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Defining what the system should manage and planning the implementation are two keys to a successful computerized maintenance management system.

Information is the key ingredient in meaningful decisions on reducing maintenance costs. A computerized maintenance management system (CMMS) is a tool that can provide valuable information about how a maintenance department is performing.

Sandia National Laboratories purchased a CMMS to make good maintenance business decisions through data acquisition and to provide a mechanism for reducing maintenance costs. In order to achieve this goal, a phased implementation was conducted to transition from an old CMMS (and way of thinking) to a new CMMS (and way of managing maintenance). The CMMS was successfully implemented at Sandia because of two important factors: defining what the CMMS should manage, and phasing in the applications of the system in an order consistent with the work control process.

Selection

Determining the purpose of the CMMS is the first step in deciding which system to select. If the system is going to be used only to document work being done, then almost any CMMS will do. But if the system is going to manage maintenance activities through data acquisition and analysis, then the choice of CMMS narrows considerably. Sandia took the latter approach in selecting a system that would allow for data gathering and ease of analysis.

A joint application development (JAD) team was given the responsibility to develop and document the requirements for managing maintenance activities. The team consisted of maintenance personnel from managers to craftsmen as well as information systems personnel. The team documented the existing work control process and then looked for ways to improve the process (including all regulatory requirements). Hardware and network requirements were also defined.

The importance of defining the maintenance process and then looking for ways to improve it prior to selecting a CMMS cannot be emphasized enough. A maintenance department has the opportunity to improve maintenance effectiveness when converting from an old system to a new system. Sandia viewed this time as an opportunity to improve the work control process and find a system that would support such an improvement.

Test and review

The implementation of the CMMS began with the development of a detailed plan which stated the order of implementation of each work control process (including training requirements). The plan was developed by the implementation team who had the sole responsibility of replacing the existing CMMS with the new CMMS (work control, hardware, software and network). The team consisted of work control users, information system programmers, network administrator, and computer support personnel.

Other teams were assembled to test, evaluate, and make recommendations to modify specific applications prior to implementation. They were:

Test team—responsible for testing and evaluating the new CMMS against all JAD requirements.

Warehouse and procurement team—responsible for testing, evaluating, and implementing the system's Inventory and Purchasing modules.

Work control team—responsible for integrating the existing work control process with the Work Order module.

Work request team—responsible for integrating the Work Request application with the way work is received.

Decision team—responsible for deciding on specific maintenance topics relevant to the new CMMS to improve the work control process.

The decision team addressed the issues listed in the box on the first page of this article.

By having many teams evaluate different applications of the system, potential problems were

identified and corrected prior to the actual implementation. This methodology of reviewing and testing provided a high level of acceptance by users having a major part in the modification of the system. Without this system acceptance, this project would have failed at implementation.

Implementation

The actual implementation of the CMMS was performed in two parts: warehouse and procurement process, and work control process. During each conversion, a partial changeover was not considered. On a Friday the old system was being used and on Monday the new CMMS was being used by all core users. This total conversion worked only because of the modifications made to the system by each team prior to implementation and because all training was conducted prior to the actual implementation.

Implementing a CMMS is a systematic process of evaluating the correct order of application implementation. This process can be conducted if the knowledge base of the new CMMS is well known along with the knowledge of current and future maintenance operations. Therefore, the first step in implementing a CMMS is to take all available training classes (user and system administrator) to become an "expert" on how the system works and can potentially be modified. Next, a phased implementation has to be developed, reviewed, modified, and accepted by management. Sandia used the following phased implementation:

1. Test and validation. The CMMS was tested against all established JAD requirements to assure that it would perform all maintenance processes. The entire work control process (with all appropriate data loaded) was tested to understand how the new CMMS administered work from one application to another.

2. Decisions. After a thorough understanding of the system (through training) and a general understanding of how the CMMS administers work was achieved, decisions had to be made to merge the old system and set up the new system. The biggest decision was how to define and set up the equipment assemble structure (EAS). The EAS is the foundation of a CMMS, and a good deal of time was spent defining maintenance tracking levels. All installed facilities systems were defined to the lowest level of equipment maintenance that was to be tracked. This defined what equipment records Sandia was going to keep in the database. The greatest contribution of the EAS is the ability to track maintenance costs at the equipment level (then roll-up them to the system level) in order to perform optimal replacement analysis.

3. Modifications. Every application in the CMMS was reviewed for its applicability to the existing

work control process. Each team learned every application, evaluated its functionality, and made recommendations to modify the application (field modifications or additional table requirements) to better fit Sandia's process. Modifications were then made to the application. This approach insured that the existing work control process was included in the CMMS prior to implementation.

4. Training. Training of all users was developed and conducted by in-house Sandia personnel because they had the system knowledge combined with the work control process knowledge (both current and future). The training program was broken into two groups: inventory and purchasing, and work control. The inventory and purchasing group consisted of all users responsible for procuring and storing maintenance materials (excluding work control flow through the CMMS). The implementation team trained all planners and supervisors on work order flow through the CMMS (excluding inventory and purchasing). Users learned the application and then learned how the application was going to be used at Sandia.

5. Warehouse and procurement. The Inventory and Purchasing modules were the first to be implemented because the CMMS is set up to check for materials before a work order can be moved to in-progress status. All stored material data was converted into the inventory database and procurement personnel started submitting purchasing orders to the Sandia Purchasing Department. Most inventory "bugs" were worked out prior to full implementation of the work control process.

6. Work control. The work control implementation consisted of a comprehensive use of most of the applications in the CMMS . Sandia's work control flow through the CMMS consisted of work order generation, receival of new work order, detail of work order, assignment of work order, posting of craft daily time, completion of the work order, and closing of the work order.

7. Equipment. The equipment application is the foundation of a CMMS and great care should be taken to correctly set up this application. All equipment data was converted from the old CMMS to the new CMMS equipment application. Each piece of equipment was then placed into the correct location of the defined EAS with the appropriate priority assigned to it. Then the correct equipment specification screen was assigned to the equipment for additional name plate data acquisition.

8. Job plans. Generic preventive maintenance (PM) job plans were written for all equipment types that require PM . These job plans would serve as a template when the PM masters were

to be created. The objective was to build a library of job plans that could be used in future PM development.

9. Preventive maintenance. Preparing a PM master in a CMMS takes a great deal of effort, but yields many benefits. A PM master will automatically generate work orders when they are due and specify appropriate operations, materials, labor, and specialty tool requirements. The warehouse will always know what materials are needed for PM and when they are needed. Sandia is in the process of generating PM masters for all equipment requiring PM by using the EAS equipment priority.

10. Failure analysis. Tracking why equipment failed and how to fix it is the final leg of the implementation project. Sandia plans to use technical teams (mechanical and electrical) to define the most common failures for equipment types and define permanent repairs.

The implementation of a CMMS at Sandia has been going on for 2 years and should be completed by the end of this year. The success of the implementation was due to the primary definition of what Sandia wanted the new CMMS to do—allow us to make good maintenance business decisions through data acquisition and analysis. We are now in a position to start generating performance indicator reports to show how Sandia is doing as a maintenance department. Implementing a CMMS is not easy or cheap, but a well set up system will generate the information required for good business decisions for reducing maintenance costs. **MT**

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