Drypressing Cost Model
(developed by MIT Materials Systems Lab)

- **A useful example of a Spreadsheet Model**
- **Brief Explanation and Exploration**
- **Used in Optimal Plant Exercises**
- **Available at: ardent.mit.edu/real_options/ MIT/Course Materials/Spreadsheets**

Inputs to Model

- **Blue entries "unprotected" (you can change)**
- **For Exercises, deal with Capacity, Volume**

Total Plant Capacity	15,000,000	parts/year	
Annual Part Production	3,000,000	parts/year	
Operating Days/Year	230	days	
Part Material	0	(0-Al2O3,1-Si3N4)	
Current Material Price	$8.00	$/lb	
Material Price Override	$0.00	$/lb (0-no override)	
Part Weight	0.018	lbs	
Number of Shifts	2		
Part MTBF (relative to steel)	0.80	(1 = steel)	
Dedicated/Non-Dedicated Production	0	(0-ded;1-not ded)	
Cost of Labor	$22.00	$/hr incl benefits	

Model internal features

- **Illustrate innards of a Technical Cost Model**
- **Not needed for Exercise**

Materials Preparation	$88,729
Spray Drying	$0
Isopressing	$239,736
Green Machining	$550,249
Drying	$102,848
Firing	$646,025
Finishing	$1,802,748
Inspection	$206,522
==========	==========
Total Cost of Facilities	$3,636,856
Materials Preparation	99.0%
Spray Drying	100.0%
Isopressing	98.0%
Green Machining	89.0%
Drying	100.0%
Firing	100.0%
Finishing	99.0%
Inspection	97.0%
==========	==========
Total Yield	82.9%

Model Results

- **Cost / part**
- **A function of**
  - **Plant size**
  - **Demand**
- **Why?**

COSTS BY OPERATION		$/piece
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	Material	$0.1941
	Spray Drying	$0.0000
	Isopress	$0.0577
	Green Mach	$0.0779
	Drying	$0.0090
	Firing	$0.0830
	Finishing	$0.4633
	Inspection	$0.0468
	==========	==========
	Total Cost	$0.9318
COSTS BY FACTORS		
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	Materials	$0.2282
	Energy	$0.0292
	Labor	$0.3497
	Capital	$0.2220
	Other	$0.1027
	==========	==========
	Total Cost	$0.9318

Cost/part variations

- **Use Two – Way Data Tables**
- **Economies of Scale – bigger plants produce cheaper -- Use Two – Way Data Tables**

PRODUCT	PLANT SIZE		
0.93	5000000	10000000	15000000
2000000	0.76	1.05	1.28
4000000	0.49	0.64	0.76
6000000	#VALUE!	0.50	0.58
8000000	#VALUE!	0.43	0.49
10000000	#VALUE!	0.39	0.44
12000000	#VALUE!	#VALUE!	0.40
14000000	#VALUE!	#VALUE!	0.38
16000000	#VALUE!	#VALUE!	#VALUE!

Economies of Scale

- **Larger Plants produce cheaper parts**
- **When operating at or near capacity!**

PRODUCT	PLANT SIZE		
0.93	5000000	10000000	15000000
2000000	0.76	1.05	1.28
4000000	**0.49**	0.64	0.76
6000000	#VALUE!	0.50	0.58
8000000	#VALUE!	0.43	0.49
10000000	#VALUE!	**0.39**	0.44
12000000	#VALUE!	#VALUE!	0.40
14000000	#VALUE!	#VALUE!	**0.38**

CAUTION: possible inefficiency!

- **Despite economies of scale when operating at capacity, big plants may be inefficient!**
- **… When fixed costs spread over few parts**

PRODUCT	PLANT SIZE		
0.93	5000000	10000000	15000000
2000000	0.76	1.05	1.28
4000000	**0.49**	**0.64**	**0.76**
6000000	#VALUE!	0.50	0.58
8000000	#VALUE!	0.43	0.49
10000000	#VALUE!	0.39	0.44
12000000	#VALUE!	#VALUE!	0.40
14000000	#VALUE!	#VALUE!	0.38

Summary

- **Drypressing Model is a good example of a spreadsheet model**
- **Realistic picture of important features technical production functions, cost models (better than economist models)**
- **Models may also incorporate optimization (see Satellite model, using MatLab -- later)**