Written by MT Staff
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A few years ago at the Port of Portland, OR, the marine maintenance department was using three separate, standalone management systems—one was a COBOL-based system, the second was designed originally for over-the-road trucking, and the third was a homegrown system.

Taken together, all three systems did not exactly fit with the container cranes, tractors, paving equipment, dredging barges, reach stackers, and railroad tracks that are used to move more than 30 million tons of cargo through port facilities every year.

Because it was faced with serious Y2K computing problems, Port management decided to take the opportunity to research available computerized maintenance management systems (CMMS) and enterprise asset management (EAM) systems. The goal was to find a single system that could handle the immediate needs in the marine facilities and equipment maintenance departments, as well as the future needs of the dredging operations, management, and aviation facilities maintenance at Portland International Airport.

Team selection

A team that included representatives from the equipment maintenance, IT, marine facilities, and purchasing departments reviewed request for proposal responses from 12 suppliers. It selected Avantis.PRO from Avantis, a unit of Invensys Production Management, Foxboro, MA, because "it offered all the bells and whistles we needed and they proved with their demonstration that the system could be tailored to fit the multitude of uses we wanted," according to Robert Maracle, general superintendent of marine equipment maintenance for the Port of Portland.

"Efficient operation of the port facilities is critical for two reasons," Maracle said. "First, we need to be able to move a lot of cargo expeditiously so that we provide cargo handling services that enhance our customers' productivity in distributing goods. Second, we need to be able to provide high-quality service with great cost efficiency so we can maximize the business benefit to the Port of Portland. We now have the ability to manage infrastructure maintenance in such a way that we're making the best use of our physical assets-and we're providing a growth path that can allow us to use one central set of enterprise applications to service our EAM needs for such a diverse array of facilities."

Port of Portland staff worked with an EAM consulting firm to develop overall plans for the

system. Planning was critical, Maracle noted, because no computing system could ever be efficient without well defined application requirements. "We spent considerable time designing and building the foundation of our hierarchy, which has never been changed," Maracle noted. "It has worked extremely well for us. I can't emphasize enough the value of spending the up-front time in planning and designing and thinking your way through some of these things. It really pays off because you end up with something that you can put to work with confidence. And you don't have to keep fixing it. It's well organized."

In-house implementation

The staff did all its own planning input, using three teams representing maintenance, inventory, and purchasing. They built the system on a theoretical basis in a conference room pilot program, creating most of the asset hierarchies in an Access database, for subsequent transfer into the EAM. Working for five weeks, 10-12 hours a day, they produced a list about 6000 lines long and about 20 columns wide.

"We started in July 1998 and went live with this system on April 19, 1999," Maracle said. "The first three months were spent learning what an entity was, what the terminology meant, how to build the hierarchies so the costs would roll up, and how to create value lists. Once we had everything defined, IT could then implement it. Our IT project manager, Jenni Lipscomb, had the unenviable task of keeping things on track and coordinating efforts from multiple departments. She was marvelous because she's been with the Port for many years and knows what applications are being automated."

Application knowledge was critical because of the scope and diversity of equipment assets to be maintained. "We have more than 17,000 entities identified right now, including applications for marine equipment maintenance, facilities maintenance, navigation (dredging) operations, and our electrical shop," Maracle said. "While that may not be a lot by some standards, it's certainly far more than we ever anticipated we'd have when we started using this system.

"We have 15 workstations spread around the site, with about seven users in Terminal 6 and eight in facilities maintenance," he continued. "That doesn't include the administrative people who do requisitions for purchases outside of the maintenance area. All of these people have workstations of their own. We're also now using the program to do time card data entry for payroll."

Data input and trending

Maracle does a PM schedule run for the electric shop and for the equipment shop every Thursday morning. These runs are tied in with the inventory and purchasing systems as well. "Our purchasing manager's logic was that maintenance generates more purchase orders than any other area of the Port," he said. "Dollarwise, it's not the most, but in quantities of POs it is, so it makes sense to have a system where maintenance, inventory, and purchasing are integrated in one system."

Bar code systems are used for tracking service parts inventories, in both the electric and equipment shops, which results in major cost savings for the Port. "Our parts inventory, frankly, was in horrendous shape; it was easy to let inventory get out of control because we really had no controls," Maracle explained.

"We had parts sitting here for years that we had thought we were going to need, and didn't. They might have been useless by the time we got around to needing them. To compound our own problems, we built a new maintenance shop and moved our entire inventory. All the bin locations changed, so we lost track of a lot of items."

Port staff is now in the process of reducing inventory by at least 65 percent in both the electric shop and the equipment shop. More parts are now ordered for just-in-time delivery. A key to achieving this reduction was identifying replenishment levels so that only as many parts were purchased as were needed.

"Our purchasing people love automatic replenishment because they can now simply press a key and generate a purchase order for everything that's on the list," Maracle added. "We're now more efficient about identifying replenishment groups as well, and it has reduced inventory significantly, which translates into major savings.

"It was a real eye opener to run usage reports and discover that out of the 11,200 line items we have, we may be using only about 2500. That's just 22 percent of our inventory, which tells us that we had accumulated a lot of in "X" period of time, so we'll just buy four of them.

"If they don't get stored in the same place, however, the next time you go looking for one, you may not find it so you buy another one. But we'll probably use some more, so we'd buy another two or three extra ones. Now we might have seven or eight in inventory and not even realize it.

Also, when we got rid of old equipment, spare parts were still hanging around taking up shelf space. It was a vicious circle, but the system has eliminated that problem," Maracle said.

The new system now permits Port departments to track the time it takes for a technician to go out and do a maintenance or repair job, including what equipment and parts are taken, how long the employee is there, and what tasks are performed. In the old equipment shop system, only one "employee" was identified, as number 9998. When supervisors went to a work order to see what was done and who performed the work, it was always number 9998. There was no accountability, a problem that plagued the work force for years.

"That's all changed. We identify every employee in the shop and everything he works on. Individual names go on every work order," Maracle noted. "All time during the day is accounted for and the time entered for work orders is matched to payroll records. We can even compare the time tracked with what a contractor bills for a job, since the work order is now a specific entity in the system.

"Our identity structure is quite detailed and it allows us to look at all data related to a piece of equipment and spot trends to discover what kinds of problems we're having. We've identified entities right down to engine components, transmissions, and tires."

Realizing potential savings

When Port of Portland staff set up new preventive maintenance programs, they were able to do some things that they were not able to do in the past. Handling PMs on container cranes represented a huge expense in the past because each crane was serviced in total for every PM. Today's new generation of cranes has indicators that tell exactly how many hours each drive motor has actually run, as a percentage of the crane "on" hours.

"With the new system, we can input that data directly so that when the power is turned on to the crane, we know what percentage of hours the hoist runs or the trolley runs or the boom operates or the gantry operates," Maracle explained. "We've studied actual drive usage and have found that the hoist operates 65-67 percent of the time and the trolley operates 63-65 percent of the time. But the boom motor operates only about 5 percent of the time and the gantry operates only about 3 percent of the time.

"My question was," Maracle explained, "if the boom and the gantry operate less than 5 percent of the time that the hoist and the trolley operate, why do we PM them as often?" Now, each has its own PM schedule based on the "power on" time. "Because the equipment shop labor billing rate is so high, currently $132/hr, this change in approach to crane PMs has probably saved us about $250,000 in routine maintenance in the first year alone," he said. "Plus we're not out of service as long."

"Environmental issues are a major concern here at the Port and we've cut down the waste volume of the oil and filters that we have to dispose of," he added. "The beauty of the system is that we have the information we need to review trends like this. We can retrieve any data that's been input and can slice and dice it any way we want in order to do theoretical planning, the what-ifs. This is something I now use every day."

Success reflected in ROI

While the crane PM changes already have saved a quarter of a million dollars in the first year, they are just one measure of return on investment for Port of Portland staff.

"When we were doing the justification for this, each department did its own cost justification as far as savings we expected to see," Maracle said. "When we sat down together to add it all up, we figured nobody would ever believe the numbers so we cut our expectations.

"None of our conservative financial models got the payback to be more than two years, and it's turned out to be much better than that. The project ended up costing us about $2.1 million, which was about 8 percent over our projected budget. But we've more than made that back in ROI already, so the project has paid for itself," he added.

Work procedures in general are much more efficient now, which is reflected as much in work that is not being done as it is in how people do their work.

"We have a much better analytical tool to examine how we go about things, so we're no longer doing PMs on things like bathroom fans anymore," he added.

"Another example: we have welders up in the cranes that we use once every 5 years. To be sure they were always ready, we were doing PMs on them every 90 days to 6 months. We don't do those anymore. We figured in some cases it would be more effective if we just let things fail. Sometimes you can buy a brand new piece of equipment and still be ahead of the game, just because of the money you don't spend on PMs. We were able to cull out a lot of that stuff only by using the new system.

"The EAM system has been so successful that we now get requests for visits and demonstrations from other port facilities around the country who are looking for a system that will help them achieve the same benefits," Maracle concluded. **MT**

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