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To gain the full value of a computerized maintenance management system (CMMS), a core foundation of trusted data must be available each and every time the system is used—starting from day one. Striving to have high data integrity from the outset of its CMMS implementation, Alliant Energy, an international energy holding company, determined that it required external support and expertise to properly complete its project in a timely manner.

The primary benefits gained from a well-implemented maintenance management system include improved overall maintenance efficiency, compliance, safety, and plant availability. For Alliant Energy's plant personnel to extract maximum value from the CMMS investment, the integrity of plant equipment data needed to be very high.

Whether embarking on a new implementation or a re-implementation, building a reliable knowledge base of equipment and engineering data demands significant man-hours, specific skills, timing, and project teams that are often beyond the ability of a plant to support in its entirety.

Need to revise master equipment list

When the Burlington (Iowa) Generating Station, a facility owned and operated by Interstate Power & Light, a division of Alliant Energy, began evaluating the process required for the implementation of a CMMS, it turned to Black & Veatch, a global engineering, construction, and consulting company, to assist with project deliverables. "To achieve the maximum return on our assets and increase shareholder value, we needed to implement a CMMS at our facility," said Ken Wilmot, Burlington plant manager.

" In this period of volatility within our industry, it is paramount that we understand and predict our equipment failures and the corresponding impacts on load and revenue to our facility." To achieve the desired outcome, one of the first steps was to update the critical plant drawings as well as revise the master equipment list.

To support Alliant Energy's CMMS and lockout-tagout implementation projects, Black & Veatch assisted with the re-establishment of databases for plant equipment—nearly 7000 records. With teams of specialists walking down each plant system, the project also updated critical piping and instrumentation drawings (P&ID) and electrical one-line drawings and delivered them in full vector AutoCAD format.

Through improved access to complete, reliable information, and improved work processes and technologies to maintain it, this effort has increased plant operation and maintenance (O&M) efficiencies and safety for plant personnel.

Kickoff meeting vital to project

Project guidelines were developed during the project kickoff meeting. This is a critical stage to establishing mutual expectations—introducing project engineers to plant staff, establishing daily lines of communication with plant leadership, and collaboratively establishing the in-scope and out-of-scope boundaries.

In this case, 3 days of project scoping discussions were held. All standard conventions were documented, including abbreviations, equipment naming rules, equipment numbering schemes, plant equipment classes, system names, plant orientation, database field widths, system lists, location ID, and physical location.

This was followed by a one-day trial run, after which the project guidelines were issued to the project team. Trial run results generated a lot of useful clarification issues and provided the first opportunity to measure project team productivity. Early returns revealed that nearly 80 pieces of mechanical equipment were surveyed per person, per day, and this number quickly rose to more than 120 pieces. Electrical equipment collection rates were much higher, as this equipment is more closely arranged and repetitive.

Significant consideration was given to project safety. Data was collected from grating level, or 6-ft ladder height. It was agreed that field staff would not be allowed to open any equipment enclosures or electrical or control panels.

Equipment specifications

Establishing plant equipment classes, or specification templates, was a separate project by Alliant Energy that provided the team with more than 100 equipment types and attribute sets for each. These were to be the basis for matching equipment data to values, conforming to a standard attribute list across all equipment.

“ We needed to identify as much equipment, and equipment history, as possible within our facility,” said Patrick Kelleher, Burlington maintenance systems engineer. “With the fleet using the same general equipment naming and specification templates, we are able to report on what type of equipment works well and what types do not.

“ I can see at a glance if a 25-hp motor, in a particular situation, is not doing well across the fleet. We can look at the data, make educated decisions, and plan accordingly. Additionally, the fleet now has greater accuracy in the information used for centralized stores and procurement.”

With well-designed field forms, reference lists of equipment templates, and naming rules, the field staff walked light, had rugged low-cost tools, and captured data quickly—with no lighting issues, no reboots, and no lost data. Since field work requires the skill level of domain specialists who understand the parts, equipment, systems, and safety issues, and for the cost that this implies, it was important that once data collection started there would be no technical delays.

When the data was delivered and training conducted, the staff was working on a complete equipment database of nearly 7000 records of data. “The trust in the new system was immediate,” Kelleher said.

Since Alliant was tackling two projects at once—the CMMS and a new lockout-tagout system—the scope encompassed collecting all equipment nameplate data for all potentially energized equipment, including mechanical, electrical, steam, and hydraulic. In some cases, skid mounted systems were specified as one asset, but routinely included the main breaker, vents, drains, and isolation valves as unique assets.

Options tried in building database

Early in the project, various approaches to building the database were tried. Most were centered around attempts to use in-house labor, a decision that inherently has a schedule impact to project deliverables.

Alliant Energy’s first attempt to create the equipment list was a drawing takeoff exercise in which a maintenance professional, who was tied to a desktop, populated a database with available drawing details such as equipment name, asset number, P&ID number, drawing

coordinates, and location ID, among others. In many cases, this can be an excellent starting point, but plant drawings can miss important assembly and subassembly details. They also lack the important OEM nameplate, procurement data, and location details.

“ However, having a pre-populated database that can be loaded onto a handheld computer is an excellent option when there is sufficient pre-existing data that merits this approach,” project manager Andy Carroll said. Data collection performed using handheld computers and pen and paper are both appropriate methods depending on circumstances and cost.

The ultimate decision is primarily driven by whether the project is a data validation exercise or one of data creation. In the case of the Burlington station, existing databases were incomplete and not trusted. Therefore, existing data would be used more as a quality assurance (QA) check, rather than as a data source to prepopulate the new equipment list.

One other option that was considered, but dismissed, was for the O&M staff to collect the equipment data during their downtime, an option that is most often very slow and disjointed. In these times of lean organizations, this can be an empty promise because staff rarely has any downtime. The bigger dangers include the impact to overall project schedule and the staff response to using a system that seems to have some good data, as well as some unvalidated data.

The longer this activity takes, the less QA tends to stay with the effort, and the likelihood that labeling and naming rules are not followed increases. Alliant decided that careful development of data rules was required up front, followed by a rapid execution of information gathering, QA, and final delivery.

For this project, it was decided that field personnel would be provided hard-copy field forms and use pen and paper to collect all new data. Low-cost data entry services were used to transcribe the data using a simple but powerful application that Black & Veatch and Alliant Energy co-developed. Ryan Deschaine, Black & Veatch programming engineer who also managed the data entry activities, added some QA and data entry monitoring routines.

The more important features included ones that constrained any assumptions that a data entry clerk could make. For instance, when a clerk determined that there was missing data or

unreasonable data, the instructions were to flag the record, create a trouble log entry, and move on. The log then was reported back to the field for investigation or for reconciliation during final punch list activities.

Drawings converted to AutoCAD

A second major deliverable for this project was the conversion of approximately 80 engineering drawings to full vector AutoCAD format. Considering the age of the plant and the quantity of physical changes that had been made over the years, the plant staff was not sure how much it could afford for drawing updates, but knew there is no better time to capture as-built plant information than when a team of specialists is walking down each plant system.

However, converting 30,000 drawings to full vector format is an exorbitant expense. Therefore, a compromise had to be made. In this case, the AutoCAD conversion project included all P&ID and electrical one-line drawings. All remaining drawings continue to be scanned to either a TIF file or CAD overlay. All files are managed then in the corporate document management system.

Considering that the database is the most critical issue when implementing a CMMS, it is paramount to understand that the database is only as good as its plan for ongoing development and upkeep. “Having a good database to start with is important; however, as maintenance is performed and changes to the operation occur, it is just as important to revise any affected documentation, including engineering, OEM, and operational procedures, and then change the CMMS database accordingly,” Kelleher said. “Drafted prints are the link between the CMMS database, plant staff, and engineering.”

The database is comprised of many slices of information—equipment data (current and historical), preventive maintenance tasks, inventory (including critical spares lists and bills of materials), job plans for work orders, and links to other data sources. “We developed a library at our site so we could accurately track our documentation,” Kelleher said. “In that effort, we scanned 5 GB of documents.

“ In our CMMS, we have the ability to link these documents to the respective levels of the database. This not only will cut down on general research time, it will aid in finding fast answers about equipment in question. One of the most enjoyable parts of implementing a CMMS is taking the pass-down knowledge and handwritten practices and transferring that knowledge and information into formal PMs and routes, which are automatically generated, and seeing the old card file be transformed into daily, weekly, and monthly lube schedules.”

" Based on the milestones and deliverables that were established for the project, Black & Veatch exceeded our expectations," Wilmot said. "We are now well on our way with the implementation of the CMMS at the Burlington Generating Facility and have demonstrated the value of this type of partnering arrangement with others within the Alliant Energy organization." **MT**

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