Six Elements of a Successful Maintenance Management System
Part One – Introduction to the Six Elements

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Public agencies are required to maintain and improve the level of service for a continually growing catalog of assets with a stagnant or decreasing number of resources. The need for a comprehensive strategy for maintenance management programs increases along with this growth. To succeed; agencies must analyze, improve and document using the following six elements of a successful maintenance management system; 1) preventive maintenance, 2) stock and procurement, 3) work tracking, 4) workforce development, 5) statistical analysis and 6) performance measures in order to make the best use of existing resources and justify requests for additional or alternative resources.

The six elements, supporting maintenance programs and policies increase resource performance (efficiency), align the correct resource to the task (effectiveness) and if justified provide rational data to justify an expansion of resources to improve levels-of-service and meet increasing demands of scale.

The series of six articles to follow will describe each of these six elements, detail its components and explain their overall importance to a successful maintenance system. An explanation of how each element depends upon the other elements of the maintenance management program will also be provided. Finally the results of the implementation of these programs and policies will be put forward along with a discussion of the lessons learned and some of the problems associated with implementing a maintenance management system.

Preventive Maintenance
Perhaps the most important and least understood of maintenance functions is preventive maintenance (PM). Preventive maintenance is those tasks and that work which can be accomplished to alleviate “responsive” maintenance. One of the greatest boons to productivity and costs savings is the ability to schedule work. It is the very essence of being proactive. Responsive maintenance, also known as corrective, repair or unscheduled maintenance, is work that is not scheduled and thus is work that is not planned. Parsonson says in Management of Traffic Signal Maintenance, that eighty percent of a maintenance program should be planned with at most twenty percent responsive maintenance taking place. 1 A maintenance program that is not meeting this goal is not proactive. It is spending its time “fighting fires” and reacting to crises rather than in planning. A program that does not have time to plan does not have time to think ahead and make the tactical changes and corrections that enable the strategic plan to succeed. Preventive maintenance then is set up to prevent the need for responsive maintenance and many of the greatest cost savings are to be achieved at this process level. An example of preventive maintenance would include the inspection of traffic signal mounting hardware—enabling the scheduling for replacement of worn parts at a time of the agency’s choosing—rather than an expensive midnight response when the hardware fails on its own.

Stock and Procurement
Inventory and procurement processes direct the availability of parts and materials for the maintenance group. In some cases special tools and vehicles necessary for the maintenance team would be included in this category. The process of how parts and materials are made available for personnel can make all the difference in the efficiency and effectiveness of the work. How many steps must the team take to obtain needed materials? Are parts readily available or must they be ordered? This is not to say that large stockpiles of any and all possible parts and materials must be kept in the on-hand stock system. Just as importantly, stock must be managed wisely with just the right amount provided just when it is required. Just-in-Time (JIT) stock systems can and do work when properly managed. The widely based practice of rework or rehabbing traffic signals and signs by the agency must be included in the stock system as well. This work and the resultant stock are usually not taken into account by the stock and procurement system. If the rebuilt equipment is not accounted for incongruities will result during analysis since the rebuilt equipment was not procured in the traditional manner, does not have the same life-cycle as new equipment and may not have been returned to the asset management system inventory.

Work Management Systems
This is the process of recording, tracking and maintaining all maintenance activity data. The work management system is used to track the process from the original service request, to planning, scheduling and acquiring work performance figures. Failure and root cause data may be recorded and tracked as well. A Computerized Maintenance Management System (CMMS) is best implemented by the organization to simplify the discipline and routine collection of this data. Without this collection, analysis, and failure forecasting, much of the benefits of a proactive maintenance system will be impossible to acquire. Most of the data needed by the various maintenance processes is collected at this stage and the relationships between the processes cannot be established if they are not tabled in a closely controlled fashion.

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Workforce Development
There is growing concern that today’s workforce does not have the skills and knowledge necessary to keep pace with the ever advancing technological complexity of equipment they are required to maintain. The scarcity of vocational-technical school and apprenticeship schools does not bode well for the industry at large. Agencies must therefore develop their own skills-based technical training programs for their specific equipment and assets and performance measures must be developed to detect adequate levels of those skills while encourage workers without penalizing and decreasing security. A telling performance measure for this program would be the number of return visits to an asset due to the same set of faults.

Statistical Analysis
Statistical Analysis puts together all the data gathered around a particular asset or resource. The information associated with downtime, emergency repair, repair stocks, maintenance costs and the labor, equipment and part resources information is collected and decisions are made based on this information. The economics, efficiency and effectiveness of the operation is measured and indicated. With accurate data an agency can determine whether to continue to maintain or replace an asset. It can determine which parts to stock and which to order just-in-time (JIT). An agency can also make an accurate assessment of whether it is more cost effective to use contract labor in place of its own. The data gathered by the previous programs is vital to make relevant decisions. All the system baseline data must be collected and analyzed. The performance measures for each element are analyzed and indexed.

Performance Measures
Continuous improvement is the uppermost and final process, synthesis and highest expression of the others. Maintenance system improvement must be continuous to be effective and efficient as equipment, processes and staff changes as well as the operating environment itself. Everyone in the agency must be involved, energized and proactive looking for the chance to change things for the better. Benchmarking is a popular method of continuous improvement. It involves carefully establishing a baseline for the operational status of the organization and then comparing this status with similar organizations. This comparison can serve as a stimulus if a consistent plan can be developed to help improve the agency in those areas found lacking.

Conclusion
Joel Levitt in his book The Handbook of Maintenance Management compared maintenance costs to an iceberg. There are the direct costs that everyone sees like labor and materials. These costs are often the part that management sees as a burden and are often the first to be cut when operations faces tough budgets. Then there are the indirect costs that lie below the figurative waterline. Factors like set-up time, missed schedules, excess inventories, crises management, customer complaints, and liability. These indirect costs are what maintenance management systems are meant to forestall and if implemented wisely these programs allow for increased cost control and aid in providing quality and a high level of service.

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Footnotes: