Moving training toward performance improvement

BY PHILIP N. MCCULLOUGH

The Perry plant's training simulator is a fully operating system used for solving problems, testing new methods, and developing improvements leading to advances in plant performance.

AT FIRSTENERGY'S PERRY-1 nuclear power plant in Ohio, a diverse team of about 12 engineers, instrument technicians, mechanics, and electricians gather in a noisy but tidy 3000-square-foot interior room. There, they focus on pipes, tanks, pumps, filters, reservoirs, demineralizers, and heat exchangers, carefully taking measurements, making adjustments, and comparing notes.

At any moment, they know the room may get a lot noisier. The lights may dim. System flows and pressures may fluctuate wildly. And it could get pretty toasty in there. But these nuclear professionals won't get hot under the collar, because this is business as usual—that is, when you're in a training simulator.

Perry's new flow loop training simulator looks, sounds, feels, and acts like the real thing. The fully operating system duplicates four closed-loop systems found in the plant—cleanup, cooling, heating, and recirculation—and uses the same equipment as the real plant, only borrowed from Perry's mothballed Unit 2. The self-contained system allows Perry to conduct innovative, results-oriented training. "For the past 20 years, this industry has understood the value of control room simulators for operator performance," says Tim Rausch, Perry's plant manager. "The flow loop we have created essentially mimics that training experience for other work groups. It's built on the same principles, and we're convinced it's well worth everything that's gone into it."

Called "The Loop of Excellence" by Perry employees, this simulator and training mock-up has quickly become a mechanism for solving problems, testing new methods, and developing improvements that lead to real advances in plant performance. Perry used the simulator to focus on electrical system safety before the spring 2003 outage, with excellent results: zero errors related to these outage activities. Also, engineers and mechanics have used the simulator to practice pre-job briefings and achieve an error-free modification in the plant. "When the mechanics went in the plant and installed a pump modification, it went without a hitch," says Rausch.

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Perry maintenance mechanics Fred Barthany and Mark Paolillo practice pump shaft alignment during a training session on flow loops. (Photos: Tommy Thompson)

First, define success

In the nuclear power industry, there are countless examples of how training has led to improvements in plant performance. But all too often, the link between training and these improvements has become evident only after the training has taken place. Instructors have traditionally presented training that they expect to reduce maintenance rework, decrease radiation exposure, or improve valve performance, but they haven't typically offered training that is specifically designed to meet these distinct, measurable performance improvement goals.

This is changing. The new emphasis is on first defining what success will look like in terms of hard, quantitative data—for example, a 20 percent reduction in radiation exposure, or valves that fully function and require no rework. After defining success in advance, today's nuclear power plant staffs are challenged to develop training that will arrive at those tangible goals, then measure performance to make sure the goals were met, and finally analyze results and continually adjust training as needed to maximize improvements in plant performance.

In a business climate that is increasingly competitive, cost-conscious, and results-oriented, utility executives need to know what return on investment they can expect for their training dollars. They need assurances that an investment in training is truly an effective remedy for a work area in need of improvement or a stimulus for further advances on the continual path to excellence in specific areas of plant performance. Today's executives deserve to know how training will help them achieve specific business goals, such as safe, reliable plant operation. Further, they are justifiably looking for the most cost-effective approach to performance improvement. They need to have confidence that training is the most appropriate approach that will yield the most positive results. In short, training has to add value—real, concrete value.

The current transition to training that is designed to improve plant performance re-

Electrician Jim Palumbo works in full protective gear to rack out a 480-kV circuit breaker on the Perry training simulator flow loop as Mark Monk, lead electrical instructor, observes.

quires a shift from metrics of trainee satisfaction to metrics of performance improvement. This new approach moves performance-based training from focusing just on training indicators to a focus on performance indicators.

Traditional metrics emphasizing class satisfaction and volume of student hours won't reveal training dividends, predict whether the learner will perform better, or help the plant improve. Satisfaction measures are useful only in predicting whether students will want to take future classes. Similarly, volume metrics are not a useful measure. They show how much time students spend in courses, but not the value created for the organization. In fact, volume metrics can encourage training that is too long or unnecessary, sapping company resources that could be put to better use.

These traditional metrics focus on the wrong parameters. To determine training's payoff, we must assess the transfer of knowledge to the learner, the learner's performance improvement, and the ultimate impact on the business. This is the information that translates into return on investment and makes a difference. Although it's more difficult to measure, it can be done.

Performance improvement

Gone are the days when the nuclear power industry did training as a one-size-fits-all approach to meet a regulatory requirement. Today's competitive and rapidly changing nuclear industry demands more than training just for the sake of training. Training today must be an integral part of each plant's core business—a part that yields tangible, cost-effective improvements in organizational performance.

The National Academy for Nuclear Training seeks nothing less than to fundamentally redefine training to ensure continued excellence in a highly skilled workforce—something that is absolutely imperative for industry success in the future. In today's business environment, excellence in human and plant performance will be achieved through training that is part and parcel of the company's business strategy and operations; through training that helps people and organizations learn on their own; and through training that is really just one piece of a larger system called Performance Improvement. Today's choice is clear, and the stakes are high. Does the industry continue to run training as a stand-alone enterprise? Or does the industry become the champion of training as a strategic element in the performance improvement process?

Perry employees participate in a cross-functional training exercise.

Training and performance improvement do not necessarily have a cause-and-effect relationship because training does not necessarily achieve the desired results. Employees who go to class and pass their exam successfully complete training, but if plant problems persist in the same areas training focused on, then the plant has not accomplished performance improvement. Conversely, performance improvement does not always require training. Effective leadership, procedures, communications, hiring practices, and many other activities also help improve performance. The best decisions on how to achieve performance improvement are based on the value that different approaches bring. Which approach will be most successful will depend on the specific objectives to be achieved.

Yet all too often, training is applied to address performance issues it might *not* be able to improve. Are employees not following procedures? Retrain them on station policy. Are managers sending mixed messages? Train them on communications techniques. Are departments not working well together? Send everyone to teamwork training.

What this knee-jerk response often misses is that the undesirable behaviors might not be caused by a lack of knowledge or skill. If they are not, training is unlikely to be an effective answer. When other performance drivers such as inappropriate job goals, feedback, or incentives cause a problem, training will not produce the desired results. The industry needs to invest training resources where they will best work to solve performance problems and close performance gaps.

To be an effective part of performance improvement, training should be strategic and ongoing. The connection between

learning and plant performance improvements should be clear and understood by all. Training must be part of the core business, and the training staff must see themselves as an integral part of the team. Trainers must act like internal performance consultants who work alongside managers to spot the real problems beneath any plant symptoms and determine proactive strategies for improving performance at both the department and plant levels. The mindset needs to be one of continuous improvement in operational safety and excellence.

Redefining training as we know it is no easy task and will require a partnership between the training staff and line managers to co-own training from start to finish—from the needs analysis to the evaluation of results. Because learning must be continuous, supervisors and managers who have daily interaction with the work force will assume increasing responsibilities for the learning process. Training must be integrated with the job. Training, and any resulting changes in performance, must often happen in real-time to be effective.

Accreditation improvement

Today's changing training needs have been a driving force behind the National Academy for Nuclear Training's recent Accreditation Improvement Initiative. Launched in 2002 with extensive industry input, the premise behind the initiative is that in today's competitive business environment, training must become a strategic tool that will improve worker performance, thereby improving plant performance.

The Accreditation Improvement Initiative has three key goals:

- Establish training as a core component of performance improvement.
- Eliminate the low-value aspects of the accreditation process.
- Clarify and focus accreditation standards.

Before the Accreditation Improvement Initiative, the accreditation objectives and criteria focused on the quality of training in terms of training delivery, trainee satisfaction and training documentation. Now these objectives and criteria focus on training to improve performance, with an emphasis on training for desired outcomes, changes in worker performance, and graded application of the systematic approach to training.

Two revised National Academy documents—ACAD 02-001, *The Objectives and Criteria for Accreditation of Training in the Nuclear Power Industry,* and ACAD 02-002, *The Process for Accreditation of Training in the Nuclear Power Industry*—serve as the foundation for improvements to the accreditation process. The key

Training: The post-TMI years

Many nuclear power plant veterans would agree that training isn't what it used to be. Nuclear training has come a long way over the past two decades, driving significant across-the-board improvements in nuclear power plant performance. And the training evolution continues today, spurred by the persistent demand for nothing less than excellence in nuclear safety and plant performance.

An early defining moment in the evolution of nuclear power plant training was the 1979 accident at Unit 2 of the Three Mile Island (TMI) nuclear power plant. Before the accident, training was far less comprehensive. Often taught by part-time instructors, licensed reactor operators trained in generic control room simulators on knowledge of the reactor and the core, with a focus on large-break loss-of-coolant accidents. Training for the crafts was mostly in apprentice programs. Mechanics and pipe fitters learned their trade by working alongside a journeyman or mentor, often without learning the "whys" behind tasks.

In the wake of the accident, the Kemeny Commission conducted a comprehensive study and investigation of the accident and provided recommendations to prevent or mitigate similar accidents going forward. One of the Commission's key recommendations was that the industry should set and police its own standards of excellence. The industry took swift action to launch the Institute of Nuclear Power Operations (INPO), giving it the mission to promote the highest levels of safety and reliability—to promote excellence—in the operation of nuclear electric generating plants. INPO began focusing on its four cornerstone programs: plant evaluations, training and accreditation programs, assistance, and events analysis and information exchange.

The Kemeny Commission recommended training improvements and the establishment of agency-accredited training institutions for operators and immediate supervisors of operators. In May 1982, INPO established an accreditation program for the nuclear industry that required utilities to seek accreditation for their operator, maintenance, and technical training programs. To maintain industry control of training and qualification of nuclear plant workers, the industry responded by committing to prepare its training programs for accreditation.

The Nuclear Regulatory Commission endorsed the INPO-managed accreditation program in March 1985 after a two-year period of study during which the NRC determined that INPO was effective in improving training programs. In 1985, INPO's Board of Directors formally established the National Academy for Nuclear Training, bringing together the nuclear utility industry's training activities and facilities, the National Nuclear Accrediting Board, and INPO training and accreditation activities.

The NRC subsequently published a series of endorsements of INPO-managed accreditation and in 1993 issued a Final Rule establishing INPO accreditation as a means for compliance with federal regulations. This came as a result of a 1990 federal court decision calling for an NRC rule on training that would require that training programs be established, implemented, and maintained using a systematic approach to training.

From these post-TMI beginnings, nuclear training has continued to evolve. In the wake of the accident, an early emphasis was on using a more structured, systematic approach to training with the goal of improving plant safety and reliability. Training scope broadened as well. TMI had demonstrated that design-based accidents involving large-break loss-of-coolant accidents were not the only area of concern in protecting the reactor core. Site-specific control room simulators were built to train reactor operators in a setting that mirrored the operation of actual plant systems. In addition, training was broadened to include structured on-the-job training programs, and focused just-in-time training for specific activities.

During the 1990s, more training emphasis was placed on human performance elements, going beyond technical skills training. Plant workers began receiving instruction in various methodologies and approaches such as procedural adherence, self-checking, independent verification, and supervisory oversight to guard against human error. At the same time, management ownership of training became a priority, and subject matter experts led training, leading to a greater interdependence between the training department and the plant staff.

All these training advances have contributed to extensive improvements in plant performance over the past two decades. Going forward, nuclear power plant staffs will continue to be challenged to develop and implement training that is specifically designed to achieve measurable improvements in plant performance.—*P.N.M.*

changes to these revised documents include the following:

■ These objectives and criteria reflect a balance of training processes and outcomes that support performance improvement.

■ The accreditation self-evaluation report optimizes the use of plant self-assessments and is reduced in length.

■ A graded application to the systematic approach to training is appropriate for the development of training.

The industry is just now completing its first full year of these changes to the accreditation process, and the industry response is overwhelmingly positive. The explicit connection between training and performance improvement has caused training professionals and plant management to continually pause, reflect on, and challenge whether training is really adding value. They make sure they are actually seeing the desired results.

While the emphasis on measurable results from training is new, there remains a focus on approaches that have served the industry well for decades. The five-step Systematic Approach to Training—analyze, design, develop, implement, and evaluate—remains an effective tool for developing training that is results-oriented. This time-tested approach begins with identification of training needs and recommendations for addressing any human performance shortfalls. It places training squarely in a plant's corrective action program, helping identify areas where knowledge and skills can be improved and how training can measurably improve plant performance.

Determining nuclear's future

In many ways, the nuclear industry is at a crossroads. There were huge improvements in the 1980s and the 1990s, but what worked in the 1980s and the 1990s can't be counted on to sustain further improvements in the nuclear industry. The key to a positive future for the current plants depends on ensuring nuclear safety while striving for higher levels of performance.

Integrating targeted training into daily plant activities to achieve distinct, measurable improvements in plant performance is a difficult challenge, but a number of nuclear power plant staffs are making clear progress.

"Our continued improvement in station performance is linked to our training performance," says Brian O'Grady, general manager of plant operations at Entergy's James A. FitzPatrick nuclear power plant in New York. "FitzPatrick's continuing assessments of training programs and its focus on training as a solution to plant problems are among its greatest strengths. We have instilled in our organization that training is the most important thing we do today for what we are going to be tomorrow."

At Detroit Edison Co.'s Fermi-2 nuclear station, training has recently undergone a revival. Today, the plant staff understands and appreciates training's value, and actively shapes it. Fermi-2 executives, line managers, and staff agree that they have been through a major cultural change these past few years. The change has resulted in many success stories:

■ Training is now part of Fermi-2's core business.

■ Employees at all levels own and actively shape training programs.

■ Training self-evaluation is ongoing, thorough, and set to high standards.

■ When training issues surface, corrective action is immediate.

■ Line and training personnel partner to make sure training is strategically used to improve specific areas of plant performance.

Going forward, FitzPatrick, Fermi-2, and all our nation's nuclear power plants will need to continually focus on training as a tool for improving plant performance. Training will continue to be performance-based, with defined, measurable performance improvement goals. It cannot be a stand-alone, activity-driven process, but instead must be part of a larger system that drives performance improvement through an atmosphere of continuous learning. NN