



*Pima  
International  
Leadership  
Conference 2006*

*Looking at  
Reliability from a  
Financial Perspective*

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*Results Oriented*

*Reliability and Maintenance*

*Consulting and Training*



*Selling maintenance to top management*

***Maintenance Managers are in a  
“Budget Jail”.***

***Have a plan.***

***Sell the plan.***

***You will not get much time.***

***Keep it simple.***

***Educate.***

***Sell.***

## *Reasons why portion of maintenance employees increases*

- *Maintenance organizations are driven by costs instead of what drives costs.*
- *“Why do we spend so much money on maintenance when we never have any break downs here?”*
- *The total cost of maintenance is often hidden. (Lost production, increased capital spending, safety, late deliveries)*
- *Good Maintenance cost time and money, bad maintenance cost more of both.*

## *Three ways to reduce maintenance costs*

### **1. Cut costs**

*Short term savings.*

*Long term loss.*

*Valid maintenance work is postponed, not eliminated*

### **2. Maintenance Prevention**

*Alignment, balancing, lubrication, operating practices, filtration...*

### **3. Execute remaining maintenance more efficiently.**

*Identify early, prioritize, plan work, schedule work, execute work, record, Analyze, improve.*

## *Selling Maintenance to Management*

***1. Do not sell maintenance.***

- ***Sell Reliability.***

***2. Do not sell a program.***

- ***Sell a process.***

## *What is Reliability?*

- *Dependability*
- *Consistency*
- *Steadfastness*
- *Trustworthiness*

**“Able to be trusted to do what is expected or has been promised”**

# *Measurements of Reliability*

*Quality Performance x Time Performance x Speed Performance*

$$90\% \times 90\% \times 90\% = 72.9\%$$

Reliability Index  $\frac{\text{MTBPL}}{\text{MPL}}$

MTBPL = Mean Time Between Production Loss  
(Time running/Number of Production Losses)

MPL = Tons Lost/Number of Production Losses

Reliability includes  
Process, Equipment  
and Design.

**Market**

**Reliable Production**

**Process  
Reliability  
-OPERATIONS**

**Equipment  
Reliability  
-MAINTENANCE**

**Engineering/Procurement.  
-LCC, Reliability, Maintainability**

## *Reliability is the revenue side of maintenance*

*Average market price over five years = \$700/unit.*

*Average variable cost over five years = \$450/unit.*

*Contribution = \$250/unit.*

*Production today = 100,000 units/year.*

*Reliability today = 88%*

*Reliability goal = 94%*

*6% = 6,000 units x \$250 contribution = \$1,500,000/year.*

*And lower costs for maintenance, capital spending,*

*Safety, late deliveries.*

## *Total Reliability – Overall Production Reliability (OPR)*

*Reliability performance.  
Today's Happy Islands*

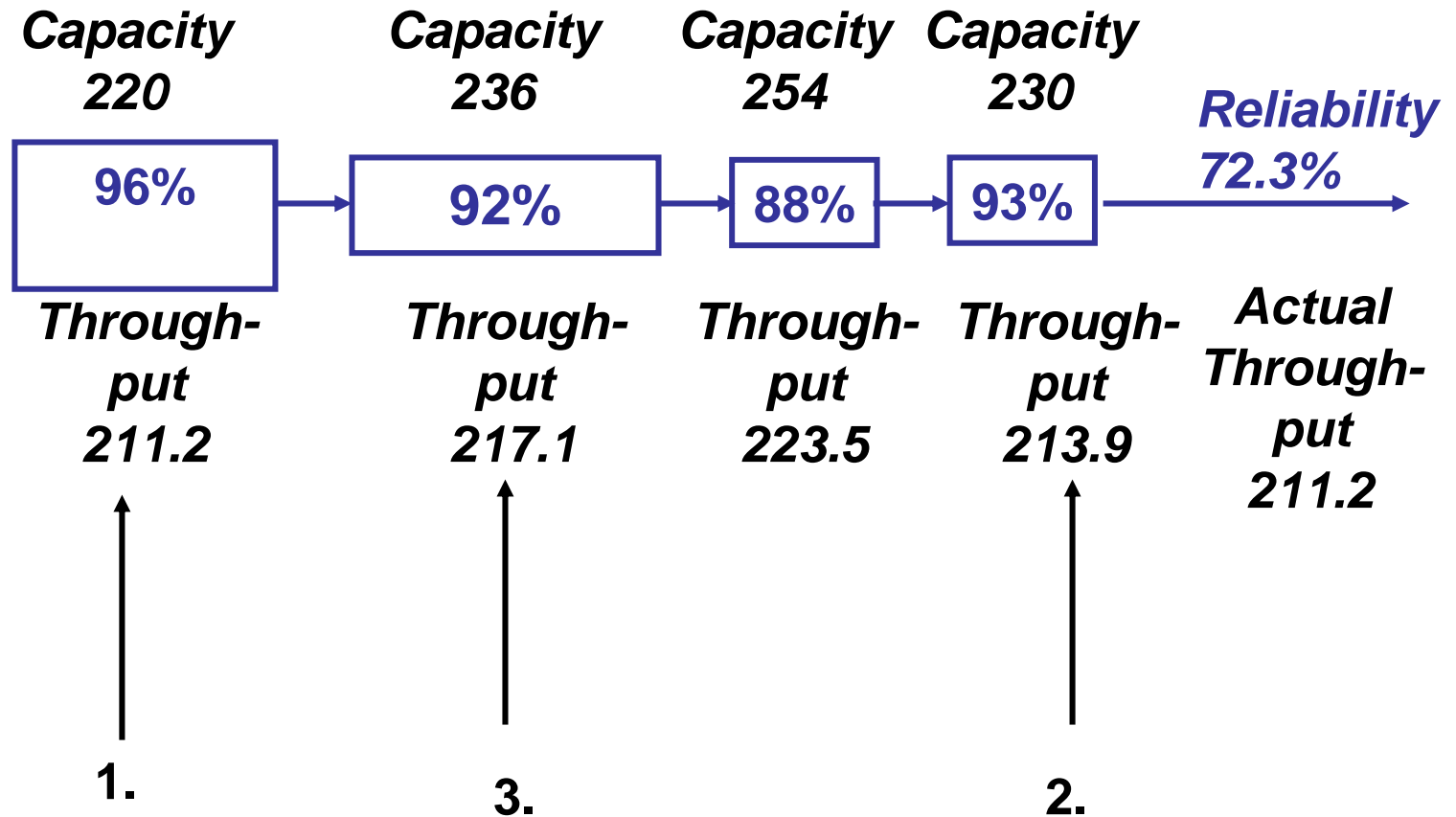
<i>Operations</i>	<i>98.6%</i>
<i>Mechanical</i>	<i>95.4%</i>
<i>Electrical</i>	<i>97.4%</i>
<i>Instrumentation</i>	<i>98.3%</i>
<i>Process Control</i>	<i>98.1%</i>
<i>Other</i>	<i>97.3%</i>

*Reality  
OPR = 86.3%*

*Reliability is a partnership*

***Process Reliability + Equipment Reliability  
= Overall Production Reliability***

*Capacity x Reliability = Quality Production Throughput.*



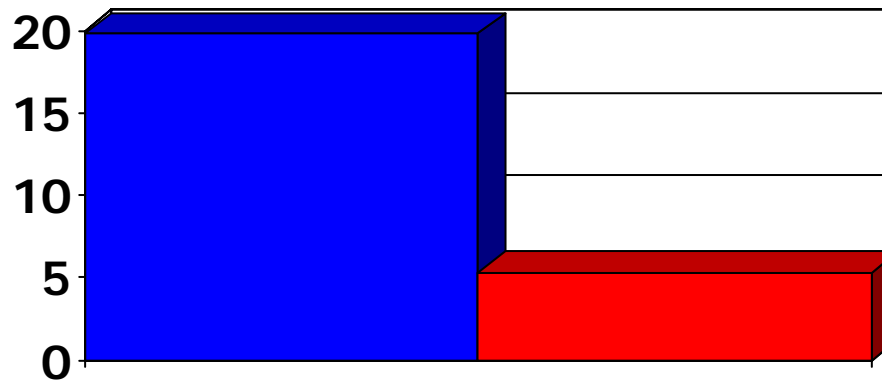
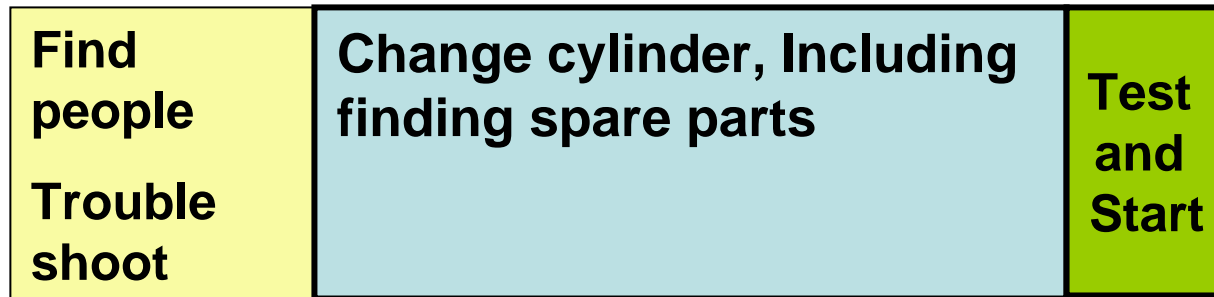
*Examples*

***Use some realistic examples***

## *Unplanned and Unscheduled Example*

<i>Time</i>	<i>Activity</i>	<i>Minutes</i>
11:30	Unloading stops, Operator calls maintenance	2 x 10
11:50	Two mechanics and one electrician arrives	3 x 20
11:50	Trouble shooting starts	
12:40	Finds that pressure OK. Cylinder moves only half way. Cylinder hot.	3 x 50
12:50	Decides to change cylinder because of internal leak. Calls store to find out if they have a spare cylinder. Name plate missing. Equipment record is missing data on type of cylinder. Store sends three possible choices of cylinders Start disconnecting cylinder after locking out hydraulic system.	5 x 40
13:30	One more mechanic is called to get the right tools including rigging tools.	
14:45	Cylinder removed	4 x 75
16:10	New cylinder in place	4 x 85
16:50	Unlock, remove air from system, start up and test completed	4 x 30
<b>Time Down</b>	<b>5 Hrs and 20 Minutes</b>	
	<b>Maintenance Hours 19 Hrs and 50 Minutes</b>	

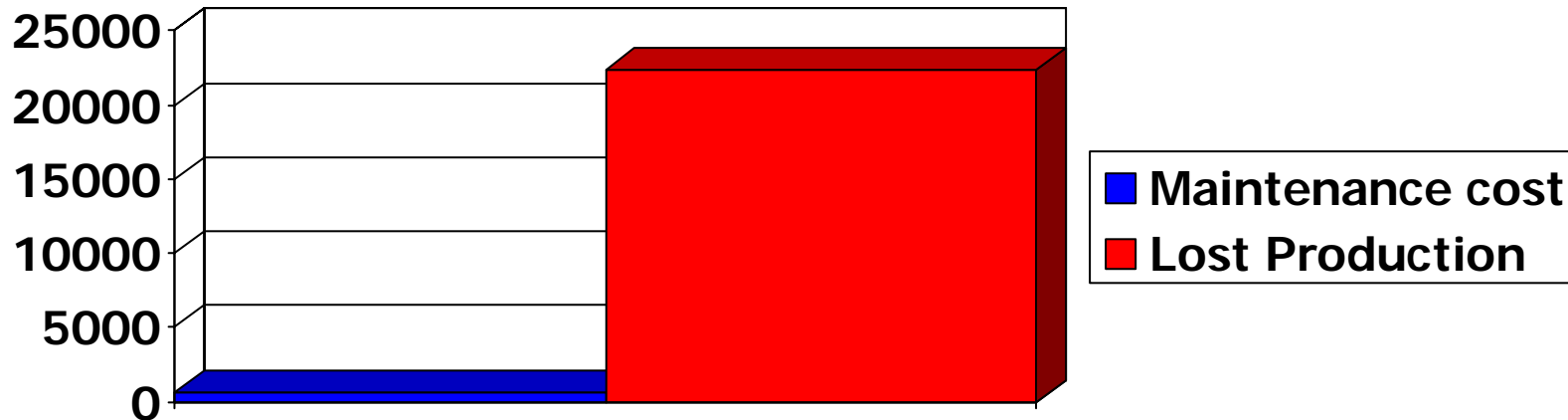
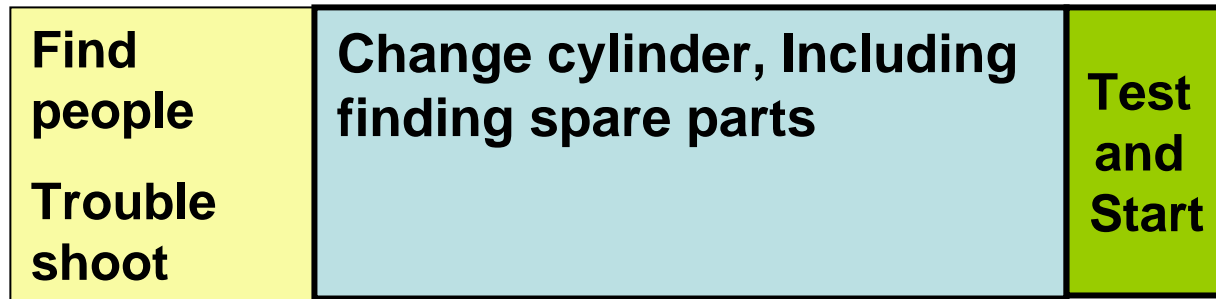
## *Unplanned and Unscheduled Example*



Time Losses



# Unplanned and Unscheduled Example



*What we can do better*

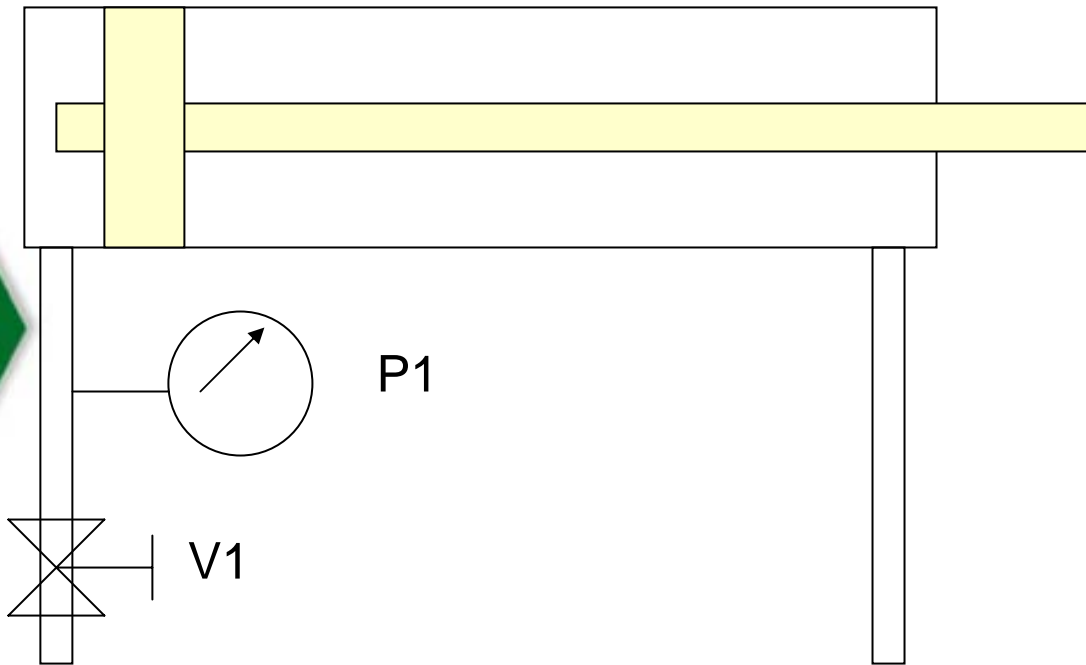
***We can reduce Down Time to Zero  
and reduce maintenance  
cost by at least 50%.***

*What we can do better*

***Maintenance Prevention:  
Root Cause Problem Elimination.  
Filtration, Hydraulic Fluid Temperature.***

***Preventive Maintenance:  
1. Inspect Cylinder Weekly  
for internal leakage.***

# *Inspect Cylinder*



1. Operate the piston to minus position
2. Close valve V1. If pressure P1 increases the cylinder is leaking.

## *What we can do better*

- 1. Inspect Cylinder Weekly for internal leakage.***
- 2. Plan replacement of cylinder.***
- 3. Document and save plan.***
- 4. Schedule replacement when unloading station is available.***

## *New Scenario*

- *Operator inspects cylinder as part of his/her work – Cost = “0”*
- *Planning replacement of cylinder four hours \$40 = \$160. Job plan will be documented and saved.*
- *Organized store delivery of parts one hour = \$20.*
- *Two people will replace cylinder safely in two hours = \$240.*
- **Total Maintenance Cost \$420.**

## *New Scenario*

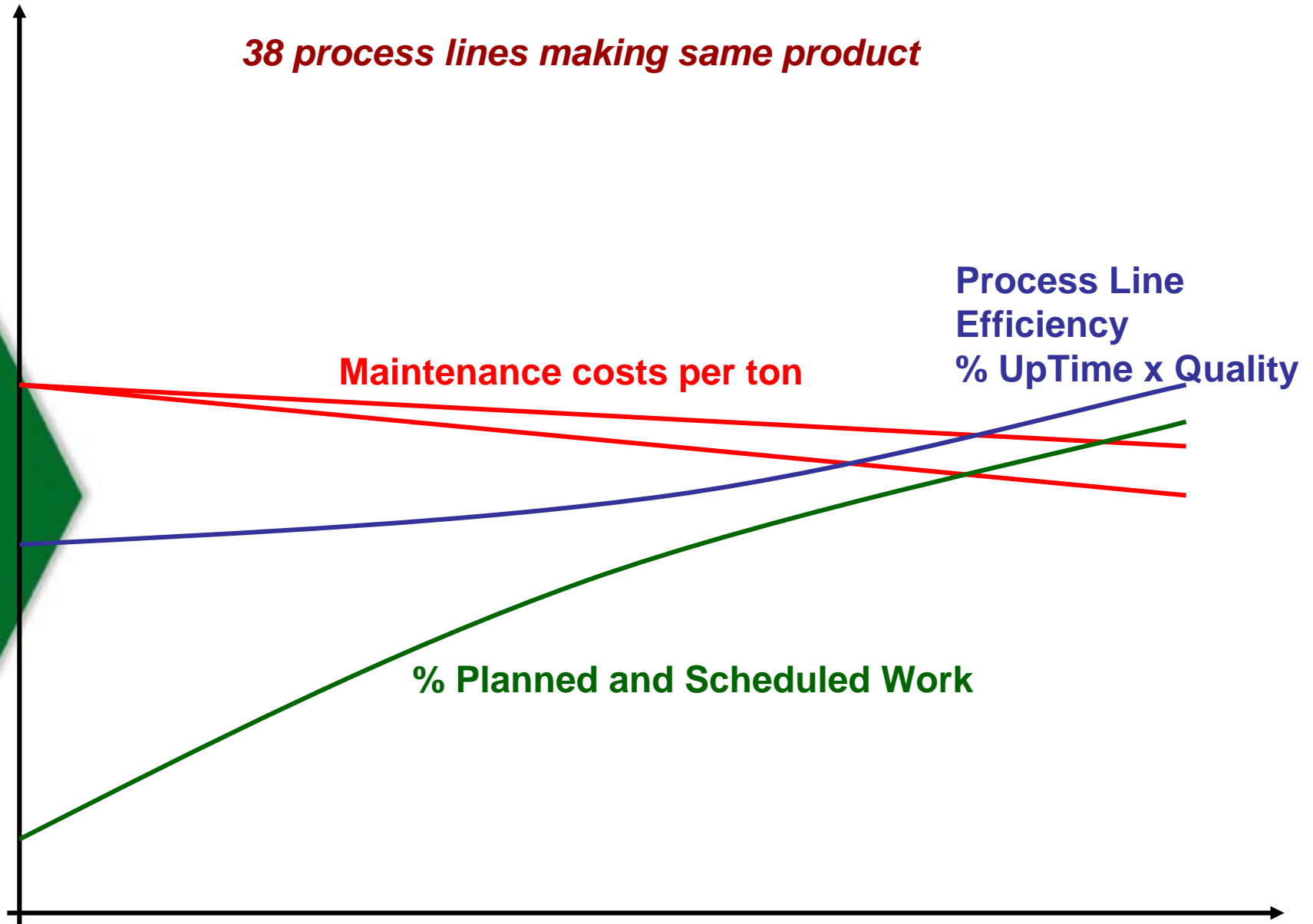
- ***Before: Maintenance costs = \$800.***
- ***After : Maintenance costs = \$420.***
- ***Maintenance Cost Savings: \$180 = 48%***
- ***Reliability savings = \$22,386 = 100%***

## *People efficiency*

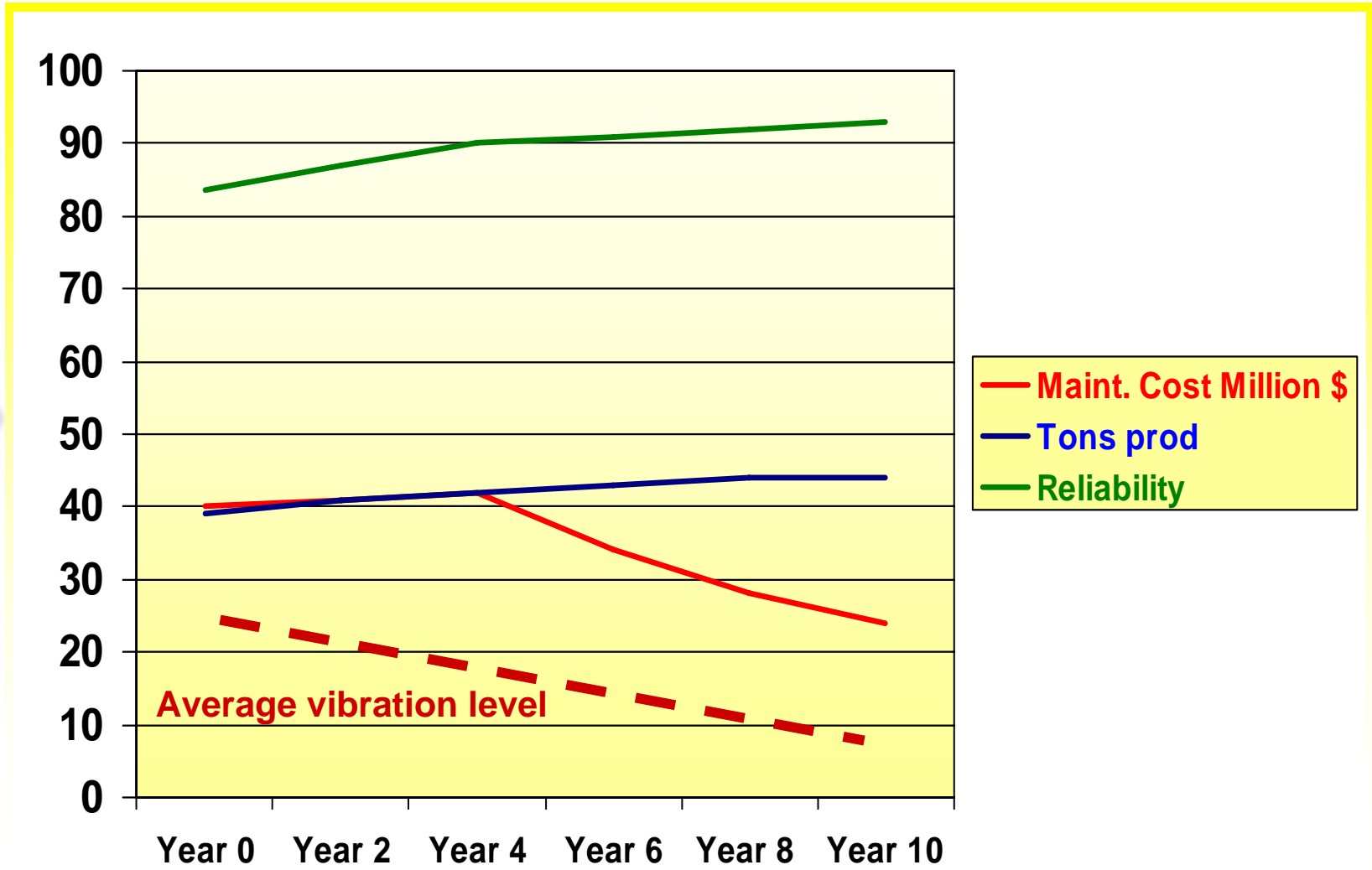
	<i>% Unplanned Unscheduled Work.</i>	<i>% Wasted Time</i>	<i>% Total Wasted</i>
<i>Present</i>	<b>70</b>	<b>60</b>	<b>42</b>
<i>Future</i>	<b>10</b>	<b>40</b>	<b>4</b>

***38% Improvement potential***

**38 process lines making same product**

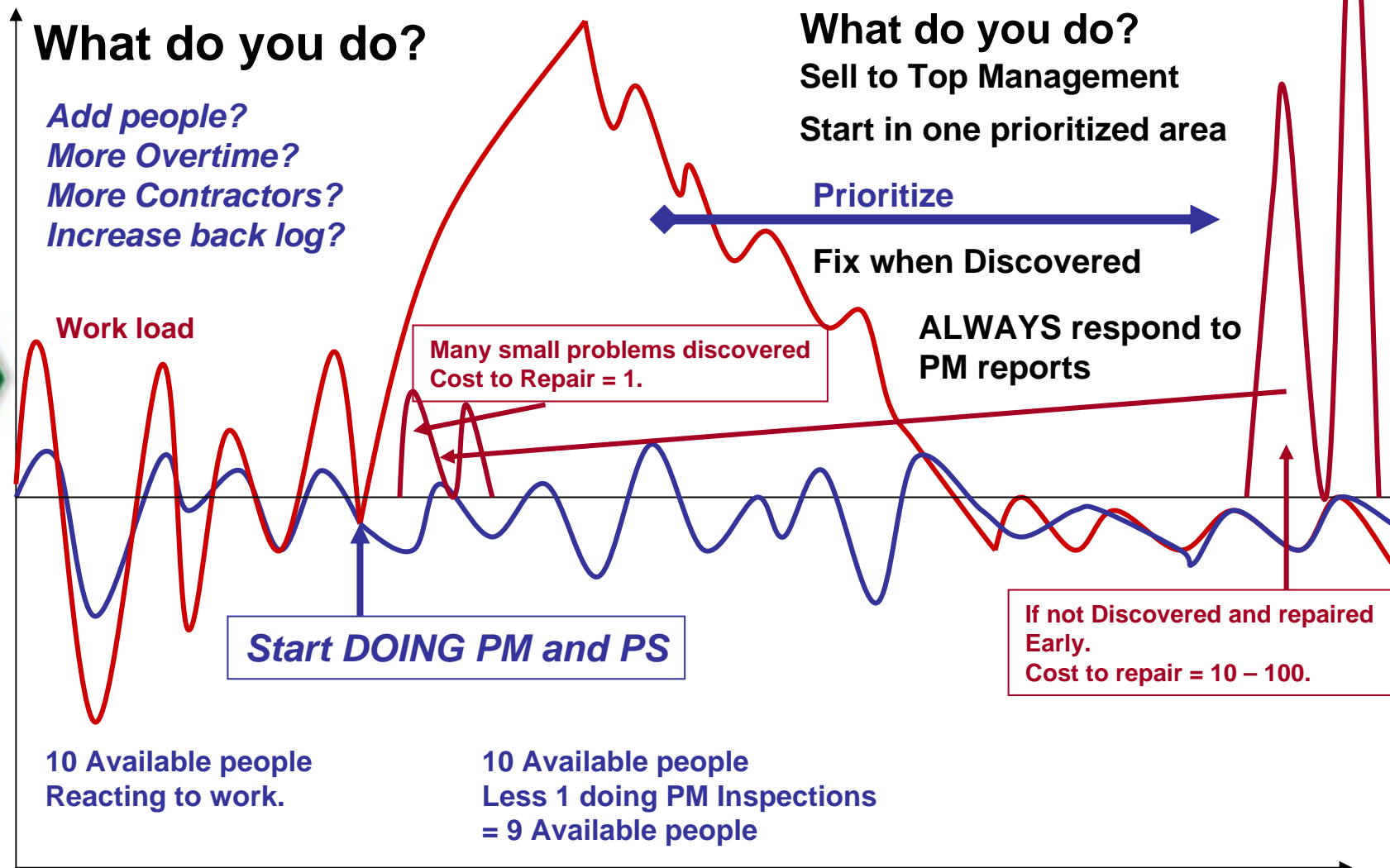


## Ten years effect of a reliability improvement focus.



# The challenge.

Move from React to Prevent to Continuous improvement.

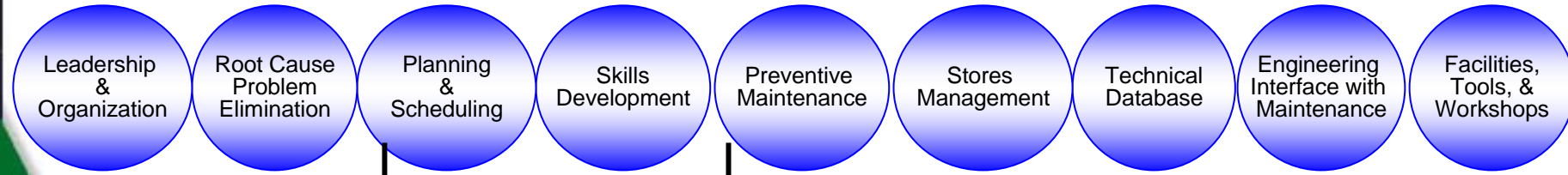


## *Selling Maintenance to Management*

- *Do you know how good you are?*
- *Do you know how good you can become?*
- *Do you know how you can close the gap?*
  - *Do you have a plan?*

# Current Best Practices (CBP)

## KEY PROCESS



## SUB PROCESSES

Work Request  
Prioritization  
Backlog  
Planning  
Scheduling  
Execution  
Recording  
CMMS Tool

Maintenance Method Selection  
Cleanliness  
Lubrication  
Alignment  
Balancing  
Operating Procedures  
Filtration  
Condition Monitoring

## ELEMENTS

Example 2: A few example “Planning elements”

- 32. Standard job plans are used for all repetitive and critical jobs
- 33. Jobs are always planned before they are scheduled
- 34. Operations support the planning process

Example 1. A few sample “Lubrication Elements”

- 26. Lubricants are stored properly in clean, organized storage areas.
- 27. Filtration is used to maintain lubricant cleanliness.
- 28. Ferro graphic analysis is used to identify oil contaminants and contamination levels.

*“World Class” Proposed definition*

***A CBP score over 75.***

## *Partnership*

- 1. Joint Mission Statement.***
- 2. Operations Statement.***
- 3. Maintenance Statement.***

*Mission maintenance department*

***To safely deliver  
continuously improved  
Equipment Reliability  
through the execution of CBP.***

***Belief.***

***Improved Equipment Reliability  
Will reduce maintenance costs***

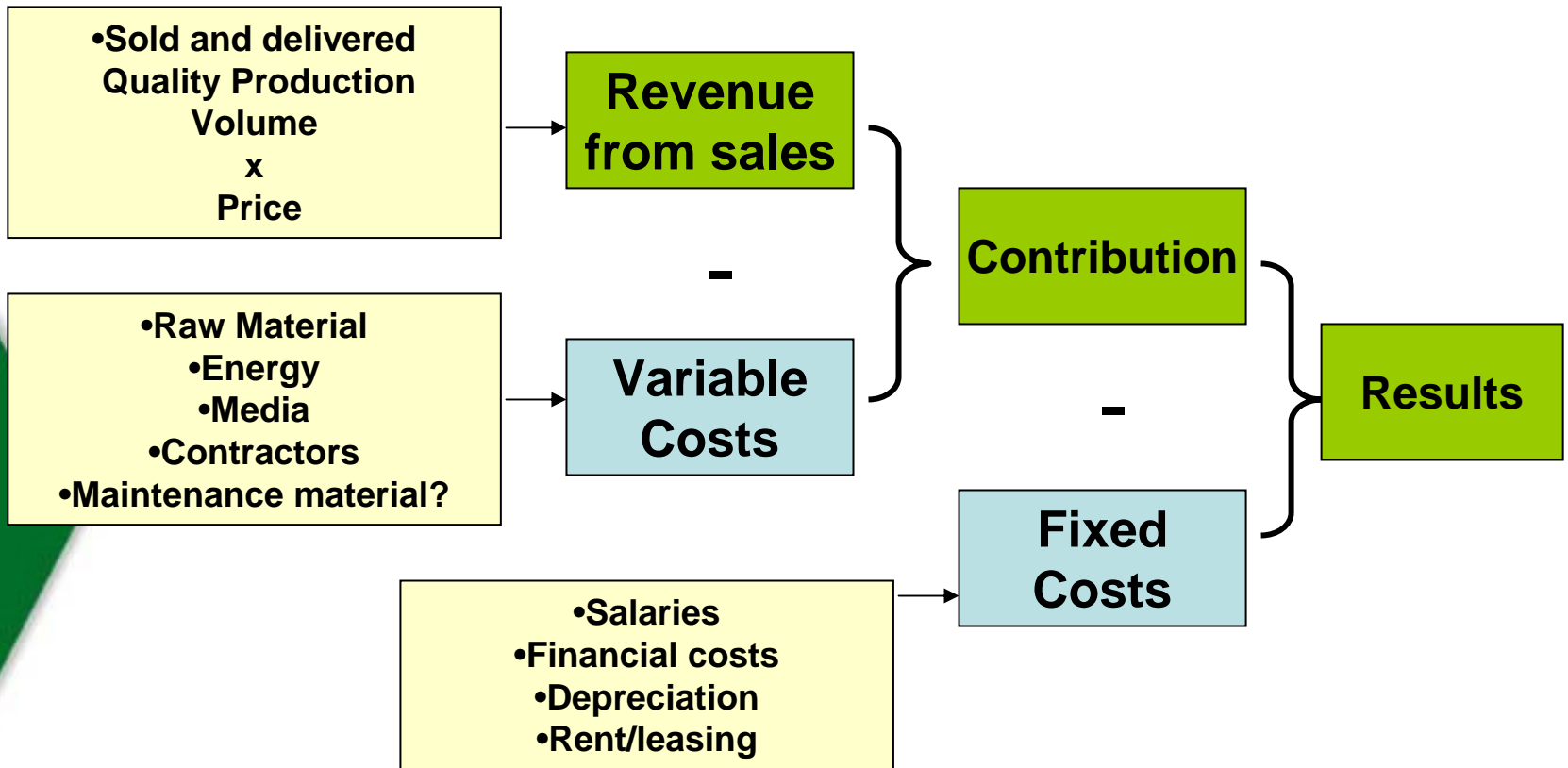
## *Vision Statement example*

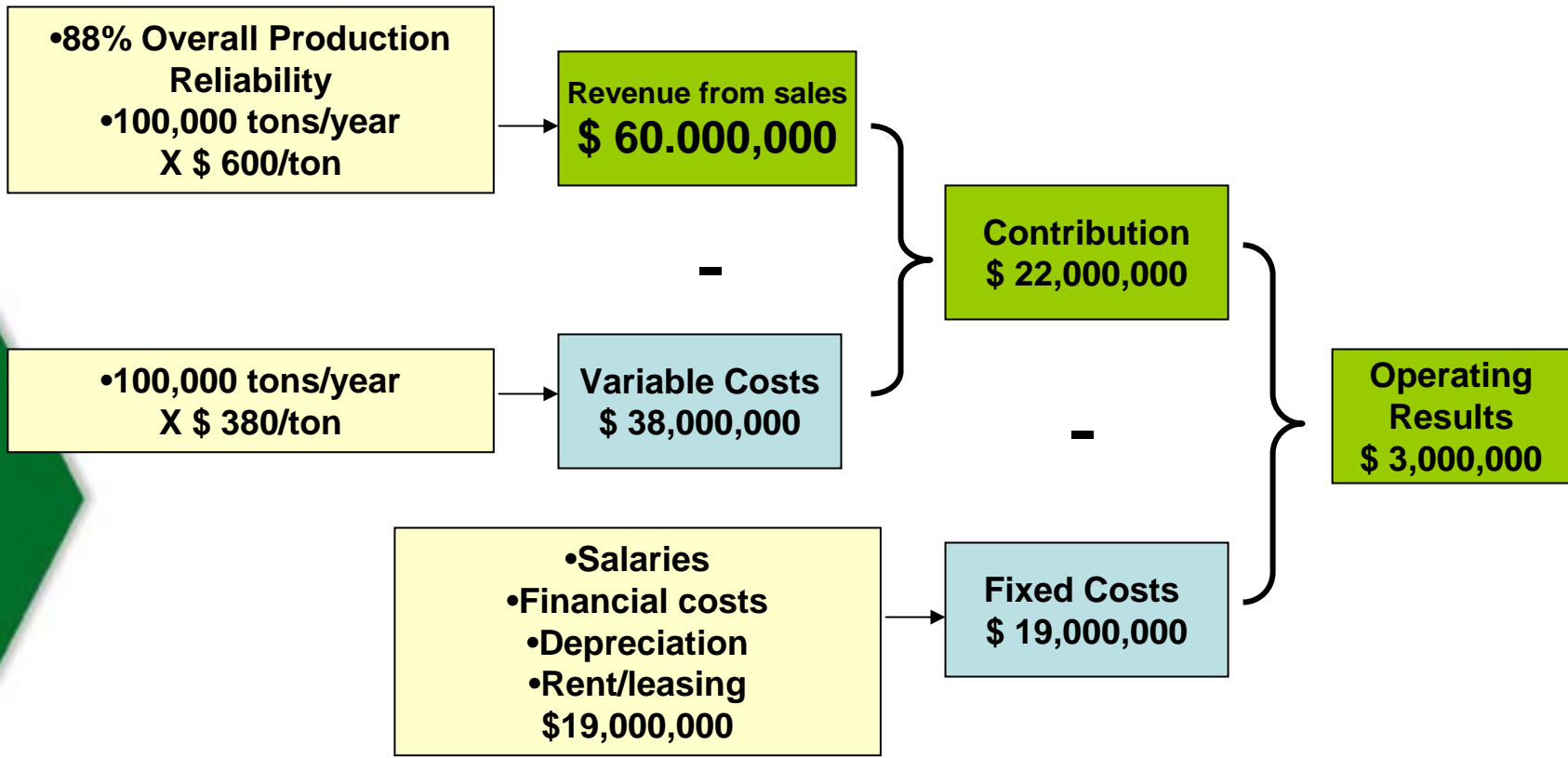
***By the end of year 2008 achieve  
a CBP score of 75+***

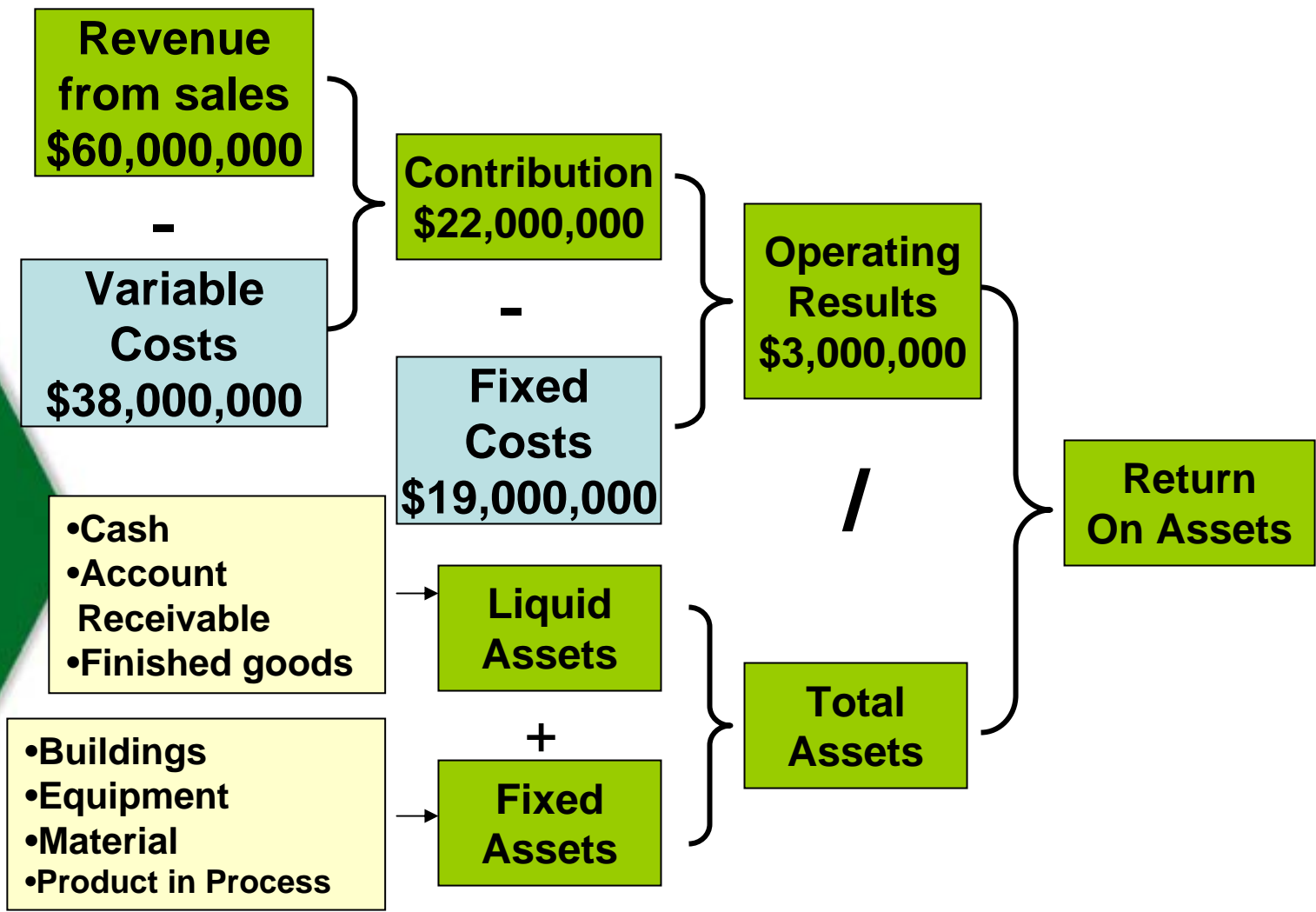
- Overall Production Efficiency 95% on Process Line 1, 2, 3. (Time based on 8760 hours per year x Quality Performance)
- Maintenance costs stabilized at or below 2005 level.
- Overtime less than 5%
- No lubricators on shift
- No maintenance supervision on shift. One mechanic and one I/E person per shift.
- 95%+ of all shut down work Planned and Scheduled
- 80%+ of all daily work Planned and Scheduled
- 5% + of all maintenance hours spent on Root Cause Problem Elimination (RCPE)

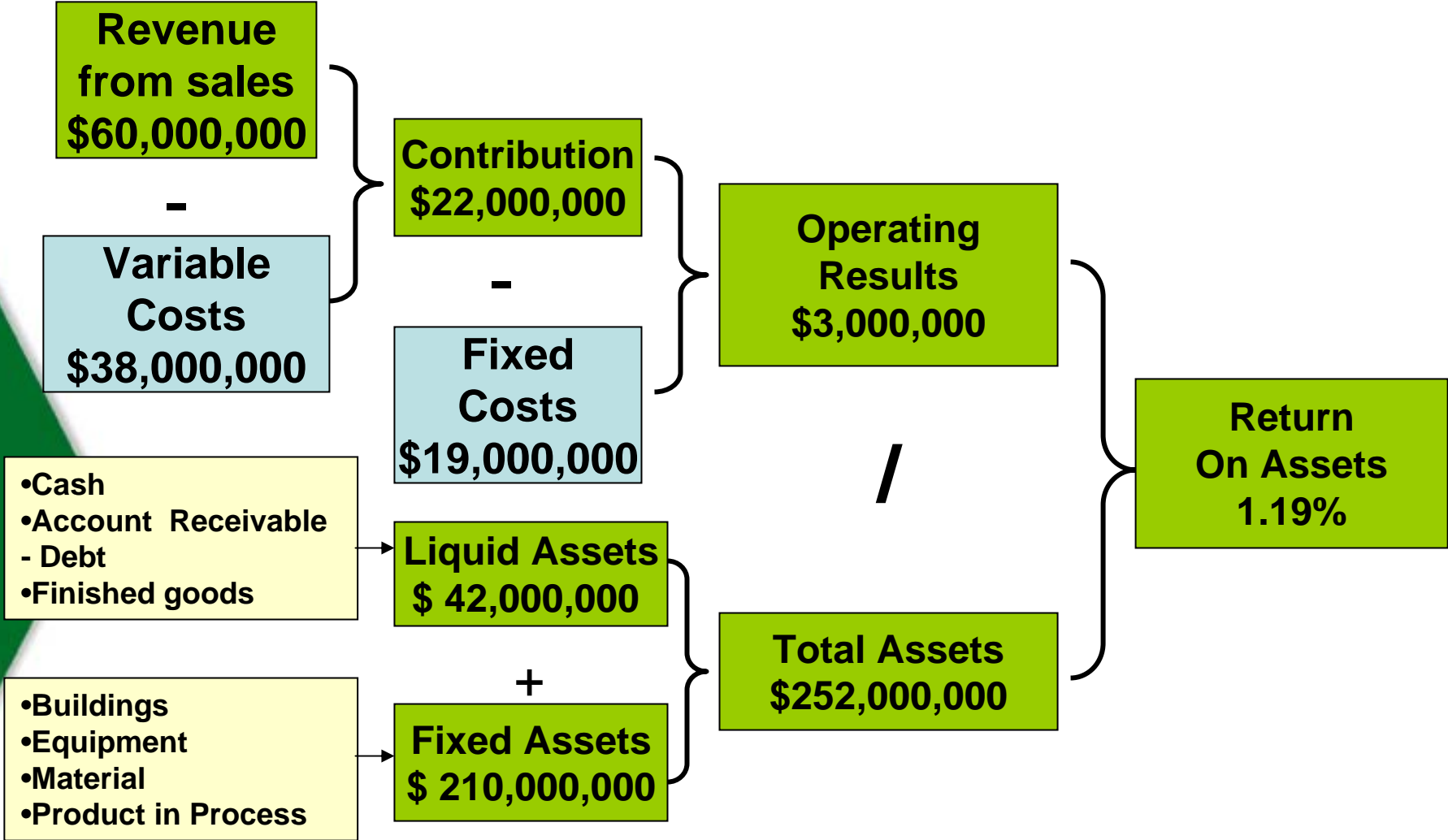
*Financial language*

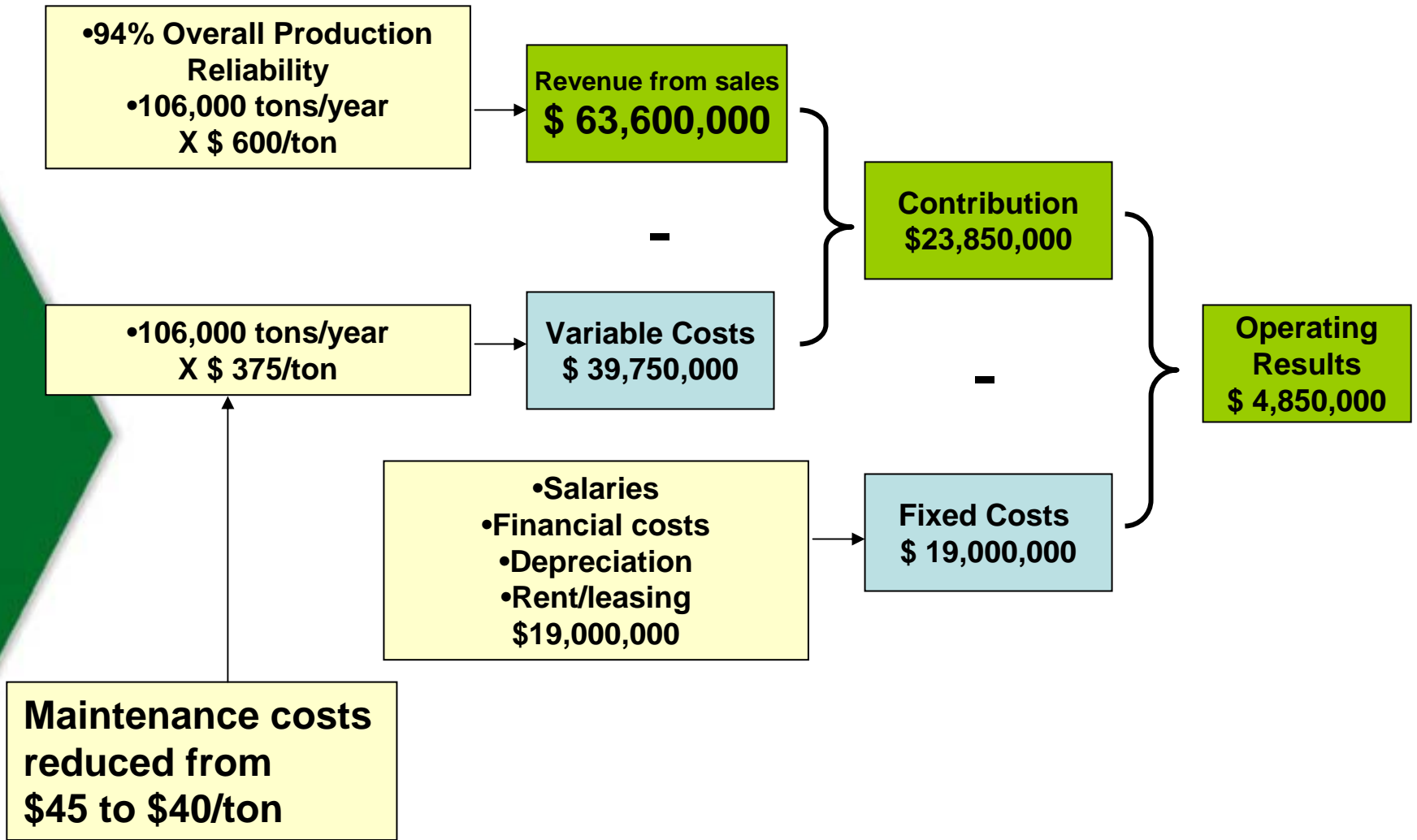
**Talk the language of the  
decision maker.**



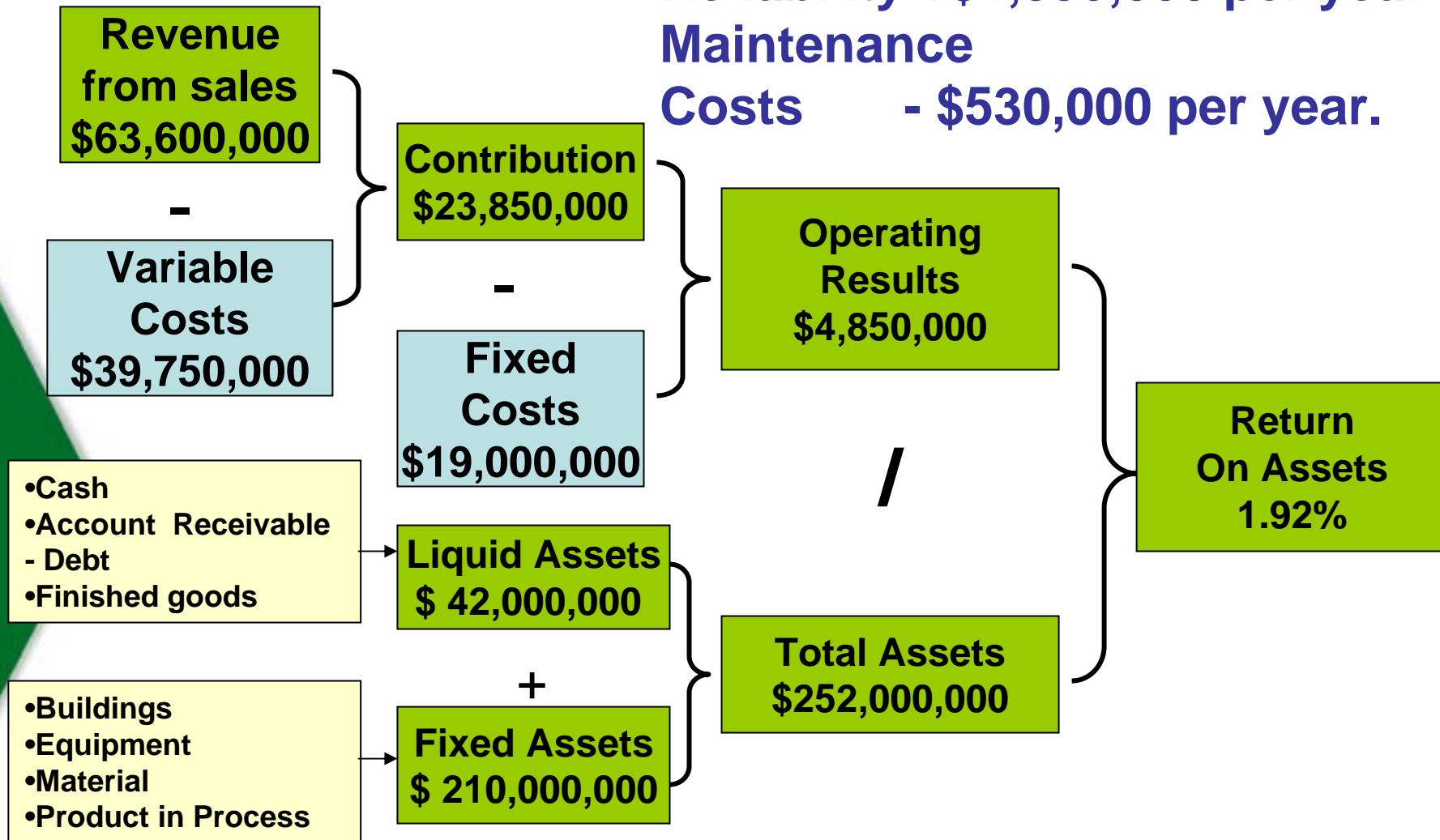








**Reliability +\$1,850,000 per year**  
**Maintenance**  
**Costs - \$530,000 per year.**



# Thank You for Listening!

For more information

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