


The Third Annual BMP '99

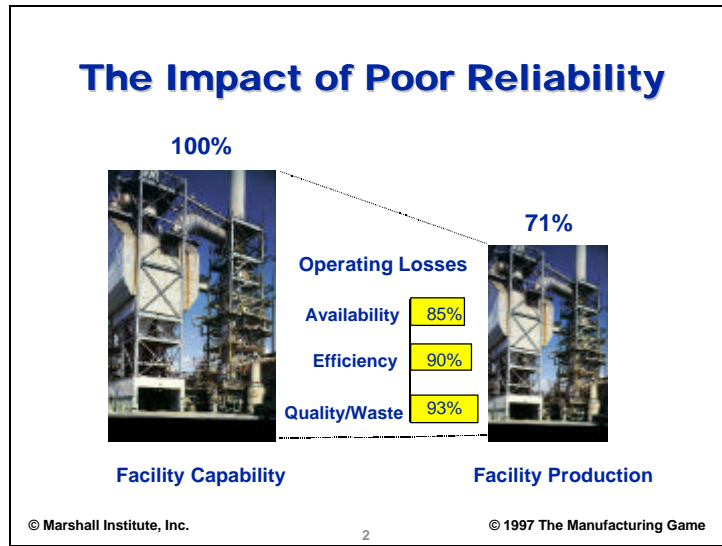
**Action Teams: Reliability
Improvement on the Front Line**

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The Manufacturing Game™

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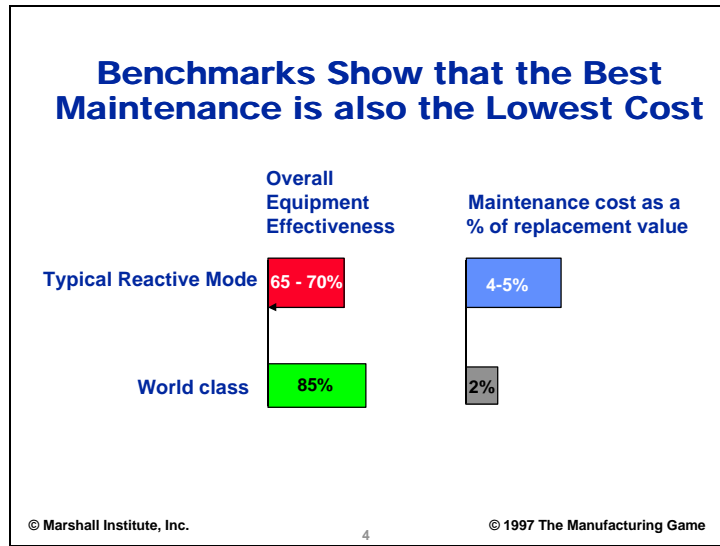
Why is Maintenance Treated like a Cost?

It is a big cost!

- **5 -15% of Total Manufacturing Cost depending on the industry**
- **DuPont spent as much on maintenance as their entire net profit for 1987 and as much as they spent on R&D that year**

More spending and more people has not always lead to payback

- **Many examples of expensive Computerized Maintenance Management Systems that were implemented but never used**
- **Increases in planning and predictive personnel have not been offset by other savings**

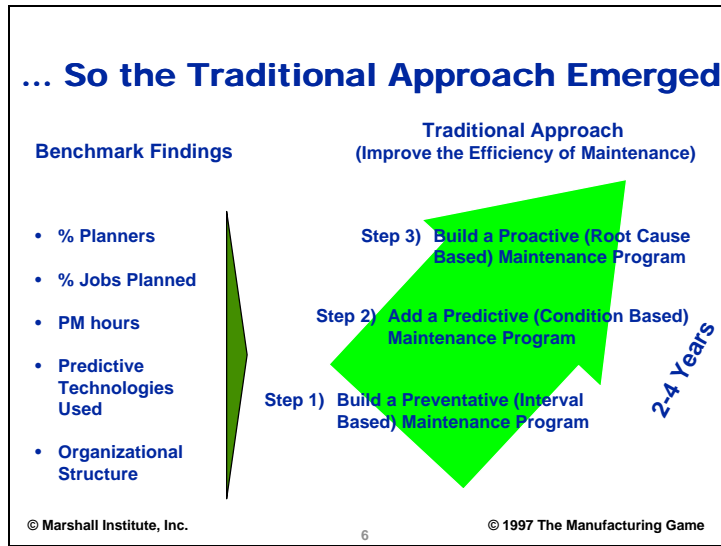


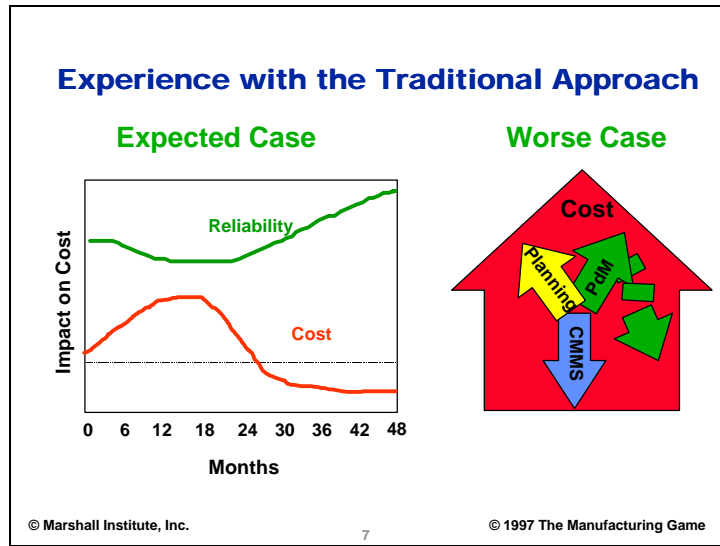
**The First Ideas for Achieving
World-Class Performance...**

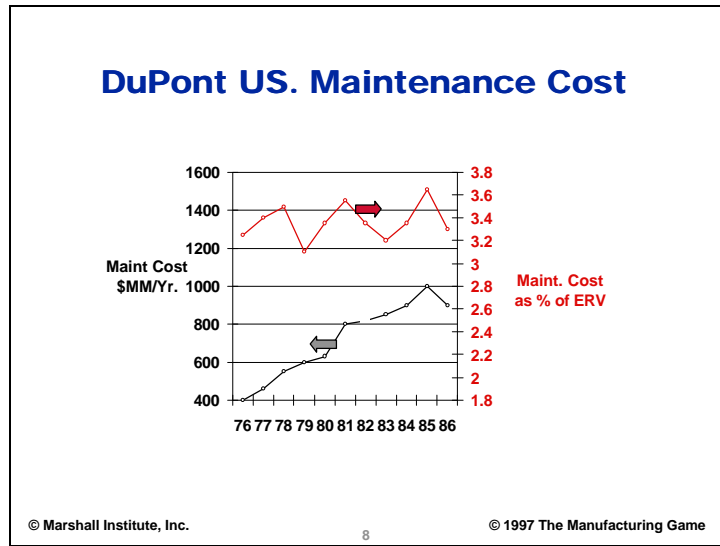


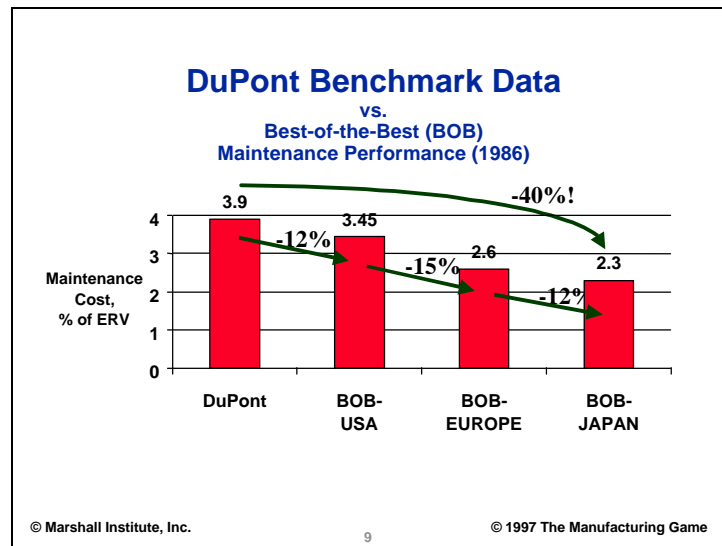
...Did Not Work

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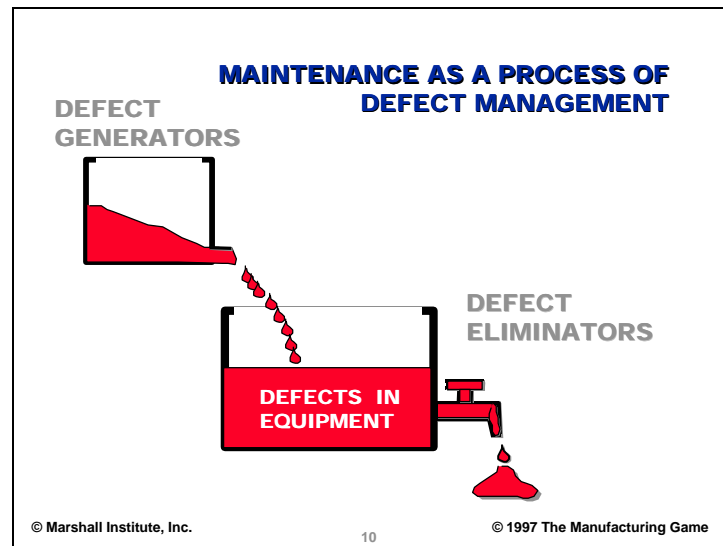






In the late 1980s DuPont commissioned ATKearney to benchmark their performance against companies in the US, Europe, and Japan. The findings of that initial study and subsequent efforts since then have come to be known as the BEST of the BEST Maintenance Benchmarking Study. [It has become the 'mother' of all maintenance benchmarking studies...and now forms the basis for an annual award known as the North American Maintenance Excellence Award, a collaboration between ATKearny and Plant Engineering magazine.] DuPont was surprised--and not just a little disappointed--to find they did not measure up as well as they has assumed they would. [They thought the study would show how good they were; they thought they had achieved functional excellence in maintenance. The data did not support that position.]

In fact, they found DuPont was at least 12% higher than the Best of Best (BOB) in the US--and even worse when compared to Europe and Japan!



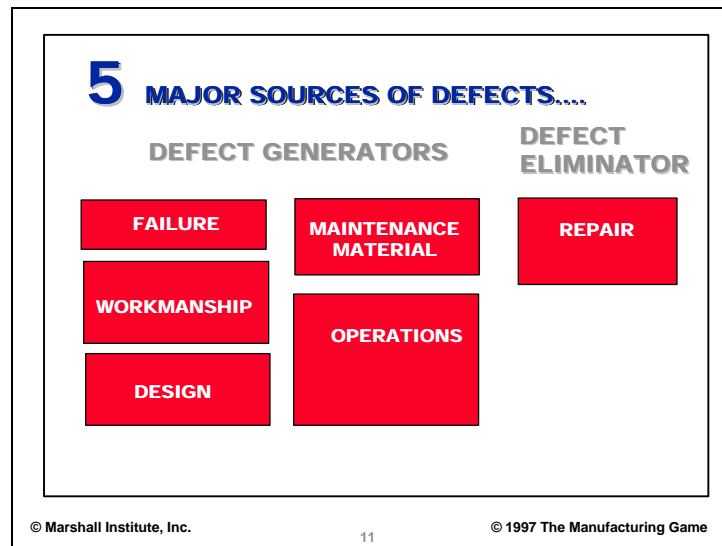
Winston P. Ledet and his colleagues at DuPont did statistical analysis on the benchmark numbers-and found they could account for almost all the variation in the data with about 11 variables. But they were all cost variables! Yet, they knew from the benchmarking interviews that the Best of the Best performers did not push cost, did not focus on cost very much at all.

But if it wasn't costs, what was it?

They had a suspicion that these improved cost factors were the result of good maintenance practices--not the other way around. In other words, low cost maintenance is a consequence of good maintenance practices-- So Ledet turned to Systems Dynamics Modeling techniques to sort out the variables. That was considerably more enlightening.

The DuPont study revealed maintenance could be modeled as a process of Defect Management (where a "defect is defined as anything short of perfection).

There are defect generators. The equipment accumulates the defects until it breaks down. The repair process is the defect eliminator. The level of defects in the equipment determines the breakdown rate.



There are 5 major sources of defects identified in the model:

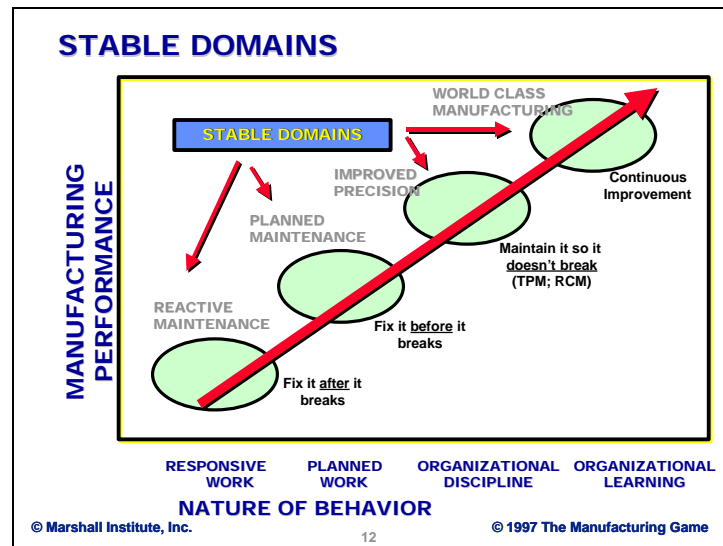
FAILURE “Collateral” damage (bearing seizure damages shaft)

WORKMANSHIP What they do; not what they *could* do. Not just skill and motivation...the *system*, as well. (being so reactive and time-pressed so as to fail to align the pump before bringing it on line)

DESIGN Design not fitting *current* use; could be poor initial design, but usually result of changes in the application or current *conditions* of use.

MATERIALS Defects in mfg., storage, handling, and sourcing. DuPont found that one in three spare parts had a defect of some sort *before* it got to the equipment.

OPERATIONS Normal wear and tear; operational practices (cavitating a pump; ignoring vibration, etc.; good example: teenage driver)



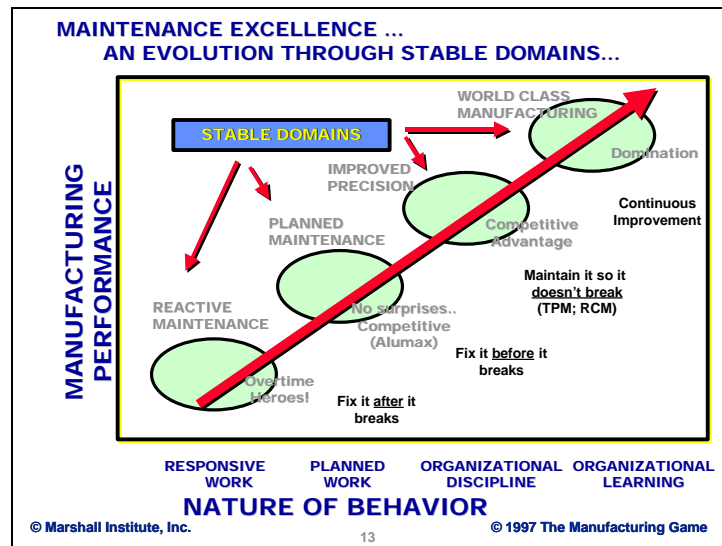
STABLE DOMAINS of PERFORMANCE

First of all, the model was able to explain how and why companies in the benchmarking study fell in place along a continuum of performance... from “Reactive” to “World Class”.

The model showed manufacturing performance and behavior of the benchmark companies were clustered into “stable domains”. In other words, manufacturing performance would tend to stabilize in certain regions and at certain levels as a function of behavior, or maintenance practices.

Admittedly, reactive maintenance organizations are on the low end of the manufacturing performance scale, but it is a stable environment, and some companies are *good at it*. It can serve you well for a long time, and become the *paradigm* of good maintenance performance. In other words many production people think *fast service* (from standby mechanics) is *good maintenance*; it’s actually lousy maintenance; just *fast service*.

It works until competition heats up, at which time an organization may need to move up the performance curve, which can be done, but only by breaking the paradigm of reactive maintenance. Those who move to a planned domain can have a competitive advantage by systematizing their resource management through planning/scheduling of work, better parts and inventory material control, and establish good work order control systems (among others).



In the planned domain, we haven't eliminated the defects so much as we are able to deal with them more efficiently, with more productive use of our labor, material, and capital resources. Perhaps the premier example of the planned domain is Alumax Aluminum Company of South Carolina where they have created an environment in which 90% of all work is planned at least one week in advance; only 2% of their maintenance activity goes to breakdown, crisis work. No surprises at Alumax!

Think TPM (Total Productive Maintenance) or RCM (Reliability-Centered Maintenance) as typical methodologies applied at the "improved precision" stage. This is a stable domain in which defects are not just dealt with better, rather defects are eliminated, so as not to have to deal with them at all. The motto of TPM is "Zero Defect Maintenance" or sometimes referred to as "Zero Breakdown Maintenance". RCM is similar in focus.

The final domain is one we've called World Class Manufacturing. We've allowed for the fact that TPM and/or RCM are not the final frontier and that even better performance is yet to come through continuous improvement. The behavior required for World Class performance domain is believed to be "Organizational Learning". (Senge, 1990). It's better to look at these improvement concepts and progressions as a journey, not a destination. The biggest obstacle in getting from one domain to another may be success in the current domain. (e.g., those in reactive domain often don't see how they can get better, those good at planning and scheduling at the level of an Alumax may have difficulty in seeing better because they are so good at what they are doing now.) Don't let any domain become the "goal".

We Needed a Different Kind of Tool....

MANUFACTURING PERFORMANCE

REACTIVE

PLANNED

IMPROVED PRECISION

WORLD CLASS

WORLD CLASS

Your Paradigm

NATURE OF BEHAVIOR

- Illustrate the dynamics of how value is added
- Challenge assumptions
- Create a road map not just a snapshot
- Build passion in the front-line
- Show individuals their role
- Builds teamwork
- Practice of new behaviors
- Launches action

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THE MANUFACTURING GAME™
...a Practice Field for Reliability

Accelerated Learning Technology says you need

- ✓ *intellectual,*
- ✓ *emotional,*
- and
- ✓ *kinesthetic*
experience

....



....to
achieve a
paradigm
shift.

**The Manufacturing Game
is designed to incorporate all three.....**

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THE MANUFACTURING GAME™

Board Game Simulation
– no computers

Cross-functional teams
(3 to 6 per plant)

3 Roles:
Operations
Maintenance
Business Services



Teams work together to lead their mediocre manufacturing facility from a reactive, breakdown maintenance mode –

... to a *pro-active, zero-failure, high-volume, low-cost* operation...

... without halting production
... and significantly improving profit!

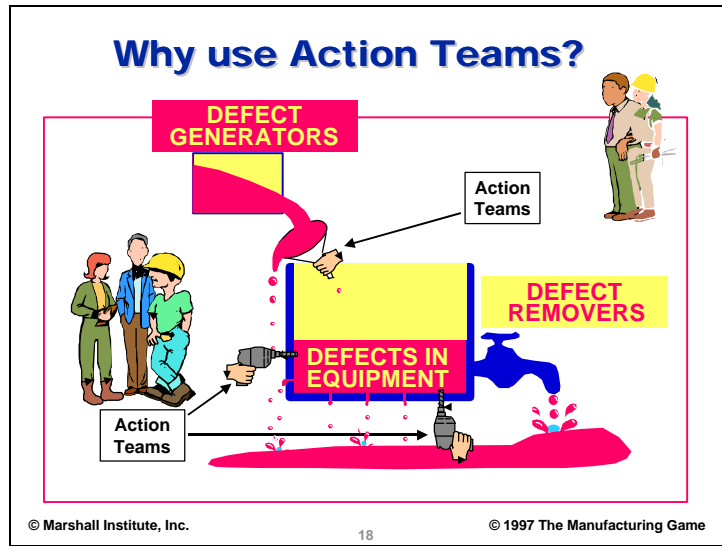
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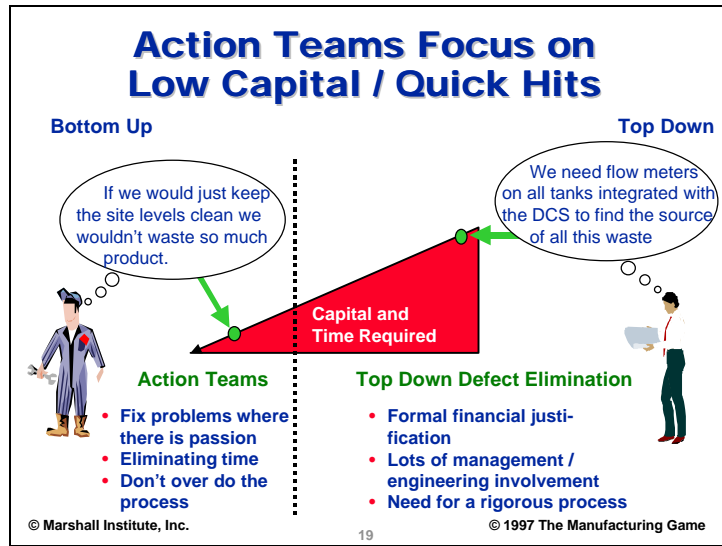
... Combined with Action Teams for Results



Action Team - A small cross functional team that :

- Focuses on achieving bottom line results in a short period of time
- Promotes learning of new skills and behaviors
- Disbands or chooses to work on a new project once initial project has been completed





ACTION TEAMS

- **Learn by doing**
- **Promotes teamwork**
- **Provides “systemic” view of maintenance contribution**
- **Provides opportunity to develop new skills, expectations, leading to proactive habits...**

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Action is the key element of The Manufacturing Game workshops. The second day of the workshop is primarily focused on translating the ideas and passion developed in the game to the real world through action teams. The concept of action teams comes from Robert Schaffer's book, **The Breakthrough Strategy** (1988). He promotes the idea of an action team coming together to work on a specific issue with a very clear goal for a short fixed period of time. In our case the issue is defect elimination. The best teams are small (5-7 people) and cross-functional; they have operators, mechanics, engineers, and procurement people from a given area. The team identifies defects in their equipment and processes and creates an action plan to eliminate one of them. They have goal of eliminating that defect within 90 days. A typical workshop will launch 4-6 action teams. Action teams are the vehicle to both begin the process of eliminating defects and continue the change in culture.

The Manufacturing Game has been used inside of DuPont for the last six years and outside of DuPont for the last four.

Several large manufacturers and producers have used this approach with a large portion of their front line-workers and managers to “jump-start” the change in culture required to achieve the best-of-the-best in reliability and manufacturing performance. By engaging the whole organization, we have found that improvements in operations can begin within 90 days and bottom line, measurable improvements *are possible within the first year*, versus the 3-5 years often quoted for more traditional approaches.

**ACTION TEAMS....
SELECTING GOALS...**

- ① In any plant or organization there are almost always steps that can be taken to produce results and produce them quickly.
- ② The selection of a first project or two is very important, because they will serve as momentum-builders.
- ③ It's OK to define overall goals in global "big picture" terms --- but also focus on some shorter term, stepping stone goals.

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A lot of companies balk at the idea of action teams. A common objection is, "We just want to train the managers. Our operators and mechanics don't have time for this." Unfortunately in a reactive mode, the front-line people will never have the time. More importantly, our experience has been that only the front-line personnel know where the majority of the defects are. Management can typically point to a few defects that production bottlenecks, but they cannot identify the hundreds or thousands of little things that eat up time, process efficiency, and quality. Another big barrier to launching action teams is management's perceived loss of control. To make a big change quickly in reliability, you cannot have a few highly managed and facilitated teams. You need to get 80-90% of your site personnel out there eliminating defects to get the impact. If every improvement and change has to come through one or a few people, the process will move very slowly and there will be little passion from the front-line.

ACTION TEAMS....
SOLVING 'CHRONIC' PROBLEMS

IT IS FORTUITOUS THAT:

- ① THE MAJORITY OF FAILURES ARE PREMATURE.
- ② THE MAJORITY OF FAILURES OCCUR ON A FEW CLASSES OF EQUIPMENT.
- ③ THE MAJORITY OF FAILURES OCCUR TO A FEW COMPONENTS.
- ④ THE MAJORITY OF THESE COMPONENTS FAIL FOR A FEW REASONS.

ACTION TEAMS.... SELECTING GOALS...

Here are some criteria:

- ① **SHORT TERM --**
Something that can achieve *measurable* improvements in about 90 days or less
- ② **FOCUSED ON ACHIEVING MEASURABLE RESULTS**
Bottom-line results -- something that can be *measured*.
- ③ **MATCHED TO YOUR ORGANIZATION'S READINESS**
The goal should be something the people who have to achieve it are both able and willing to achieve.

ACTION TEAMS....

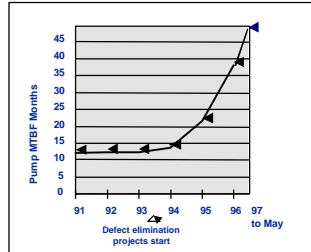
SELECTING GOALS...Continued...

Here are some criteria, continued:

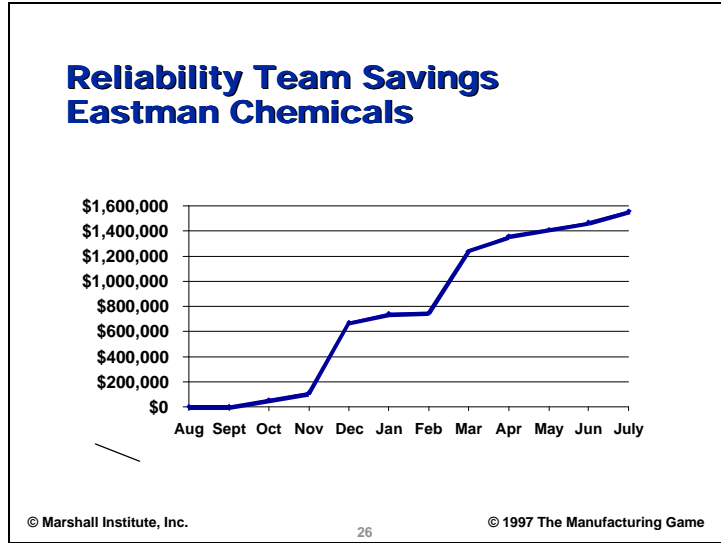
- 4** **ACHIEVABLE WITH AVAILABLE RESOURCES and AUTHORITY --**
Select a project that is not too far outside the group's span of influence and control. Don't have someone else to blame or excuse for failure!

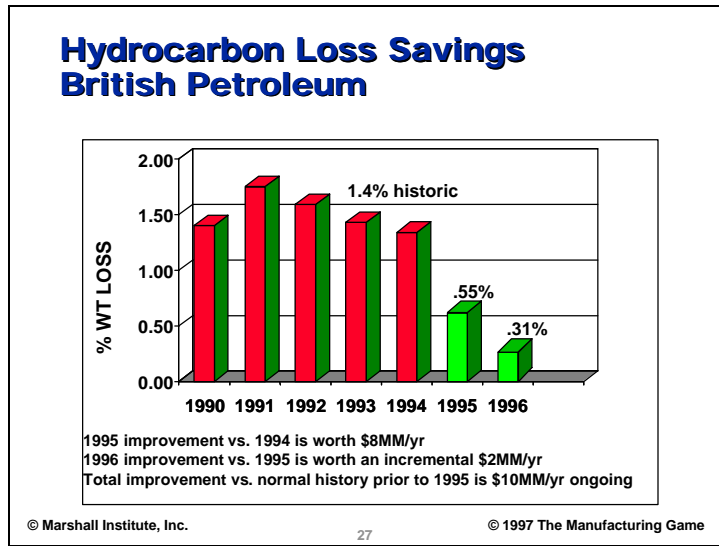
- 5** **STRATEGIC ---**
Goal should be a logical step in achieving overall strategic goals. This assures that success will move you along the right road to change --- building momentum in the right direction ----

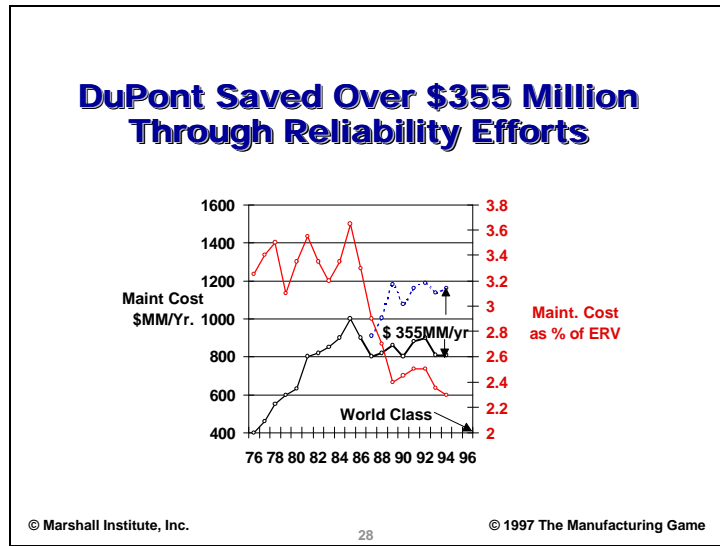
The Impact of Eliminating Work

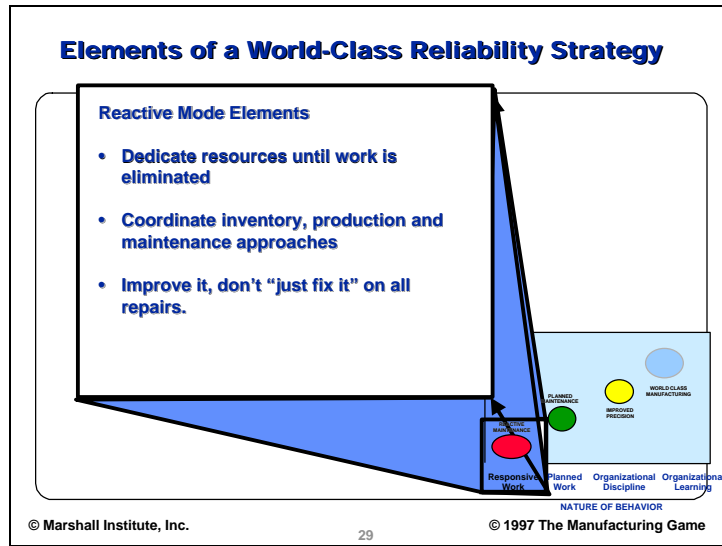


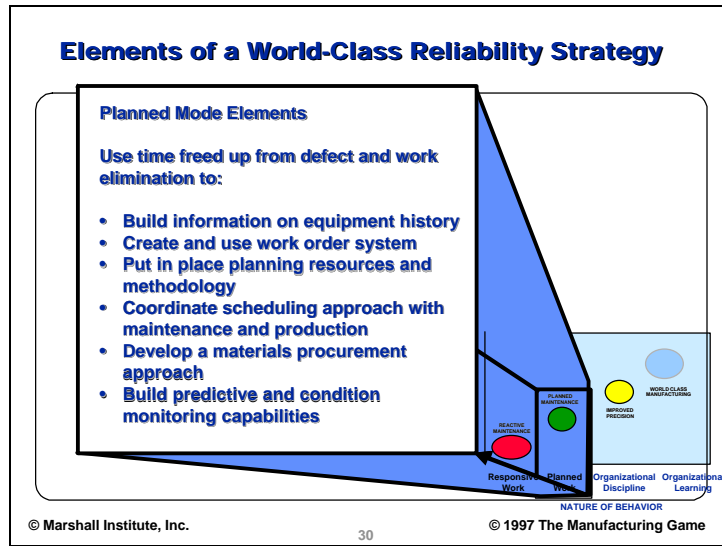
- Went from over 50 work orders a month on pumps to around 10
- Planning and scheduling 10 jobs became far less daunting than 50
- Break-ins also went down significantly giving more opportunity for planning, training, etc.

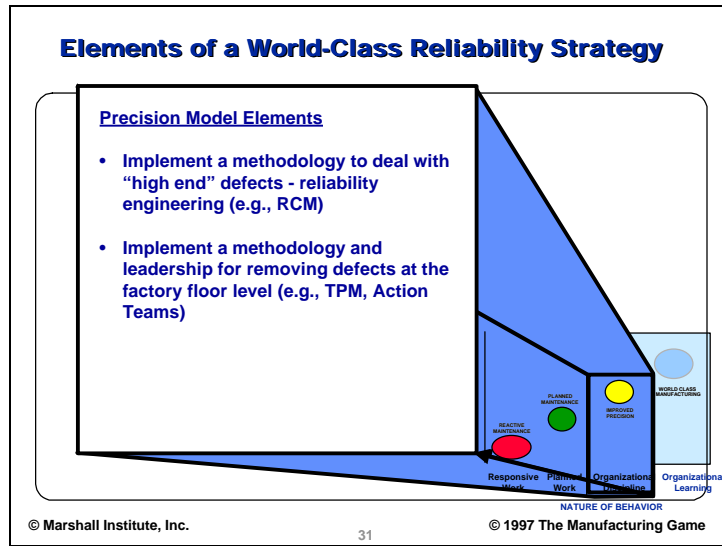












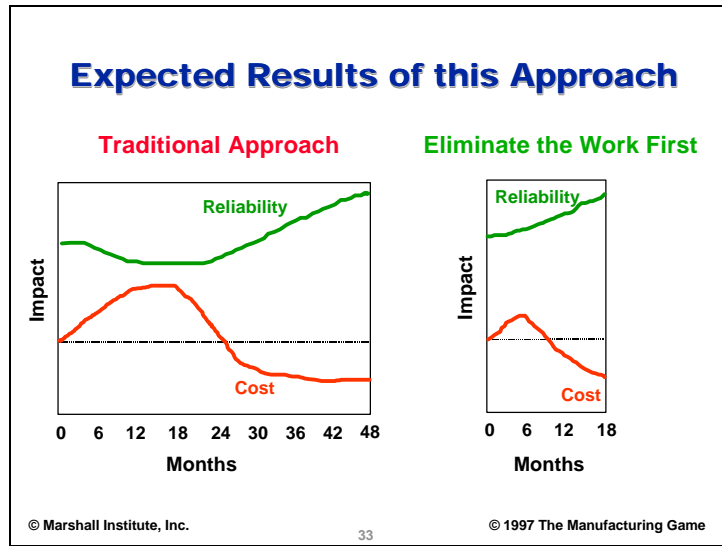
Elements of a World-Class Reliability Strategy

Measurements

- Use a family of measures to ensure alignment and avoid optimization of a piece at the expense of the whole
- Have some leading indicator measures (goals), not just means and consequences

Leadership

- Consistently communicate the need for reliability (what questions should you ask)
- Make sure people understand that the objective is improved throughput and lower overall cost per unit, not just functional cost improvement
- Create formal and informal rewards to encourage proactive behavior
- Put a structure in place to encourage and support front-line problem-solving
- Communicate that there is money for improvements that eliminate work, but that costs must be cut in repetitive low value work



Partnering for Improved Reliability
Recommendations for Management...

Our Recommendation

- Use the Manufacturing Game, and Action Teams to launch the front-line effort and change the culture while...
- Getting the infrastructure in place to build your planning and predictive capabilities and...
- Implementing the elements of a world-class reliability strategy...

Success requires that you...

- Reinforce the need for reliability improvement not just maintenance cost reduction, but by rewarding the right behavior, asking the right questions, etc.
- Participate in the workshops (2 hours for each) to show your support and give direction
- Help put in place a process for managing and directing front-line defect elimination

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SUCCESS PREREQUISITE.....

“In order for the journey to Reliability and Availability to be successful, operations and maintenance must dissolve the supplier-customer relationship and become partners.

Operations and maintenance must work together to maximize equipment effectiveness. They must work together to put systems in place that ensure that problems are resolved and will not re-occur.

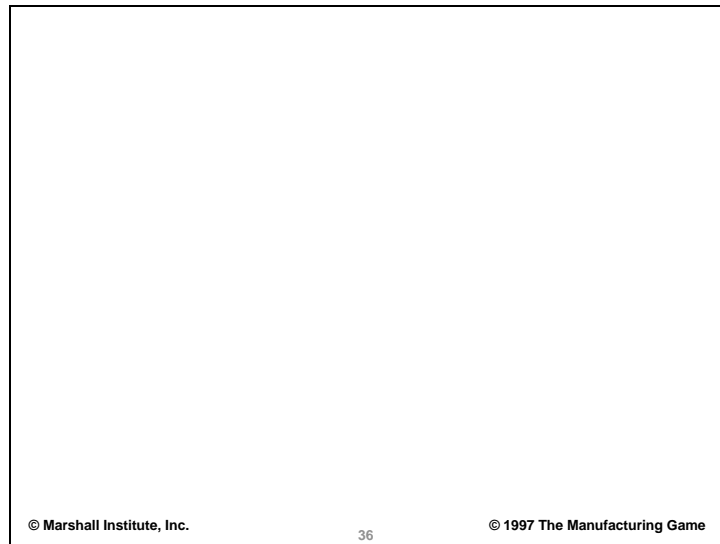
Predictive maintenance, preventive maintenance, and proactive maintenance are not programs, but a style of maintenance that requires a major shift in the way we operate and maintain the equipment.”

**Rick Wheaton, James River Corporation
RELIABILITY Magazine June 1996**

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The content of this paper is based substantially on a paper presented by Winston J. Ledet in November 1997. Mr. Ledet is a Principal in The Manufacturing Game Company. Marshall Institute is a licensee of The Manufacturing Game™. Used by Permission.

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