



Manufacturing Solutions International

Lean Maintenance for Manufacturing Series

Organizations in the existing economy face, not only the challenges of a globally competitive marketplace, but also the challenges of continuously improving technology, more complex machinery, and a workforce whose skills must continually change and improve to be competitive. Competition for our customers, as well as our workforce, is at an all time high. There is no room for mediocrity. The focus on quality, costs and customer service has led us to neglect equipment and the processes and skills necessary to maintain and continually improve those processes and equipment.

Organizations all over the world are increasing quality and cutting costs through the implementation of Lean Manufacturing Processes. Successful Lean Manufacturing implementations depend upon outstanding equipment reliability. Implementation of Lean Maintenance concepts is a necessity for success. This methodology of utilizing the entire workforce in a joint effort of asset management has led to some astonishing results, benefiting many organizations on their way to becoming World Class competitors.

Manufacturing Solutions International believes that improving asset effectiveness is a key factor in achieving business success. In order to achieve this, companies must focus the entire workforce on improvement. Continuous improvements in equipment Availability, Performance and Quality output can only be achieved through a combined effort and education of management, engineering, maintenance and operations within the organization.

MSI offers a number of workshops and services designed to improve communication, transfer skills and knowledge, build on business processes in place within the organization, and provide the tools needed for successful implementation of a Pro-Active, Reliability Centered, Effectively Managed Culture.

Product Offerings Include:

- Lean Maintenance Organizational Assessments
- Balanced Maintenance Scorecard (Metrics) Development
- Lean Maintenance for Manufacturing Overview
- The Lean Maintenance for Manufacturing Workshop
- Understanding How Machines Think
 - A Guide for Applying Systematic Troubleshooting in Manufacturing
- Lean Equipment Set-up & Changeovers
- The Lean Workplace
 - 5S organization with the Visual Management System
- Maintenance Planning & Scheduling
- Internal Instructor Development
- CMMS System Selection, Integration, Training & Implementation
- Preventive & Predictive Maintenance Procedure Development
- Standard Operating Procedure Review and Development

Lean Maintenance Organizational Assessment

Purpose: To ascertain the level of effectiveness of the maintenance processes and procedures within the organization.

Duration: 1 – 5 days, depending on the size of the facility
Debrief: Approximately 4 hours

Overview: An in-depth assessment is a critical step for any organization preparing to make improvements in maintenance management. The assessment is critical for assessing the organizations current level of effective maintenance process implementation. The primary strengths of an organization are evaluated as well as areas needing further development. Based on analysis of the organization, maintenance systems, personal interviews, surveys and an observation report of the facility, MSI prepares a report that includes strengths, areas of development, initial, short-term and long-term recommendations, and statistical analysis of data, quotes and supporting materials. Presentation of results and planning for next steps take place during a ½ day debrief meeting.

Audience: *During assessment:* The assessment consists of three parts;

- 1) 30 – 45 minute interviews with a random selection of groups of employees (all levels, areas, and shifts), with surveys completed by all (or a representative sample)
- 2) An equipment evaluation performed by our consultants with the cooperation of key maintenance and operations personnel
- 3) An analysis of current maintenance system (CMMS if available) and metrics (Current reporting measurements and standard MSI measurements)

Assessment Debrief: Senior Leader(s) and Selected Staff, Steering Committee, Union Officials

Materials: Clients will receive detailed results highlighting Strengths, Areas of Development, Process Recommendations and Next Steps

Assessment Focus Areas:

- Identification of current equipment conditions
- Identification and analysis of current maintenance processes
- Analysis of current maintenance metrics
- Effectiveness of the current maintenance / operations / management relationship
- Identification of the actual maintenance process (Flowchart)
- Comparison of the actual process flow to SOP's

Balanced Maintenance Scorecard/Metrics Development

Purpose: To establish quantifiable measurements and goals for the maintenance processes within the facility.

Overview: Any organization preparing to make improvements in maintenance & reliability must be able to measure the results. The scorecard is a critical tool used to assess the effectiveness of process improvements. MSI will guide the employees of each department to develop their metrics ensuring their relationship to the overall goals of the facility and the company as a whole. Once established and base lined the metrics will be tracked and reported at regular intervals. This will effectively align all employees toward common goals for the company.

Key Outcomes:

- Departmental Metrics aligned with the company vision
- Established tracking procedures for each department
- Base line measurements that can be compared to World Class
- Overall Plant or Company Goals
- Understanding of the Future Vision
- Alignment of all departments to the Future Vision

Lean Maintenance for Manufacturing - Overview
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Purpose: This workshop provides participants the overall understanding of Pro-Active Equipment Management and the processes necessary to integrate concepts of TPM, PM, PdM, and Lean into normal daily work. Participants will experience first hand the tools and systematic approach necessary to implement the concepts into daily work within the facility

Duration: 1-2 Days

Overview: This interactive workshop is designed to give participants a hands-on overview of Pro-Active Equipment Management and the process of Lean Maintenance implementation. Participant teams will spend approximately ½ day in the classroom and ½ day experiencing the results of applied methods each day.

Day 1 is focused on the inspection process and eliminating sources of equipment contamination. Participants remove contaminants from the equipment, tagging any abnormal conditions found. Participants will gain an understanding of the standardization process, the improvement process and the benefits of teamwork and communication.

Day 2-- Participants will learn how everyone can assist in the maintenance planning effort within the facility. Participants will also learn how organization and control of the workplace leads to a better understanding of equipment and less work to accomplish the tasks at hand.

Audience: Sr. Management, Union Leadership, Other Key Maintenance and Operations personnel

Materials: Each participant will receive a classroom workbook and team workbook that includes forms, checklists and sample documents.

Key Outcomes:

- Understanding of current Communications between departments
- Understanding of current equipment conditions
- Improved teamwork
- Understanding of proven concepts of TPM, RCM, PM, and PdM
- Understanding the benefits of implementing a Pro-Active Equipment Process

The Lean Maintenance for Manufacturing Workshop

Purpose: This workshop allows participants to experience first hand the tools and systematic approach necessary to implement the Lean Maintenance Process within the facility

Duration: 4 Days

Overview: This highly interactive workshop is designed to allow participants to not only learn about the processes, but to actually experience them. Participant teams will spend approximately ½ day in the classroom and ½ day implementing what they have learned, on their equipment.

Day 1 is focused on inspecting equipment through a hands-on cleaning process. Participants remove contaminants from the equipment, tagging any abnormal conditions found. These are recorded and summarized. Abnormalities will be corrected throughout the duration of the workshop, whenever possible, and work requests written for the remainder.

Day 2 Participants will uncover sources of the contaminants and identify inaccessible areas that need improved access for inspections and PM tasks. Working in teams, participants will develop and implement improvements for these areas to reduce or eliminate the sources of contaminates. This process will yield many ideas for improving the operation of equipment, as well as preventing the recurrence of the abnormal conditions. Participants will also begin to draft standards for the equipment. Checklists and charts for inspection and lubrication are developed to assist in the preventive maintenance procedures for their equipment.

Day 3 Participants will learn how everyone can assist in the maintenance planning effort within the facility. Basic fundamentals of maintenance planning are used to document facts when recording a maintenance work request. Participants will also learn how organization and control of the workplace leads to a better understanding of equipment and less work to accomplish the tasks at hand.

Day 4 Participants will implement the first stages of a visual management system in the workplace. Presentations of the teams experiences and findings of the week will be developed and presented to the management group along with recommendations from each team. The afternoon is used for a discussion of next steps needed, for the process to proceed within the facility.

The Lean Maintenance for Manufacturing Workshop

Audience: Employees from all areas of the facility including management, engineering, maintenance, operations, and office personnel. The team presentations will be performed for all management personnel, as well as any other interested employees who are available to attend.

Materials: Each participant will receive a classroom workbook and team workbook that includes forms, checklists and sample documents.

Key Outcomes:

- Improved Communications between departments
- Improved equipment conditions
- Improved teamwork
- Lubrication charts for the equipment
- Inspection checklists for the equipment
- Corrected problems and abnormalities with the equipment
- Understanding of the TPM processes
- Plans for implementing a Pro-Active Equipment approach
- Improved organization of the work areas
- Identified areas of improvement

Understanding How Machines Think

Purpose: This workshop introduces participants to a systematic process of dissecting a production machine into separate operations, allowing them to fully understand individual component functionality and interaction. Once understood, the systematic troubleshooting process can be applied easily and effectively

Duration: 1 Day (2 Days Optional)

Overview: The workshop provides participants with a systematic method of separating the multiple functions of any machine into distinct operations; identifying and recording the information needed to identify the problem, analyze the root cause, and implement a solution. Participants will experience first-hand, faults created in the specially designed trainer. Using the simple step-by-step methodologies learned in this highly interactive workshop, participants will learn to identify the sequence of operations for any production machine, or system, analyze the components involved in each operation, and determine each component's specific function. Using this information, problems can be readily identified and corrected, substantially reducing downtime involved in typical troubleshooting processes. Day 1 is spent in the classroom working with the trainers learning and practicing the methodologies.

Day 2 (Optional for in house workshop only) is spent focused on applying the methodologies learned, to your equipment, through hands on involvement with your equipment and drawings of your systems.

Audience: Any employee faced with troubleshooting equipment problems or responsible for those who do, as well as employees who wish to gain a better understanding of the equipment they operate and maintain

Materials: Each participant receives a workbook that includes forms developed for information gathering and troubleshooting equipment. Each team receives wall charts of the Equipment Information Sheets and the Systematic Troubleshooting Charts.

Understanding How Machines Think

Key Outcomes:

- Completed “Machine Information Chart”
- Understanding of Equipment “Sequence of Operations”
- Understanding Component functionality
- Understanding Component testing procedures
- Understanding how to apply the
“Systematic Troubleshooting Approach”
- Standardized Troubleshooting approach throughout the facility

Lean Equipment Set-Up & Changeovers

Purpose: This workshop introduces participants to a hands-on, systematic approach to reducing changeover and set-up times. Participants will experience, first hand, methods to reduce changeovers and set-ups on their own equipment

Duration: 2 Days

Overview: This workshop provides participants with a clear understanding of the steps required to implement a complete set-up reduction program for all equipment in the entire facility that would benefit from reduced changeover times. It is important for participants to have a clear understanding of the processes in a “real-world” environment. Participants gain hands-on experience working directly on the factory floor during the workshop.

Day 1--The training begins in the classroom, where participants learn the benefits of reduced set-ups, as well as the step by step methodology for reducing set-ups in a simulated environment

Day 2--Participants learn the principles of Quick Changeovers. Working in teams, participants observe and document an existing changeover in the facility. They will then apply the step by step process to reduce the documented changeover time. Once the teams have developed new standard procedures, they will perform and document the changeover again, using the newly developed procedures. The changeover will, once again be well documented. Each team will document the reduced time and, when possible, calculate the cost savings and possible increased production.

At the end of day 2 participants will develop presentations of their experiences, findings, savings, and improvements from the workshop. Each team will present to the management staff. This allows for instant recognition of the teams for their work on the improvements and allows each team to make recommendations to the management staff for implementation throughout the facility.

Audience: Set-up personnel, machine operators, maintenance technicians, support engineers, production and maintenance managers, area supervisors, and Sr. management responsible for set-up or lead-time reduction.

Lean Equipment Set-Up & Changeovers

Materials: Each participant receives a workbook that includes forms developed for the information gathering process and analysis of existing set-ups, as well as materials and forms used to create new standard procedures for reduced set-up times

Key Outcomes:

- Immediate Set-Up reduction of the selected equipment
- Understanding of the benefits of reduced changeover
- Understanding of the Step by Step process of Changeover Reduction
- New Standard Procedures for each of the Changeovers / Set-Up
- Improved equipment conditions
- Improved Lead Times
- Improved Teamwork
- Understanding of “How To” apply the techniques to other equipment

The Lean Workplace
5S organization with the Visual Management System

Purpose: This workshop introduces participants to a systematic process of the 5S system (Sort, Store, Shine, Standardize, Sustain), as well as the methodologies to implement 5S and Visual Controls into the workplace

Duration: 2 - 3 Days

Overview: This highly interactive workshop provides a hands-on approach to understand the benefits of 5S implementation. The workshop starts on day 1 in the classroom where participants experience the value of organization, orderliness, and standards from simulations involving each team. In the afternoon, each team is assigned an area of the facility. They will follow a systematic process of 5S implementation, organizing a specific work area. Each team determines what is necessary in the area and what is not, eliminating the latter. Each team then determines where things should be, based on the items left in the work area.

On day 2, teams continue the step by step process by creating standardization using visual displays and visual controls for the work areas. Teams thoroughly clean the areas and develop checklists for standardized cleaning procedures. By the end of day 2, teams have thoroughly cleaned, organized, and implemented standards in the assigned areas.

Each team will create and make presentations to the management staff and other teams. The presentations will highlight the teams' accomplishments and improvements made, as well as the teams learning's, feelings regarding the process and recommendations of how to continue the process.

Participants: Employees from all areas of the facility, including management, engineering, maintenance, operations and office personnel. The teams should be made up of a cross-functional group and include employees from all areas on each team, if possible.

Materials: Each participant will receive a classroom workbook and team workbook that includes forms, checklists, and sample documents

The Lean Workplace
5S organization with the Visual Management System

Key Outcomes:

- Several Highly organized work areas
- Elimination of unnecessary or unneeded items in the work areas
- Understanding of the value of organization/cleanliness and standards
- Understanding of the 5S process
- Improved communications between departments
- Improved teamwork
- Improved organization of the work areas
- Identified areas of future improvement
- Improved awareness of how to lower costs, improve quality, improve safety, and increase moral in the workforce

Maintenance Planning & Scheduling

- Purpose:** To provide participants with a working knowledge of the maintenance planning and scheduling process
- Duration:** 2 Days
- Overview:** This workshop provides participants with the tools necessary to properly plan and schedule maintenance work. Participants will bring outstanding maintenance requests from their department or area with them and they will be used in the workshop. Each team will first plan a work request as they normally would, sharing the process with the other teams. Participants will then learn the methodologies of planning including information gathering, the equipment walk-down process, and prioritization of work. Each team will then use these processes to plan this work order again. The entire class will then compare the results of the planning exercise.
- Scheduling is an important and sometimes detached part of the maintenance process. Participants will develop a 1-week schedule based on the current production schedule of the facility and the prioritization of the work requests they have planned. Each team will develop a timeline of activities for the schedule they have created and a maintenance scorecard to track improvements in the planning and scheduling process. They will learn how to conduct pre-schedule meetings, as well as follow up meetings to review the maintenance scorecards and results of the weeks' maintenance activities
- Audience:** Maintenance Planners, Mechanics, Operations Personnel, Management and employees that are involved in the creation of work requests or work orders
- Materials:** Participants receive a workbook that includes forms for equipment evaluation during the walk-down process and meeting agendas
- Key Outcomes:**
- An agreed upon Work Process Flow
 - Criteria for approval, routing, and prioritizing work requests
 - Actual Planned Work Orders for the facility
 - A usable maintenance schedule
 - Meeting management skills
 - Increased communication & understanding between operations and maintenance
 - “Hands On” working knowledge of the planning and scheduling process

Trainer Development & Certification

Purpose: To provide the skills necessary for your internal trainers to continue the training effort within the facility

Duration: 2 to 5 Days

Overview: This workshop provides participants with the tools necessary to properly plan, organize and perform any of the MSI workshops. Participants will develop a “Trainers Guide” manual for the specified workshop. Through interactive participation and practice, each participant will gain the skills necessary to perform the workshops for other employees

Audience: Any employee with the interest of becoming a trainer for the facility

Materials: Participants receive a workbook and an outline that will be used to create a personalized trainers guide for the specified workshop. Participants will also receive additional materials such as overhead transparencies, videos used in the workshops, and instructions for any of the team building or training activities used in the specified workshop

Key Outcomes:

- An understanding of the processes used in adult learning
- A thorough understanding of the course subject matter
- An outline and agenda to be used for organization of future workshops
- Increased presentation skills

CMMS – Selection / Implementation / Training

Purpose: To assist the organization in the proper selection and implementation of a computerized maintenance management system.

Overview: The selection of a CMMS system for an organization can be an overwhelming task. Our experienced staff of maintenance and IT professionals has the knowledge and experience to guide an organization through the selection process, starting with the identification of needs and the development of project goals. Once the organization is clear and aligned in the desired outcomes of the project, we can assist with the development of the “Request for Proposal”, selection and final purchase of the system.

MSI can also manage or assist in the implementation of the system, from the initial process mapping procedures, data collection, data transfer, PM and PdM procedure development, to database management, training development and delivery.

Key Outcomes:

- Identified actual plant or organization needs
- Prioritized listing of the plants’ “wants”
- A thorough Request for Quotation document
- A current process map of all functions of the maintenance organization
- An implementation project timeline & plan
- A training program tailored to the needs of the plant or organization

PM / PdM Procedure Review / Development

Purpose: To establish an effective preventive maintenance process within the organization by providing the proper procedures to maintain existing or new equipment.

Overview: Effective maintenance of any equipment is highly dependant on the understanding of how to maintain the equipment. Typical PM procedures provided with new equipment from the OEM vendor are inadequate. PdM procedures are virtually nonexistent with most equipment. Developing procedures for existing or new equipment can be an overwhelming task for any organization. Procedures can be purchased and installed by a vast number of databases within the consulting world, but are they adequate? Our experienced staff of maintenance professionals has the knowledge and experience to guide an organization through the development process. We utilize the knowledge available in your staff of maintenance and operating technicians as well as our expertise. Based on the equipment manufacturers recommendations, equipment utilization, and the operating environment, we will develop proper care procedures for your equipment.

MSI can also develop and deliver Preventive and Predictive Maintenance training and Self Training Manuals.

Key Outcomes:

- Clear, concise, and understandable PM/PdM procedures
- Accurate time or meter estimates
- Procedures installed in your CMMS database
- Procedure manual for each production line, system, or machine complete with digital pictures which can be used for training
- A training program tailored to the needs of the maintenance or operations

**Operating Procedure Review / Development
SOP's**

Purpose: To establish an effective operating process within the organization by providing the proper procedures to run and care for existing or new equipment.

Overview: Effective reliability of any equipment is dependant not only on the proper maintenance, but also on the proper operation of the equipment. Understanding & following the correct standardized methods of operation greatly increases the reliability and availability of the equipment. Operating procedures delivered with new equipment are rarely adequate for the training of your operational technicians. Developing procedures for existing or new equipment can be an overwhelming task for any organization. Our experienced staff has the knowledge and experience to guide an organization through the development process. We utilize the knowledge available in your staff of maintenance and operating technicians as well as our expertise. Based on your organizations needs, we will develop proper operating procedures for your equipment.

MSI can also develop and deliver Operational training and Self Training Manuals.

Key Outcomes:

- Clear, concise, and understandable Standard Operating Procedures
- Procedures installed in your database if applicable
- Procedure manual for each production line, system, or process complete with digital pictures which can be used for training
- A training program tailored to the needs of the maintenance or operations