

Reducing Maintenance Costs “A Manageable Journey”

The Road to Total Productive Maintenance Goes Through Basic
Maintenance Blocking and Tackling

A Kaufman Global White Paper

Introduction

Rising maintenance costs is an ever-present enemy of an organization's profitability. These costs appear as direct and indirect labor, materials and facilities. To meet this threat to economic viability, companies must invest wisely in the tools and practices required to optimize maintenance performance.

The evolution to maintenance excellence in any organization is dynamic. It involves implementing new methods and advancing technologies, as well as instilling into the organization the skills required to learn and effectively use them. Today, we see some companies keeping pace, and many who are falling behind. What separates the leaders from the laggards? Experience tells us that companies that *implement* well have reduced their maintenance costs by 25-40%.

Major factors that contribute to achieving such an improvement are: knowing *what* needs to be done and knowing *how* to do it. The "what" can be called the *science* of maintenance—the preventive, predictive, productive and reliability-centered aspects of maintenance. These technologies in themselves can be a significant challenge to the organization, but we find an even more significant challenge to be "how" to do it with minimal risk and cost, which involves people. Maintenance is not just for maintenance personnel. It must involve everyone, at all levels, who may be impacted by, or they impact, the level of maintenance service being provided.

The Science of Maintenance

Because of the competitive pressures to improve our businesses, the maintenance of our facilities is viewed by many firms as potentially the last significant competitive advantage. We believe if you stabilize the cost and predictability of your equipment operations you will open up new opportunities in your market place. In order to achieve a real competitive advantage, the equipment maintenance process needs to be held as a plant core competency and a critical function of the manufacturing process. Therefore the equipment maintenance process must be owned by the operating units and not the maintenance organization.

We have seen many programs ("programs of the month") being offered and enforced as the new cure-all or solution to the ills of plant maintenance. None of these programs have had the staying power or impact desired. What is the answer? What can be done? What business-like process can deliver measurable results? The answer can be found in solid business work processes redesigned to increase productivity and engage the entire work force in the process of equipment reliability. The technology associated with maintenance will continue to improve with each passing year and there will be a need to stay in touch with those developments. But technology is not the whole solution. Each maintenance process must be designed to support the specific operating environment and needs of the plant. Although the elements of a top notch program are essentially the same, they need to be applied in a manner that best suits the operating unit.

Evolutionary Stages of Equipment Maintenance

In the last fifty years the science of maintaining equipment in our facilities has changed and evolved. Those stages of development have been described as:

- **Breakdown Maintenance** – Equipment is run until it breaks before repair or replacement ... "run to failure", maximizing output in deference to production schedule requirements (not equipment reliability requirements).

- **Preventive Maintenance** – Routine activities are periodically performed to keep the equipment operating within manufacturers specifications.
- **Predictive Maintenance** – Condition-based testing technology is used to monitor changes in operating characteristics and predict equipment failure.
- **Productive Maintenance** – A coordinated combination of the activities noted above are blended with life cycle costing and new plant process design methods to proactively improve operating reliability.
- **Total Productive Maintenance** – TPM is a comprehensive application of Productive Maintenance using total employee participation.
- **Reliability Centered Maintenance** – RCM is a process designed to determine the maintenance requirements or the impacts of any physical asset in its operating context. SAP and other Computer Maintenance Management Systems are incorporating this process which requires a heavy emphasis on data analysis.

All maintenance areas today are in one or more of these stages of development. Usually they are in several at one time, further complicating the journey and making management much more difficult. It isn't unusual for organizations to spend considerable amounts of time tied up in definition discussions while losing sight of the basic blocking and tackling necessary for all of them.

Routine Maintenance

Routine maintenance includes the ongoing processes that schedule and control work performed by maintenance crews (both contracted and non-contracted). These are the basic "blocking and tackling elements" of maintenance. While they are intuitively assumed by all the other phases and programs, the extent of their implementation enables or limits the success of the entire maintenance effort. Simple to describe, challenging to execute, these basic blocking and tackling processes include:

- **Work prioritized by "equipment owners" based upon an agreed to priority matrix.** Typically most work is given the highest priority (ASAP) by the requestor, resulting in no one believing or supporting the priorities; and maintenance is forced to set their own (usually a losing proposition that satisfies few).
- **Most work (except emergencies) planned by skilled planners.** Given the nature of the priorities, typically the work doesn't have time to be planned. Planners learn from the start that they are expeditors. Planning training is minimal at best, creating a standard practice of writing plans without understanding the job.
- **Work schedule based on priorities.** Equipment is prepared prior to maintenance and staged by equipment owners, and assumes maintenance resources are available. Schedule integrity is one or two days at best. "Higher priorities" bump jobs the day they're scheduled. Equipment and parts availability delays starts. Crews improvise to "fill in", leaving backlogs of partially completed jobs.
- **Resources allocated and scheduled based upon the most appropriate skills for the task and to increase utilization.** Typically the utilization of skilled resources is 30% to 50% at best. Shut-down processes wait for the start of the maintenance shift. Maintenance craftsmen wait for operators to finish their tasks and vice versa. Contractors with skill sets identical to ours wait on everybody.

Routine maintenance is the groundwork for all maintenance performed in the operation. It is the basic “how to get it done” for all the activities in all the phases and programs, from the largest plant shut-down to the simplest changing of a light bulb. Its effective existence is universally assumed in the success of all the maintenance programs.

Preventive and Predictive Maintenance

Preventive maintenance (PM) is normally a time or usage based inspection or adjustment of equipment. PM includes:

- Visual inspection
- The use of nondestructive testing and checking methods
- Exchanging limited life materials (e.g., belts, fluids)
- Adjusting equipment operating parameters (e.g., alignments, calibrations, re-torquing)
- Dismantling, inspecting, cleaning and adjusting reassembly components.

Preventive maintenance work can prolong the life of a piece of equipment and avoid emergencies. It should be defined for each piece of equipment and reviewed regularly (at least once a year). If a PM task for a piece of equipment has been defined, it is typically not periodically reviewed or adjusted. For example, it is not unusual to find that the equipment has been removed from operations while monthly PM tickets continue to be printed. “Penciled PM tickets” refer to PM work that is not actually done but the ticket has been completed (penciled-in) and returned for updating. PM work is often held as “the very lowest priority”.

Much of the PM work (visual inspection and adjustments) should be done by equipment owners or operators. They must join with the craftsmen in taking responsibility for the care of the equipment on a day to day basis. Typically very little PM work being done by the operators, who think this kind of work is Maintenance’s job. This attitude leads to a lack of ownership and respect for the equipment’s operating needs.

Predictive maintenance (PdM) is a condition-based activity, monitoring key characteristics of equipment operations, forecasting future failure or departure from optimal operation, and taking corrective action in a planned and controlled environment. The basic “blocking and tackling” methods for PdM include:

- Regular monitoring or testing of critical equipment conditions
- Precision alignment and balancing of rotating equipment
- Integration with and adherence to schedule priorities
- Root cause failure analysis performed for every significant equipment breakdown
- Standards (specifications) for equipment and component reworks or rebuilds (applies for plant shops and outside vendors)
- Vendor certification programs
- Plant infrastructure that supports PdM as a part of a plant process reliability program

There are many proven PdM technologies or techniques including:

- Vibration monitoring
- Thermal analysis

- Oil (lubricating/hydraulic)
- Corrosion analysis
- Leak detection
- Structural integrity

The techniques of PdM monitoring can be periodic or continuous, automated or manual. Changes in operating conditions are analyzed statistically in order to forecast/predict impending failures. Repairs can then be planned and executed efficiently. Unexpected failures or breakdowns in equipment can cause production interruptions, loss of sales, personal injuries, and corrective repairs that may be 200% to 500% more costly. Most organizations apply some of the PdM techniques, but not consistently. More often than not, these techniques are held as maintenance people experimenting rather than a well developed plant approach to ensure reliability of operating equipment.

Routine, preventive and predictive are basic steps in a path forward to total productive maintenance (TPM). With TPM, all plant personnel are involved in a comprehensive quality based program that is focused on the reliability and safe operation of the facilities. These changes in approach to plant maintenance are difficult to implement at best. They require a well crafted approach to change.

The Art of Implementation

We continually witness new programs (versus technologies) to improve the maintenance of plant equipment and assets. Some of the “new” programs look suspiciously similar to previous programs, but with a new twist. In all cases, we hear of the amazing benefits these programs provide. Yet we also hear of the unmet expectations of these same programs. Getting an organization to implement the changes necessary to achieve expected benefits is the significant challenge.

SLIM-IT[®] is a pronunciation of the acronym for Structure, Lean (Daily Management System), Mentoring, Metrics, Teamwork, Tools, Training and Technology (SLMMTTTT). SLIM-IT is the primary engine of any maintenance (or other) implementation because it aggressively attacks the wastes that derail so many initiatives. As described above, most organizations have ample technology, tools, training and teamwork “potential” to solve almost any problem or achieve any goal. The difficulty lies in compelling the right combination of the “four Ts” to come together at the right time. This is what SLIM-IT does. **Figure 1** presents the SLIM-IT conceptual model.

The *structure* element of SLIM-IT employs several processes / mechanisms, including:

1. Executive Steering Committee (ESC) that directs and mentors (coaches) the maintenance initiative (and all other initiatives from that point forward).
2. Work Stream Teams responsible for implementing an ESC-approved element of work such as implementing shift start-up meetings or transferring a new product into a facility.
3. Experts that provide process coaching, an executive sounding board, content expertise and overall initiative management for the organization.
4. Charters for each work stream team. These are developed with and approved by the ESC. Charters include objectives, critical success factors, activities, deliverables, responsibility matrices, schedules and so on.

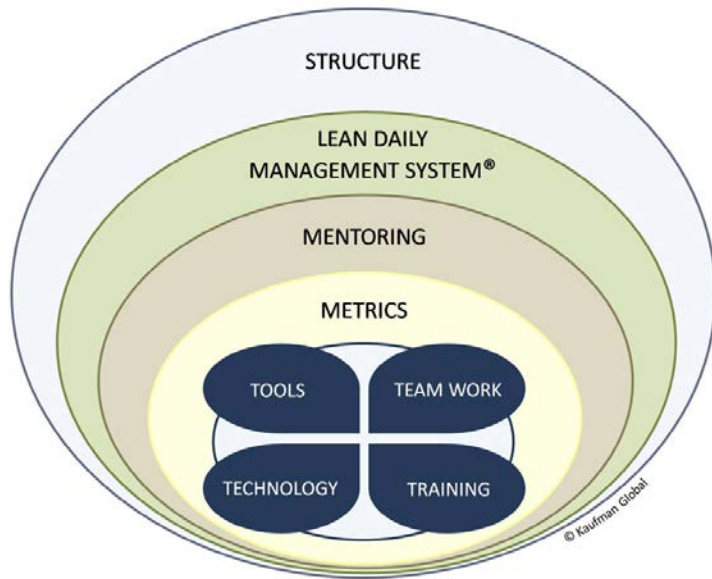


Figure 1 – The SLIM-IT® Model

Figure 2 provides a diagram of how to organize a typical maintenance implementation. Note that the implementation emphasis in **Figure 2** is focused ownership by the organization’s personnel (the speckled areas). The ESC runs things, and the work stream teams coordinate, teach, coach, do, help, aid and so on for each element of the implementation. The work streams shown in **Figure 2** are those that would be typical of an organization launching an aggressive initiative. All of the work streams would not start at once but would be cycled in over a period of three to six months. As the first few teams completed their assignments, they would disband and others would begin. The sequencing and schedule is, of course, directed by the ESC.

The *Lean Daily Management System (LDMS®)* is the skeleton upon which an initiative is built (assuming that the brain and nervous system are the elements presented in **Figure 2**). It is vitally important to understand the central position that only the LDMS can hold in making implementation work. The LDMS implements and sustains structured, mandated, planned, focused and coached efforts to improve the performance of day-to-day micro-process activities. It extends the *structure* element “down” to all work groups every day.

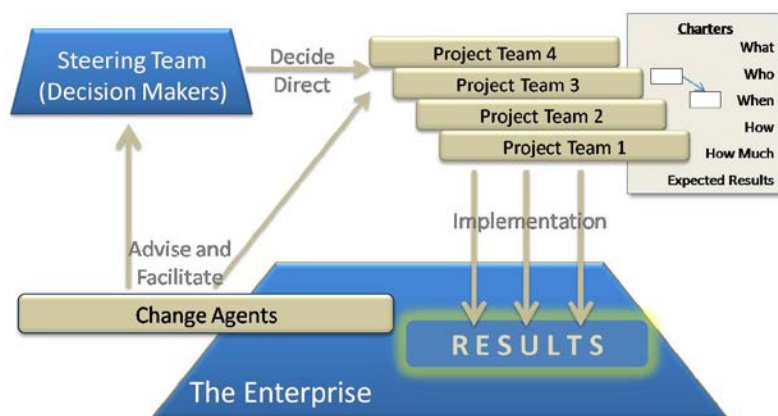


Figure 2 – The Structure Element of the SLIM-IT® Model

The building block of an improvement initiative is an intact work group. An intact work group is a group of hands on workers who work near each other on similar processes every day. Each work group, of ten or fewer people, operates its own LDMS. The LDMS nurtures improvement and sustains realized gains. It compels, coaches, mandates, and supports the work group in applying the correct tools to minimize waste in the work area.

The LDMS® consists of five elements:

1. Primary Visual Display (PVD) – The PVD is a large visual display that presents the current status of the work group on all key metrics, goals, objectives and action plans.
2. Work Group Meeting – This is a tightly facilitated, structured, daily, stand-up meeting of the intact work group held in front of the PVD and lasting no more than ten minutes.
3. 20 Keys® Action Plan – The Kaufman Global 20 Keys approach focuses each work group on a long-term improvement plan. Every set of 20 Keys (customized for different functional areas or processes) consists of a chart for mapping goal attainment and a corresponding set of point or level descriptors for individual keys. Each work group assesses itself and develops its own 20 Keys Action Plan for improvement. Figure 3 displays a sample 20 Keys chart. The improvement plan lists the specific actions required by the group’s members to attain the point goals. The chart and the accompanying improvement plan are posted on the group’s PVD.

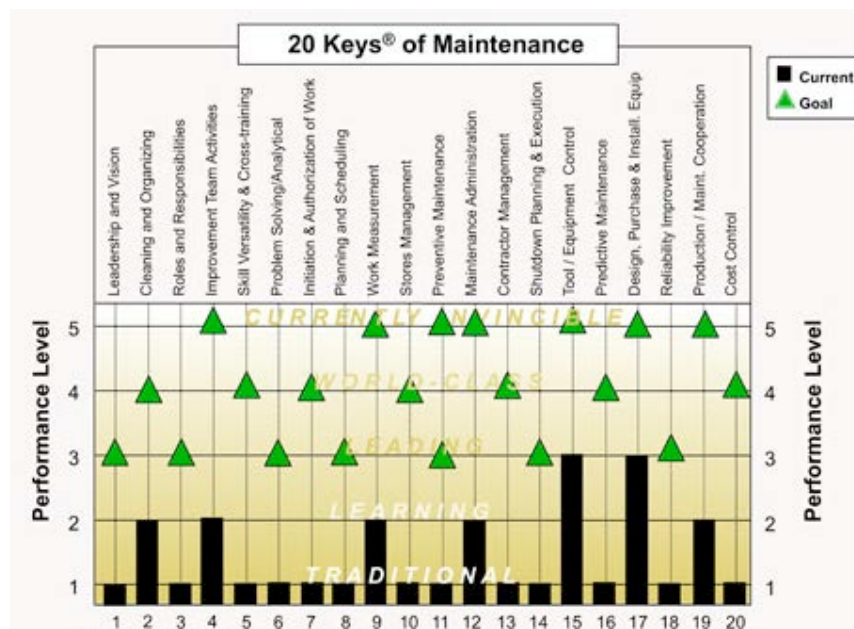


Figure 3 – A Sample 20 Keys® of Maintenance Chart with Current State and Goal Objectives

4. Kaizen Action Sheet Improvement System – This technique allows the work group to capture small “inspirations” and improvement ideas. These are often “too small” to be considered by the formal suggestion system but are the basis for continuous improvement.
5. Detailed Micro-process Metrics Tracking and Short-Interval Coaching – It is essential for the work group to identify and track key micro-process metrics on a daily (sometimes hourly) and

weekly basis. Short-Interval Coaching is a technique where critical metrics are collected on a regular basis by workers (on check-off sheets or the like) and reported to the supervisor or lead several times per day as he/she “makes the rounds.” This is a critical element in correcting the myriad of small issues that sabotage competitiveness almost invisibly.

These five elements, if implemented and maintained, provide a rock-solid foundation for any world-class maintenance program. They provide the mechanism for each work group to take ownership of their work processes. The LDMS establishes the involvement and commitment that are the soul of world-class achievement in every human group endeavor. All other tools and techniques will realize only a fraction of their potential if any of these elements are not implemented and rigorously practiced.

Mentoring is the next element of SLIM-IT. This is the day-to-day coaching of managers and supervisors in real time, on-the-job, as the tools and techniques are implemented. The coaching must be done by highly experienced experts who understand the why, what and how of applying the tools and techniques. Mentoring is the mechanism that assures that management behaviors at all levels will be changed sufficiently and over a long-enough period to infuse them into the organization’s culture. Without the mentoring element of SLIM-IT, everything else simply distills down to another tired, old traditional improvement plan – lots of smoke, mirrors and glowing progress reports but no behavior changes on anyone’s part.

Metrics get a lot of attention in traditional organizations but they are often too little, too late and are typically collected at the wrong level for the wrong purposes. A key element of the SLIM-IT model is not only to focus on the appropriate micro-process metrics within each work group, but also to pull the entire organization together around a central core of universal metrics. This is where implementation of the 20 Keys® methodology applied site-wide (at the work group level) becomes critical to focused, long-term success.

Summary

Everlasting and increasing market pressures on profits and performance demand that improvement initiatives have a high success rate at delivering real, financial benefits. This sends organizations looking for state-of-the-art solutions. Unfortunately, their search is for technologies that will provide the “silver bullet”. All too often the importance of implementation is underestimated or ignored. How often have we seen the single entry on a project schedule: IMPLEMENTATION with little description of how to prepare for success, define what it looks like while it’s happening or how to know when it’s done. Implementation of maintenance improvement technologies must be approached with the understanding that it will take time to change and even longer to create a new world-class maintenance culture.

About Kaufman Global

Kaufman Global is a proven implementation partner that focuses on accelerating performance. For 20 years we have worked with clients around the world to drive enterprise-wide change initiatives and cultural transformations. Leveraging Lean, Six Sigma and proprietary change management techniques, Kaufman Global delivers structured implementation and transformation projects that enable sustainable operational and financial results.

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