

**2015 International Forum on DFMA  
Boothroyd Dewhurst**

**DFMA Integration into Supply Chain and Operations**

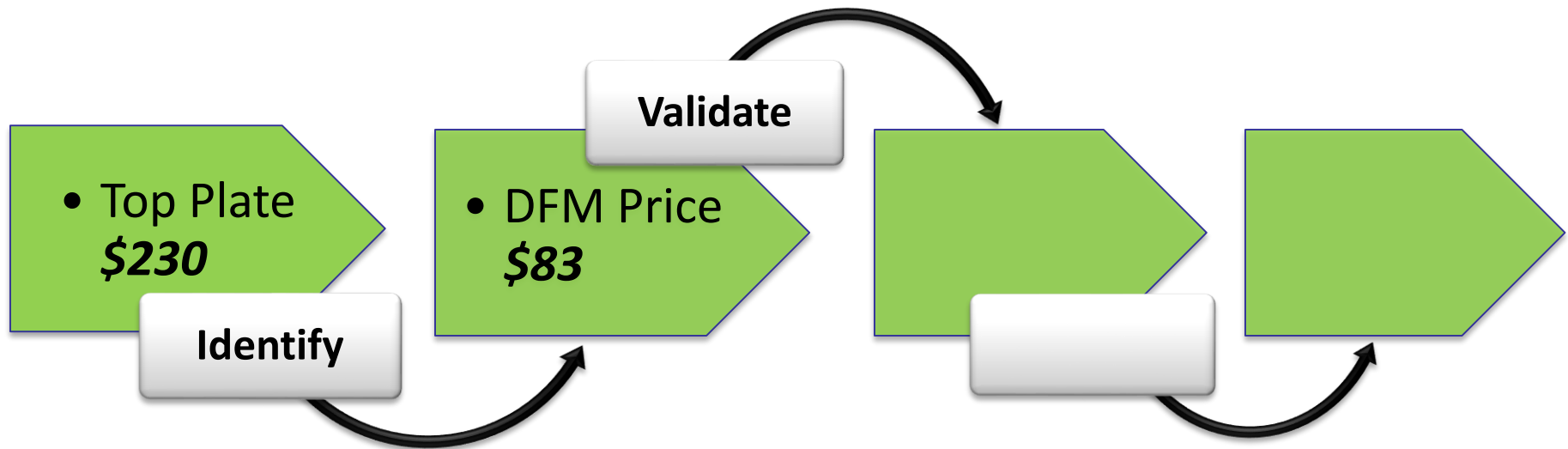
**June 3, 2015**

**Presented by: Kevin Dailida  
Sr. Director of Operations and Supply Chain**

# Agenda

- Supply Chain - Getting Started
- DFM Analysis
- Design For Manufacture – Cost Drivers
- Supply Chain Transformation
- Supplier Engagement
- Results





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

**The best opportunities originate in the design phase**

- Where to start?
  - Legacy designs
  - Existing / legacy parts managed by Supply Chain
  - Total Spend Opportunities - Volume X Price (Standard)



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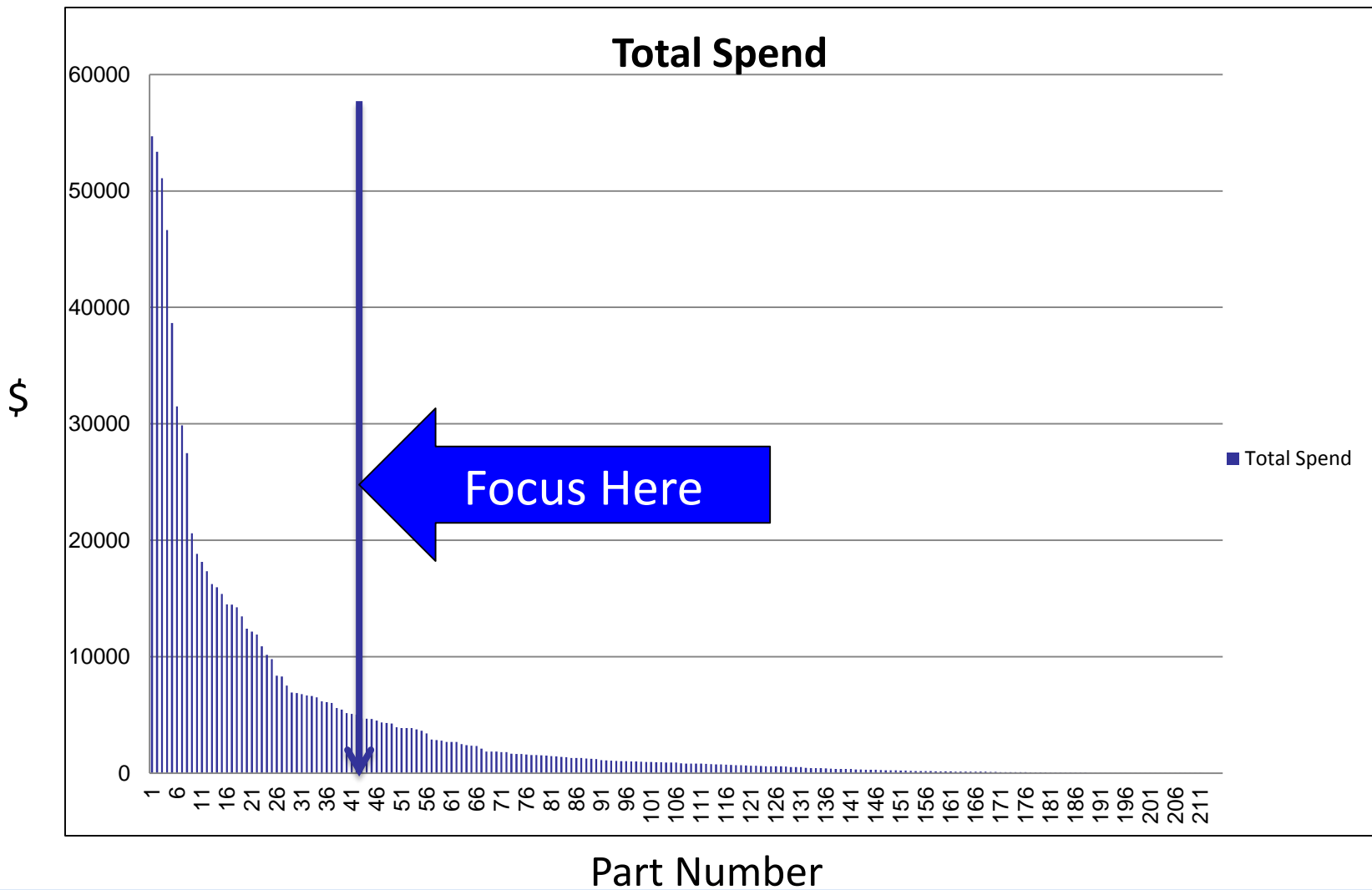
## Identify (Parts):

- Dwg / Model
- Price (Standard)
- Yearly volume
- Batch / lot size

## Validate (DFM Analysis):

- Identify cost drivers
- Suggestions to reduce cost
  - What else could perform function?
  - What would the alternative cost?

# Supply Chain - Getting Started



**Top 80% of spend is reflected in 20% of parts**

# DFM Analysis – Material



File Edit Analysis View Reports Graphs Tools Help

Generic nickel alloy machined/cut from stock part

- Stock process
- Workpiece
- Generic automatic chucking lathe
  - Setup/load/unload
  - Load bar
  - Feed bar to stop
  - Rough and finish cylindrical turn
  - Finish face
  - Drill single hole
  - Finish cylindrical bore
  - Finish contour turn
  - Cutoff
  - Rough and finish cylindrical turn
  - Form or groove (parallel)
  - Drill single hole
  - Finish cylindrical bore
  - Finish face
  - Form or groove (parallel)
- Inspect visually

Analysis type

- Full analysis
- Quick estimate

Part basic data

Batch size	1000
Overall plant efficiency, %	85
Stock material form	Round bar or rod
Material hardness, Bhn	178
Material cost, \$/lb	25
Material scrap value, \$/lb	1.15
Cutoff method	Other

Part geometry

Volume, in <sup>3</sup>	8.321
Weight, lb	2.671



# DFM Analysis – Material



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Bar dimensions

Bar stock length, ft: 10

Workpiece geometry

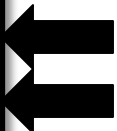
Length, in.: 1.25

Diameter, in.: 3.75

Picture

Load Clear Scale to fit Transparent

Notes



# DFM Analysis - Setup

File Edit Analysis View Reports Graphs Tools Help

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Work handling

Workholding device	Collet
Number of reversals	1
Load/unload time, s	15.1
Reversal time, s	11.39

Machine setup

Machine rate during setup, \$/hr	16.5
Setup operator rate, \$/hr	30
Setup rate, \$/hr	46.50
Basic setup time, hr	1.5
Setup time per tool, hr	0.25

Other costs

Tool, fixture, or program cost, \$	0
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# DFM Analysis - Processing



File Edit Analysis View Reports Graphs Tools Help

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  - Form or groove (parallel)
  - Drill single hole
  - Finish cylindrical bore
  - Finish face
  - Form or groove (parallel)
- Inspect visually
- Edge break
- Check with snap gage

Tool material: Indexable carbide

Include tool replacement cost?

Diameter of work surface (dw), in. 3.75

Diameter of machined surface (dm), in. 3.688

Length of machined surface (lm), in. 1.03

Finish cut allowance on radius, in. 0.01

Surface roughness 32 µin. 0.8 µm

Cutting speed during rough cuts, ft/min 405

Feed per revolution during rough cuts, in. 0.004

Number of rough cuts 1

Depth of rough cut per pass, in. 0.021

Cutting speed during finish cut, ft/min 450

Feed per revolution during finish cut, in. 0.003

Power available, hp 5.50

Maximum power required, hp 0.860

Spindle speed available, rpm 5,000.000

Picture

Load Clear Scale to fit Transparent

Notes

Calculates the machining time and cost for a rough cylindrical turning operation followed by a light finish cylindrical turning operation. You specify the machining allowance to be left after the rough turning operations and the number of rough turning cuts or passes required to remove the bulk of material is automatically determined.

Baseline

# DFM Software - Extras

File Edit Analysis View Reports Graphs Tools Help

Load bar  
Feed bar to stop  
Rough and finish cylindrical turn  
Finish face  
Drill single hole  
Finish cylindrical bore  
Finish contour turn  
Cutoff  
Rough and finish cylindrical turn  
Form or groove (parallel)  
Drill single hole  
Finish cylindrical bore  
Finish face  
Form or groove (parallel)  
**Inspect visually**  
Edge break  
Check with snap gage  
Measure with depth micrometer  
Measure with micrometer (tolerance  $\geq 0.001$  in)  
Wash/degrease part  
Plastic bag part  
Box parts and tape box  
Profit

Rejects, %	0.5
Sampling percentage, %	100
Inspected area, in <sup>2</sup>	33.328
Labor rate, \$/hr	30
Part handling time, s	5.4
Inspection time, s	2
Operation time, s	7.40

Picture

Load Clear Scale to fit Transparent

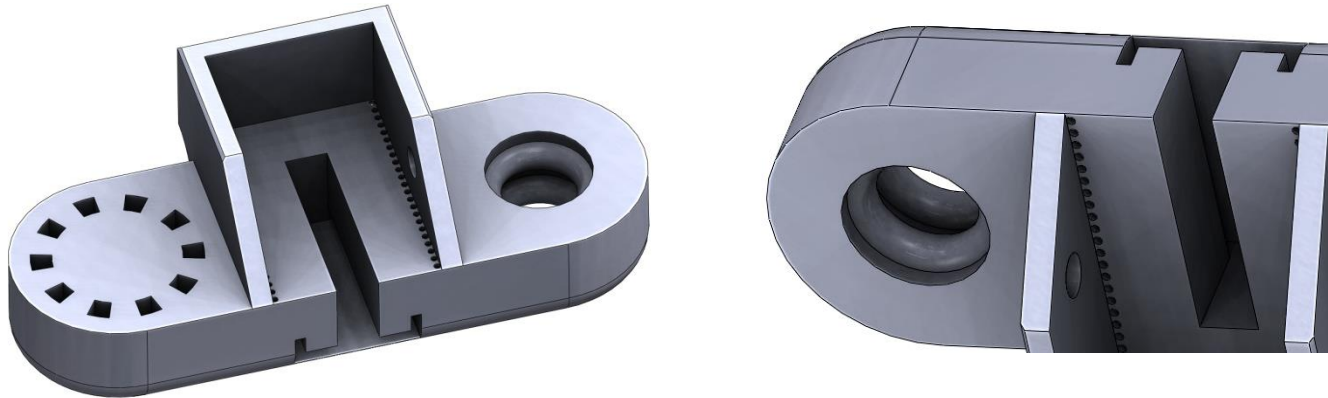
Notes

Acquire one part and visually inspect surfaces for flaws.

Baseline



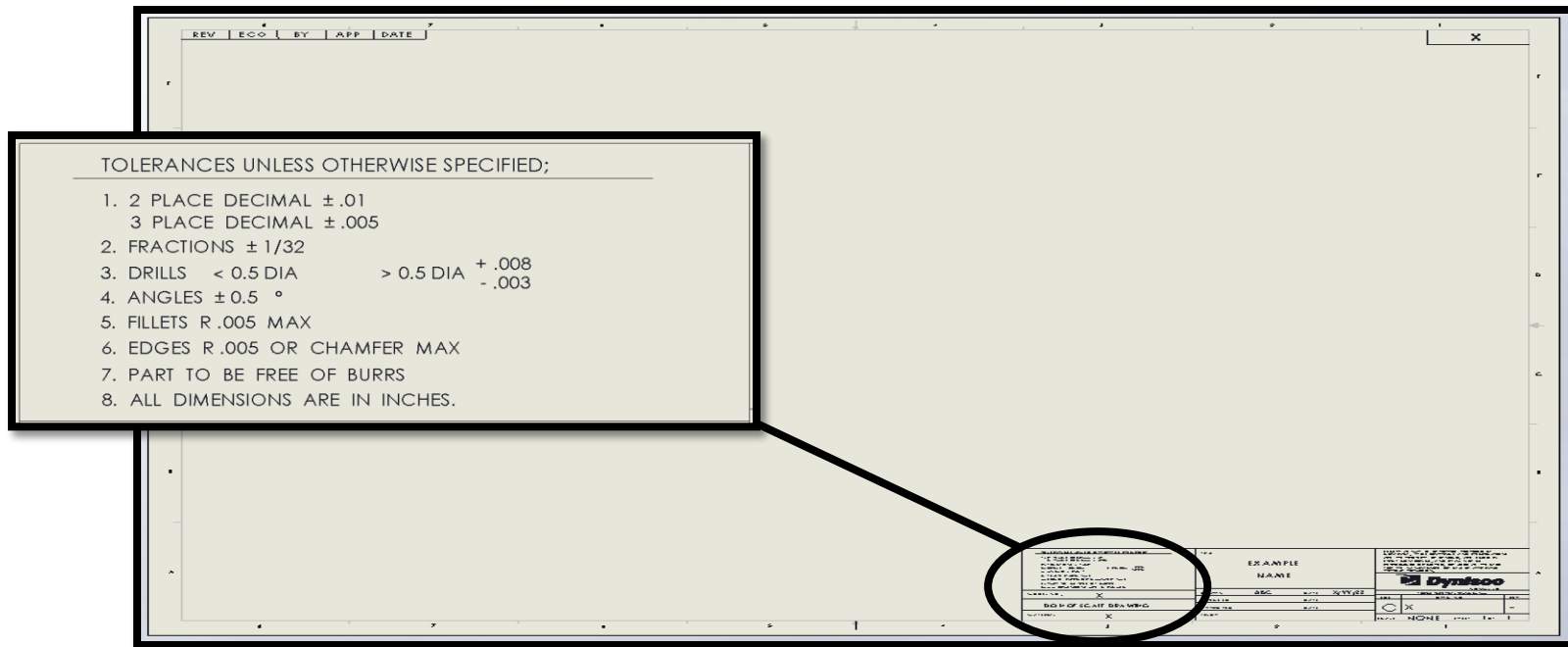
- Modeling makes things easy....too easy?



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

**Supply Chain needs to match supplier capability to design**

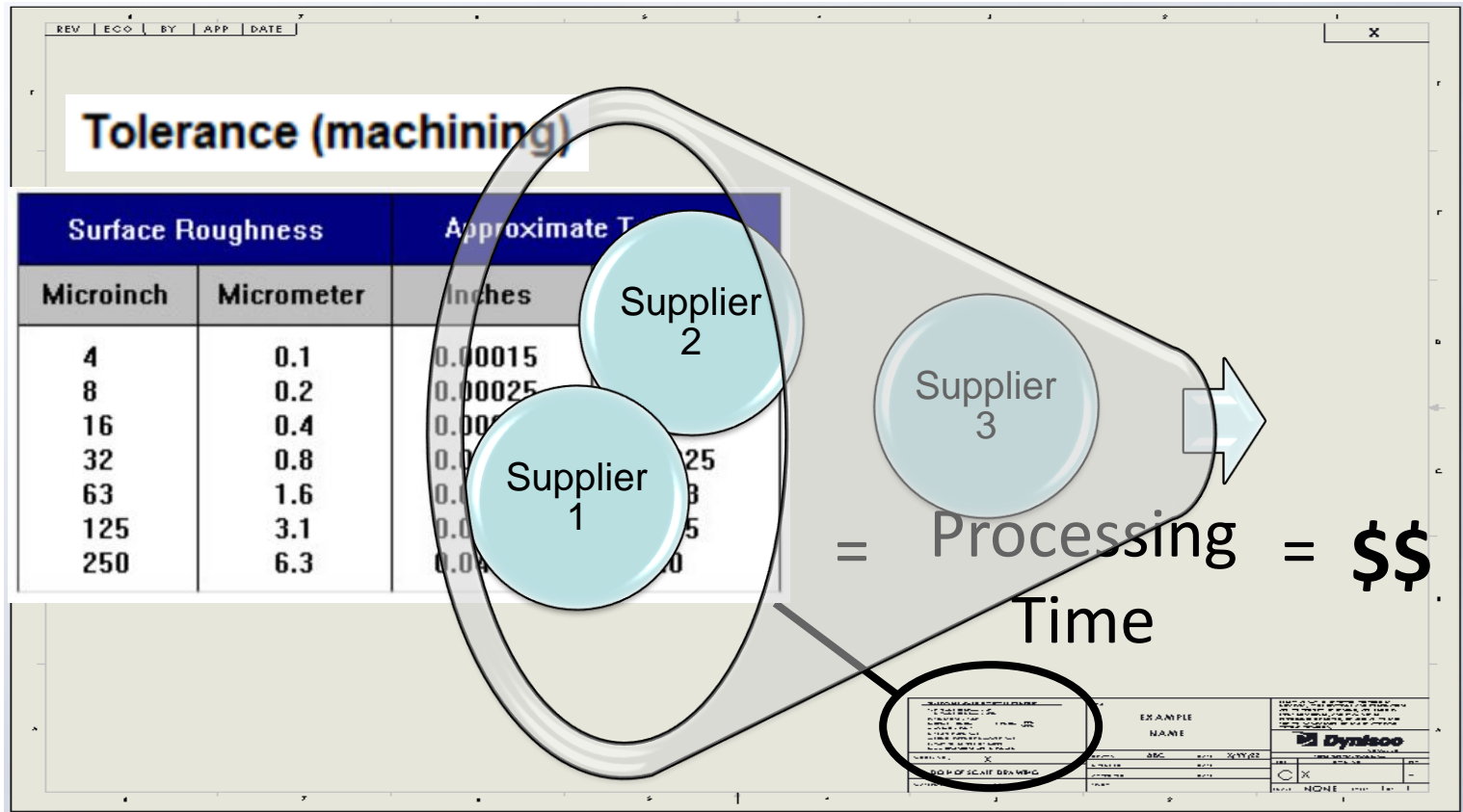
# Design for Manufacture – Cost Drivers



- Specified vendors (Engineering designated)
- Units of measure: Inch vs. Metric
- Metal standards based on geography

**Be aware of design specifications that can drive cost**

# Design for Manufacture – Cost Drivers



Limited Supply Base Funnel

Ensure finishes are aligned to function

# Supply Chain - Transformation

## Vertically Integrated



## Supplier Dependent



Today's businesses are heavily dependent on supply chains

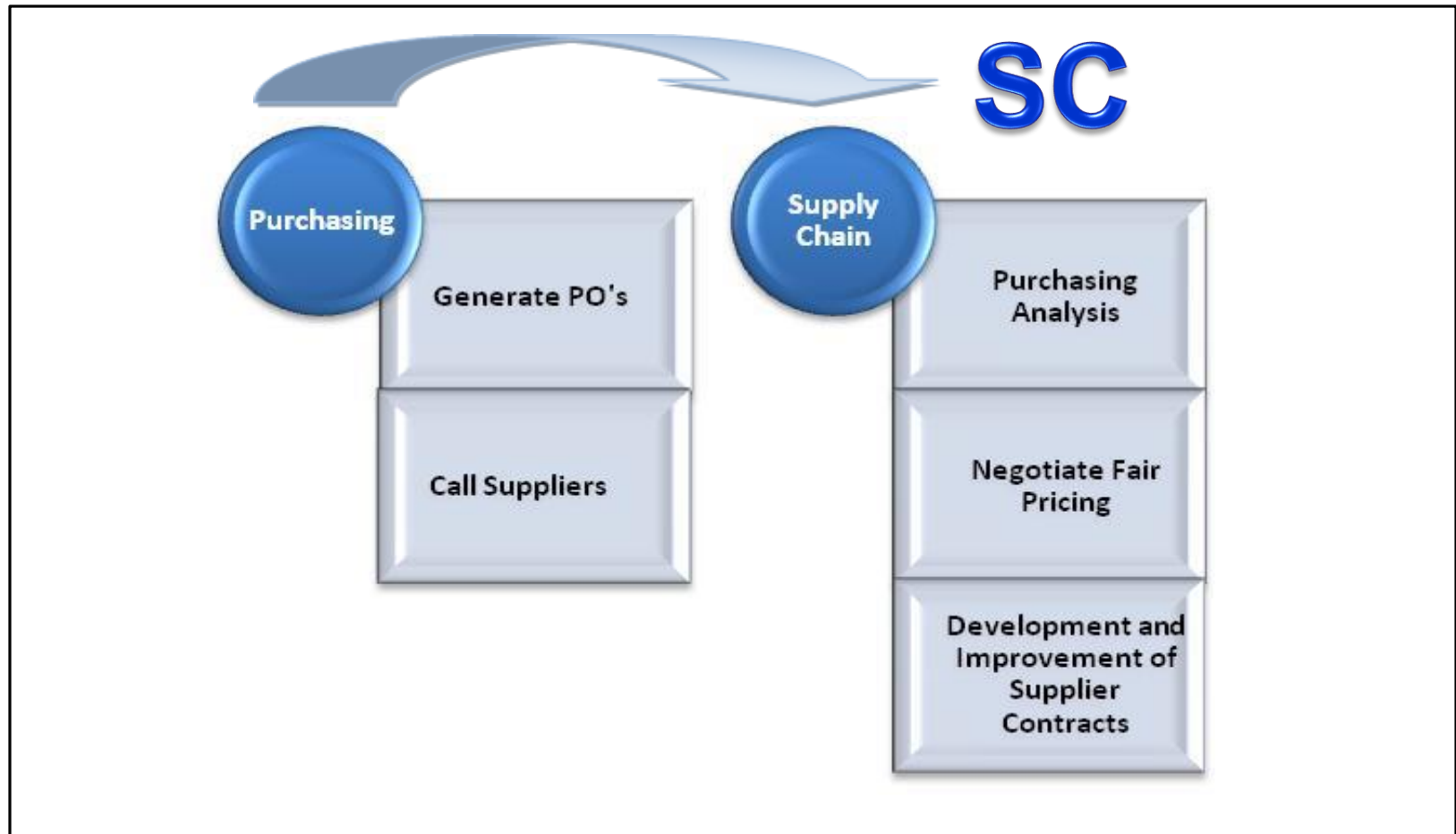
# Supply Chain - Transformation

- Companies are seeking a new / different range of skill sets to support supply chain activities
- Placing more emphasis on supply chain analytics and less on keystrokes



**Achieving more value through data analysis and decisions**

# Supply Chain – Transformation



**Find ways to automate repetitive purchasing transactions**

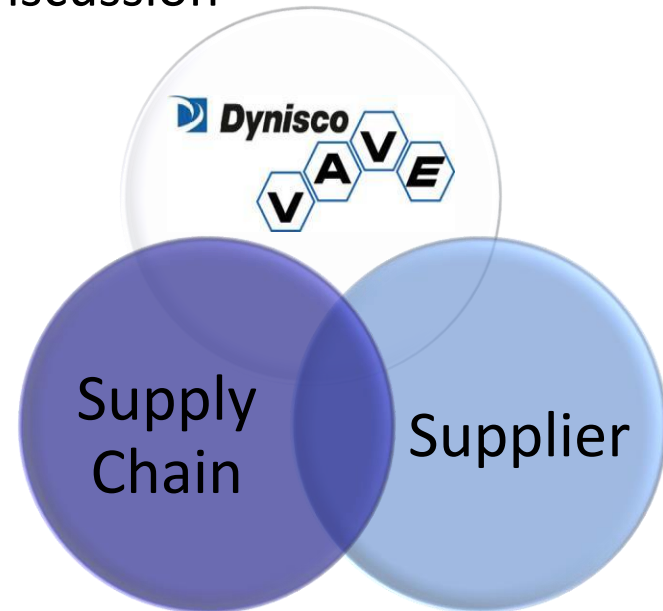


# Supply Chain - Transformation



- Discussion driven by historical information and cost reduction targets
- Very little information regarding mfg processes shared or discussed
- Primary communication – RFQs

- Value Add Value Engineering group supplies additional process information & DFM models
- Primary communication – Supplier Discussion



**DFM data stimulates improved communications**

# Supply Chain - Transformation



C18  
MINNEAPOLIS AUTO AUCTION  
3001 JEFFERSON HWY  
MAPLE GROVE, MN 55126

MSRP \$41,295.00 116 1212063

**QUALITY USED VEHICLE**

**FORD MERCURY LINCOLN**

**STANDARD**  
THE FEATURES LISTED BELOW REPRESENT  
**SAFETY/SECURITY**

- DRIVER & PASS SRS AIR BAGS
- 4-WHL DISC ANTI-LOCK BRAKES
- SIDE DOOR INTRUSION BEAM
- FRONT/REAR CRUMPLE ZONES
- ANTI-THEFT SYSTEM
- REMOTE KEYLESS/ILLUMINATED ENTRY SYSTEM
- CORNERING LAMPS
- 5-MPH BUMPERS

**FUNCTIONAL**

- DELAYED ACCESSORY POWER
- REAR AIR SUSPENSION
- AIR COND W/AUTO TEMP
- SPEED CONTROL (FINGERTIP)
- POWER WINDOWS W/EXPRS DOWN
- STEERING WHEEL W/AUDIO & CLIMATE CONTROLS
- UNIVERSAL GARAGE DR OPENER
- 109,090 MILE TUNE UP INTVL

**VEHICLE DESCRIPTION**

**USED VEHICLE - F**  
**SELLING PRICE**

**DEALER INSTALLED OPTIONS**

**EXTENDED SERVICE PLAN**

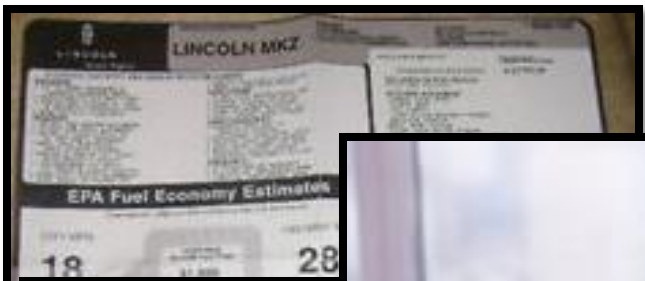
**TOTAL**

**VEHICLE PREVIOUS USE - CHECK ONLY ONE.**  
 \_\_\_ Company Service \_\_\_ Red Carpet Lease Termination  
 \_\_\_ Test or Transit Damage Vehicle  
 \_\_\_ Dealer Daily Rental \_\_\_ Rental Repurchase  
 \_\_\_ Manufacturer Buy Back  
 See Form FPD-0500 / FPD-0545  
 For Additional Information  
 \_\_\_ Other, Ask Selling Dealer for Details



Did I get a fair price ???

# Supply Chain - Transformation



## Fair Purchase Price

Updated weekly, the Kelley Blue Book® Fair Purchase Price shows you what others have been paying for this car recently. It's based on current market conditions like vehicle availability, local demand, and seasonal buying trends.

Kelley Blue Book reports on actual transactions based on arbitrary formulas.

## Monthly Payment

at 1.99% interest rate for 60

Without	\$36,490
	\$0
With	\$36,490
	\$2,281
	\$946
	\$0
	\$39,717
	-\$7,298
	\$32,419
Monthly Payment (for 60 mos)	\$568/mo



**Problem Car Alert Search Results**  
**BUYER BEWARE!** Here's just

Year	Make/Model	V
2008	Cadillac Sts	
1999	Toyota Landcruiser	
2004	Ford Ranger	
2008	Ford Taurus	
1993	Ford Escort	
2006	Dodge Stratus	
2005	Jeep Liberty	
2006	Jeep Commander	
2003	Ford F Series Truck	
2002	Nissan Altima	
2008	Saab 9-3	

**IMPORTANT:** These are just a few examples. Your car is not one of them -- [Order CARFAX Reports](#) now!

**Better Information ... Better Negotiations**

# Supply Chain – Transformation



Part Cost History

Standard Cost / Current Cost

Vendor History

Cost results, \$	Previous	Current
material	0.62	0.62
setup	0.44	0.44
process	2.66	2.66
rejects	0.03	0.03
piece part	3.74	3.74
tooling	0.00	0.00
total	3.74	3.74
Tooling investment	0	0


- Material Cost
- Set up costs
- Process Options
- Quality
- Tooling
- Profit

DFM brings discussion from the past to present

- In the early stages of DFM implementation, there are initial barriers to overcome




Are we going to use this data to challenge our suppliers?



Are we going to tell them how to make our parts?



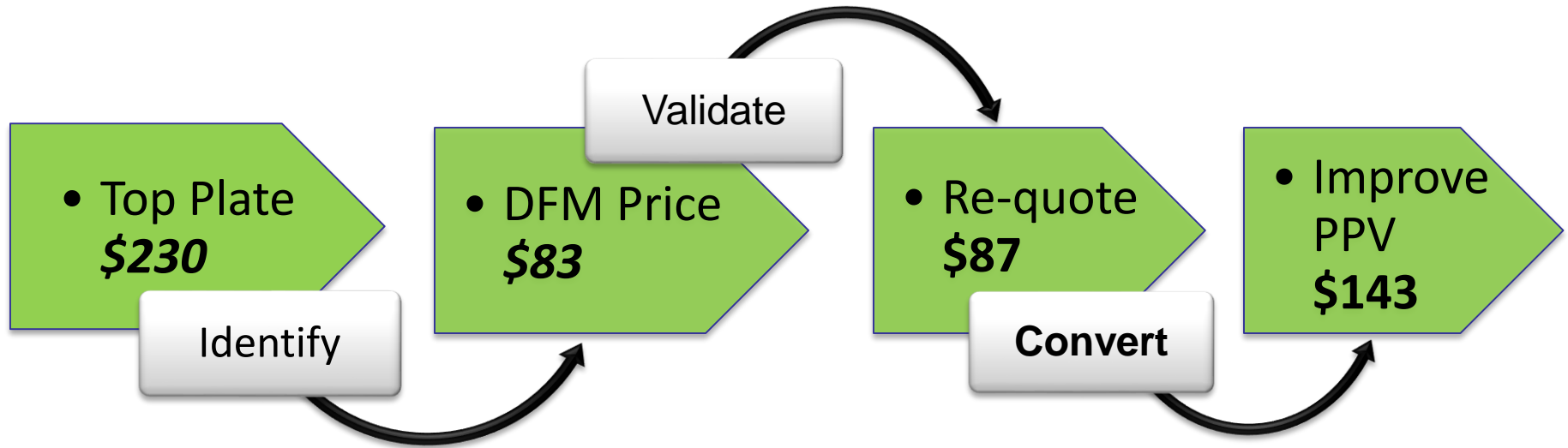
Are we going to dictate their profit margins?



I don't want to burn any bridges!

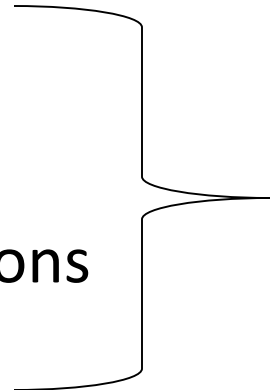
**Minimizing negative perceptions is key**

# Supply Chain - DFM Process Model



- **Convert** – Engage suppliers

**Move the focus from internal to external**

- Start with a parts list
  - Performed DFM analysis
  - Review design and print specifications
  - Obtain understanding on pricing
- 
- Supply Chain Homework
- 

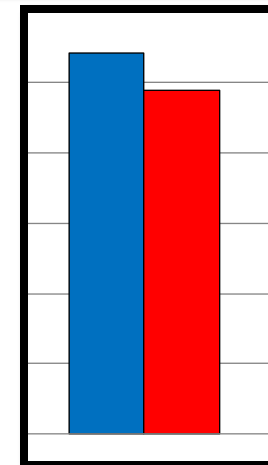
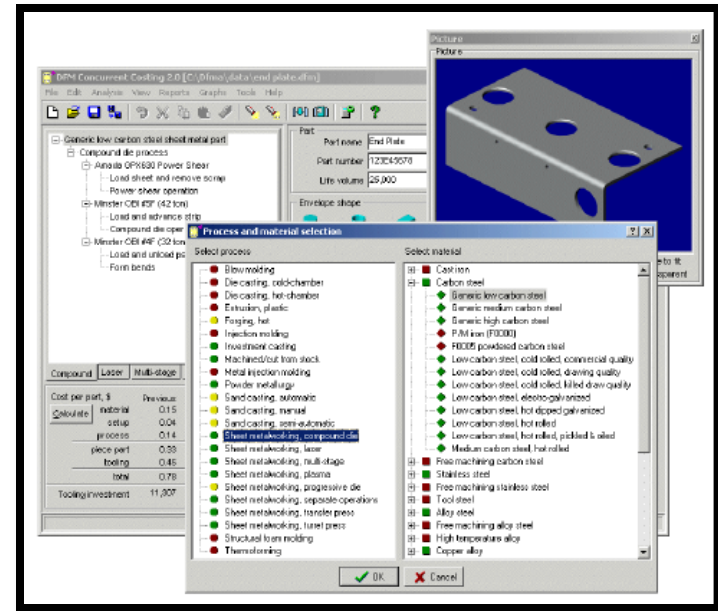
## Suppliers (Initial responses)

- “Material price went up”
- We have held the price for “X” amount of time
- Analysis apprehension...validity (\$\$\$)
- **Red Flag:** Quote / Price is a “nice, round number” (**\$230**) and a large gap exists when compared to DFM price

# Supply Chain – Supplier Engagement



- 150+ parts
- DFM's completed
- Meeting Established
- Approach:
  - Non-adversarial
  - Discuss cost drivers / processes
  - Review DFM of “their” part(s)
  - Solicit supplier suggestions
  - Convey our message



Std. vs. DFM \$

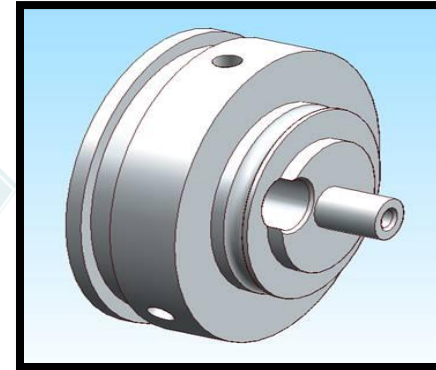
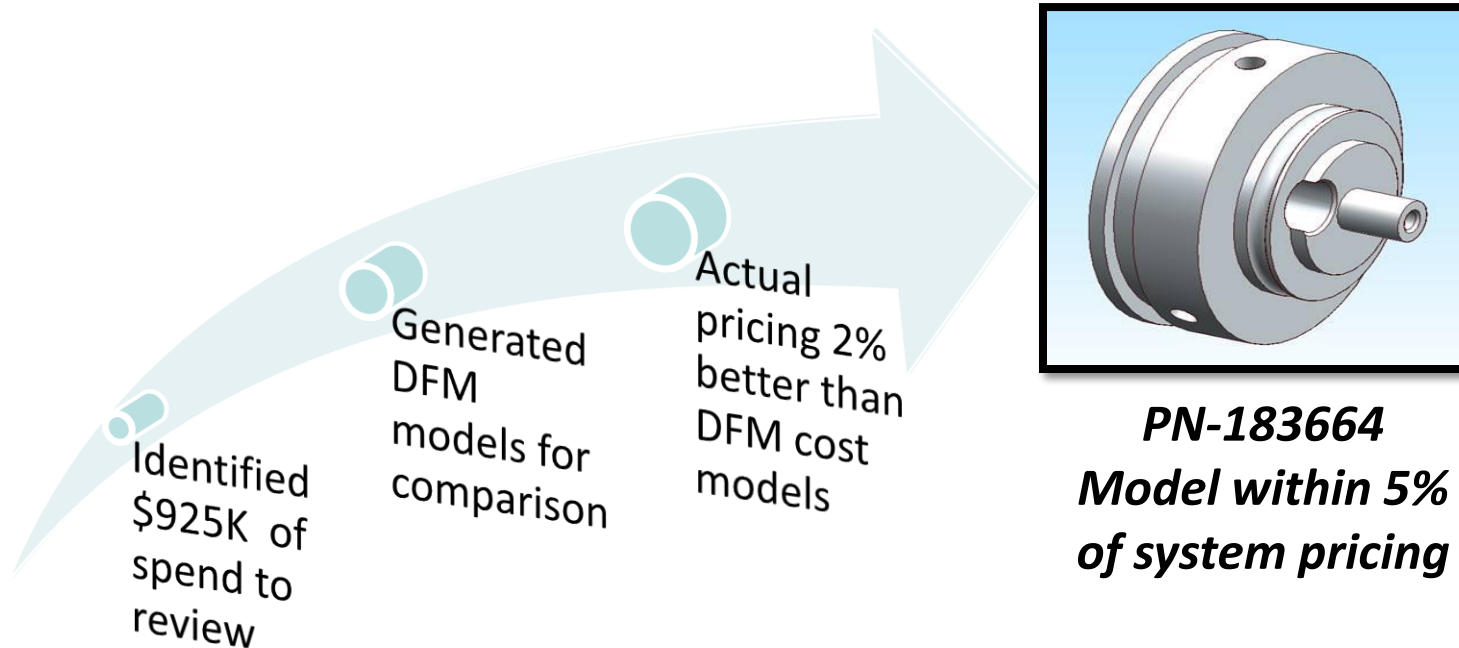


# Supply Chain - Results

- Over last few year's VMAS businesses have identified, modeled and evaluated over **\$4.1M** in spend
- Over **\$685K** or 17% of the spend was highlighted as savings opportunities
- Opportunities included modifications to designs, potential material substitutions, process changes and strait forward cost reductions (*being charged to much*)



# Supply Chain - Results



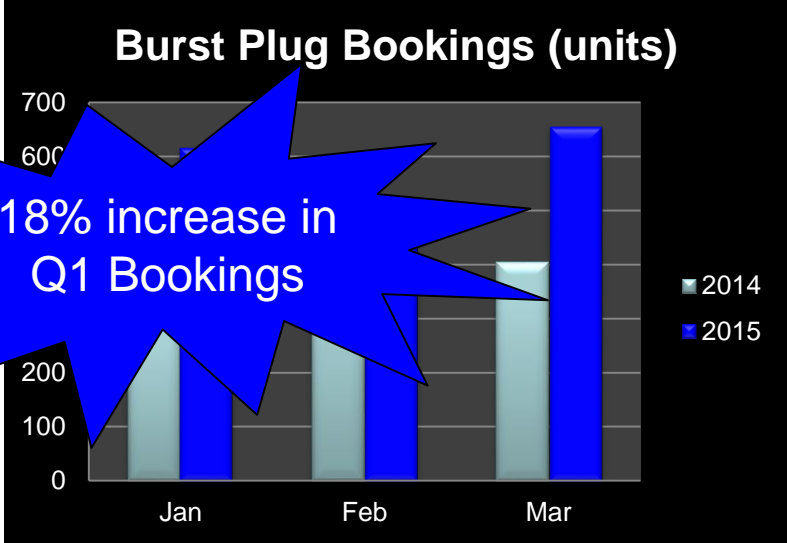
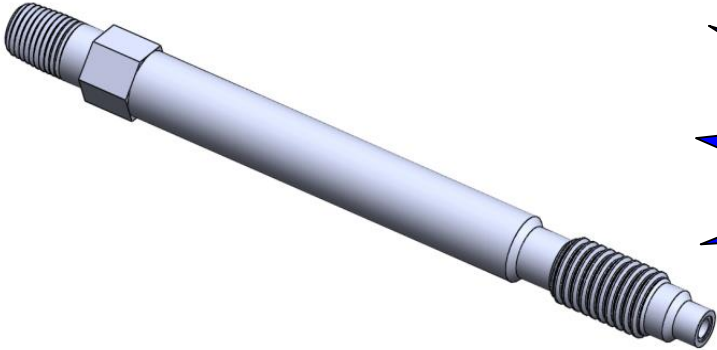
***PN-183664***  
***Model within 5% of system pricing***

**Validated that SC was achieving fair pricing**

# Supply Chain - Results



<u>Burst plug Configuration</u>	<u>Usage</u>	<u>Lot size</u>	<u>Std</u>	<u>DFM Pricing</u>	<u>Actual Pricing</u>
1	875	100	\$	-30%	-26%
2	6	6	\$	-81%	-79%
3	1	1	\$	-41%	-46%



**DFM played key role in increased bookings**

# Supply Chain - Closing Remarks



- DFM is not specifically designed for cost reduction alone
- It can be utilized to validate pricing in addition to negotiating better pricing based on manufacturing analytics
- DFM helps supply chain organizations move forward and improves the value that individuals can bring to the business
- DFM has been a key tool within Dynisco to help develop better supplier relations and weed out suppliers whom we don't want to do business with.

**Suppliers participating in process have seen more business**

**Questions on DFMA Integration  
into Supply Chain  
and  
Operations?**

**Thank you**