Power Maintenance

A Strategy to Improve Plant Performance

Dennis Blanton

As a manufacturer of industrial power conversion and transmission products, Rockwell Automation Power Systems has experienced the pressures of foreign competition and free trade with which most of you are familiar. We faced higher prices for raw materials along with market demands for improved quality, lower production costs, and reduced delivery times. Our response was the development and implementation of an integrated plant improvement program using the most current lean manufacturing, six sigma, and maintenance technologies. The result was that in the declining markets after September 2001, we were able to significantly impact plant performance and improve profitability. We call these programs *PowerLean* and *Power Maintenance*. The *PowerLean* program is a unique combination and application of the principles of lean manufacturing and six sigma. *Power Maintenance*, the subject of this article, is a program that has successfully improved our maintenance management and equipment reliability.

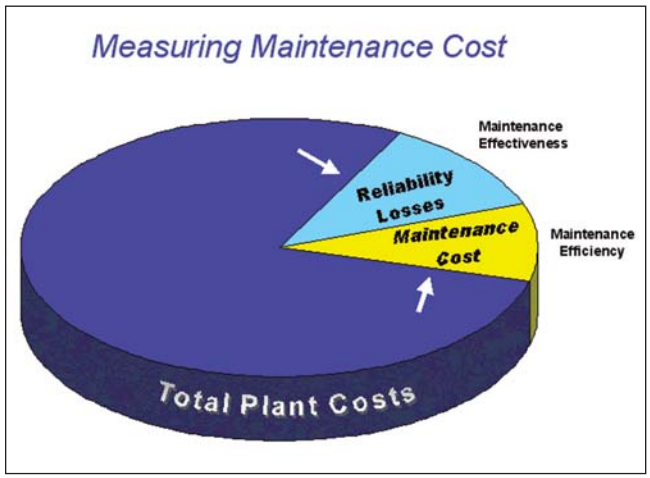
Rockwell Automation's *Power Maintenance* program is based on our successful experience in implementing maintenance improvement programs in our own manufacturing plants and service centers, as well as those of our customers. We base our programs on individual plant operational requirements and values. Our emphasis is to document and establish a rational basis for designing plant maintenance and reliability programs specific to an individual plant's needs.

Assessment

Maintenance assessments are designed to baseline current maintenance practices and to identify the most significant plant costs related to maintenance performance. This approach allows us to focus on identifying maintenance tasks that are aimed at the prevention, early detection, and mitigation of expensive or repeating equipment failures. These tasks will also address detection and prevention of unanticipated first-time component failures. By measuring and frequently reviewing equipment failure data, the maintenance program is audited and adjusted to become more effective and efficient.

This process allows the plant maintenance organization to focus its limited resources on performing the most important activities that will produce the most value in support of plant production. Focusing on these activities provides the greatest positive impact on the plant's maintenance costs, productivity. and quality.

We use an assessment process that is designed to objectively analyze the practices of a maintenance organization



in fifteen specific areas. Since maintenance performance is a result of the practices employed, it is important to clearly understand how maintenance is currently managed and to define a vision of how it should be managed in the future in order to achieve optimum performance from the improvement investment.

Maintenance performance can be accurately measured only after a clear understanding of the plant operational requirements and values have been established. Maintenance performance has two major components.

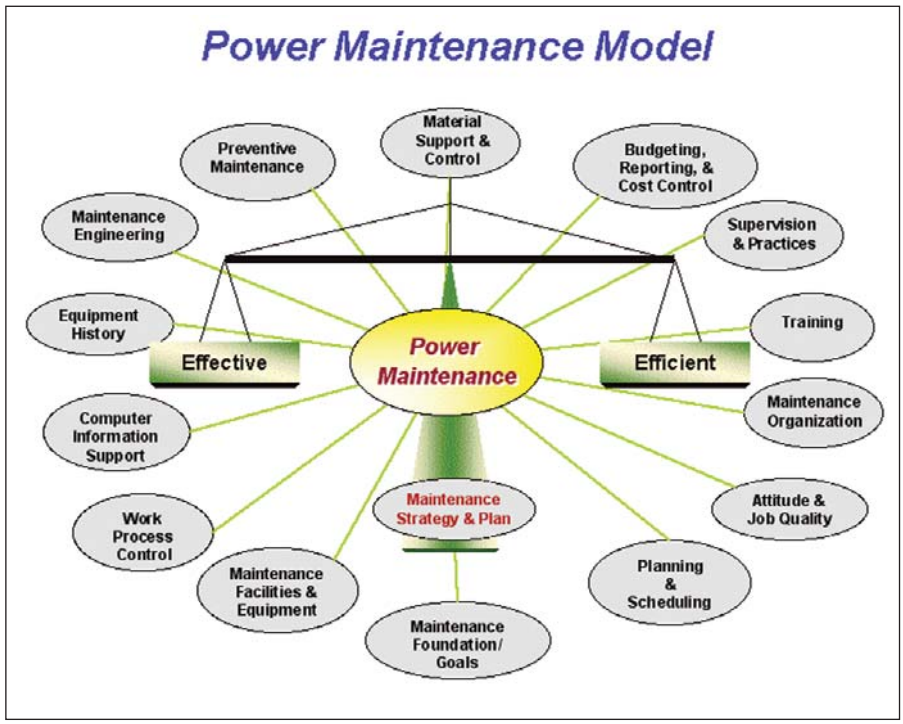
Effectiveness. Maintenance is effective when it accomplishes its mission of providing functional equipment capable of producing quality product at its designed rate when required by operations, without unscheduled repairs, while preserving the value of the assets. The cause and cost of failures to accomplish the specified mission should be carefully measured.

Efficiency. The efficiency of a plant's maintenance organization should be measured and improved continuously. This involves the economic use of manpower and materials to accomplish the maintenance mission, measured in a number of ways including: wrench time, backlog, overtime, schedule compliance, rework, PM inspections vs. corrective work orders, stores performance, etc.

Master Plan

A master plan is required for improving plant reliability, organizational effectiveness, efficiency, and program management. It is the guiding document for the maintenance department that protects it from mismanagement and

reverting back to a culture of reactive maintenance. The master plan evolves as the maintenance improvement program progresses.



Preliminary Master Plan

This is the first cut at a master plan that is created during the initial maintenance assessment. It defines the initial activities for implementing the findings and recommendations from the assessment. It is used to estimate resources required for the maintenance improvement process. This information is combined with the estimated benefits from improved performance to create a cash flow for project justification.

Maintenance Master Plan

Immediately following the initiation of the maintenance improvement project, the preliminary plan is expanded upon by the project team to plan and schedule in detail the activities, resources, critical path, etc. required to manage the development of all maintenance programs and initiatives outside the normal day-to-day maintenance activities. This will include special training, equipment strategies, computerized maintenance management system (CMMS) implementation, master equipment listing, spare parts/stores improvement, reorganizations, etc. The master plan is a continuing document that becomes the maintenance department's perpetual plan with a one- or two-year outlook that is updated at least monthly. It provides long-term justification, continuity, and guidance for maintenance performance improvement programs.

Equipment Strategy

Before equipment can be maintained properly, it needs to be in a known serviceable condition and maintainable. The importance of the equipment to the plant mission must be identified. During the equipment strategy phase of the maintenance improvement project, the following activities take place.

- Plant processes, systems, value streams, and equipment are identified and assigned a criticality through a defined procedure.
- Process or system failure modes and effects analyses (FMEA) are performed to determine how the equipment fails, the effects and costs of those failures, and how they can be prevented or mitigated. This information is used for prioritizing the maintenance improvement activities to focus efforts where the best returns can be achieved.

Individual equipment strategies are then performed and prioritized by the above process. These activities include:

- Event planning
- Equipment FMEA
- Condition assessment and restoration
- Bill of materials
- Spare parts requirements
- Maintenance requirements definition
- Drawings and documents

Program Development

During the master planning and equipment strategy processes, a number of decisions are made regarding how maintenance will be performed and what techniques and programs will be required to meet the expectations. As each of these components is defined and information is accumulated, the programs need to be fully developed, often requiring special skills. Included in this development phase will be:

- CMMS implementation
- Work process control
- Preventive maintenance inspections
- Periodic maintenance requirements
- Predictive maintenance routes
- Lubrication program
- Stores/spares management
- Maintenance quality
- Failure elimination
- Document control
- Change management

Organization

Once a vision has been clearly defined for the effective and efficient management of plant maintenance, responsibilities will likely change and reorganization may be required. Also, during the maintenance improvement process, additional, temporary manpower requirements can disrupt the daily flow of work if it is not well planned. Training needs must be addressed to prepare people for new roles and certain programs must be developed before the new roles can be assumed. During the maintenance improvement process—moving from current steady state to future steady state—transitional events must be carefully planned and scheduled.

Metrics

A system of metrics must be incorporated to clearly track maintenance effectiveness and efficiency performance improvements in order to justify the maintenance improvement program. These metrics should be layered with reports meaningful to everybody. This system is critical for the new culture to survive, and to ensure improvements gained during this process continue to be realized and increase. For instance, general performance roll-ups should be presented periodically to upper management. More detailed metrics at the department level will enable mid or lower management to focus their energies in the right places. Measurements directly affected by individuals should be made available to them so they can understand where and how they contribute to the overall success of the maintenance department and plant performance.

There are three key elements in developing an excellent maintenance program:

1. Evaluate the condition of the plant equipment and bring all critical equipment to a known serviceable condition. Define equipment failure modes and causes and develop required maintenance, parts, and documentation strategies.
2. Evaluate the current maintenance practices, procedures, and organization. Implement the maintenance management practices and tasks that will keep the equipment in a predetermined serviceable condition.
3. Measure maintenance performance, analyze results, and continuously improve maintenance efficiency and effectiveness. Focus on failure elimination.

In conclusion, a successful maintenance improvement program is realized by applying the maintenance organization to the activities that will have the greatest positive impact on a plant's maintenance costs and plant reliability.

Dennis Blanton is the general manager, maintenance, for Rockwell Automation Power Systems, headquartered in Greenville, South Carolina. He was a presenter at the IOMSA Summer Convention in 2004. ■

Memoirs of Hunt Moore: Part III

How I Started My Own Company

Hunt Moore with Frank Boling

Wilson, Arkansas

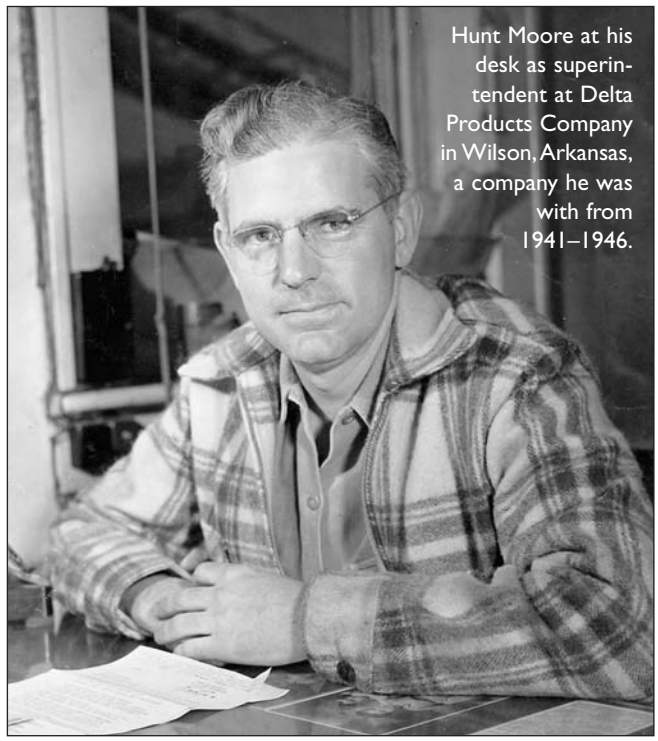
Allis-Chalmers did a lot of work at Wilson, Arkansas. As a result of this I spent a great deal of time at this plant and eventually, they offered me the superintendent's job. It was quite a leap of faith for me and an even greater one for my wife, to move from the city of Milwaukee to post-war Wilson. This was a typical southern plantation town where a business had sprung up in the middle of the cotton fields. The town was totally owned and operated by the Wilson family. All the houses were small and identical and had only the basic necessities. But we settled in and as an oil mill superintendent, I found that I didn't get to spend a great deal of time at home anyway.

Oil milling in those days, especially in the smaller locations, was a sort of seat-of-the-pants operation. But after some time, we got the mill running well and settled in to as much of a routine as could be expected.

It wasn't very long before my previous experience with Allis-Chalmers and the close-knit nature of the industry combined to lead other people to contact me for advice and assistance in planning new extraction plants. Such a contact was Mr. Ed Hudson, who asked me to come to Fresno, California, and help him process cottonseed in a solvent plant. I took a leave of absence, loaded up the family in a car, and went out west for two months.

Another Fork in the Road

Shortly before I returned from Ranchers Oil Mill in Fresno, I heard that an explosion and fire had destroyed the plant in Belzoni, Mississippi. They contacted me for help to rebuild the plant with the express need to complete the work in time for the new crop of beans. Ed Hudson at Ranchers and I worked on the design of a new solvent plant during nights before I left Fresno. Later, Ed sent me detailed drawings of the equipment so that I could have the equipment fabricated locally. I could see then that my career as an "oil mill man" was taking a new turn and since the Wilson plant was changing hands, I resigned, we moved to Memphis, and I set up an office in the front bedroom of our house with two drafting tables and with the help of Paul Butler and Thorp Callaway, N. Hunt Moore Consulting Engineers, was born December 27, 1951.



Hunt Moore at his desk as superintendent at Delta Products Company in Wilson, Arkansas, a company he was with from 1941–1946.

We had a very innovative design for the solvent plant, but we could not find a source for the crackers and flaking mills for the new plant with good delivery times. From my contacts, I learned that the Central Soya plant in Decatur, Indiana, had some used equipment for sale. I made a trip to Decatur and bought a meal sifter and a hammer mill for use for the Belzoni job. While I was there I saw a new flaking mill being unloaded at their plant. I was told that this was the first flaking mill purchased from Germany since the end of World War II. I was very impressed with the workmanship. I got the contact information from a bulletin on the Bauermeister Flaking Mills built in Hamburg, Germany.

Back in Memphis I sent a cablegram to Bauermeister asking the price and delivery time of cracking and flaking mills. The price and delivery time were good so this became the first equipment we ordered from Bauermeister. The Belzoni plant started up that fall and caused quite a

stir in the industry. In those days, there was not so much competition and a number of visitors came to Belzoni to see this plant. One of these visitors, Southern Cotton Oil Company of Newport, Arkansas, asked us to supply them with five Bauermeister flaking mills for the new processing facility that they were building.

Traveling Abroad

After this order was shipped, we received a cable from Bauermeister GmbH asking if Mr. Herman Bauermeister and Mr. Willhelm Depmer could come to visit us. Mr. Depmer was formerly with The Hansa Mueller Company in Hamburg and the founder of a well-known solvent plant supplier in Europe. He was acting as a consultant for Bauermeister. We were offered exclusive sales rights for the Bauermeister oilseed equipment in North America. The American oilseed industry needed more good equipment supplier links so I decided to go to Germany to see the Bauermeister factory because of the great interest in their equipment. At this time, Hamburg was still in reconstruction mode from the heavy Allied bombing during WWII. I found the Bauermeister factory to contain a mixture of very old machine tools and also some very modern machine tools. It was amazing to see how much these industrious people had accomplished in rebuilding their country after the horrible devastation of the war.

This visit to Germany led to many more contacts with German firms and European oil mills. Bauermeister had an exhibit at a big chemical engineering fair in Frankfurt, Germany, that was held every three years. Because of the basic costs of operating process equipment in Europe and especially in post-war Germany, all industrial equipment suppliers were forced to develop new and better equipment, which was more energy efficient and well made. For this reason, I attended these fairs often so that I could see what was new and also to meet American visitors and show them this latest in milling equipment.

Some time later, at the Frankfurt fair, we made contact with AZO GmbH and eventually formed a business partnership with them that is operated today by my son, Bob Moore. This meeting place in Frankfurt also was responsible for our long association with Sulzer-Escher Wyss who, with our cooperation, developed the first hot dehulling concept used by most U.S. soybean processors.

Over the years, my relationship with Willie Depmer grew to the point that he was sharing with us some of the leading-edge technology being utilized in Europe in solvent plants. One of these ideas was a very efficiently designed first effect evaporator, which we were able to sell to a number of plants in the U.S. We, in turn, passed on our successful designs for cost-effective solvent-air separators, which today are a necessary and vital part of air pollution control.

Hunt Moore, circa 1953, after he had formed N. Hunt Moore & Associates.

Through Willie Depmer, I met Hans Shoemacher and Heinz Thiem. Both of these men were involved with Oilmill Hamburg, formerly known as Hansa Mueller. Mr. Shoemacher was the inventor of the very successful design of the desolventizer-toaster-drier-cooler, or DTDC. Mr. Thiem was the superintendent at Oilmill Hamburg, which acted as the test plant for many of Shoemacher's new ideas. It was very interesting to me to know these two gentlemen.

Changes in the Oilseed Process Industry

After the rapid build-up of crushing capacity that lasted through the 70s, a general maturing of the industry caused a large number of independent processors to either merge or sell out to the big players already having multiple-plant operations. This consolidation changed our focus from engineering to equipment supply because the larger companies had their own complete engineering departments. Due to the extreme competitive nature of the business, we were no longer welcome in many places.

A Lifetime of Travel

Traveling has been one of the abiding aspects of my career. Domestically, many of the plants were located in small, hard-to-reach towns that required flying into the nearest metropolitan airport and then driving some distance. Such out-of-the-way places as Gonvick, Minnesota, Fredonia, Kansas, and Port Gibson, Mississippi, always kept us on the road. Later, as we made new contacts overseas, we traveled extensively in Europe to Belgium, Germany, France, Spain, and Italy. And after that, we were involved in plants located in Brazil, Argentina, Korea, and Egypt. Some of these foreign places were easier to get to than some of the domestic.

Little did I know those many years ago, when the rubber band damaged my eye, that it would lead me to meet so many interesting people and visit all those exotic lands. I am sure that there are other professions that produce a higher standard of living, but for me, I can't imagine any career more rewarding than the one that I happened into one fine day. And thinking back to my original dream of flying airplanes, I suppose that dream has been mostly fulfilled because I have spent a great deal of my life flying. And it has been fun! ■