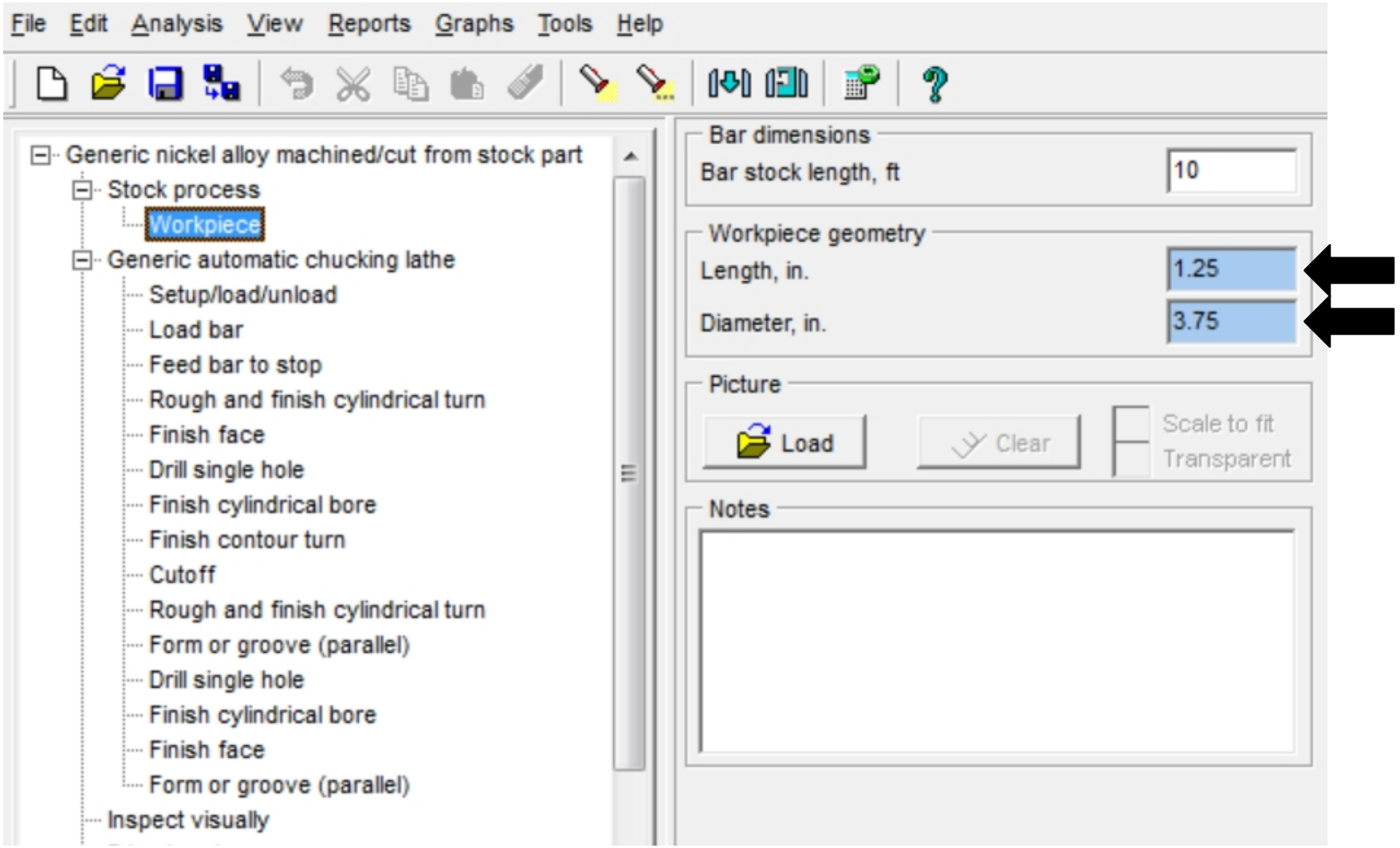
Supply Chain - Spend



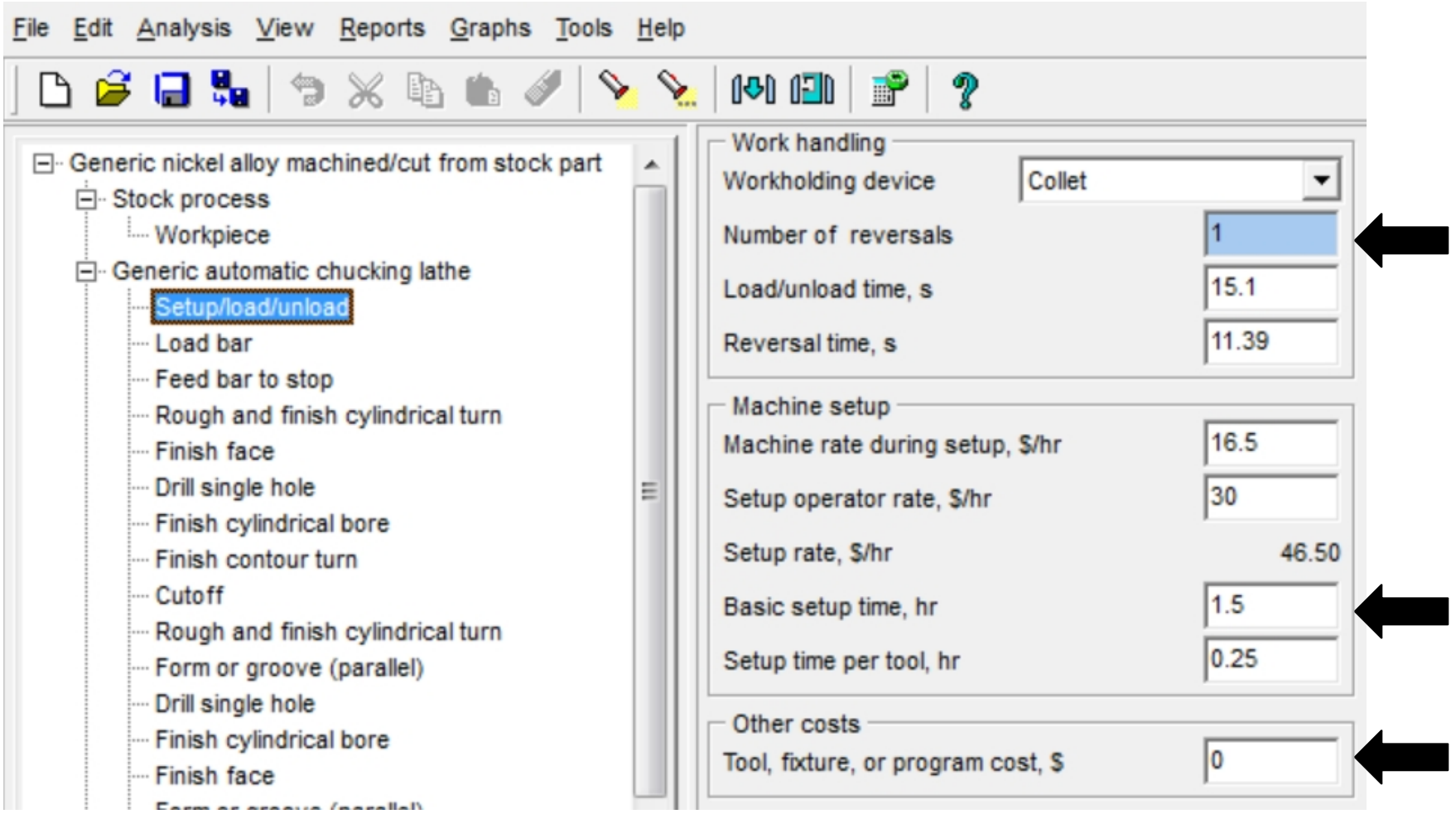
DFM Software – Material



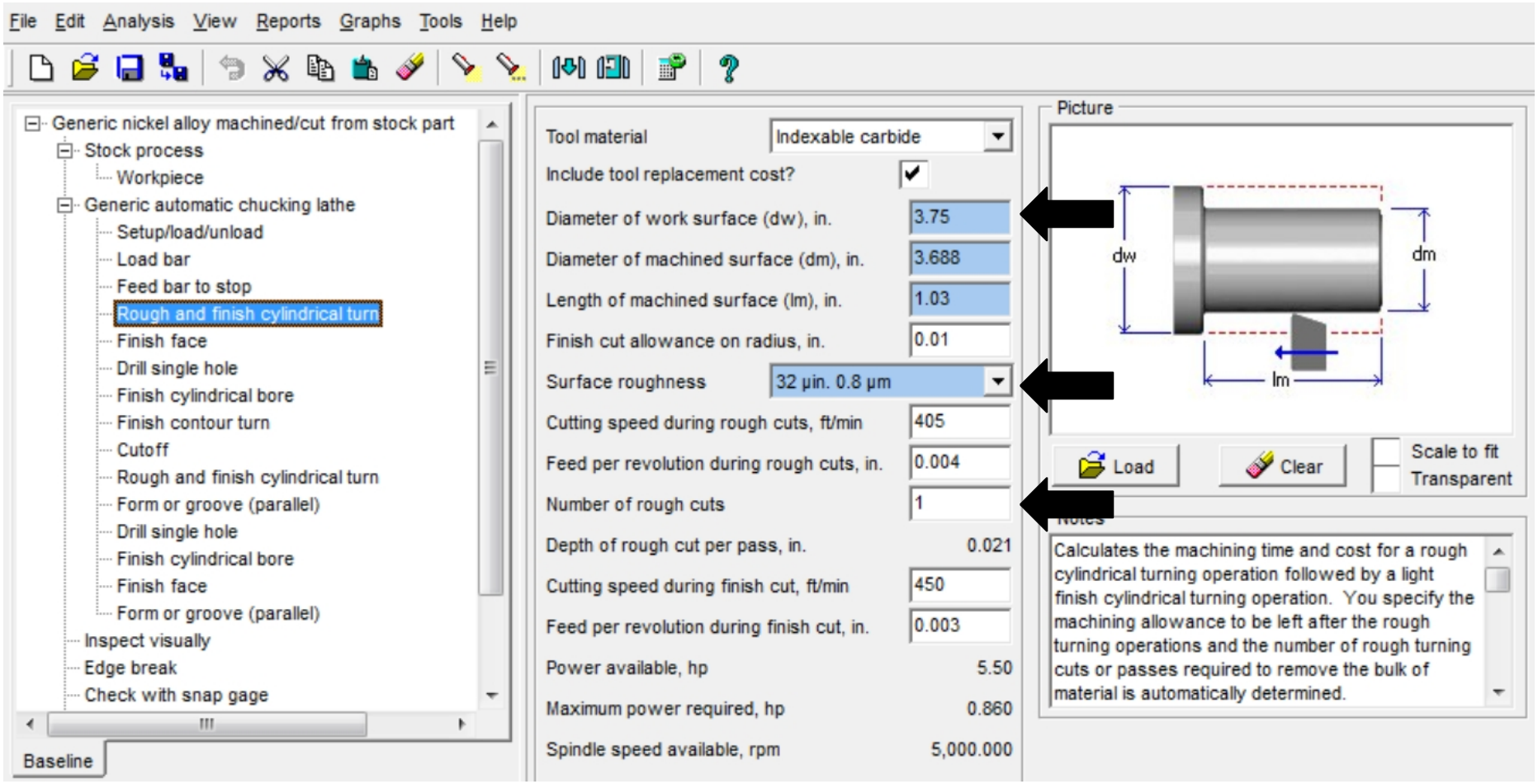
DFM Software – Material



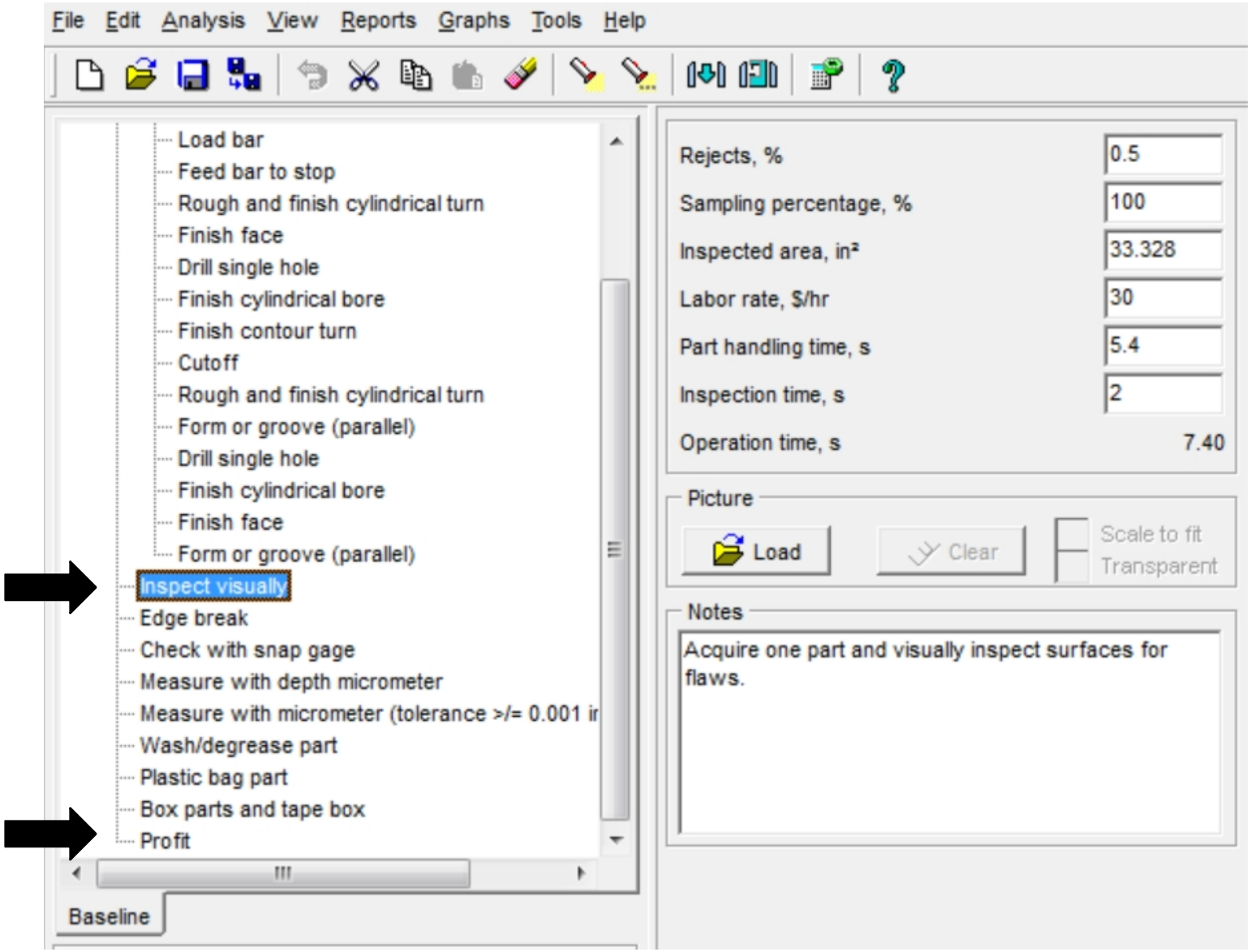
DFM Software - Setup



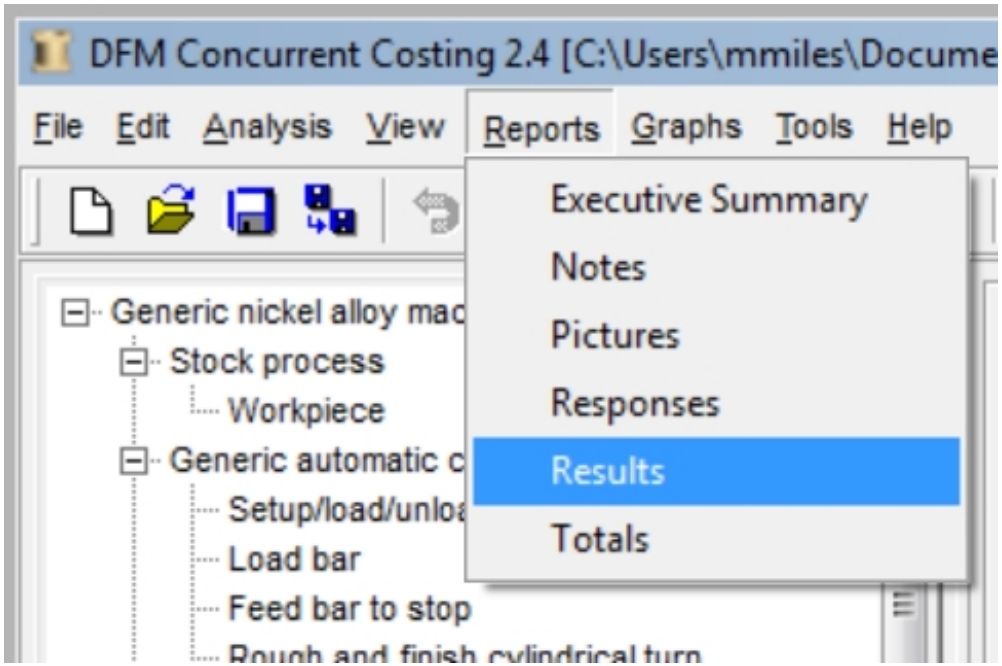
DFM Software - Processing



DFM Software - Extras



DFM Summary - Results



- Reports \ Results
- Link Results to drawing, similar to a First Article Inspection report

Example: 303 SS Burst Plug Housing (lathe part)

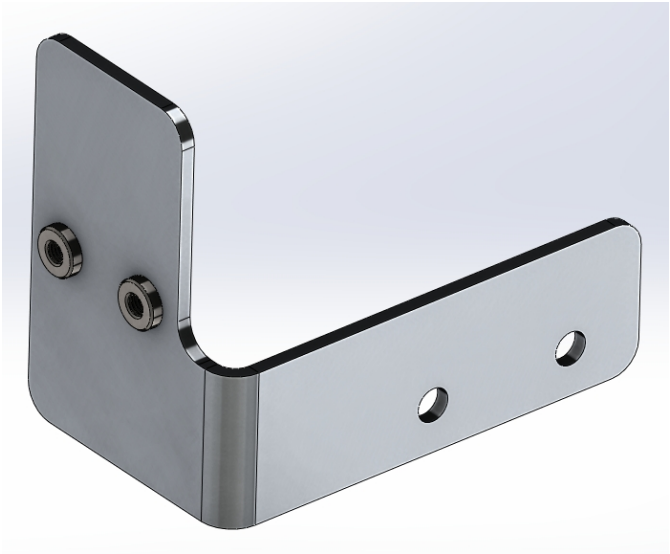
- DFM processing time ~ 1100 seconds
- Supplier routing ~ 1200 seconds

DFM Summary - Results

Number matches “process-to-dimension” on the dwg

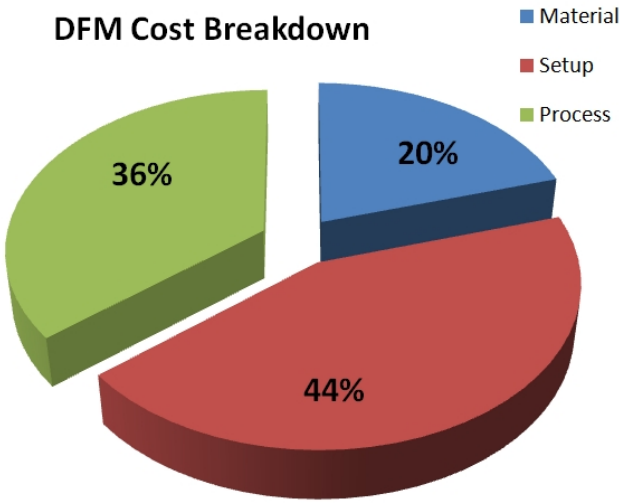
Process Chart	Batch Size	Cost per part, $							Operation time per part, s
		Material	Setup	Process	Rejects	Piece part	Tooling	Total	
19 Finish face				0.06		0.06		0.06	6.00
20 Finish face				0.03		0.03		0.03	3.00
Generic CNC machining center	**40**		**1.16**	**4.78**	**0.32**	**6.26**		**6.26**	**439.30**
Setup/load/unload			1.16	0.46		1.62		1.62	46.30
21 Rough and finish single peripheral end mill				2.18		2.18		2.18	197.00
22 Rough and finish face mill				0.48		0.48		0.48	41.00
23 Rough and finish face mill				0.45		0.45		0.45	39.00
24 Drill multiple holes				0.29		0.29		0.29	28.00
25 Rough and finish single slot end mill				0.25		0.25		0.25	24.00
26 Rough and finish single slot end mill				0.34		0.34		0.34	32.00
27 Rough and finish single slot end mill				0.34		0.34		0.34	32.00

DFM Summary Example

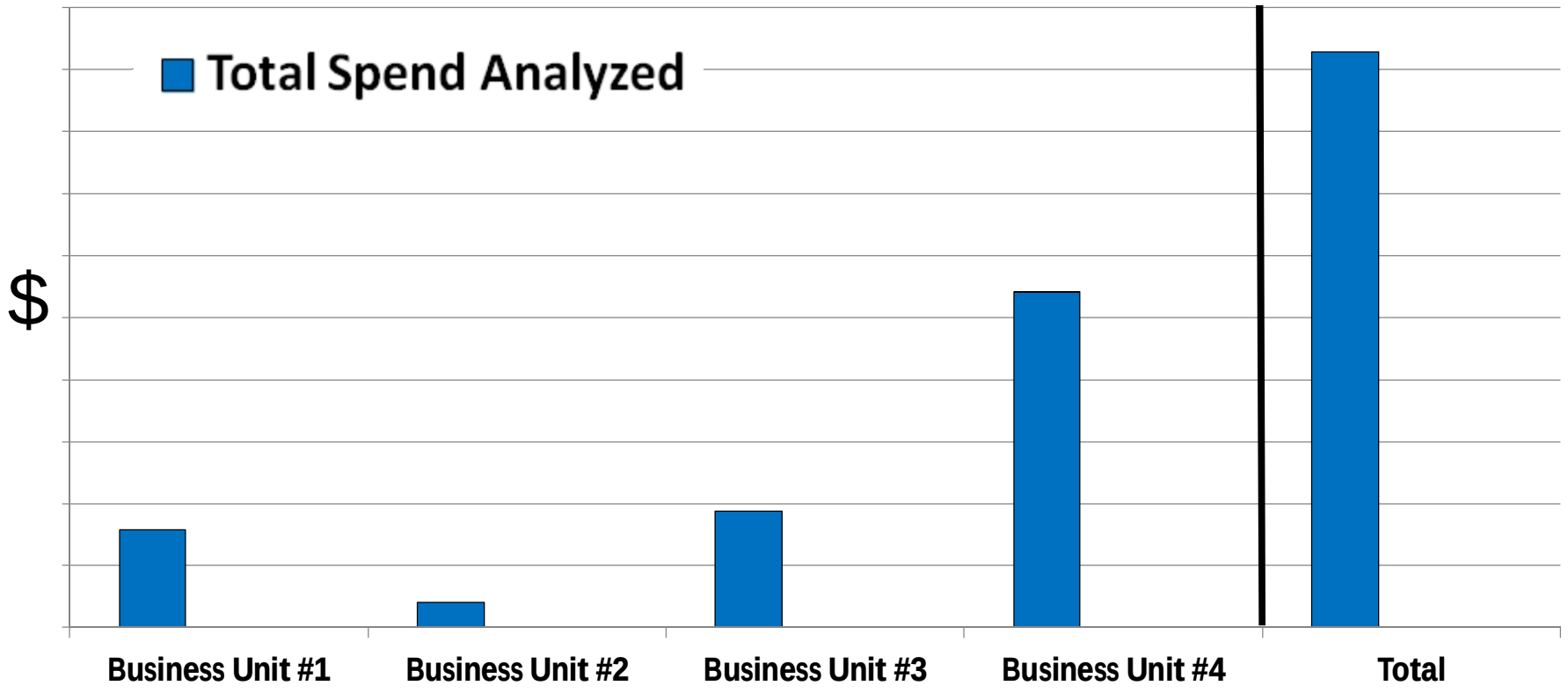


- Std Price $21.55
- DFM 10pc US $12.76
- DFM 25pc US $11.62
- DFM 10pc Asia $6.21

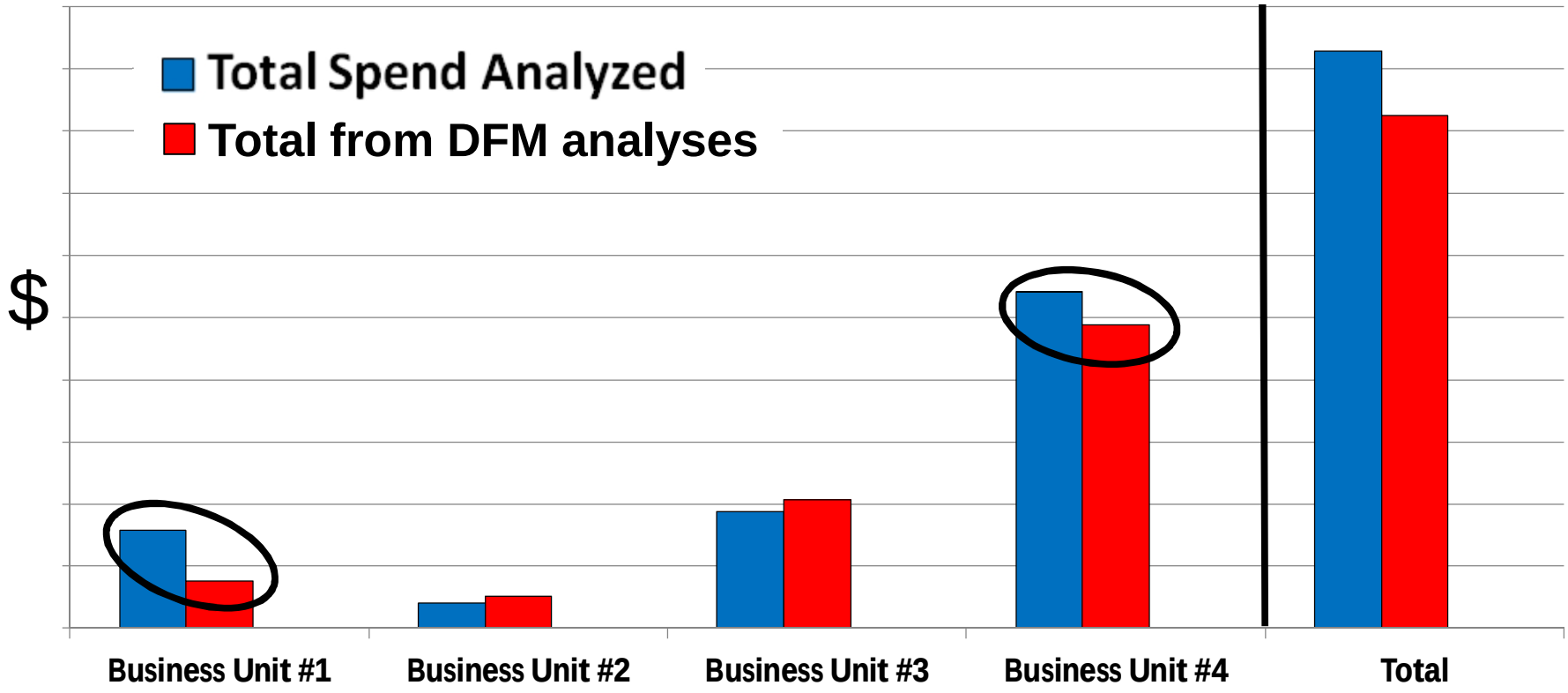
- 11GA 5032-H32
- Clear anodize finish



Supply Chain - Spend

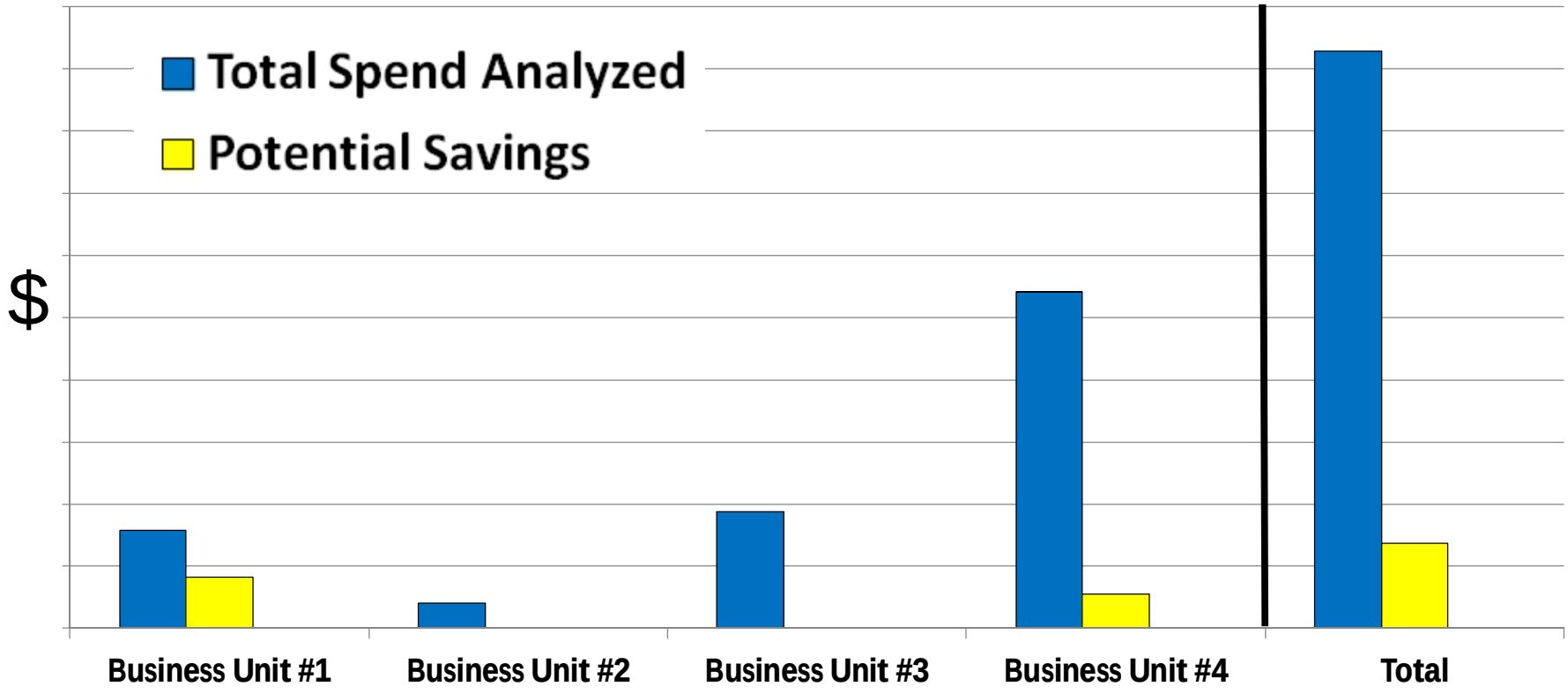


Supply Chain – Spend vs. DFM



-52% 30% 10% -10%

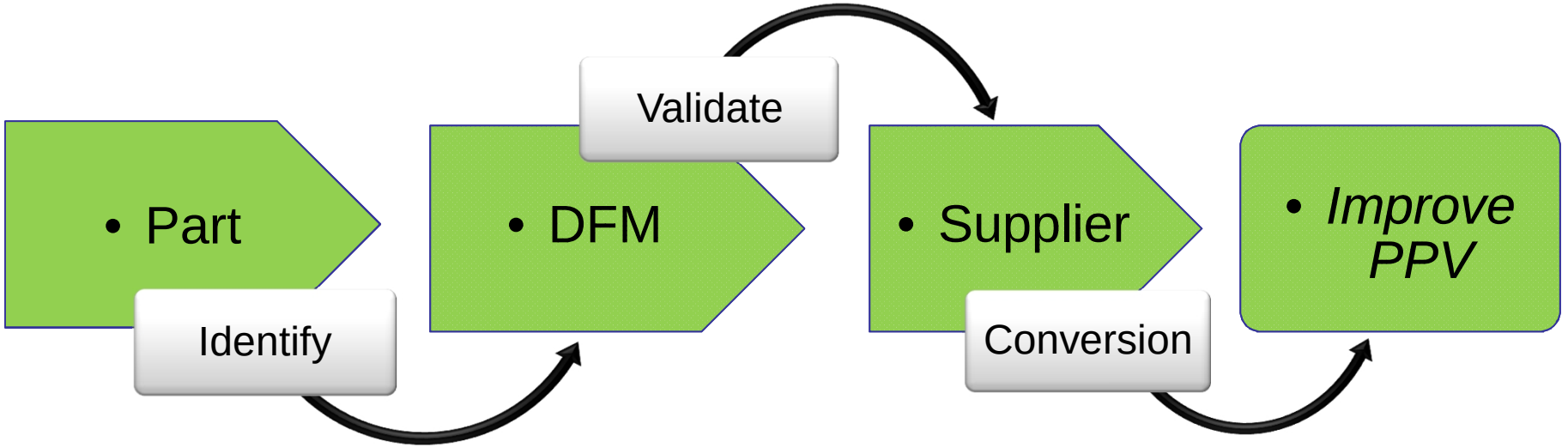
Supply Chain – Potential Savings



52%

10%

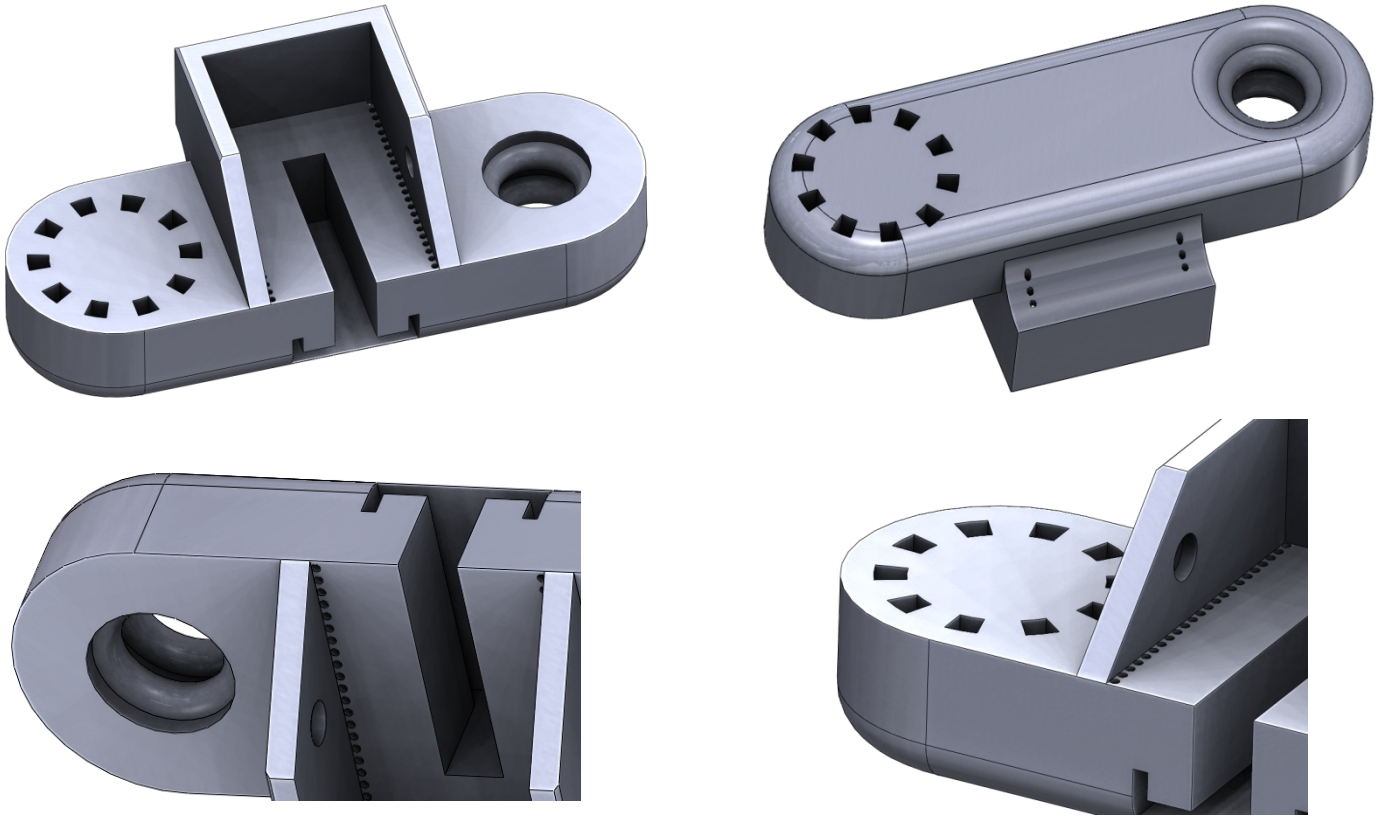
DFM Process



- Identify – Size the opportunity, Std. Price vs. DFM Price

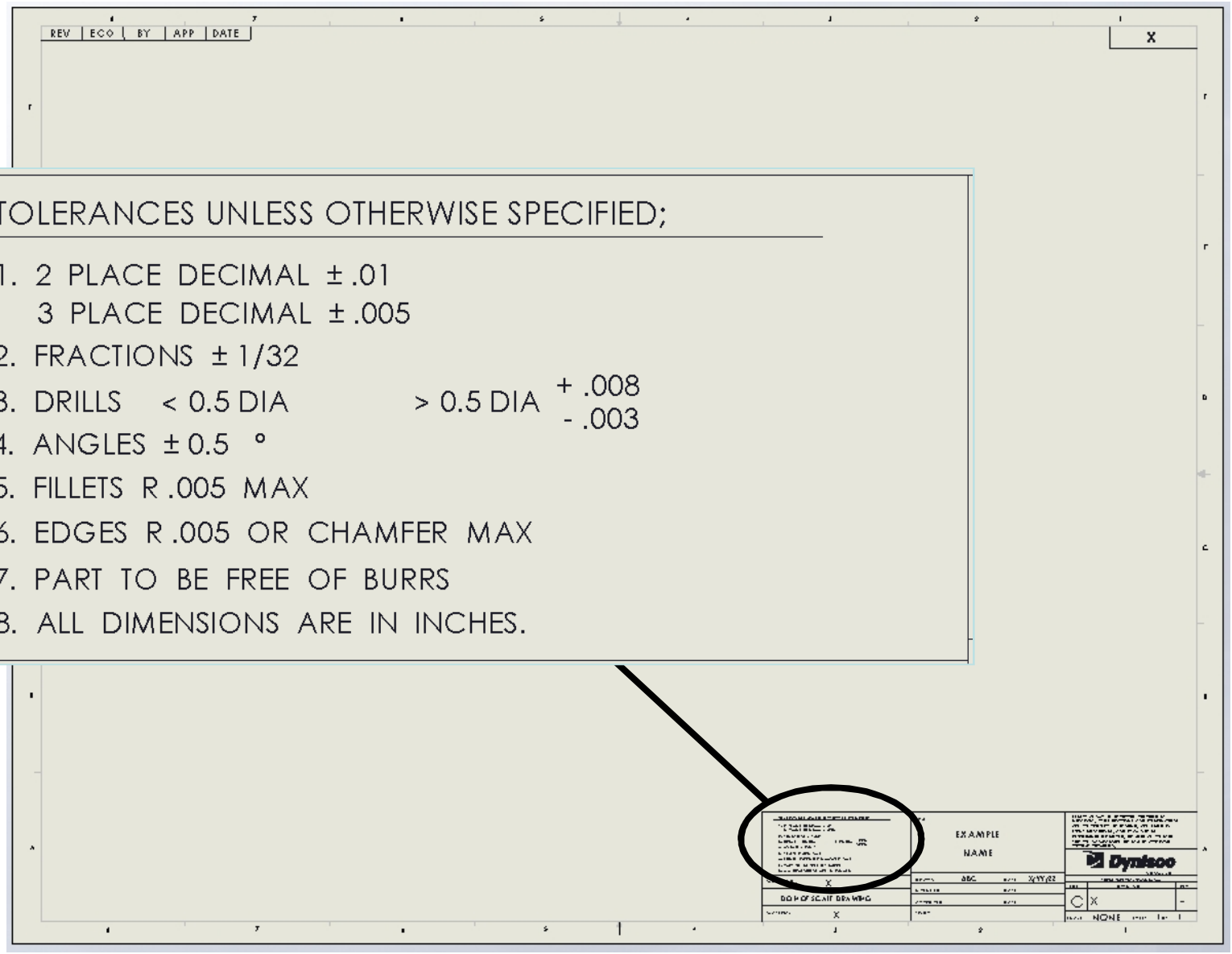
Design for Manufacture

- Modeling makes things easy….too easy?

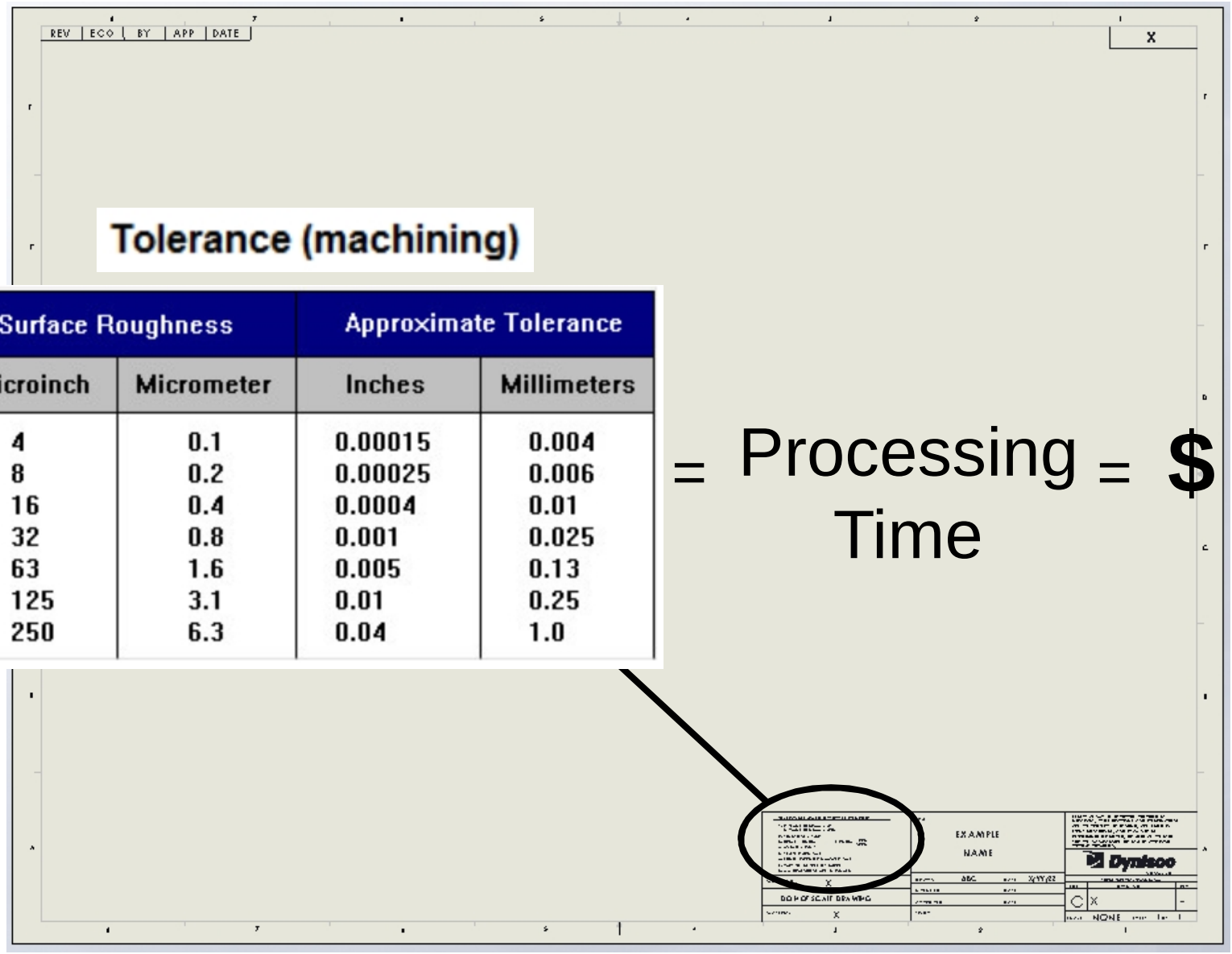


- *Just because you can model it, doesn't mean you can machine it…. And be cost effective*

Design for Manufacture



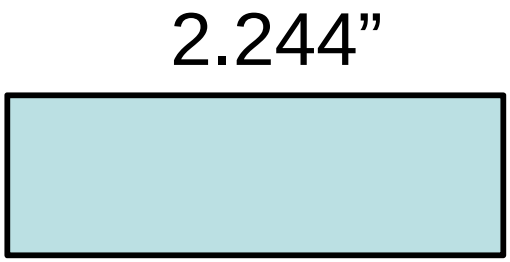
Design for Manufacture



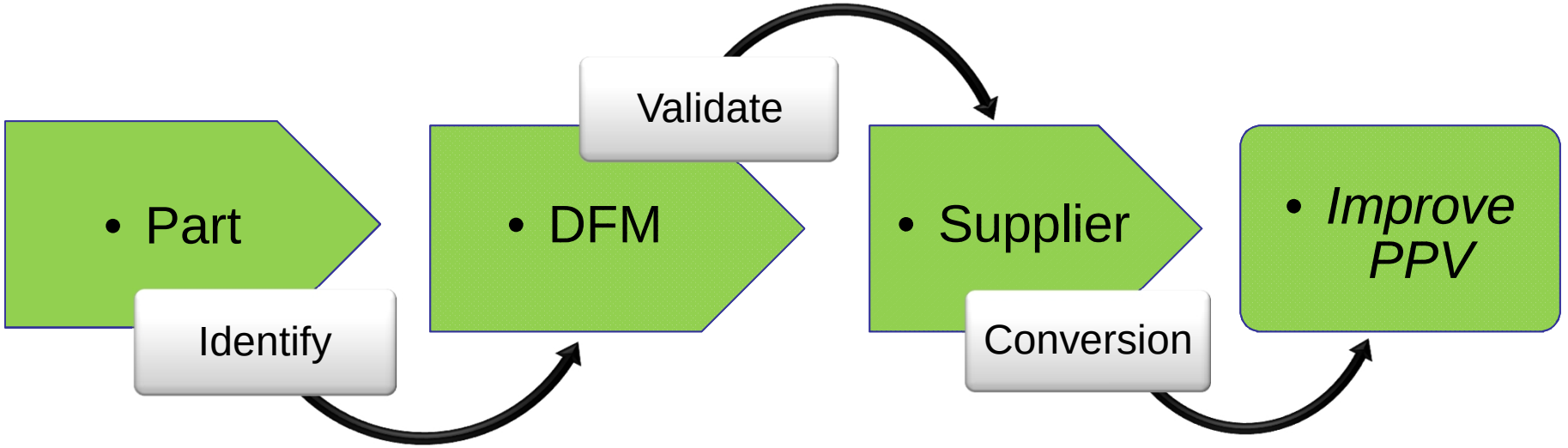
Design for Manufacture

- DFM request on a new product – 51 machined parts
  - Example 1: 19 sheet metal parts
    - 7 different gages of thickness
    - 5 different materials
    - 4 different finishes
  - Example 2: Part made from rectangular bar

Cross-section dimensions on print



DFM Process



- Identify – Size the opportunity, Std. Price vs. DFM Price
- Validate – Accuracy of the DFM model & design cost drivers

Engage Suppliers

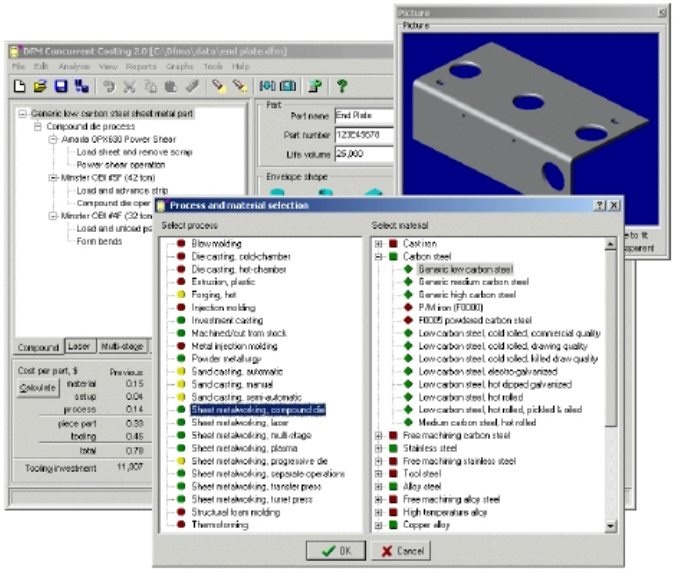
- Started with a parts list from Supply Chain
- Performed DFM analysis
- Reviewed the design and print specifications
- Now you have the Data on Pricing

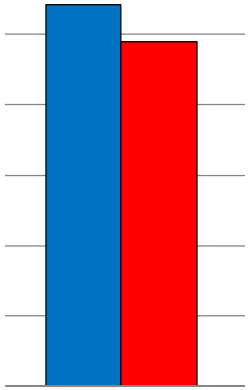
Suppliers:

- “Material Price went up”
- **Red flag**: Price is a “nice, round number” (**$230**) and a large gap exists when compared to DFM price
- Last time the part was quoted
- $$$

Supplier Example #1

- 150+ parts
- DFM's completed
- Meeting set
- Approach:
  - Non-adversarial
  - Cost drivers / Machining process
  - Show DFM of "their" part
  - Supplier suggestions
  - Implied message

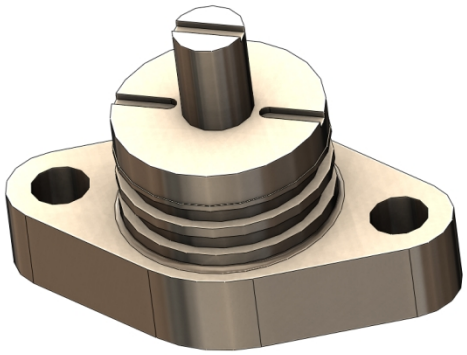


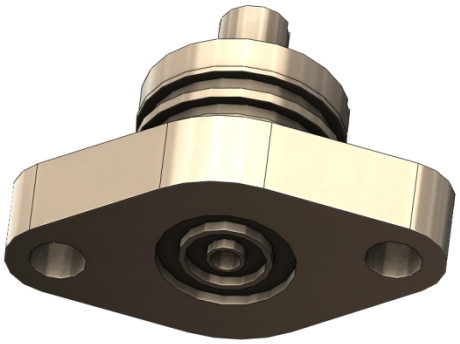


Std. vs. DFM $

Supplier Example #2

- Mat'l: Inconel
- Intricate part
- Tight tolerances





- Std Price $484.81
- DFM #1 $69.06
- DFM #2 $95.79
- DFM #3 $147.79

What was missed?

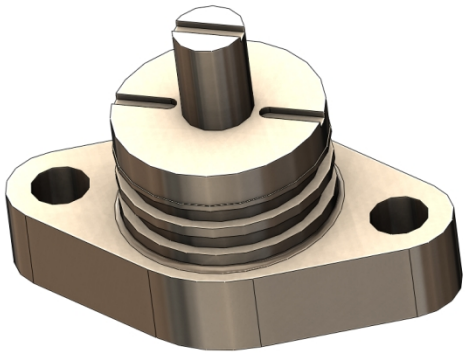
- Lot size
- Reject rate (%)
- $4200 bar stock, 5 ft leftover
- Actual bar 2.50" dia., DFM used 2.00"
- Special Tooling
- Programming / Debugging
- Best Operator / Best Machine = Higher Rates
- Communication

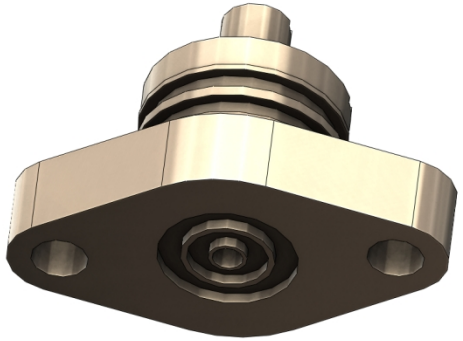
Supplier Example #2

- Mat'l: Inconel
- Intricate part
- Tight tolerances

Final Production Quote

- Std Price $180.85
- DFM #4 $152.16

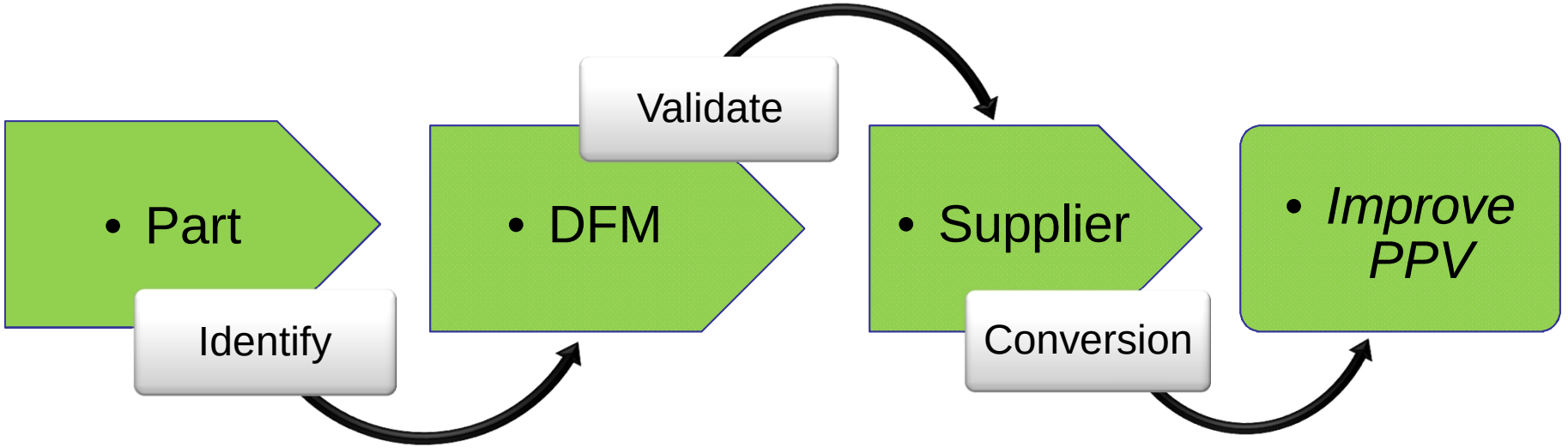




Final comment from Supplier:

With refinement $150-165

DFM Process



- Identify – Size the opportunity, Std. Price vs. DFM Price
- Validate – Accuracy of the DFM model & design cost drivers
- Conversion – Engage suppliers

Results – Date of last Quote

$7.33, Cap, Std Price
$9.63, DFM
$5.09, Re-quote

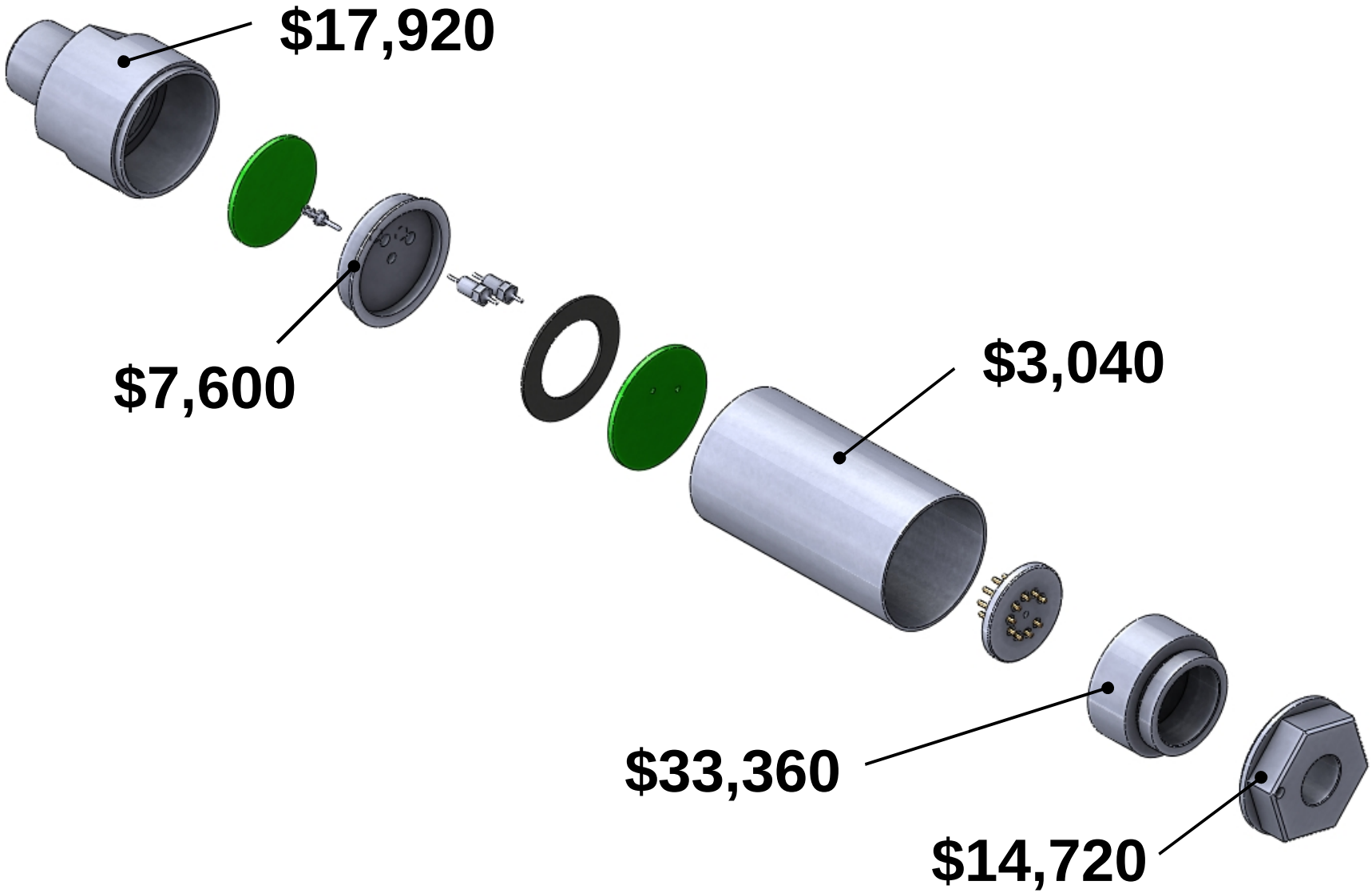
$8.47, Sensor, Std Price
$9.93, DFM
$4.30, Re-quote

$3.17, Header, Std Price
$3.40, DFM
$2.22, Re-quote

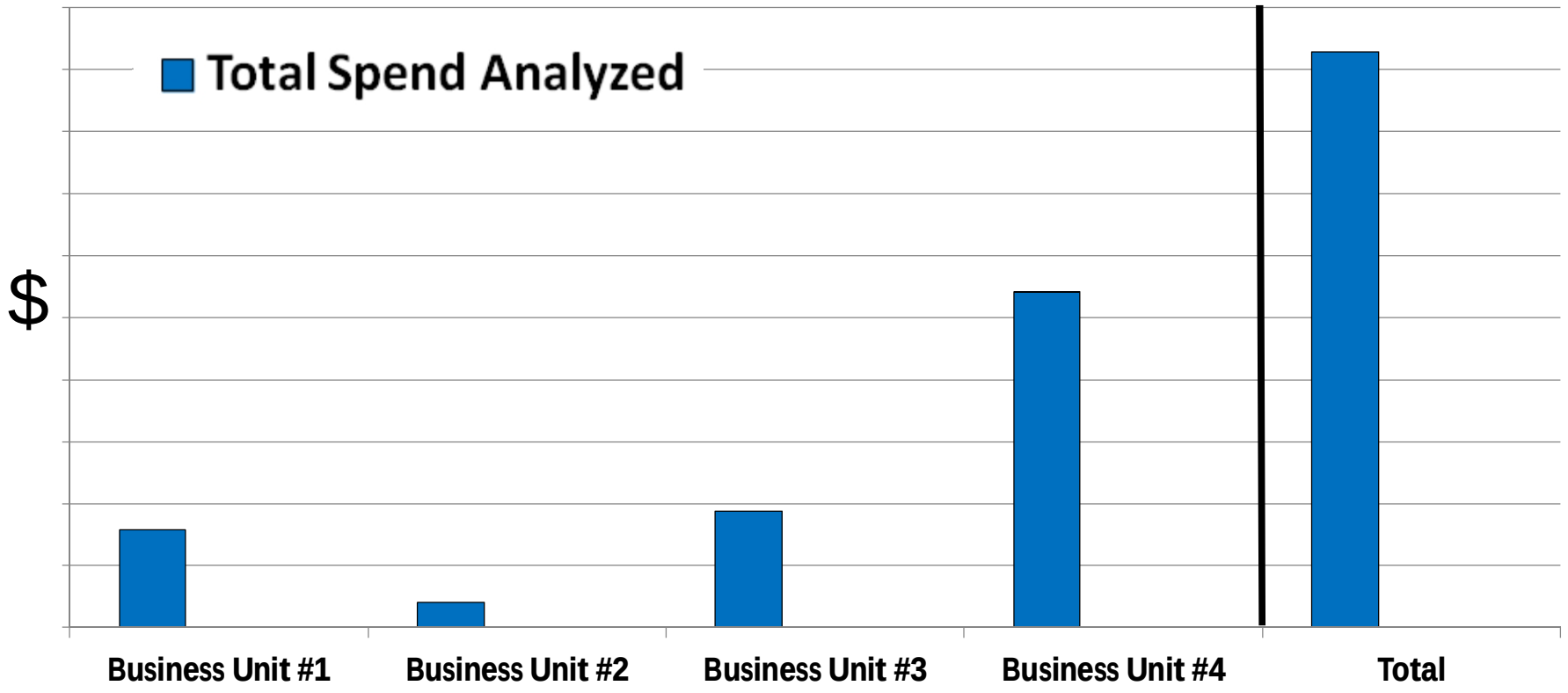
$1.33, Housing, Std Price
$1.81, DFM
$.95, Re-quote

$4.54, Cap, Std Price
$5.21, DFM
$2.70, Re-quote

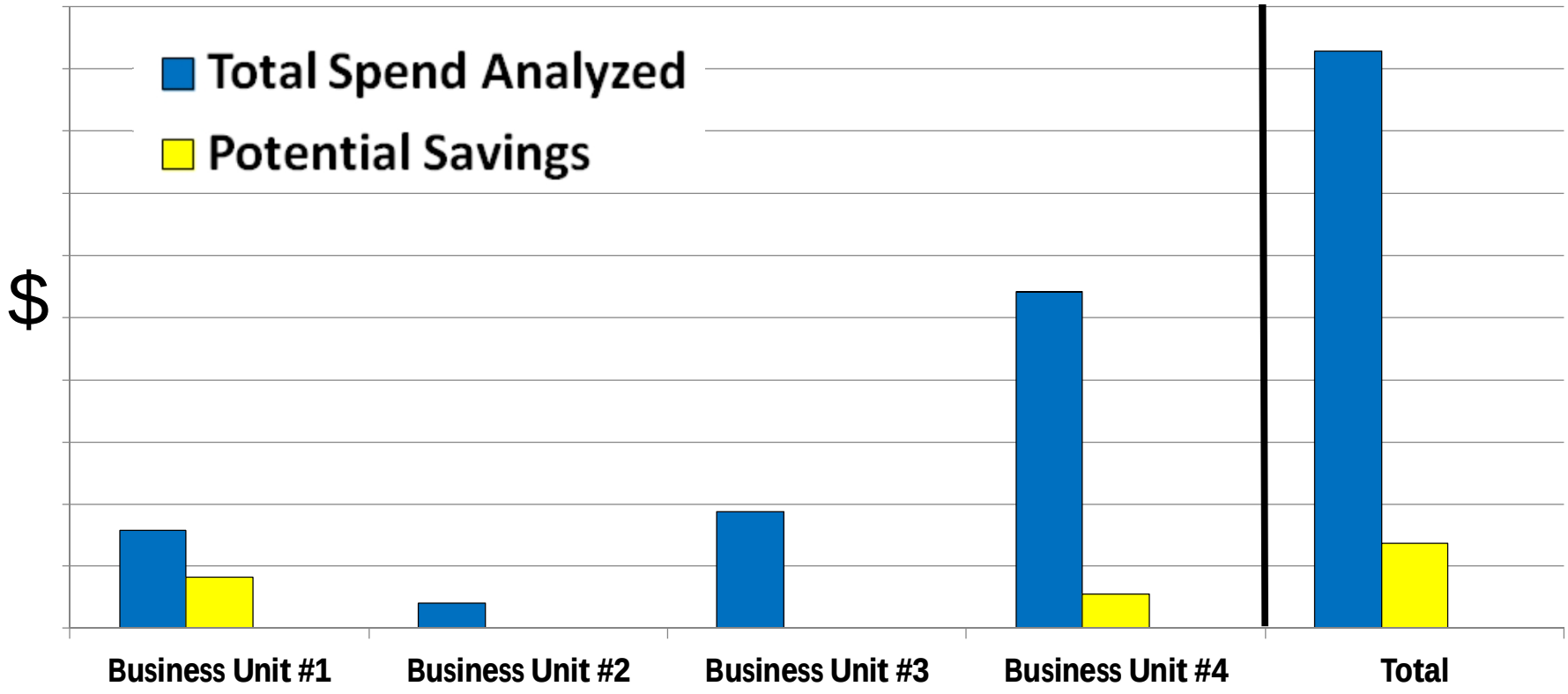
Results – Date of last Quote



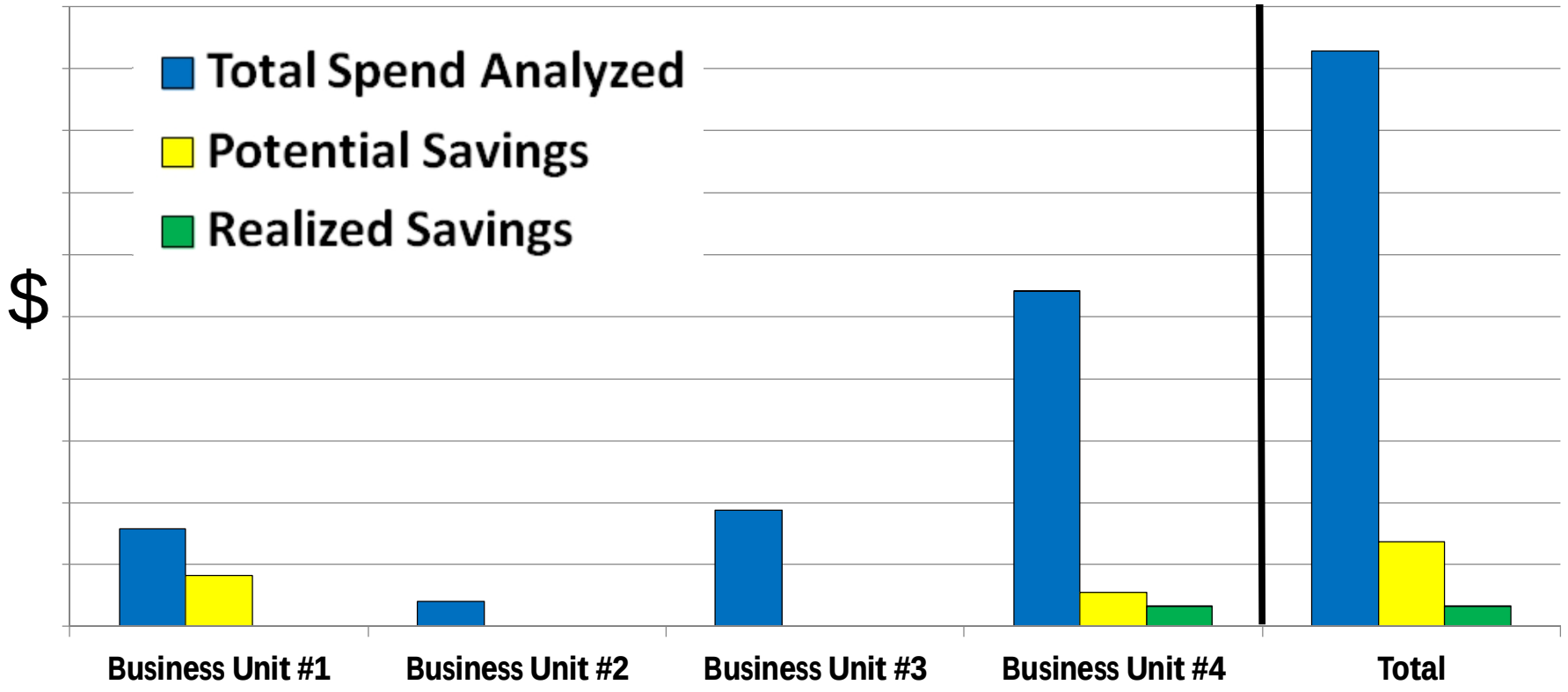
Supply Chain - Spend



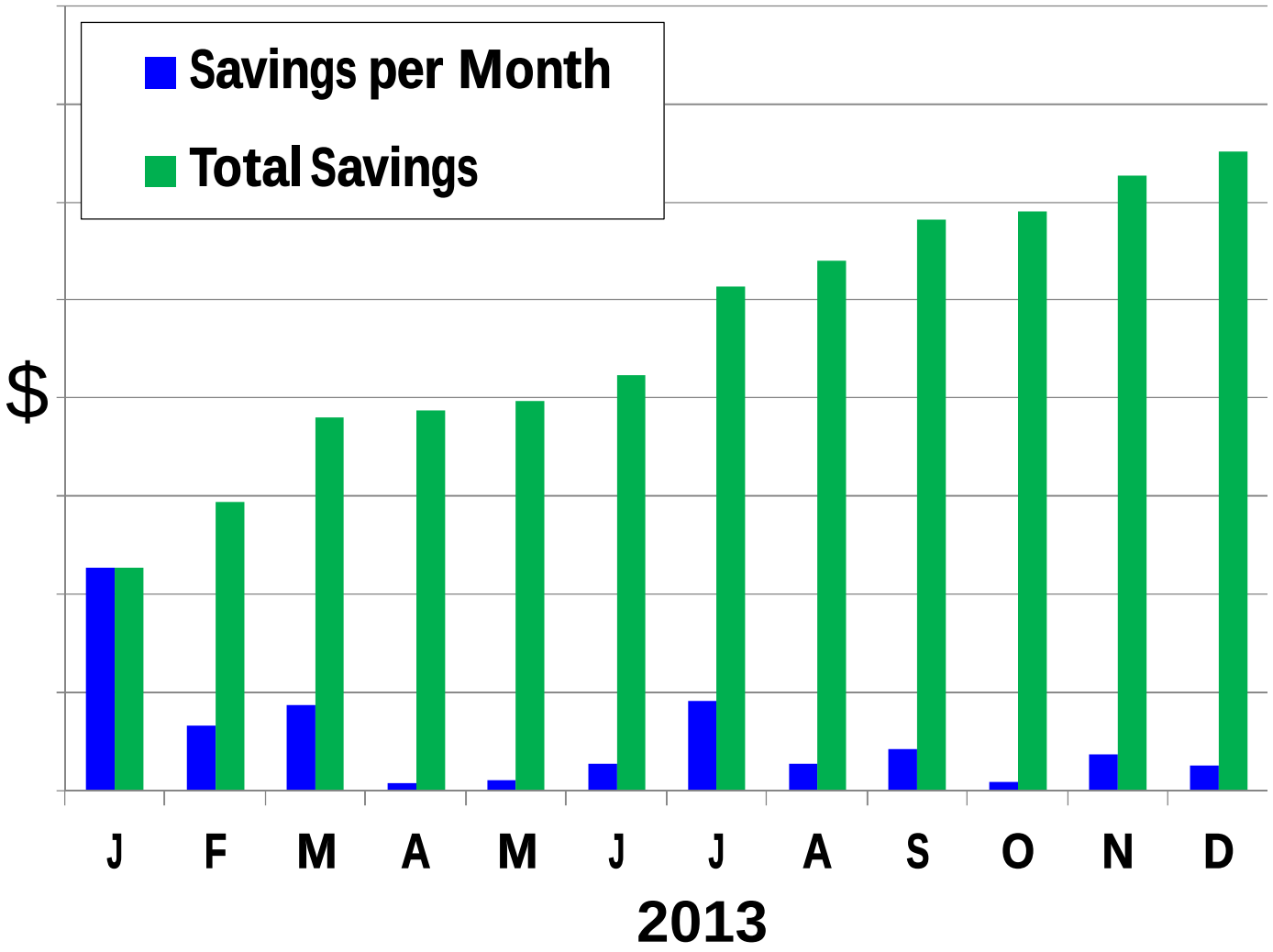
Supply Chain – Potential Savings



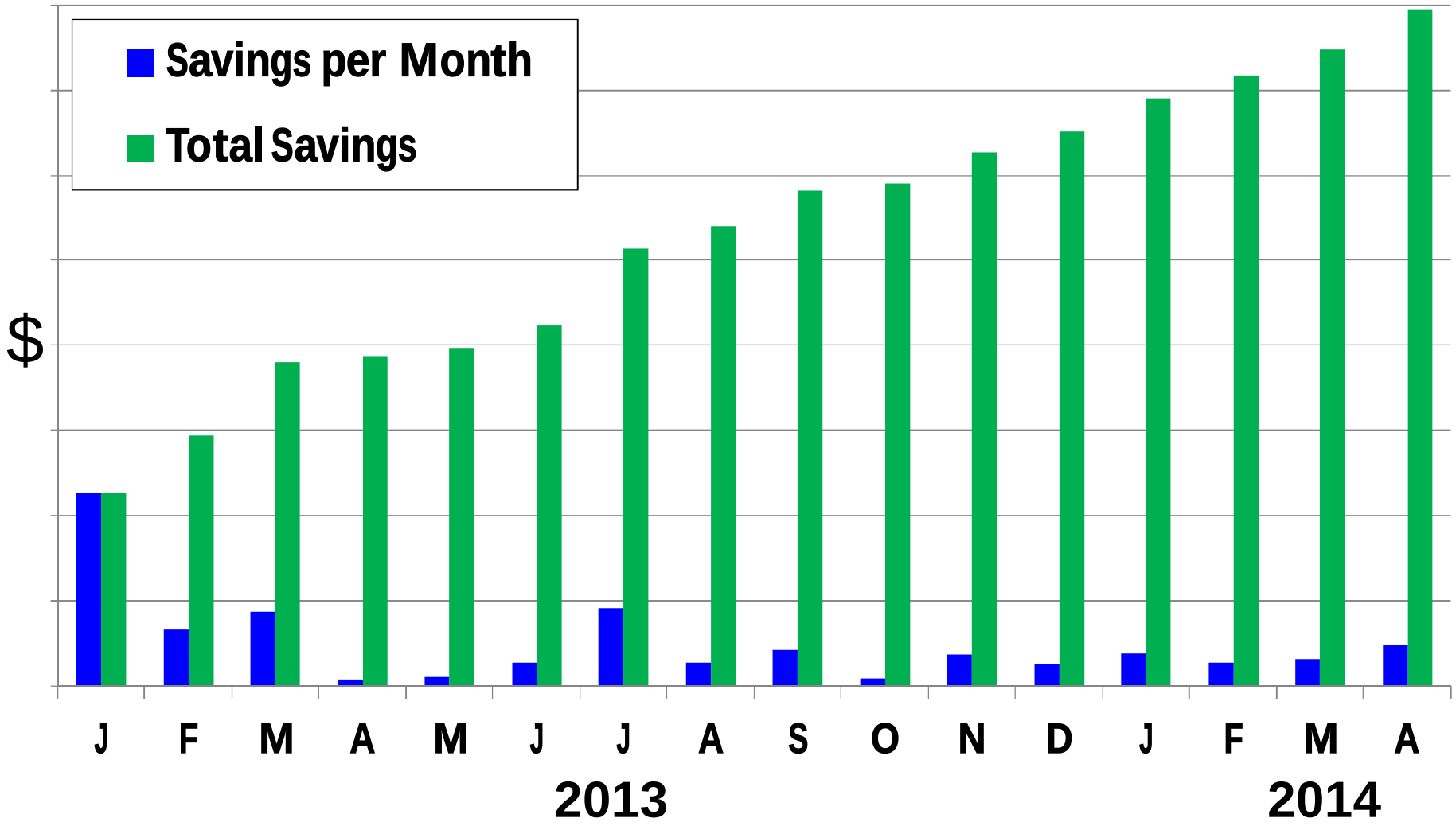
Results – Realized Savings



Results – Business Unit #4

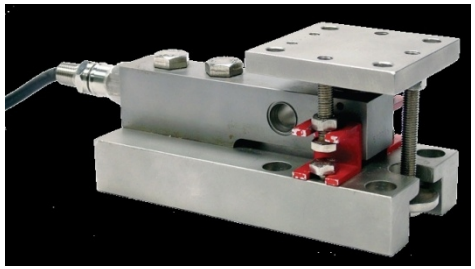


Results – Business Unit #4



Results

- Established cost savings program
- Internal departments
  - Engineering, Supply Chain, Finance
- Business Unit #1 – 52%
  - Supplier meetings, cost savings started
- Business Unit #4 – Key Supplier
  - More opportunities to supply parts

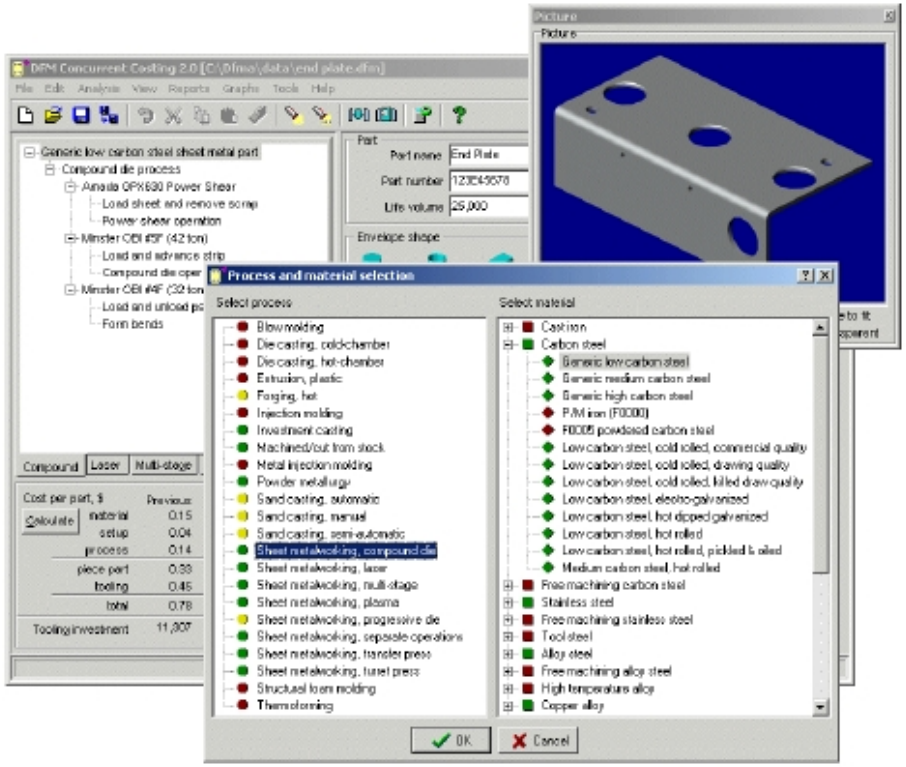


DFM Application

- DFM Process
- Existing parts within the Supply Chain
- New Product Development

Design for Manufacture

Early Cost Estimating



Source: Boothroyd Dewhurst, Inc.

Summary

Questions?