Written by Krzysztof (Kris) Goly, CMRP, Siemens Industrial Service
Tuesday, 01 May 2007 00:00

Be sure to assess and benchmark all aspects of your Maintenance function.

Last month, in part I of this two-part article, readers again were reminded of the fact that improvements in Maintenance performance and equipment reliability have a direct link to a company's bottom line. The article then went on to detail how assessing and benchmarking all aspects of an organization's Maintenance function is critical in developing a detailed roadmap to success. In this month's concluding installment, two case studies highlight how real-world companies leveraged the findings of their respective Maintenance Business Reviews to help their plants move down the road to increased uptime and profitability.

Case studies

Case #1. Single Cement Plant…

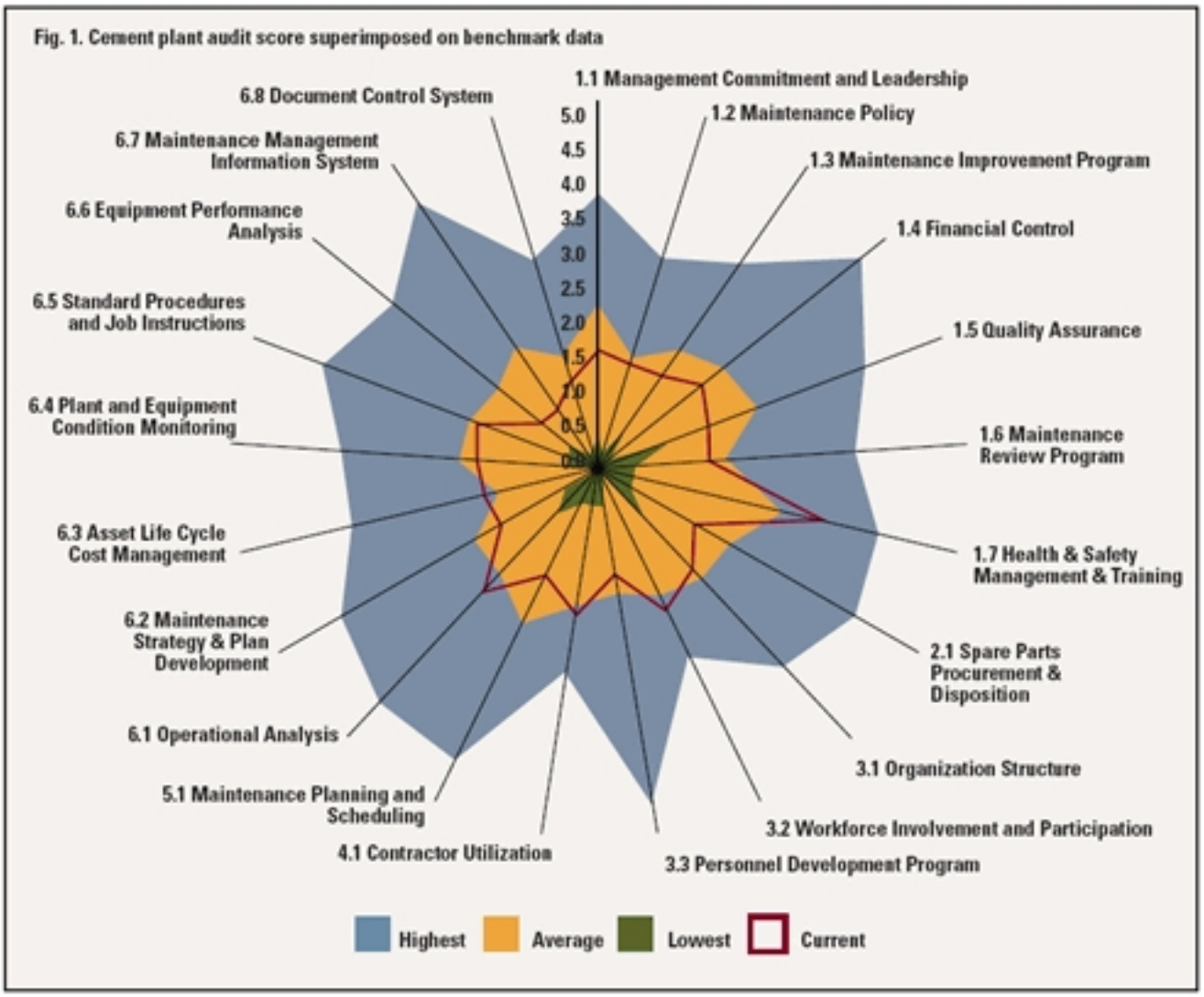
A cement plant consists of four wet process kilns producing approximately 1.3M tons of clinker per year. Alongside the "old" plant, a modern dry process plant was built with a design capacity of 2.15M tons per year. Once the new plant was commissioned, the plan was to decommission two of the existing wet process kilns. This was projected to bring the total plant capacity to 2.8M tons per year.

Over the years, the plant had been struggling to achieve the budgeted production levels. This was a difficult task in light of low equipment reliability and availability. There was a perception that most of the problems were caused by Maintenance and that something needed to be done—*although there were no concrete systems in place to validate this perception*. The new high-capacity dry process kiln put even more emphasis on the way the plant was run and maintained. As a solution, plant management chose to purchase and implement a computerized maintenance management system (CMMS).

Experience has shown that a CMMS alone will not solve maintenance problems or improve maintenance efficiency and effectiveness. At least it won't without a comprehensive improvement and implementation program based on "best practices" tailored to the local plant-specific and business conditions. Thus, the plant manager decided to conduct a Maintenance Business Review in order to:

- Benchmark the Maintenance organization
- Identify opportunities for improved plant performance (uptime).
- Develop improvement targets for the Maintenance organization.
- Implement a detailed Maintenance Improvement Program.
- Build a proactive Maintenance organization to ensure reliability and availability of the new

kiln once online.



The review and benchmarking was conducted, and the improvement potential was identified. The spider chart in Fig. 5 indicates the score achieved by the plant superimposed on benchmark data—*best, average and lowest scores recorded in the database*.

The data in Fig. 1 is important because it shows how the cement plant's Maintenance function compared to bestin- class and peers. Moreover, the review report contained detailed information on how the Maintenance organization functioned, its strengths and weaknesses, opportunities for improvement and that all-important road map for implementation. The main findings are reflected in the following list:

- The Maintenance organization was reactive in nature. The majority of work performed amounted to corrective actions resulting from equipment breakdowns. No history was recorded.

- Although some of the equipment Preventive Maintenance (PM) Plans were completed based on OEM recommendations, these were not executed.
- Maintenance planning and scheduling was not practiced. Workers had to plan their own work.
- There was at least one major outage per kiln every year, yet there were no structured outage plans to follow. As one supervisor put it, most outage work was planned in "people's heads."
- Spare parts were scattered throughout the plant. There appeared to be an excess of big-ticket items in storerooms, tying up monetary resources, while there were numerous stock-outs, causing unplanned downtime and a need for rush deliveries.
- Plant equipment reliability and availability were not monitored to the required detail to support effective root cause analysis.

It is important to note that the Maintenance Business Review of this operation projected the potential for improvement in financial terms. It was estimated that a realistic increase in plant availability would result in additional production valued at $2.1M annually. Savings from optimizing spares-holding was estimated to be approximately $500,000.

Subsequently, a detailed Plant Improvement Program (PIP) was developed, with emphasis on modern maintenance techniques and technologies. The CMMS implementation plan formed an integral part of the PIP implementation. More importantly, a maintenance strategy for the new kiln critical assets was developed, thus ensuring that the systems would perform at the required levels in the future and that there would be no condition deterioration.

The implementation process of the new strategies spanned a time period of approximately 12 months, with results exceeding expectations and initial estimates. Although not all of the elements are described in detail in this article, key implementations included:

- Installing CMMS software

- Populating the CMMS with plant asset data
- Creating asset hierarchy down to maintainable item and assigning equipment criticality
- Developing Preventive Maintenance (PM) plans for most critical equipment, which included implementing a process for development and optimization of these plans
- Developing and implementing a comprehensive integrated Predictive Maintenance (PdM) Program for all critical equipment
- Designing and implementing work order process flow best suited for the plant (The process was implemented in the CMMS.)
- Designing and implementing a Plant Performance Monitoring System (This system has proven to be an invaluable tool for the identifi- cation of "low-hanging fruit," therefore it has allowed for cost-effective elimination of the plant problems and bottlenecks.)
- Redesigning the Maintenance organization and then introducing Maintenance Planning and Scheduling functions, as well as a Plant Reliability Engineer
- Reviewing spare parts inventory, resulting in a stock reduction of $500,000
- Implementing a spare parts management process, using the CMMS and a bar coding system for inventory management, to ensure accuracy of inventory and limit stock-outs
- Developing BOMs (Bills of Materials) for most critical equipment
- Training key personnel in Planning and Scheduling, Reliability and modern Maintenance Management techniques
- Creating a "reliability culture" throughout the plant

This list reflects the "tangible" benefits. It does not capture the "intangibles"— *specifically how management changed the overall perception of the Maintenance function*
. As a result, Maintenance now is considered to be an integral contributor to improved business performance. People have recognized the value of the Maintenance function, and this has helped increase employee morale and contribution to the business.

Introducing the Reliability Engineer and the Plant Performance Monitoring System into the organization helped in identifying plant and equipment problems, but, more importantly, created an actual reliability culture. People began noticing problems—and dealing with them. The Maintenance organization began planning its work—and being more proactive than in the past. The results? Increased plant uptime and production came about without an increase in the Maintenance budget! Today, this cement plant's PM program is in place and EXECUTED!

Case #2. A Cement Corporation…

A cement corporation owns nine cement plants located around the country. The plants were managed through three regions. Unfortunately, there was limited communication among the regions, let alone among individual plants. Each of the nine plants adopted its own Maintenance Management processes and practices; there was little standardization or best-practice sharing. Although some of the plants had installed CMMS, they were deriving various degrees of

effectiveness from these systems.

Management made the decision to purchase and implement an Enterprise Resource Planning (ERP) System throughout the corporation. This created the perfect opportunity to redesign and create new management processes.

The vice-president of Operations understood the importance of modern, standardized maintenance processes for sustainable plant performance and profitability. A decision was made to carry out a maintenance audit at each of the nine plants. The intent was to review the Maintenance organizations, benchmark their processes and identify best practices and opportunities for improvement through creation of common benchmarks, standardization and transfer of best practices, methods, tools and people.

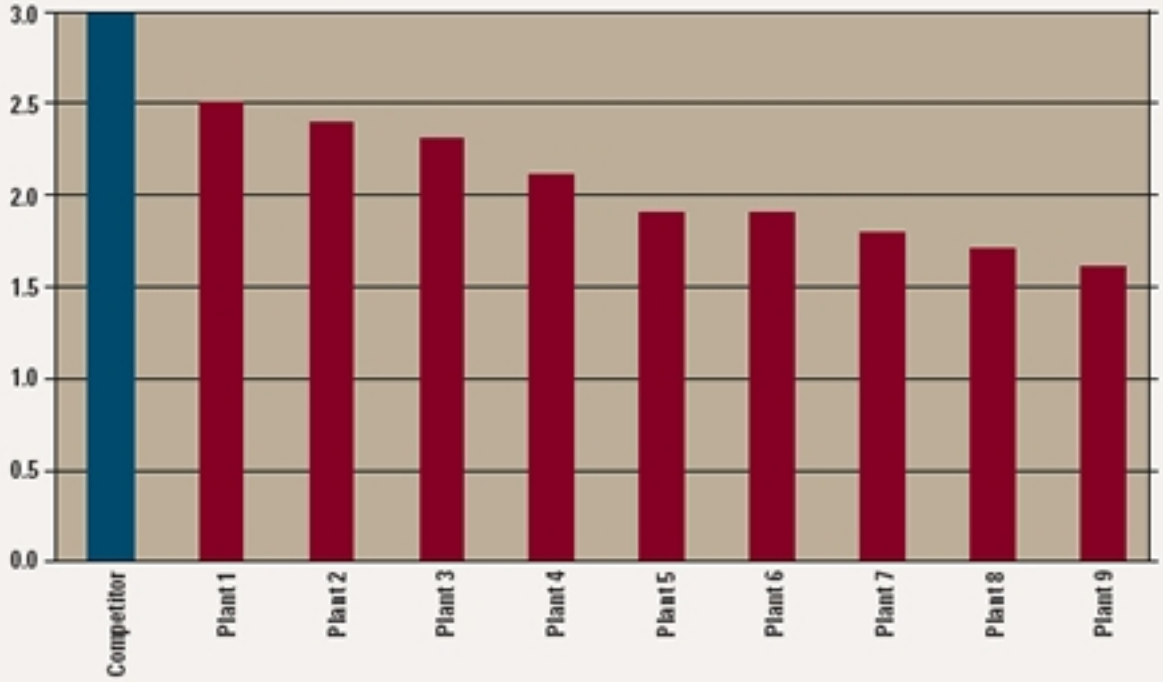
The standardized audit and benchmarking process was performed by the same team of certified auditors over a 12-month period. The results, presented to the corporation's Technical Committee, formed the basis for development of a detailed Maintenance (Plant) Improvement Program. The following lists detail some of the findings.

Strengths

- Management took a forward-looking approach and commitment to improve maintenance practices and performance.
- Workforce:
- Knowledgeable and technically sound
- People react well to crisis
- Commitment demonstrated in all plants

- ERP and CMMS standardization across the Group perceived as a good opportunity
- PM programs developed and implemented at all plants, but not all resulted in the same level of effectiveness
- Well-maintained plants, in general
- Personnel aware of the continuous improvement process and its benefits

Fig. 2. Normalized audit benchmark data for all plants compared with competition. The furthest left bar represents score for a competing plant. A higher score is better.



[redacted]

kris.goly@siemens.com