

Risk *topics*

Developing an Effective Maintenance Management Program

Introduction

A maintenance management program is essential in assuring all construction, installations, and service operations are performed in accordance with acceptable safety and health standards. The maintenance management system provides for direct management participation as well as the maintenance department's providing planned preventive maintenance and adequate response to unscheduled events that occur. Too often, maintenance management is limited in scope to the response to breakdowns and equipment failures. This type of reactive management leads to direct and indirect expenses that are unnecessary and can be controlled.

Key Elements of the Program

The key elements that make up an effective maintenance management program are outlined below. These elements offer a basic guideline. Other specific programs may also be necessary to achieve a well managed system for your operation.

Management Commitment: A strong management policy establishing leadership and support for the maintenance program is the first essential part in establishing the program.

Management must communicate its sincere support through an aggressive communication of the policy and procedure to all employees.

Budget: A maintenance program needs adequate budget to provide the parts and services required to make the program work. A budget process should be established and adequate resources directed at maintenance. The maintenance department is often overlooked during budgeting. Then it becomes extremely difficult to finance the needed services from current operating funds.

Management Review: Management participation continues through the process of review and audit of the program. It becomes a vital part of the follow-up and remedial actions.

Authority: The policy should delegate authority and assign responsibility to the appropriate employees. Specific responsibilities and performance standards should be established and communicated. Where division of responsibility is required between departments or specialties, those responsibilities must be clearly established. Enforcement of policy and procedure becomes a key element in the success of the program.

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Ability: Managers, supervisors, and technicians should be selected who have the ability to lead and direct the program. Leadership skills, communication skills, and the ability to function within the formal and informal organization structure are important elements in the maintenance management program. This means placing the proper people in the proper function. Management must be aware of the skills and abilities and recognize that the skill, experience, and expertise may not be sufficient for all services and repairs.

Skill and Training: The maintenance management program provides for testing to determine skill levels. Employees should be assigned duties that are commensurate with demonstrated skills. The program also provides adequate training on how to cope with new facilities and equipment or to upgrade the technical ability of the employees. The skill level assessment provides a basis for determining what level of outside services is required. These outside services may be contractors providing service, suppliers, trade associations, conferences, and publications.

Facilities Inspection: A thorough facilities inspection is a key element in identifying the scope of the maintenance management program. This inspection lists the various life safety equipment, building services equipment, production and process equipment, and industrial equipment that should be included in the maintenance program. After the initial inspection for identification, then periodic inspection tours should include top management representatives.

Maintenance Audit: An audit is the barometer of success for the program. An audit will show the real success in terms of continued operation, reduced maintenance costs, reduced downtime, and increased production.

Preventive Maintenance: The purpose of preventive maintenance is to prevent catastrophic equipment failures and to improve productivity by reducing unplanned downtime and equipment damage. The preventive maintenance portion of the program has four major functions:

- Establishing the schedule and performing the periodic maintenance as a routine that meets or exceeds the manufacturer's recommendations for service. The maintenance schedule must be systematic, based on time, usage, age of the equipment, extent of use, and the importance of the equipment to the overall operation and safety. The manufacturer's specifications and recommended maintenance schedule should be consulted.
- Establishing and maintaining documented records of the service and repairs for all equipment. The record should contain a complete history of the maintenance provided from the time the equipment was purchased and placed in service. The records should also identify exactly what parts are to be serviced, the type of service to be provided, and the frequency of the service. The documented service record should identify the technician and verify that service was provided in accordance with the schedule. A list of parts used should also be included.
- Establishing a useful lifespan for each piece of equipment, than repairing and replacing equipment and parts on schedule. The past service records are vi-

tal in determining the useful life and replacement schedules.

- Identifying critical parts, establishing inventory levels, and controls for spare parts. Substantial company resources can be invested in spare parts stock. The identification of critical parts is very important in balancing cost with reduced waiting time for replacements. Some factors to consider in establishing the critical parts inventory are the availability of parts, the cost of the parts, and the impact on operations when the part fails.

It may also be useful to categorize the equipment to assist in the planning for preventive maintenance.

- *Life Safety Equipment* – Exits, path to exits, ramps, railings, emergency lighting, portable fire extinguishing equipment, automatic sprinkler systems, stand pipes, hose racks, and hood and duct fire suppression systems, alarms, and other equipment.
- *Building Services Equipment* – Electrical distribution system, fuse boxes, and over current protection devices, lamps, lighting, heating, ventilation, and air conditioning equipment, cooling towers, water treatment facilities.
- *Production Process Equipment* – Boilers, spray painting and coating equipment, machinery conveyors, compactors, incinerators, and other waste disposal facilities, industrial trucks, battery charging operations, fuel dispensing systems, chemical re-

actors, and other process equipment.

Nonscheduled Maintenance: In spite of a thorough preventive maintenance program, occasions will arise when equipment fails. A good nonscheduled maintenance system provides for work orders and service requests to be issued in the event of accidental failures or malfunctions. The program should establish responsibilities, priorities, and procedures to respond promptly to the unscheduled events. Work orders should be documented, reviewed, and followed up to assure the work was done. A work order review will help to identify weaknesses in the scheduled maintenance system.

Predictive Maintenance: Many companies in the chemical and petroleum industries have enhanced their maintenance program for critical equipment by incorporating predictive maintenance. It consists of continuous monitoring of process equipment for any abnormal operating condition. Commonly used monitoring techniques include vibration analysis for rotating machines, infrared thermography for heat generated and hot spots, oil analysis to detect residual metal particles in lubricants/coolants, and nondestructive techniques such as ultrasonic and x-ray scanning.

Safety

Safety procedures should be developed for all maintenance operations. Include in the safety procedures the use of personal protective equipment, lock-out/tagout, material handling, and the use of ladders, scaffolds, tools, and equipment.

Personal Protective Equipment: Protective clothing and equipment should be made available to fit the hazards of various maintenance operations. Procedures should be developed to identify

specific personal protective equipment for each maintenance task. Employees should be trained in the care and use of personal protective equipment, including eye protection, ear protection, respirators, gloves, and protective footwear.

Lockout/Tagout: Many tasks of working on equipment and providing the needed service require strict safety precautions. The maintenance management program establishes and enforces the procedure for lockout and tagout of electrical, pneumatic, and hydraulic equipment. The methods and precautions must be established and enforced for the safety of the maintenance employees. When lockout and tagout are required, this should be indicated on the service record. Key controls should be rigid for all lockout systems. Tagout procedures also apply to some forms of equipment and tools that cannot be effectively lockout out, but present an inherent danger, if used. Tagging defective extension cords, ladders, and tools and removing them from service prevents accidents.

Material Handling: Mechanical material handling devices should be used for moving and handling materials during maintenance operations. Material handling tasks should be reviewed to determine where material handling devices can be used. Training is needed for the proper use of such devices, including hand carts, lift trucks, hoists, and chains. A preventive maintenance program should be developed for material handling devices. For maintenance tasks that need manual material handling, employees should be instructed on lifting techniques and getting help for heavier items.

Ladders and Scaffolding: Ladders and scaffolding should be inspected prior to use. The durability of rungs and components should be determined. Scaf-

olds and ladders should only be used for their designed purpose. Ladders to roofs should be secured at top and bottom, and only wooden or fiberglass ladders should be used around electrical power. All scaffolding over 10 feet should be provided with guardrails, midrails, and toeboards on all open sides. Scaffolding from 4 to 10 feet in heights and having a minimum dimension in either direction of 45 inches should have guardrails on all open sides and ends. Workers should not use cross bracing to climb scaffolding. Access should be provided as each level.

Tools and Equipment: Equipment and tools should be provided with guarding at the point of operation and at power transmission apparatus. Before any equipment is used, care should be taken to inspect blades or grinding wheels. All equipment and tools should fall under a preventive maintenance program. Tools and equipment should be grounded and electrical cords maintained in good condition with no cracks or wearing.

Permit Systems: Hot work and entry into confined space need written procedures and permit systems. Operations needing permit systems should be determined by management. Permit systems should include the starting and ending time of the work, the exact area that the work is performed in, and the controls necessary to ensure safety.

Summary

If maintenance programs receive low priority, they may fail to provide the necessary management support staff, budget, and parts to effectively maintain a facility. Management commitment and support of a maintenance management program will not only enhance the facility, but it will conserve the resources of the company through decreased costs, increased production, and reduced down time.

References

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ZURICH

Zurich Services Corporation
Risk Engineering
1400 American Lane
Schaumburg, IL 60196

Telephone +1-800-982-5964
Fax +1-847-605-7736