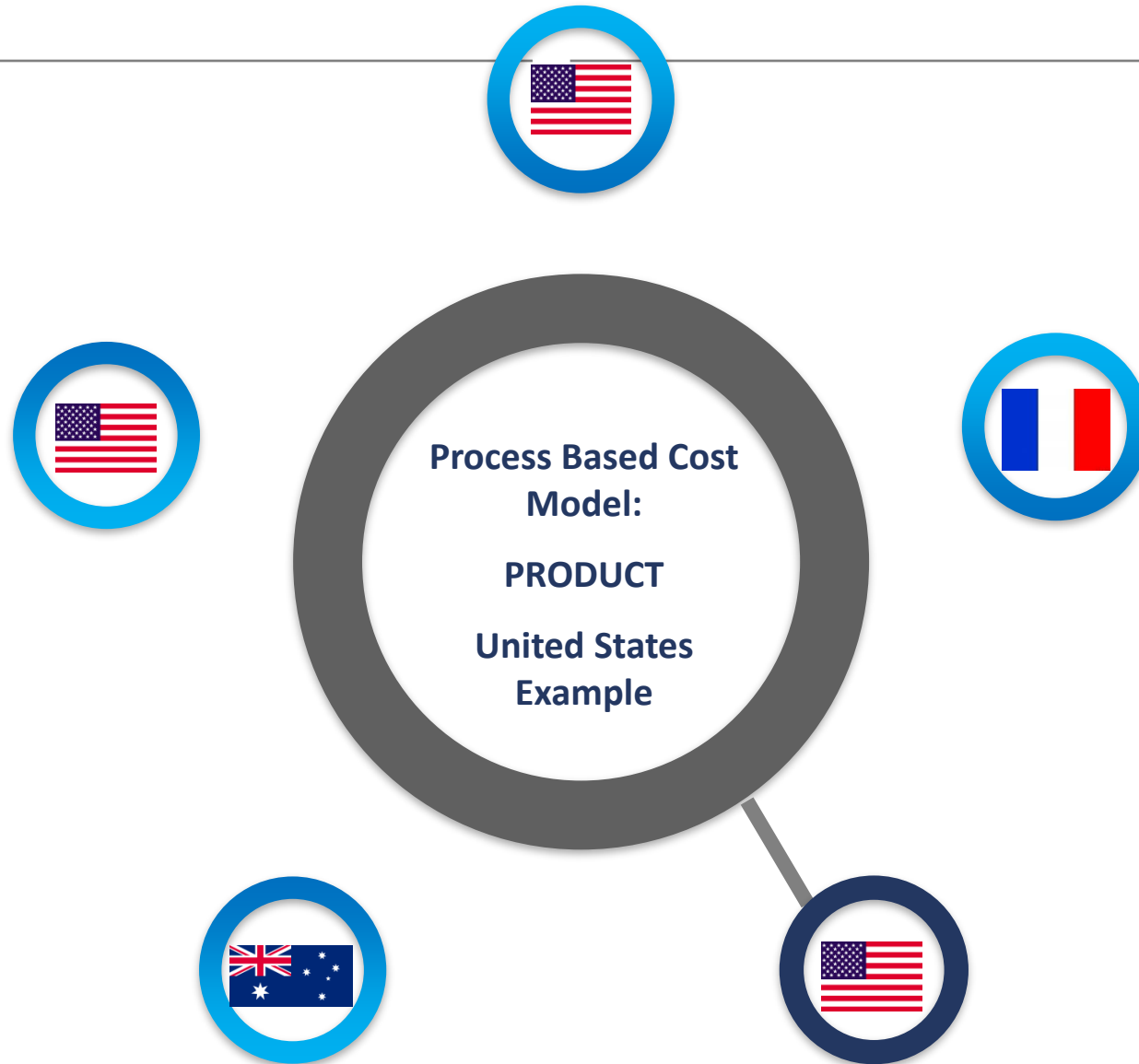


COST MODEL EXAMPLES



Scenario: Plastic Housing Example

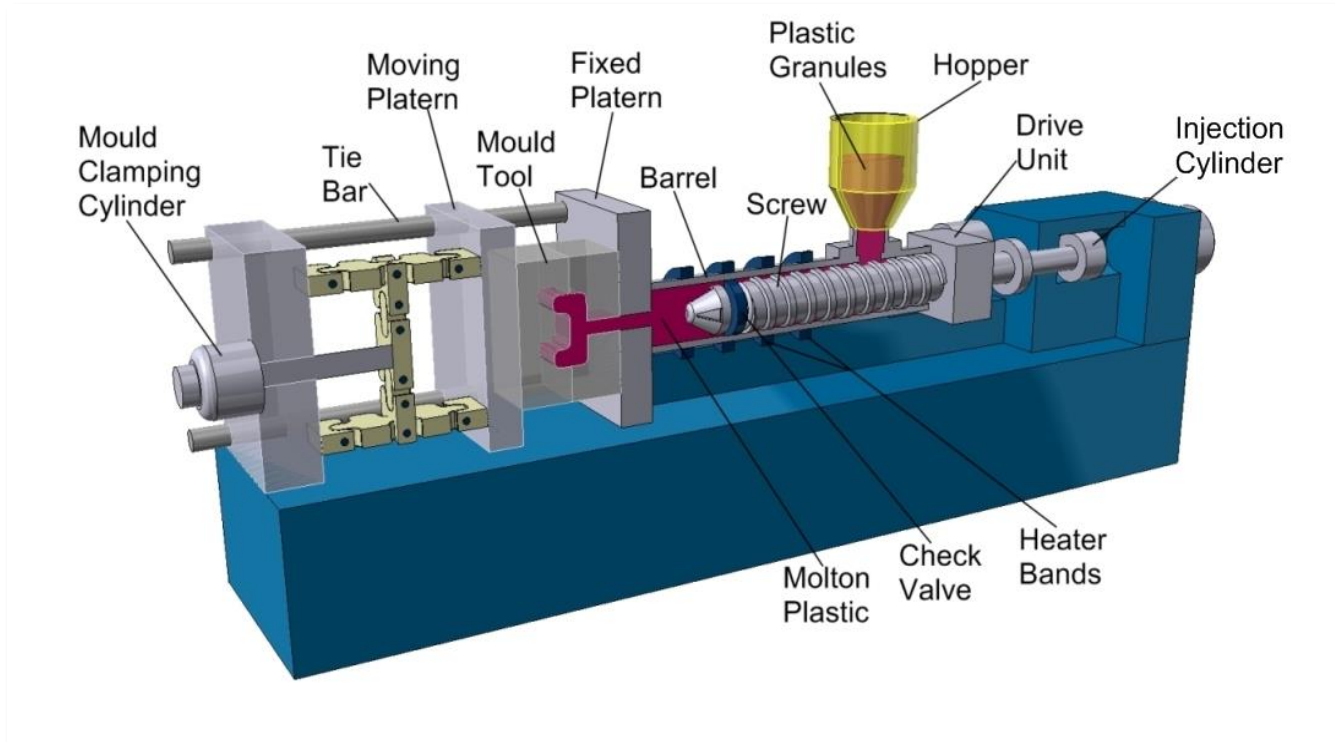
- Company XYZ is a manufacturer of consumer products in the US. It is currently evaluating a proposal for a plastic housing required for one of its products.
- The incumbent supplier, located in Peoria, IL, specializes in injection molding. The supplier has a strong financial standing and current revenue of \$1.85 billion.
- The supplier has proposed a price of **\$2.50 per plastic housing part** requiring **1.1lbs of medium impact abs resin**.
- The process calls for the use of a **600 ton injection molding press** that typically produces **120 parts per hour**.
- The supply manager would like you to prepare a process “should” cost model in order to be prepared for the upcoming negotiation.



Understand the process

Process consists of four distinct operations (600 ton injection molder):

1. Melting the resin (**Injection Medium impact ABS**)
2. Injection of the resin into the closed mold
3. Cooling the resin inside the closed mold
4. Opening the mold and ejecting the molded part



PART WEIGHT

1.1 lbs resin / part

Source: Specification

CYCLE TIME

30 seconds / part

Source: Subject matter expert & site visit

Determine key drivers for each cost element

Cost	Cost Drivers	Data Source/s
Direct Material	Raw material price, weight (quantity), yield	www.ptonline.com , spec, IMM Benchmarking report
Direct Labor	Labor rate, labor hours, yield	www.salary.com , subject matter experts, site visit
Manufacturing Overhead	Loaded machine hourly rate, machine hours, yield	www.plasticstechnology.com , subject matter experts, site visit
GSA & other exp and Profit before tax	Industry ratios	RMA- Annual Statement Studies, Company Financial Reports, Reuters, etc.

$$\text{Direct Material} = \frac{\$}{\text{lb}} * \frac{\# \text{ lbs}}{\text{part}} * \frac{\# \text{ parts}}{\# \text{ good parts}}$$

resin price *weight* *yield*

Obtain information to quantify key drivers

Information for Material cost driver: Resin Price

Market Prices Effective Mid-January 2022

Resin Grade	¢/lb
POLYETHYLENE (railcar)	
LDPE, LINER	94-96
LLDPE BUTENE, FILM	83-85
NYMEX 'FINANCIAL' FUTURES	63
FEBRUARY	58
HDPE, G-P INJECTION	87-89
HDPE, BLOW MOLDING	82-84
NYMEX 'FINANCIAL' FUTURES	57
FEBRUARY	55
HDPE, HMW FILM	87-89
POLYPROPYLENE (railcar)	
G-P HOMOPOLYMER, INJECTION	112-114
NYMEX 'FINANCIAL' FUTURES	96
FEBRUARY	70
IMPACT COPOLYMER	115-117
POLYSTYRENE (railcar)	
G-P CRYSTAL	105-108
HIPS	113-117
PVC RESIN (railcar)	
G-P HOMOPOLYMER	102-104
PIPE GRADE	104-106
PET (truckload)	
U.S. BOTTLE GRADE	78.5-80.5

*Prices in US cents per pound

Obtain information to quantify key drivers

Calculation for Material cost drivers

$$\text{Direct Material} = \frac{\$0.88}{\text{lb}} * \frac{1.1 \text{ lbs}}{\text{part}} * \frac{100 \text{ parts}}{99 \text{ good parts}}$$

Driver Name

resin price

weight (quantity)

yield

Source:

Plastic Technology website

specification

IMM Study

DIRECT MATERIAL = \$0.98

Production Yield (from secondary research)

Production data (Yield)

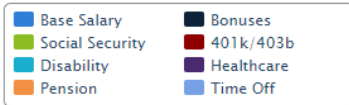
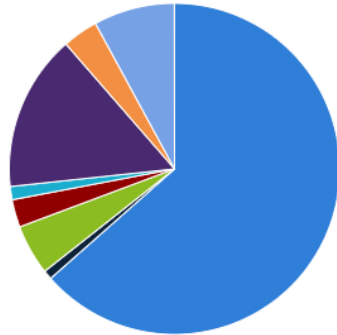
..... Scrap, customer returns, and scheduled ship date on time largely remain a testimony to the participants' efficiency. **Scrap generally runs 1 to 2.5 percent, averaging 2.0 percent.** Returns have stayed below .5 percent for the overwhelming majority of the report, averaging .30 percent, and the on-time ship date averaged 95.7 percent over the program's five years.....

** Yield of 99% is used for material costs and 98% for labor costs.

Obtain information to quantify key drivers

Information for Labor cost drivers

Machine Operator 1 Peoria, IL



Core Compensation ⓘ

	Median	% of Total
Base Salary	\$34,674	63.5%
Bonus	\$486	0.9%

Value of Benefits ⓘ

	Median	% of Total
Social Security	\$2,690	4.9%
401K/403B	\$1,477	2.7%
Disability	\$703	1.3%
Healthcare	\$8,352	15.3%
Pension	\$1,899	3.5%
Time Off	\$4,327	7.9%
Total Compensation	\$54,608	100%

Calculation for hours per year and hourly rate:

Assumes 7.9% time off (salary.com) and 15% machine downtime

Total non-productive time = 22.9%

Productive time = 77.1%

$$= 2,080 * 77.1\%$$

$$= 1,600 \text{ hours per year}$$

Hourly rate = 35,160/1,600

$$= \mathbf{\$21.98}$$

CYCLE TIME = 30 seconds / part

YIELD = 98%

Source: From process map / site visit

*IMM Study: **Yield of 99% is used for material costs and 98% for labor and machine costs.*

Obtain information to quantify key drivers

Calculation for Labor cost drivers

Direct Labor =	$\frac{\$21.98}{\text{hr}}$	*	$\frac{1 \text{ hr}}{3600 \text{ seconds}}$	*	$\frac{30 \text{ seconds}}{\text{part}}$	*	$\frac{100 \text{ parts}}{98 \text{ good parts}}$
<i>Driver Name =</i>	<i>wage rate</i>		<i>time conversion rate</i>		<i>cycle time</i>		<i>labor yield</i>
Source =	Salary.com		calculation		Subject matter expert		IMM Study

DIRECT LABOR = \$0.19

Obtain information to quantify key drivers

Calculation for Manufacturing Overhead

- 1 Apply MOH / DL ratio
from a: Industry Cost Profile **OR**
b: Zero Base Pricing™ book

or

- 2 Find a MOH \$ / hr Benchmark

Obtain information to quantify key drivers

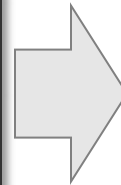
1a

Apply MOH / DL ratio to calculate MOH value

All Other Plastics Product Manufacturing

NAICS: 326199

Element	%
Direct Material	47.4%
Direct Labor	12.0%
Manufacturing Overhead	19.2%
<i>Cost of Goods Sold</i>	<i>78.5%</i>
GSA & Other Expenses	12.0%
Profit Before Taxes	9.5%
PRICE	100%



$$\frac{19.2\%}{12.0\%} = 1.60$$

IF CALCULATED DIRECT LABOR ≈ \$0.19/
unit

THEN MOH ≈ \$0.19/ unit * 1.60 ≈
\$0.30/ unit

Obtain information to quantify key drivers

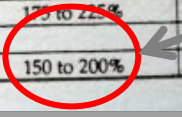
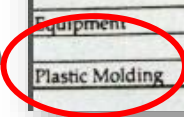
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Apply MOH / DL ratio from Industry Data

OVERHEAD AS A PERCENT OF DIRECT LABOR			
	Manual Hand Type Operations One Stage Machine Operations	Semi-Automated Process Operations & Techniques Multi-Stage Machine Operations	Automated Facilities Processes N.C.M. Computer Systems
Piece Parts	100%	175 to 200%	250 to 300%
Sheet Metal Stamping Forming Blanking Drilling Other	125%	150 to 200%	250 to 350%
Casting	125%	150 to 250%	275 to 400%
Assembly (Apparatus)	100%	100 to 200%	225 to 400%
Components	-	175 to 200%	250 to 300%
Equipment	125%	175 to 225%	250 to 300%
Plastic Molding	-	150 to 200%	225 to 300%

Overhead as a % of Direct Labor =
150 to 200%

Plastic Molding



Obtain information to quantify key drivers

2

FIND A MOH \$ / hr BENCHMARK

Custom Injection Molders' Machine-Hour Rates With Operator And Profit Margin Included^a (85 Plants)
DOLLARS PER HOUR, 2ND QUARTER 2014

Tonnage Range	\$hr	<50	50-99	100-299	300-499	500-749	750-999	1000-1499	1500-1999	2000-2999	3000+	Index ^b
Northeast	AVG	\$62.16	\$58.03	\$65.60	\$65.11	\$86.99	\$125.52	\$125.52	\$125.52	-	-	
ME, NH, VT, MA, CT, RI, NY, NJ, PA	HI	86.00	86.00	101.00	101.00	87.41	130.44	130.00				
	LO	40.00	37.70	41.23	42.41	86.41	120.59	120.00				
Southeast	AVG	\$37.95	\$45.73	\$48.21	\$63.82	\$74.72	\$82.37	\$112.59	\$112.59			
DE, DC, FL, GA, MD, NC, SC, VA, WV	HI	50.00	59.94	72.22	74.69	80.85	83.64	121.20				
	LO	30.67	33.33	33.33	58.90	69.70	81.10	105.50				
North Central	AVG	\$39.43	\$40.93	\$48.75	\$56.33	\$76.40	\$112.76	\$117.00	\$117.00			
IL, IN, MI, OH, WI, IA, KS, MN, MO, NE, ND, SD	HI	77.77	83.33	111.10	111.10	130.00	181.59	153.00				
	LO	9.42	12.00	12.96	15.00	31.37	53.01	110.00				
South Central	AVG	\$35.75	\$32.59	\$45.49	\$54.60	\$74.11	\$83.49	\$111.00	\$111.00			
AL, KY, MS, TN, AR, LA, OK, TX	HI	44.44	55.55	67.92	67.92	94.44	83.64	114.00				
	LO	20.91	24.00	31.00	44.76	63.00	83.33	107.00				
WEST	AVG	\$34.07	\$54.24	\$58.81	\$70.97	\$96.99	-	-	-	-	-	
CA, OR, WA, AK, HI, AZ, CO, ID, MT, NV, NM, UT, WY	HI	68.00	76.57	89.53	100.13	130.00	-	-	-	-	-	
	LO	24.95	24.95	25.79	35.34	72.22	-	-	-	-	-	
National Average^c		\$43.73	\$47.18	\$54.53	\$61.64	\$82.21	\$109.38	\$117.00				

^aAn adjustment factor is used where data did not already include profit

Profit & Labor In Hourly Rates

Deduct these amounts^a from the figures in the large table below to arrive at rates without profit, operator, or both.

Press Tonnage	Without Profit	Without Operator	Without Either
<100	13.0%	18.8%	33.4%
100-299	9.1%	13.8%	27.6%
300-499	8.1%	12.4%	24.1%
500-749	6.3%	10.6%	19.8%
750-999	5.7%	13.6%	19.4%
1000+	9.0%	13.5%	18.5%

^a Cumulative national averages over many surveys.

Machine hourly rate:
 → 130.00 * (1-0.198)
 = **\$104.26**

CUSTOM INJECTION MOLDERS' MACHINE-HOUR RATES

Source: www.plasticstechnology.com

Obtain information to quantify key drivers

Calculation of Manufacturing Overhead costs

$$\text{Mfg Overhead} = \frac{\$104.26}{\text{hr}} * \frac{1 \text{ hr}}{3600 \text{ seconds}} * \frac{30 \text{ seconds}}{\text{part}} * \frac{100 \text{ parts}}{98 \text{ good parts}}$$

Driver Name = *machine rate* *time conversion rate* *cycle time* *labor yield*

Source = Plastics Technology calculation Subject matter expert IMM Study

MANUFACTURING OVERHEAD = \$0.89

Obtain information to quantify key drivers

Element	Calculation / Result
Direct Material	\$0.98
Direct Labor	\$0.19
Manufacturing Overhead *	\$0.30
<i>Cost of Goods Sold</i>	<i>\$1.47</i>
GSA & Other Expenses	% GSA * Should Cost
Profit Before Taxes	% PBT * Should Cost
SHOULD COST	COGS \$ / COGS %

NEXT
STEP

Use RMA data to develop the industry cost profile

326199 - Plastic Products Manufacturers

View related industries: 326199 - All Other Plastics Product Manufacturing | Year: 2020-21 | Region: National - All Regions | [Print](#) | [Export](#)

	0-1MM	1-3MM	3-5MM	5-10MM	10-25MM	25MM and Over	All
FRB Assets							
FRB History							
FRB Sales							
IDP Assets							
IDP History							
IDP Sales							
All Other Non-Current Liabilities	7.7	5.2	7.3	4.4	7.3	6.9	6.9
Net Worth	28.7	51.3	31.5	44.6	44.5	41.4	41.4
Total Liabilities & Net Worth	100.0	100.0	100.0	100.0	100.0	100.0	100.0
INCOME DATA							
Net Sales	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gross Profit	44.4	35.3	32.0	27.9	21.5	27.4	27.4
Operating Expenses	40.2	31.7	26.8	21.4	16.5	22.1	22.1
Operating Profit	4.2	3.6	5.2	6.6	5.0	5.3	5.3
All Other Expenses (net)	1.1	.3	.9	.9	1.5	1.1	1.1
Profit Before Taxes	3.0	3.3	4.3	5.6	3.5	4.1	4.1
EBITDA	7.8	7.1	8.3	9.8	9.5	9.0	9.0
RATIOS							

Use the industry cost profile to determine the should cost and calculate the remaining cost elements

Element	%	Calculation
<i>Cost of Goods Sold</i>	78.5%	$100\% - 21.5\%$; RMA Sales – Gross Profit
GSA & Other Expenses	18.0%	$100\% - \text{COGS} - \text{PBT}$
Profit Before Taxes	3.5%	RMA Profit before taxes
SHOULD COST	100%	

Element	\$	Calculation / Result
Direct Material	\$0.98	Calculated \$
Direct Labor	\$0.19	Calculated \$
Manufacturing Overhead	\$0.30	Calculated \$
<i>Cost of Goods Sold</i>	<i>\$1.47</i>	$\$ \text{DM} + \$ \text{DL} + \$ \text{MOH}$
GSA & Other Expenses	\$0.34	$\$1.87 * 0.18$
Profit Before Taxes	\$0.06	$\$1.87 * 0.035$
SHOULD COST	\$1.87	$\\$1.47 / 0.785$

Validate model with market/supplier information

Should Cost Model for Plastic Housing (*figures in \$*):

Element	Should Cost \$	Supplier \$
Direct Material	\$0.98	Validate
Direct Labor	\$0.19	Validate
Manufacturing Overhead	\$0.30	Validate
<i>Cost of Goods Sold</i>	<i>\$1.47</i>	<i>Validate</i>
GSA & Other Expenses	\$0.34	Validate
Profit Before Taxes	\$0.06	Validate
SHOULD COST	\$1.87	\$2.50

Potential savings 33.7%