A Tight Ship

Todd Pacific Shipyards replaced time cards with PDAs, improving project management and worker safety. But first, the contractor had to meet airtight security standards. BY EVAN SCHUMAN

AT TODD PACIFIC SHIPYARDS IN SEATTLE, MANAGEMENT knows that accurately tracking employees, including the hours and projects they've worked, and assessing daily staffing needs is often the difference between running a tight ship or sinking it.

With that in mind, the shipyard in 2000 invested $250,000 to replace a traditional time card system—punch cards and clocks—with one that now uses PDAs, a wireless network and a home-built software application that securely records each employee's time and work assignment. The system helps shipyard managers determine each day if they have the right number of machinists, pipefitters, electricians and welders to work on projects that range from overhauling nuclear aircraft carriers to building new ferries.

"If we don't have work for them, they get laid off immediately," says Mike Taylor, chief information officer at Todd Pacific from 1998 through October 2005, when he retired; Taylor is now a consultant for the company. "We wanted to get off those time cards and get visibility into where everyone was working at all times."

The new system, which paid for itself in less than a year, allows Todd Pacific managers to better plan and execute jobs at the 46-acre shipyard. That's because project managers can immediately access the schedules and activities of 800 or so employees, and know which skilled workers are available for a particular assignment. If the shipyard has work to support only 10 plumbers, instead of 20, project managers will furlough the employees.

Electronic collection of an employee's daily activities also makes it easier to prepare payroll and bill customers for work, according to Taylor.

Todd Pacific, which does work for both military and commercial customers, started the project in 2000 with 65 Dolphin PDAs. It later moved to wireless Symbol 1846 handhelds running the Palm operating system and then, in 2004, started shifting to PocketPCs—and away from Palm-based PDAs—to speed transaction processing. Today, the shipyard uses 125 PDAs to track employees and their time. PDAs were chosen over laptops because the PDAs are smaller, lighter and easier to move from one job to the next.

TODD PACIFIC BASE CASE

Headquarters: 1801 16th Ave. S.W., Seattle, WA 98134

Phone: (206) 623-1635

Business: Repairs, overhauls and builds commercial and military ships.

Chief Information Officer (during project deployment): Mike Taylor

Financials for nine-month period ending Jan. 1: $169.2 million in revenue, up by 88% from same period in previous year; $8.35 million in net income, up by 68%.

Challenge: Replace a paper-based time card system with a network of personal digital assistants to track employee time and whereabouts; adhere to strict military security procedures.

BASELINE GOALS:

- Make employee tracking system pay for itself within 12 months.
- Ensure that information about employees is available immediately, eliminating 24-hour lag.
- Exceed security requirements by deploying 156-bit encryption, up from 128-bit advanced encryption standard.

The PDAs are placed in central work areas, such as a boiler room. When a worker arrives, he takes his identification card, which includes a bar code, and runs it through the reader on one of the two or three PDAs at the work site—in effect, acting as the time stamp recording that the employee has started work.

The PDA then transmits that information via a wireless network that uses the 802.11b standard to a Hewlett-Packard server, which automatically updates payroll, accounts payable and project management records—reporting the name of the employee, arrival and departure times, and project he's working on. The PDAs connect via 33 access points—23 wired and 10 wireless—on the shipyard grounds.

NAVIGATING THE CHALLENGES

Setting up this system, however, was not without some challenges.

From the start, Taylor knew that the PDAs would have to work in difficult conditions. The devices needed to be hardened to resist dust and debris from any construction site; they also had to be able to function well in the moist air surrounding ships, as well as survive the inevitable drops into water.

So, the PDAs the shipyard uses are designed to survive heavy rain, dust and up to a six-foot drop onto concrete. "[For example], when we first bought the Palms, two were dropped overboard during the second month," Taylor says. "Three fell from 30, 40 and 50 feet, but they kept running. These devices, you simply can't destroy them."

Beyond harsh elements, the Todd Pacific work site has other attributes that make a wireless PDA network challenging, such as a 46-acre construction area that includes multiple buildings and cranes, with workers inside a combat ship's hull, which signals cannot penetrate. The shipyard needed to make sure it had a usable signal across the site.

Todd Pacific's I.T. team addressed the issue by setting up two wireless networks—one outside the ship that connects to a second network inside the ship. A wireless network that uses an Ethernet backbone connects the dock and buildings; the second network uses 300-foot-long wires that act as aerial antennas. The antennas are installed inside ships so that workers in a vessel's bowels can communicate and be located, Taylor says. The antennas cost less than $2,000.

Sometimes, however, the system worked too well. Some of the PDAs became "confused" when multiple antennas tried to connect with them. Symbol Technologies, the company that was providing the wireless Palm PDAs, spent about 90 days reprogramming the software in the antennas to allow the closest PDA to be the only one connected to a particular antenna.

The system also had to meet tough security standards. Because Todd Pacific's customers include the U.S. Navy and Coast Guard, the shipyard has to ensure that the units match or exceed strict military security requirements. After all, the Pentagon doesn't want information relating to its vessels such as schematics, identification of contractors, and the nature and duration of repairs to fall into the wrong hands.

Security procedures are extensive, but are not particularly unusual for sites working on Pentagon projects. For data transmission, those measures include 156-bit encryption—which is more secure than the Advanced Encryption Standard (AES) 128-bit standard—as well as a robust implementation of the Internet Engineering Task Force's Kerberos authentication protocol, which assigns a unique key to an authorized person using the network to confirm his or her identity when sending a message about military equipment.

Todd Pacific also established a separate server to handle only data entry. The data is encrypted to 156 bits, and the algorithms for the interface are changed daily, Taylor says.

THE PAYOFF

Most of the PDAs cost about $1,550 initially, but the shipyard now buys them for about $1,350, according to Taylor. He projected that he'd be able to deliver savings in one year that would pay for the $250,000 project. He beat that goal by one month.

How? First, Todd Pacific no longer needed four data-entry clerks with an annual salary of about $45,000 each to review the work hours shown on a time card, take that information and type it into a payroll application.

Because the new system can generate electronic reports showing labor costs by project, employee, task and other factors, Todd Pacific was also able to eliminate one position in the payroll department.

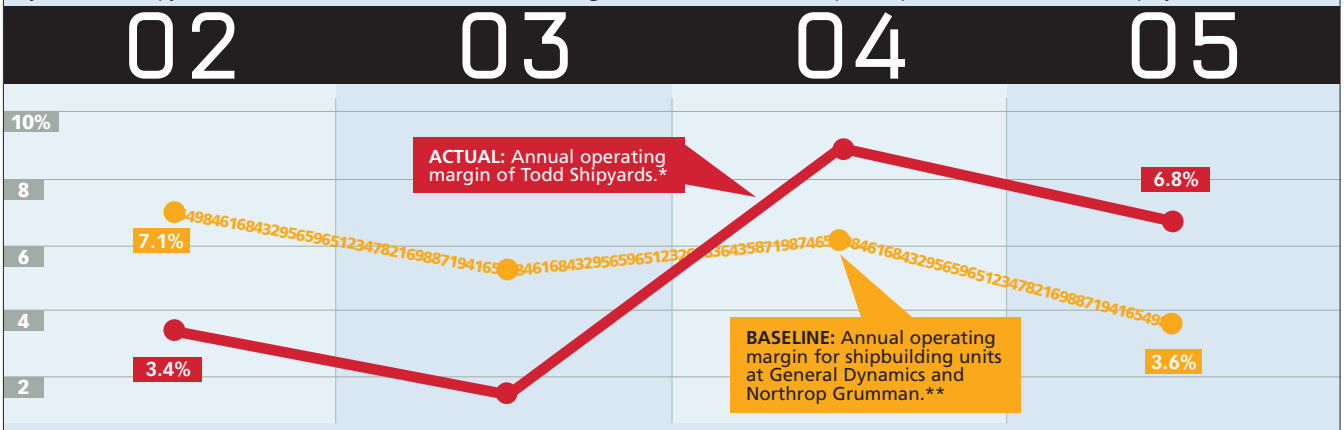
A workplace such as a manufacturing plant or construction site can show a faster return on investment for mobile devices than the typical office, says Ellen Daley, a research director at Forrester Research.

Without wireless access, a worker at a manufacturing plant or construction site may have to stop what he is working on and travel several feet, yards or even more to get to a computer to record or get information—whether it's identifying workers for an assignment or digging up schematics for a project.

In contrast, "It's hard for the carpeted offices to draw a good ROI," Daley says. "How many minutes is that person saving? What are the improvements in efficiency because

TODD PACIFIC: WAVE OF THE FUTURE

A small fry compared to General Dynamics and Northrop Grumman, Todd Pacific Shipyards has improved operating margins over the past two years. Todd Shipyards, in 2005, said the increase was due to a higher volume of work and improved performance on fixed-cost projects.



*TODD'S RESULTS FOR 2005 REPRESENT FIRST NINE MONTHS ENDING JAN. 1, 2006.
**RESULTS FOR GENERAL DYNAMICS AND NORTHROP GRUMMAN REFLECT NINE-MONTH PERIOD ENDING SEPTEMBER 2005.
SOURCE: COMPANY REPORTS

they can get their e-mail in a conference room?"

But those were just the hard-cost savings.

Of much greater value to Todd Pacific were improved efficiencies such as the ability to have personnel data—such as name, age, specialty, preferred hours, special skills and experience, where assigned, and expected completion for current project—available instantly, as well as having a real-time report on where all workers are supposed to be and what they're supposed to be doing.

The employee time tracking system, which was home-grown, can build a report that shows, for example, who's at work on a particular day, what specific project they are working on, and for how many hours. When it comes time to, say, bill the Navy for work on a nuclear submarine, the number of employees and time spent on the project can be generated from a report created with the employee time and assignment information collected by the PDAs.

TRACKING TIME

Taylor says his team built its own time reporting system because the wireless application industry was young back in 2000 and there weren't many options. He knew what he wanted, and determined that it was easier to build the software than to buy it.

Todd Pacific tied its time tracking application to Primavera Systems' Project Planner project management software, as well as an enterprise resource planning system from IFS North America. Linking to the project management application gives Todd Pacific faster and more accurate updates, and better information for evaluating future projects. The software sits on Hewlett-Packard servers and interacts with an SQL Server database.

The project management package also plays a key role in matching workers with assignments. Before the start of a workday, a project manager can designate how many people he needs to perform a particular task, such as a dozen electricians for work on a nuclear submarine. Once the workers are hired for a particular task, the system automatically logs their start time and charges them to the appropriate account so the clients can be charged.

By using the time tracking system with Primavera's application, a project manager can get an instantaneous look at project expenses and available funds. Before, "if things got slow in the yard, people would be charging expenses to any projects that had money," Taylor points out. "Now, managers can see right away what is happening and ask, 'Why do I have 10 electricians on this project when I only need three?'"

The tracking system also helps the shipyard manage contract requirements for 11 labor unions. And there are about 25 situations where workers get paid a higher hourly wage while performing tasks that are either unpleasant, especially dangerous or require unusual skills. If a worker is assigned to do a repair inside a dirty tank, for example, that worker gets paid double time during that task.

"We had to incorporate the logic for some of the union rules into the handhelds so that you could either assign premium [pay] or what the overtime was, and how people worked in different shifts," Taylor explains. "The system had to be pretty smart as to who this guy was and what his shift information was."

There was also one unexpected benefit from the wireless network: a reduction in workplace injuries. With the PDAs, an inspector or supervisor can immediately disseminate information via e-mail if he sees a hazardous condition that threatens worker safety or actually results in an injury, or observes an employee violating a safety rule.

Before PDAs, an inspector or manager filled out a three-part form and filed copies with the safety department and an employee's supervisor, a process that could take as long as three days. Today, that happens in minutes, meaning that hazardous conditions or unsafe behavior can be dealt with at once. Taylor stresses this process does not replace standard accident reporting procedures, which are still being handled manually.

Previously, the shipyard had a 20% injury rate, which means that one-fifth of all workers were reporting an injury. That rate has been cut in half, he says.

With safety improvements like that, Todd Pacific Shipyards has demonstrated that small devices can make a big difference.

BASELINE MARCH 2006 62