LEAN MAINTENANCE AND HOW TO APPLY

BY: RICKY SMITH, CMRP, CMRT, CRL

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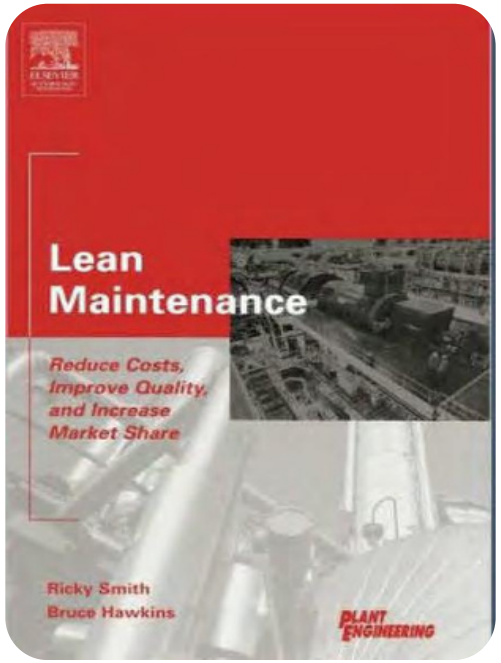
Lean Maintenance and How to Apply



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Pre-Test

Send your answers with Heather

1. Lean Maintenance Objective is to perform maintenance at the lowest cost? True or False
2. Lean is all about the reduction of waste in Maintenance and Production? True or False
3. What position in the Maintenance Process is the most critical in a Lean Organization?
    1. Maintenance Technician
    2. Maintenance Planner/Scheduler
    3. Maintenance Supervisor
4. An open Maintenance Storerooms is a requirement for Lean Maintenance? True or
5. False The #1 Waste in Maintenance is?
    1. Waiting or Looking for Parts
    2. Looking for a Supervisor
    3. Looking for Production
    4. None of the Above
6. Is your Parts storeroom unlocked?
    1. Yes
    2. No
7. Does operators perform any Maintenance Work
    1. Sometimes
    2. No
    3. Is they do are they effective?

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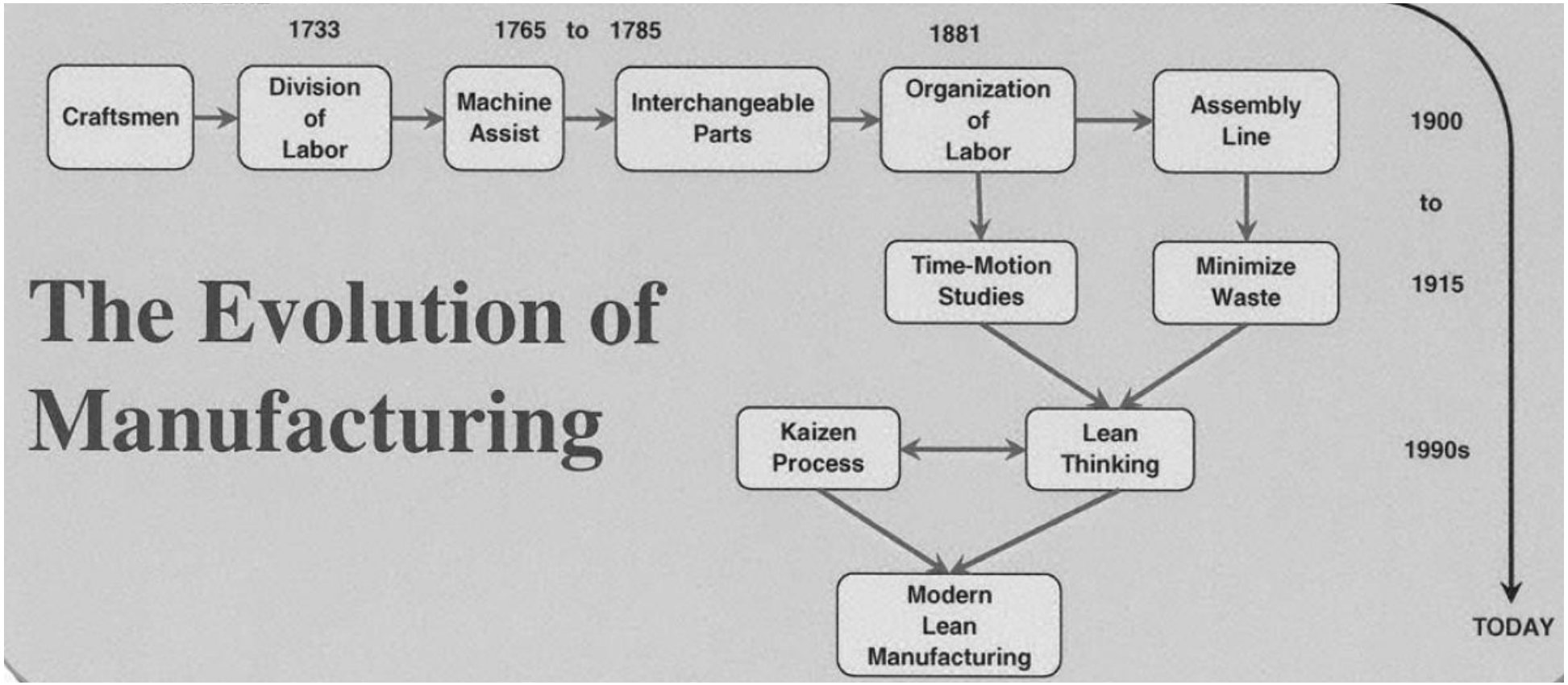
What is Lean Maintenance?

- Lean Maintenance coined in the last decade of the twentieth century, but the principles are well established in *Total*Productive Maintenance (TPM).
- Lean Maintenance—taking its lead from Lean Manufacturing—applies some new techniques to TPM concepts to render a more structured implementation path.
- Tracing its roots back to Henry Ford with modern refinements born in Japanese manufacturing, specifically the Toyota Production System (TPS)
- Lean seeks to eliminate all forms of waste in the manufacturing process—including waste in the maintenance operation.

To reduce costs and improve production, most large manufacturing and process companies that have embraced the Lean Enterprise concept have taken an approach of building all of the systems and infrastructure throughout the organization.

•The result of this traditional approach has been erratic implementation efforts that often stall-out, or are terminated, before the benefits come.

Evolution of Lean



Characteristics Common to the Majority of Lean Manufacturers:

- Waste Reduction
- Integrated Supply Chain
- Enhanced Customer Value
- Value Creating Organization

Characteristics that are most commonly left out of Lean Manufacturing implementations include:

- Committed Management
- Winning Employee Commitment
- Empowering Employees (Responsibility—and Accountability—at the Lowest Level)
- Optimized Equipment Reliability
- Measurement (Lean Performance) Systems
- Plant-Wide Lines of Communication
- All Processes and Workflows Defined
- Making and Sustaining Cultural Change
- Team Based Organization
- Continuous Improvement Practiced in All Departments and at All Levels
- Flatter Organizational Structure (less middle-level management)
- Measures of Performance Used
- Balanced Production (not maximum and not overproduction)
- Quality the First Time and Every Time

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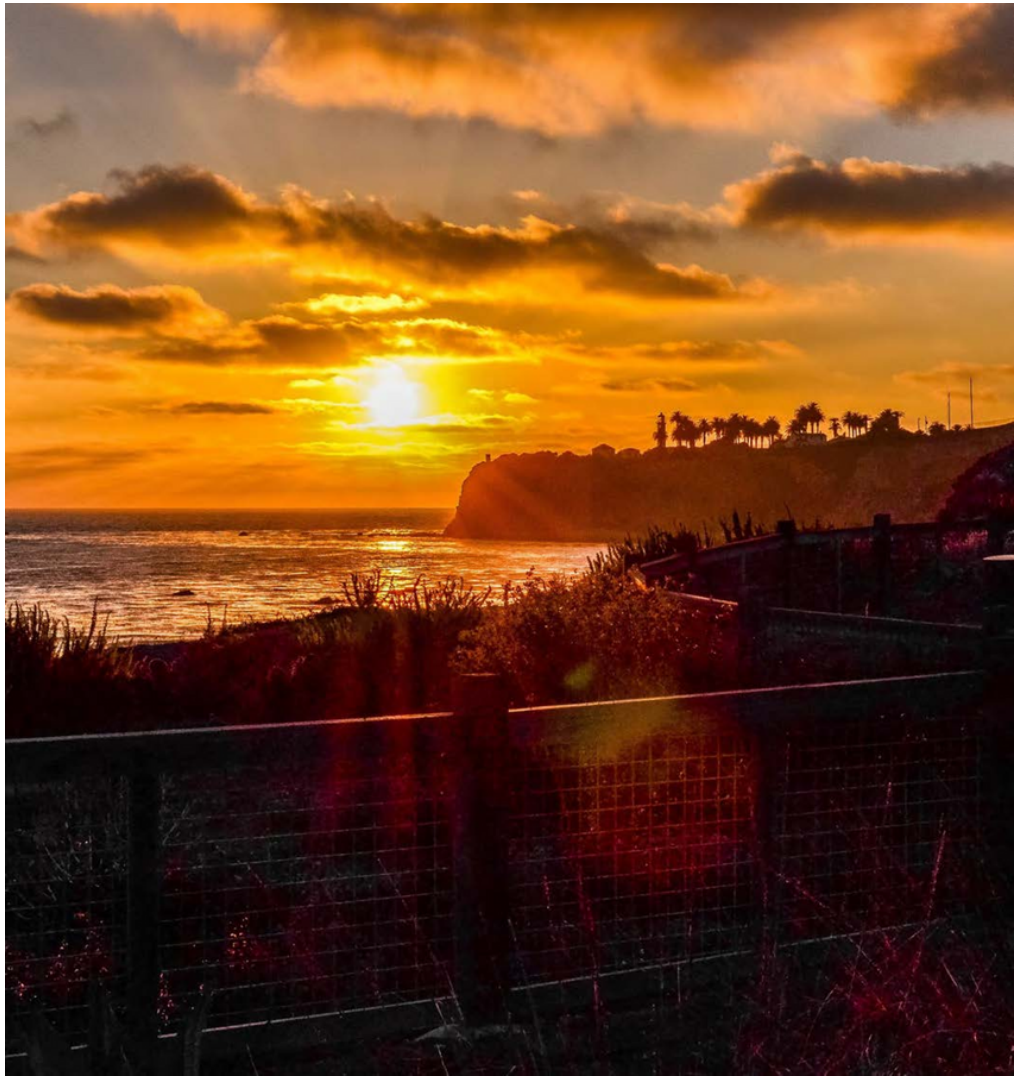
Lean is Comprehensive

Lean is a comprehensive package that includes:

- reducing inventory
- standardizing work routines
- improving processes
    - empowering workers to make decisions about quality
- soliciting worker ideas
- proofing for mistakes
- applying just-in-time delivery
- using a Lean supply chain.



“Lean is a Journey and Not a Destination, the View Improves as we focus on the right things”

- Maintenance’s Alignment with Production to Optimize Process Reliability –Increase Profit
- Managing with the right Leading and Lagging Metrics/KPIs with Dashboards
- Optimization of the PM Program (eliminate waste)
- Optimization of Planning and Scheduling thus increasing wrench-time
- Engagement of Maintenance Technicians and Operators to make the right decisions
- Training is built into the culture to align everyone with the “Best Practices” knowledge and focus

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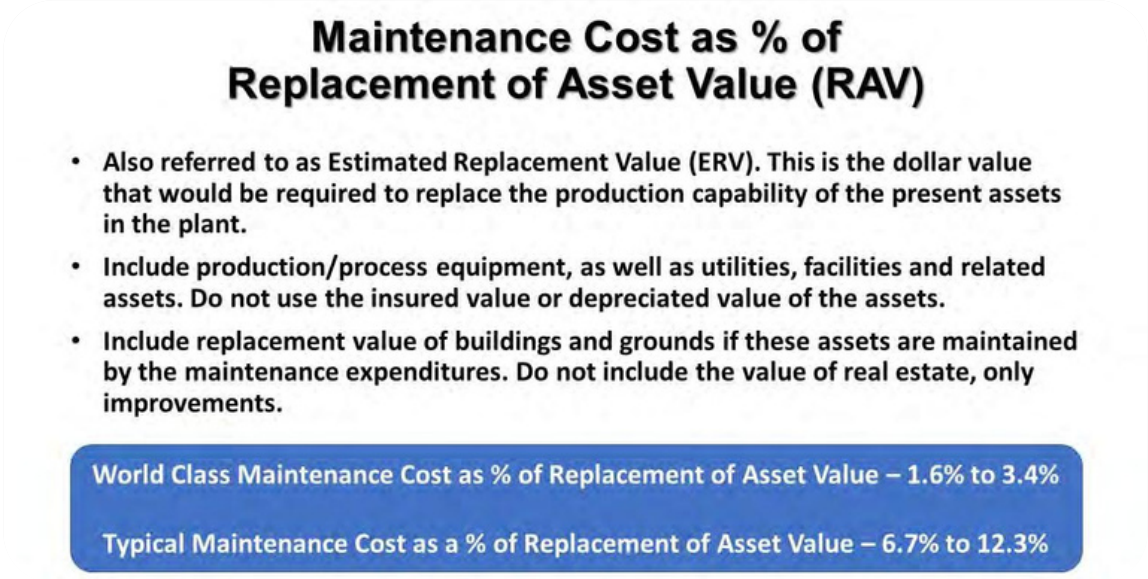
Lean Transformation is a journey

- Lean Transformation is a journey, not a destination.
- Sustainment of the continuous improvement characteristic requires dedicated, com-mitted leadership.
- It requires continual training and upgrade of skills, to include broadening those skills to cover diverse and non-restrictive job tasks

The Facts

- Properly maintained manufacturing equipment makes many, quality products
- Improperly maintained manufacturing equipment makes fewer products of questionable quality
- Inoperable equipment makes no products
- If equipment is not “Maintained” resulting the results are unknown
- Cost are high if equipment is not “Maintained” resulting in high production losses



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More Facts, Cont.

FACT 1

A manufacturing facility that has embraced all of the doctrines of Lean Manufacturing can't assume that it is equipped to implement those same "Lean practices" in the maintenance organization.

In spite of expertise in Lean Manufacturing Practices, the unique requirements of the effective maintenance function call for a completely separate set of prerequisites.

FACT 2

Conversely, without a Lean Maintenance operation, Lean Manufacturing can never achieve the best possible attributes of "Lean."

By definition, Lean means quality and value at the least possible cost.

Without maximum equipment reliability—a product of optimized Lean maintenance practices—maximum product quality can never be attained.

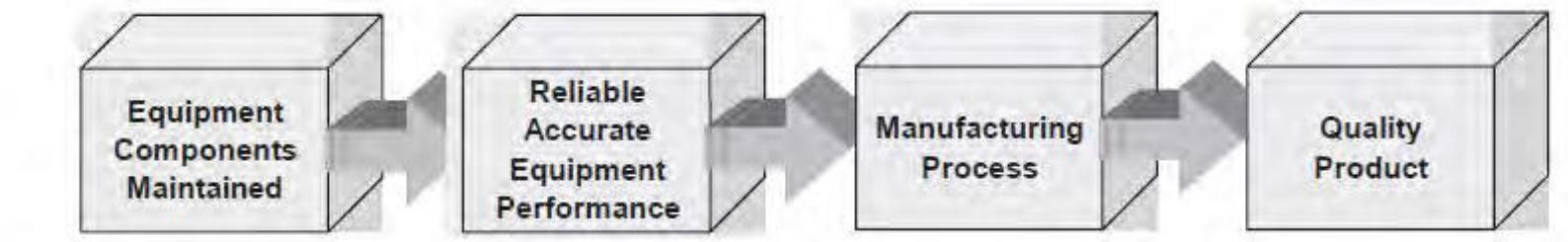
Implementation of Lean

A manufacturing plant with intentions of implementing Lean Manufacturing should begin with a few essential preparations.

One of the most important preparations is the configuration of the maintenance organization to facilitate,

First —Lean Maintenance

Second –Lean Manufacturing



5 Principles of Lean Implementation

The five principles of Lean implementation

1.Specify (value),

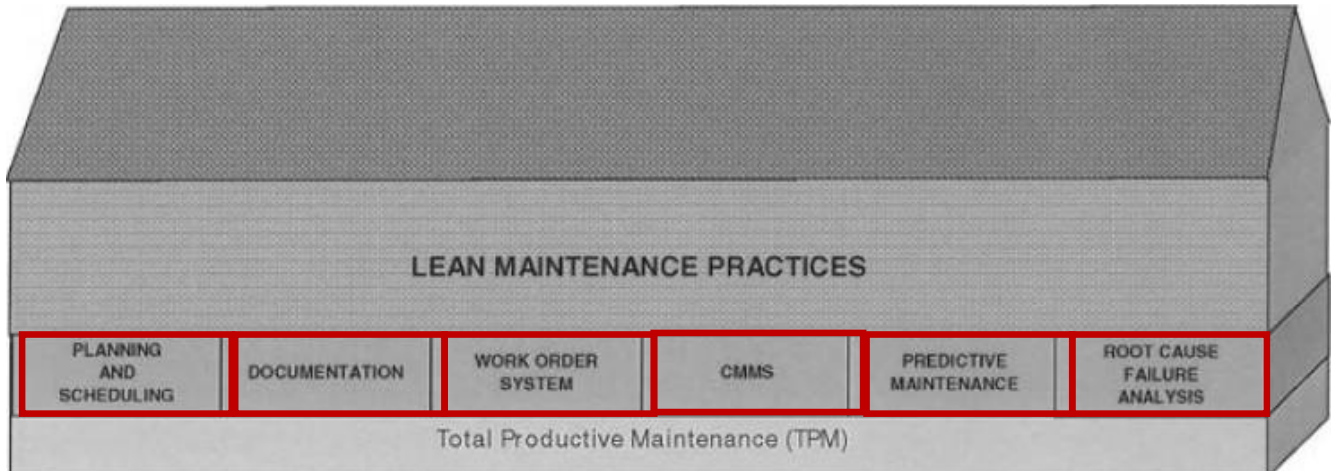
2.Map (value stream)

3.Apply (flow)

4.Selectivity (pull)

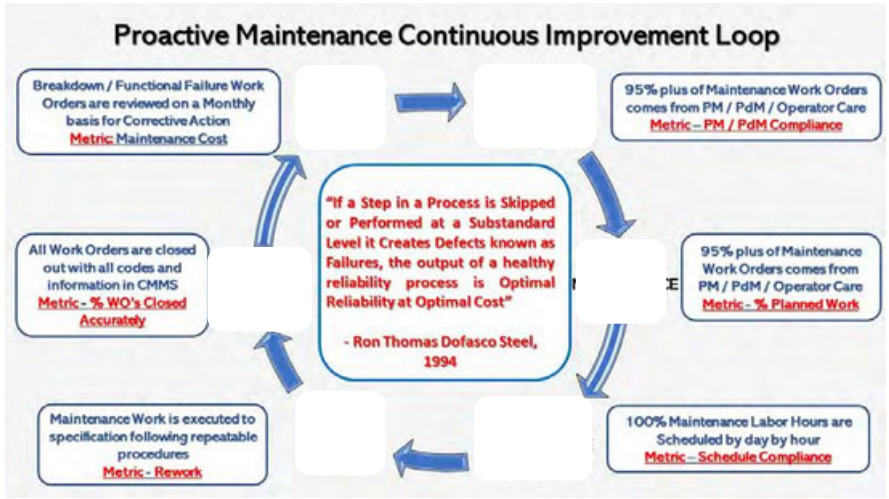
5.Continuous Improvement (perfection)

One will find it impossible to optimize the maintenance organization without first understanding the foundation elements of successful maintenance and optimizing them before approaching Lean Maintenance.



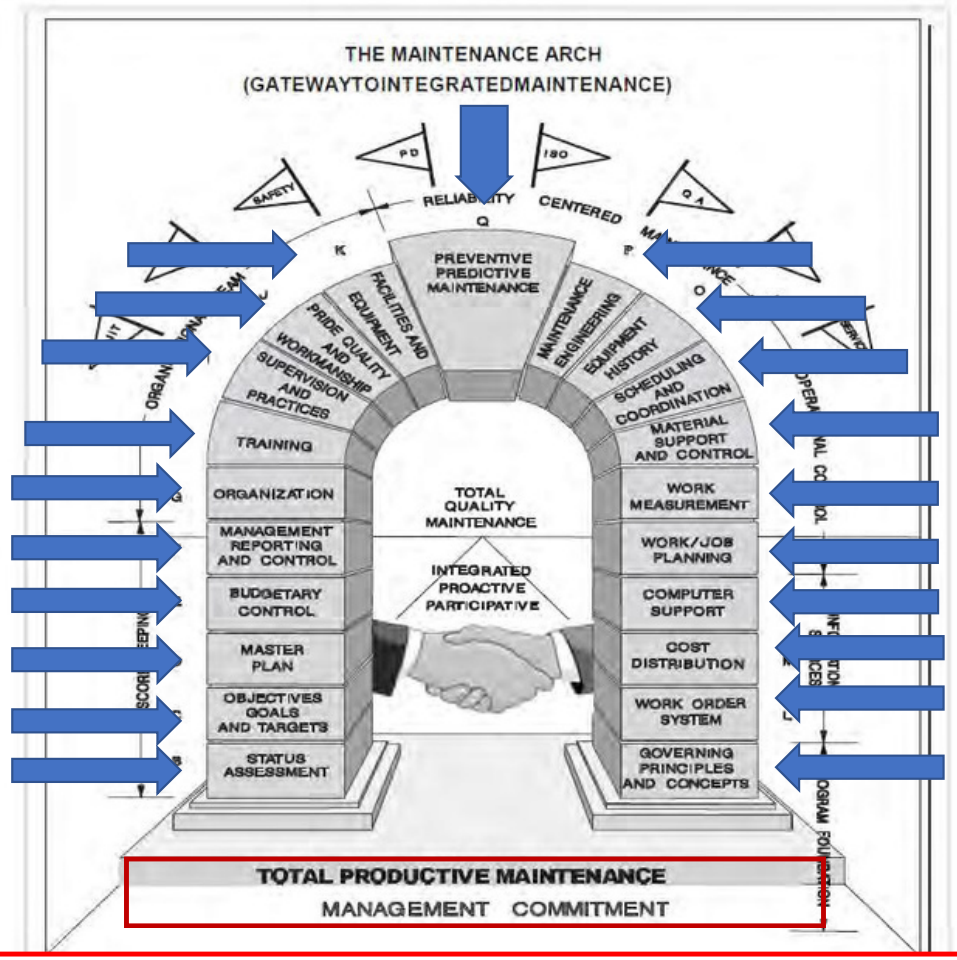
The Goal of Lean Manufacturing

- **Lean Manufacturing is the practice of eliminating waste in every area of production including customer relations**
  - **Sales, delivery, billing, service and product satisfaction**
  - **Product design, supplier networks, production flow**
  - **Maintenance, engineering, quality assurance and factory management.**
- **Its "Goal" is to utilize less human effort, less inventory, less time to respond to customer demand, less time to develop products and less space to produce top quality products in the most efficient and economical manner possible.**
- **So which element or elements supports Maintenance to obtain Lean Manufacturing's Goal the most?**



The Maintenance Arch

The Maintenance Arch provides "ALL" elements required to Meet the Objectives of Lean Manufacturing in must more detail.



Without success of Maintenance, TPM will not meet the expectations of management.

All of the elements of the Maintenance Arch are Required for Success of Lean Manufacturing

Lean Maintenance Goals

Indicator	Ultimate Goal
Backlog—Ready	2 to 4 weeks
Total	4 to 6 weeks**
Stores service (average)	95% to 98%
Materials delivered to job site	Above 65%
Stores turns per year	2 to 3
Preventive maintenance man-hours (includes PDM)	30% or greater
Unscheduled man-hours	Under 10%
On-the-job supervision	Above 65%
Schedule compliance	Above 90%
PM schedule compliance	Above 95%
Overtime	5%
On-the-job wrench time	Above 55%
% of planned work	Above 90%
Emergency maintenance labor hours	Under 2%
PPM routines/corrective WO (actions)	6:1 (without RCM)

* To be achieved by year-end.

** Excluding major overhaul (shutdown or outage).

"The productivity of work is not the responsibility of the worker but of the manager."
Peter Drucker

Name One Reason why Lean Maintenance will not Work?

"Text in your answer"

Name One Reason why Lean Maintenance will Work?

"Text in your answer"

The First Step: Top Level Management Buy-in

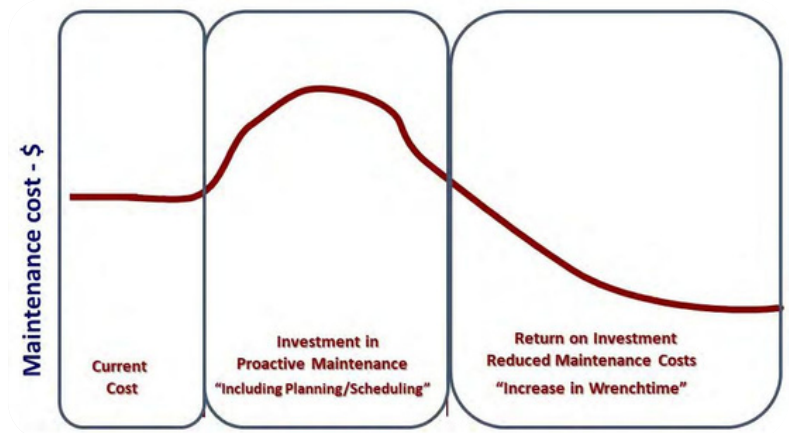
- **Executives in the most successful companies instill a passion for excellence in their entire organization.**
- **Executives lead these companies with a passion for excellence that pervades the business and creates an identity and focus for every employee.**

•Senior executives at the top of these companies articulate consistent, direct messages that enable employees throughout the organization to understand how the company works, how performance is measured and how the company is organized around its core strategies.

•For the maintenance operation this begins with a changeover from reactive maintenance to the proactive approach of TPM.

•Convincing top management of the gains, in terms of return on investment (ROI), that will be realized with the implementation of TPM and gaining its firm commitment to the process is a very necessary first step in the entire Lean transformation.

•An investment is required



World Class Maintenance Cost as % of Replacement of Asset Value – 1.6% to 3.4%

Typical Maintenance Cost as a % of Replacement of Asset Value – 6.7% to 12.3%

Proactive Maintenance Characteristics Control

- **Proactive Maintenance Characteristics Control over the Maintenance Resources**
- **With the advent of effective maintenance planning and scheduling procedures there is often a vast and rapid change in the under-standing of what is required of the maintenance resources from week to week.**
- **This often can easily extend to monthly planning periods.**
- **Increased Inventory Control—The dual effects of increased equipment reliability and better planning and scheduling will lead directly to increased control over the operation of the maintenance stores.**
- **Elimination of much of the "Waste" of the business processes—With accurate planning and scheduling processes, much of the waste in the processes will cease to exist.**
  Waste appears generally in the form of waiting times for materials, equipment availability and in the provision of inaccurate information.
- **Increased Accuracy in Maintenance Budgeting—With the increases in equipment reliability, large gains in budget accuracy are immediately possible.**
- **The ability to forecast maintenance requirements, either by equipment or activity, are vastly enhanced when we reach the planned stage of maintenance.**
- **Reduced Maintenance Costs—In conservative terms a task that has been planned and scheduled is at least 50% more efficient in terms of both costs and time to complete.**
  Using this as a standard and applying it to the amount of tasks that are now executed in an unplanned fashion we can easily see the range of savings that are possible.

The Problem with Maintenance is we are Measuring the Wrong Things

Ricky Smith CMRP, CMRT

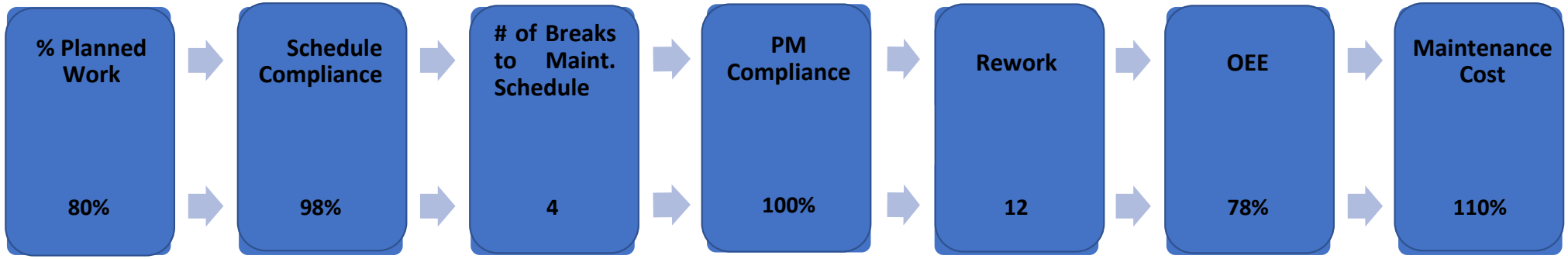
Create a Balance Scorecard

Step 1: Identify a Cross functionable team made up of key stakeholders
(buy a copy of "Lean Maintenance" and put a copy on all the stakeholders' desks –put a note on the book, "Please review and then Let's Talk")

Step 2: When someone ask what is this all about tell them: "I am scheduling a meeting on this topic next week please review the book and let's talk"

Step 3: Schedule the meeting, time and place. One hour long and be sure to use "BLUFF" (Bottom Line Up Front)

Step 4: Work with Plant Comptroller to add to the Balance Scorecard and assist and them keeping their data updated.



Lean Maintenance Metrics / Balanced Scorecard

OEE –Overall Equipment Effectiveness

- **Maintenance Labor Cost as a % of RAV / ERV**
  - **Maintenance Material Cost as a % of RAV / ERV**
- **Contract Maintenance Cost**
- **% Overtime**
- **Material Cost**
- **Stockouts**
- **Maintenance Rework**

- **Schedule Compliance using the 10% Rule**
- **% of Planned Work**

Balanced Scorecard Template

Strategic Objectives	Performance Measures	Targets	Action Plans	Perspective
				Financial
				Customer
				Internal Processes
				Learning & Growth

Maintenance and Reliability Lean Key Performance Indicators

Reliability/Maintainability

- MTBF (mean time between failures) by total operation and by area and then by equipment.
- MTTR (mean time to repair) maintainability of individual equipment.
- MTBR (mean time between repairs) equals MTBF minus MTTR.
- OEE (overall equipment effectiveness) Availability × Efficiency (slow speed) × Quality (all as a percentage)

Preventive Maintenance (includes predictive maintenance)

- PPM labor hrs. divided by Emergency labor hrs.
- PPM WOs (work orders) #s divided by CM (corrective maintenance, planned/scheduled work) WOs as a result of PM inspections.

Planning and Scheduling

- Planned/Schedule Compliance—(all maintenance labor hours for all work must be covered and not by "blanket work orders"). This a percentage of all labor hours actually completed to schedule divided by the total maintenance labor hours.
- Planned work—a % of total labor hours planned divided by total labor hours scheduled.

Materials Management

- Stores Service Level (% of stock outs)—Times a person comes to check out a part and receives a stock part divided by the number of times a person comes to the storeroom to check out a stocked part and the part is not available.
- Inventory Accuracy as a percentage.

Skills Training (NOTE: A manager must notify maintenance craft personnel about the measurement of success of skills training.)

- MTBF.
- Parts Usage—this is based on a specific area of training such as bearings.

Maintenance Supervision

- Maintenance Control—a % of unplanned labor hours divided by total labor hours.
- Crew efficiency—a % of the actual hours completed on scheduled work divided by the estimated time.
- Work Order (WO) Discipline—the % of labor accounted for on WOs.

Work Process Productivity

- Maintenance costs divided by net asset value.
- Total cost per unit produced.
- Overtime hours as % of total labor hours.

My Final Thoughts

- **If change were easy everyone would be 100% Successful**
- **The process of becoming successful in Lean is to:**

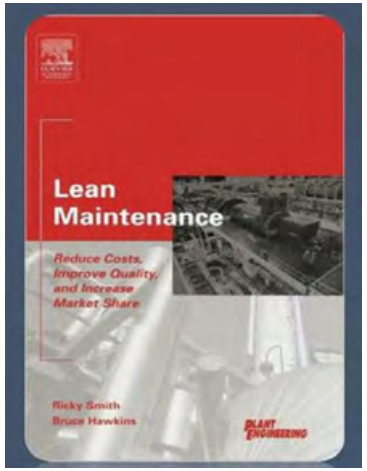
1.Knowledge of Known Best Maintenance and Reliability Best Practices is the foundation of "Lean Maintenance" (take your "production partner" with you to the training)

2.Assess current state of your Maintenance Organization current Practices against Best Practices

3.Create a 3-5 Year plan (with quick wins 90-180 days at the beginning)

4.Create a Lean Maintenance Dashboard and post for all to see (Manage what you measure)

5.Join me for Maintenance and Reliability Best Practices Workshop –May 18 to May 20



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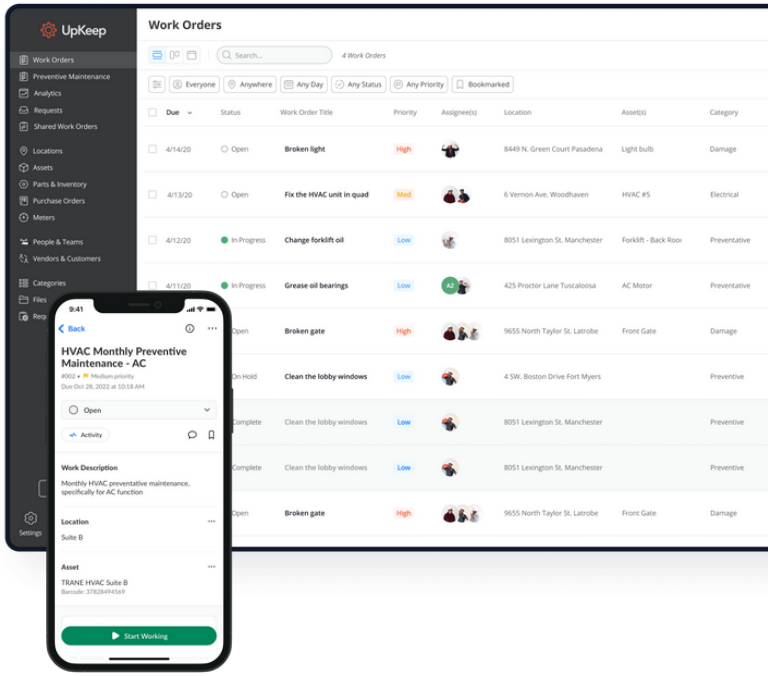
#1 Software for Maintenance & Reliability Teams

UpKeep is a service-first company that builds software designed to make maintenance easier for technicians and managers everywhere. Reduce downtime up to 18% by switching over to a preventative maintenance solution!

www.upkeep.com



Our Products

UpKeep

Mobile-first maintenance management and collaboration across all location, assets, and teams

"With nearly 340 different machines in our work environment, it's an impossible task to manually assign and track PM's. With UpKeep we can schedule regular maintenance without overlapping tasks with other critical jobs."

★★★★★ **Paul D, Health and Safety Coordinator**

edge by UpKeep

An end-to-end solution for remote condition-based monitoring

Connected and secure IoT sensors for real-time remote condition asset monitoring

DATAHUB UpKeep

Integrated & Centralized Data Ecosystem for World Class Asset Operations

The only purpose built Asset Data Platform. Asset Focused ELT Solution for advanced analytics and integrated, real-time asset data.

TMCC THE MAINTENANCE COMMUNITY COALITION

The Maintenance Community Coalition was founded on the belief that working together will benefit everyone within our community

Committed to helping each other thrive in our individual professional journeys by sharing resources and expertise, granting scholarships, hosting events, and unlocking knowledge – always at no cost.