

Reworking Equipment and Methods Speeds

Environmental Cleanup

by Jeanne Chircop

At a Glance . . .

- Workers at a U.S. Navy ship-repair facility in Japan used “kaizen,” or continuous improvement, to devise new machinery and methods to greatly improve the cleanup of oil spills.
- The new process dramatically reduced the need for equipment, manpower, time, and costs, while boosting the thoroughness and efficiency of the cleanups.

Time is of the essence when an oil spill occurs. Every second counts when it comes to keeping spilled oil from contaminating water sources and killing marine life.

That’s why there’s always a special team of cleanup experts on standby at the U.S. Naval Ship Repair Facility and Japan Regional Maintenance Center (SRF/JRMC), Yokosuka detachment, where thousands of gallons of oil are routinely drained from ships coming into dry dock.

Oil containment and recapture is no easy task, even for experts. Equipment is large and heavy. Multiple hoses are unwieldy, and methods currently used at most shipyards require elaborate and time-consuming preparation. The men of Shop X-99, including the seven-member ‘Mada Yatte Tanda’ (MYT) Team, sought to improve the process.

In the spirit of kaizen, or continuous improvement, they worked together to devise a new “super” version of their existing machinery, which they paired with alternative equipment not normally used in cleanup, and created a completely new method for capturing oil. In the process, they reduced:

- Equipment by 80 percent.
- Manpower by 50 percent.
- Time by 82 percent.
- Costs by 75 percent.

They also increased:

- Thoroughness of cleanup.
- Accuracy of equipment estimations.
- Overall efficiency.

Ready When Needed

The Naval facilities in Yokosuka comprise the largest, most strategically important overseas U.S. Naval installation in the world, serving as homeport for the Kitty Hawk Carrier Strike Group. Yokosuka is the Navy’s largest supply center in the western Pacific, as well as the primary site of ship maintenance and repair.

SRF-JRMC Yokosuka, located at the entrance to Tokyo Bay about 18 miles from Yokohama, exists as a result of a cooperative defense labor contract between the United States and Japan formed at the

conclusion of World War II. The Japanese government provides support for the maintenance of U.S. forces in the region in exchange for U.S. military protection of Japan. These forces are known as United States Forces Japan (USFJ).

The Mada Yatte Tanda Team

- Goi Satoshi
Team Leader
- Sugiura Haruo
Vice Leader
- Niikura Tsuyoshi
- Kabaya Yoshihiro
- Yanagibashi Toshihiko
- Hiramoto Tatsuya
- Kashima Kenichi

Approximately 2,000 employees, the vast majority of whom are Japanese, work at SRF-JRMC Yokosuka to keep the U.S. Seventh Fleet operationally ready. The facility has six dry docks where ship maintenance and repair are performed. The docks are spread throughout the sprawling 200-acre facility, and so traveling among them takes time. Despite the distance between the docks, the X-99 Shop crew must be ready to respond immediately to a spill at any of them at any time.

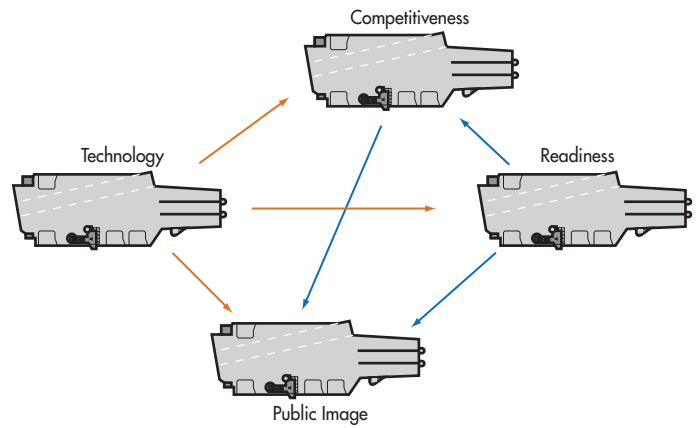
The X-99 Shop employs 65 workers, including 28 oil specialists. Electricians and mechanics comprise the remainder of the staff. All members of the MYT Team are oil specialists. Their work must meet both U.S. Navy standards and the Japan Environmental Governmental Standards (JEGS). The two governments long ago established a Joint Statement of Environmental Principles that stipulates immediate cleanup of any contamination caused by any USFJ contingent.

Focusing on Technology

All employees at SRF-JRMC Yokosuka strive to meet four major organizational goals:

1. Competitiveness: to be a model organization for efficiency, productivity, safety, and environmental protection in the ship repair industry.

Figure 1 Interrelationship Diagram



2. Technology: to operate modern facilities and employ state-of-the-art technologies.
3. Readiness: to consistently exceed internal and external customers' expectations for responsiveness, cost, quality, and timeliness.
4. Public image: to be an employer of choice in the community, known for cooperative spirit, a friendly workplace, and challenging and rewarding professional development opportunities.

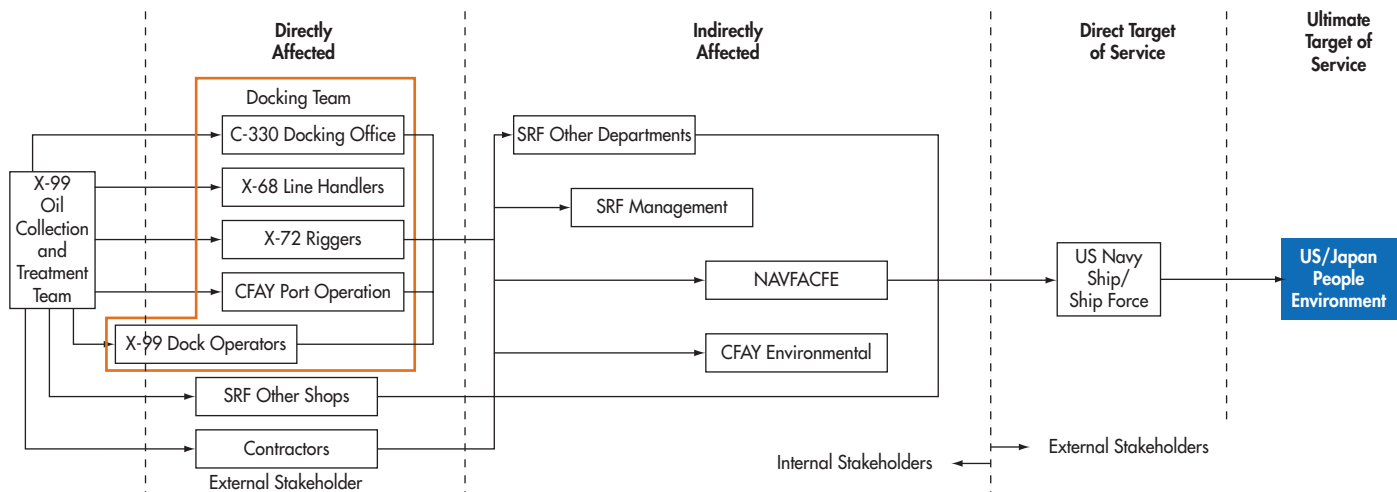
The MYT Team members decided to focus on how they might improve technology use at SRF-JRMC after drawing an interrelationship diagram of these four goals. In an interrelationship diagram, the issue with the most outgoing arrows most likely has the greatest impact on the other issues.

Team members then identified their own goals for improving technology use within their shop:

- Shortening time
- Increasing the degree of thoroughness
- Improving tools and methods
- Reducing cost

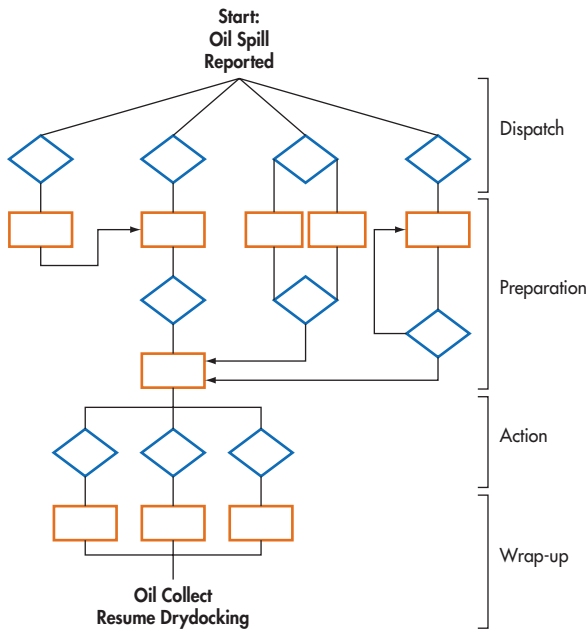
Team members also worked to identify both internal and external stakeholders.

Figure 2 Diagramming Helps Prioritize Internal and External Stakeholders



Next, the team used a tree diagram to describe methods and tools used in the cleanup process. Use of a tree diagram helped move the team’s thinking from broad generalities to specific details and helped team members develop logical steps toward achieving an objective. While there can be many options for the components of a tree diagram, depending on the desired outcome, the MYT Team used the tool to visibly show work steps through the four main phases of cleanup: dispatch, preparation, action, and wrap-up.

Figure 3 Tree Diagram of Methods and Tools Visibly Shows Work Process



Team members then examined root causes by considering a series of simple questions:

Question	Cause
Why do we have to decide what to use each time?	Different dock sizes and volumes of oil
Why do we use a truck?	No other transportation
Why does tank/barge have to be at the right spot?	Minimum distance to worksite
Why does the dock have to be dewatered?	People must walk in
Why do we have to split the team?	Need three types of work simultaneously
Why do people have to go into water?	Current machinery requires it
Why do we have to set up many lines?	Limited capability of current machinery
Why does tank/barge have to be monitored?	SRF-JRMC Regulations/Preventative measures
Why do people have to walk around?	Current machinery requires it
Why do we need people to support the skimmer	Hard hoses are difficult to maneuver

The team members quickly realized that the roots of many of their questions pertained to the current machinery they used. They then listed all the advantages and disadvantages of the current equipment and started brainstorming ideas for eliminating

the disadvantages. Little did they know they were on their way to creating a whole new process for doing their jobs.

Better Equipment Without Purchase

Traditionally, oil cleanup at SRF-JRMC Yokosuka involved setting up several hand-operated skimmers, which needed to be moved around to “chase” the oil. Dozens of hoses had to be installed in order to cover each 100,000-square-foot dry dock area. Transportation and setup of the unwieldy equipment was extremely time-consuming and required many workers. Progress stalled each time a skimmer had to be moved. Invariably, some oil was missed.

In the true spirit of kaizen, which involves ‘taking apart’ a process and reconstructing it in a better way, MYT Team members decided to completely reverse the system. Instead of “chasing” the oil with several hand-operated skimmers, they decided to ‘push’ the oil (using high-pressure water) toward a single high-capacity, self-standing skimmer with adjustable-height suction.

The next challenge was to figure out how to put their idea into action. They had no funding for new equipment, and so they looked for available materials and tools within their warehouse and set about making the new “super skimmer” themselves. After six months and collaboration with the mechanics in their shop, they succeeded.

The new super skimmer consisted of a pneumatic pump fitted atop a drum lifter, with a wide, adjustable suction mouth at the base. Working with both shop mechanics and the dock’s fire-fighters, team members devised new self-standing water sprayers to push the oil toward the super skimmer. They also created mobile back-carried sprayers and an extremely high-powered unit featuring a firefighting nozzle. All self-standing equipment was put on wheels for easier mobility.

Complete Success

The new system scored big in every area: thoroughness of cleanup, ease of work, manpower, timeliness, and cost-effectiveness. Whereas the old system required 3.5 hours to set up, the new one took a mere 30 minutes. The old system required five skimmers and 35 hoses; the new system needed only one skimmer and seven hoses. The old system pumped less than 1,000 gallons per hour, while the new one could pump 1,000 to 2,000 gallons per hour. The old system left visible oil spots; the new one completely washes the dock clean.

The very first time the MYT Team members tried the new process, they knew it was significantly better than the old way. Measuring against their original goals of making improvements in the areas of time, thoroughness, tools/methods, and cost, they pinpointed the following tangible and intangible results:

- Time: reduced both setup time and pump-out time by a total of 82 percent.

Figure 4 *New Method Cuts Time, Equipment, and Costs*

	Old Method	New Method
Delivery and setup	3.5 hours	30 minutes
Material	5 pumps	1 super skimmer
	5 skimmers	sprayers
	35 hoses	7 hoses
	5 waders oil fence	oil fence
Setup method	3 trips (warehouse ↔ site)	2 trips
	20 workers	10 workers
	5 lines	1 line
Pump-out time	2 hours	30 minutes
Pump-out method	Spots finding	Forced movement
	14 essential workers	7 essential workers
Actual costs	\$4,218	\$1,055
Cost of idle time	\$4,921	\$1,230

- Thoroughness: reduced manpower needed by 50 percent while achieving total cleanup of the docks for the first time.
- Tools/methods: reduced equipment requirements by 80 percent and made it easier to estimate job requirements by constantly using the same equipment.
- Cost: reduced both actual labor costs and costs of idle time by a total of 75 percent.

Further intangible benefits included easing labor for the cleanup crew: With the new equipment, workers no longer had to enter standing water to do their job. They also endured less strain while moving equipment, as all of the new machinery was either back-carried (lightweight) or on wheels. The large fire-nozzle sprayer is even operated while seated.

Sharing Success

The team shared news of its reworked equipment and cleanup method with major stakeholders through a formal presentation. They then celebrated with a facilitywide picnic and baseball game.

Next, they shared their accomplishment with members of the larger community by participating in the National QC Circle Contest, competing against teams from across Japan. From there it was on to international competition at the 2006 ASQ International Team Excellence Award competition, where the team competed against 26 similar teams carefully selected as finalists from around the world—including three other teams from SRF-JRMC Yokosuka and its Sasebo detachment. The event was held during the ASQ World Conference on Quality and Improvement in Milwaukee, Wisconsin, in May 2006. Although the team ultimately did not place among the gold, silver, or bronze top-three slots, team members were nevertheless recognized as world leaders in quality management.

Further, the MYT Team applied for a patent on the innovative cleanup process with the Japan Patent Office in April 2006.

For More Information

- To learn more about quality tools and techniques such as tree diagrams, kaizen, and interrelational diagrams, visit <http://www.asq.org>.
- To learn more about the ASQ International Team Excellence Award competition, visit <http://wcqi.asq.org/team-competition/>.
- To learn more about SRF-JRMC Yokosuka, visit <http://globalsecurity.org/military/facility/Yokosuka.htm>.
- To learn more about the U.S. Seventh Fleet, visit <http://www.c7f.navy.mil>.

Contributing to This Article

Mr. Kazuhito Iwasaki of the Continuous Improvement Office, SRF-JRMC Yokosuka, provided information for this article.

About the Author

Jeanne Chircop has been helping organizations share their successes for more than 20 years. She has written about quality efforts in the education, manufacturing, and natural resources industries. She holds a master's degree in journalism and resides in the Washington, DC, metropolitan area.