



The Value of Learning

Continuous Innovation at the Turkey Point Project.

NooterConstruction.com



SOMETIMES A GOOD SOLUTION to a complex problem is just the gateway to an even better one. That is what St. Louis-based Nooter Construction Company found while tackling a major portion of Florida Power and Light Company's (FPL) multi-billion dollar upgrade at the Turkey Point Nuclear Power Plant near Miami. Detailed pre-planning that prompted contractor Bechtel to award Nooter the project to remove and replace eight condensers at Turkey Point's two reactors had to be shelved immediately due to realities and complexities encountered in the field.

60

CERTIFIED WELDERS

36

DAYS EARLY

1

SUBCONTRACTOR OF THE
YEAR AWARD

NOOTER
CONSTRUCTION

But thanks to teamwork and continuous innovation the project was completed 36 days early, came in \$2 million under budget, extended the company's remarkable safety record and earned Nooter Bechtel Power's 2012 Subcontractor of the Year award. It also highlights lessons that are applicable to countless other heavy duty construction projects.

"We have the ability to what-if situations, to look beyond the surface and really involve ourselves in the nuances of that job. We can increase productivity, increase efficiency, and give customers a vision of what they are looking for in the completed task," said John Walling, Construction Vice President, Nooter Construction.

PROJECT CHALLENGES

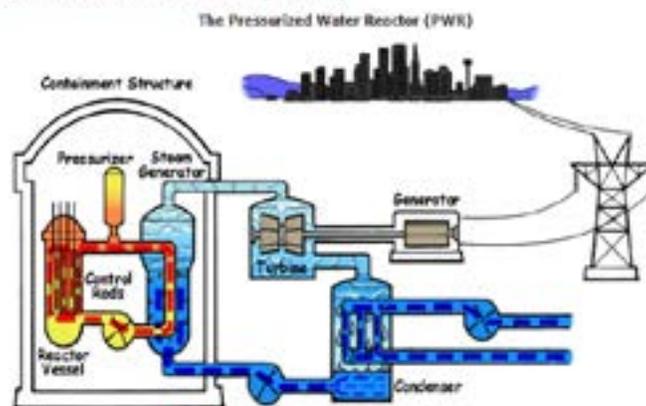
The Turkey Point overhaul was part of one of the largest uprate projects ever involving a U.S. commercial nuclear plant. FPL had regulatory approval for a 15 percent increase in power output from the pressurized water reactors at Turkey Point-3 and Turkey Point-4 which began operation in the early 1970's. Nooter's assignment was to determine the best way to remove and replace condensers at those two identical reactors. Condensers are heat exchangers, which cool exhaust steam created when nuclear reactions spin turbines to create electricity and return the water back to the steam generator to produce more electricity. For the project to succeed, new condensers were a must.

"The old condensers were plugged, so the heat transfer from the condensers was not taking place. Upgrading the old condensers made them much more efficient. The challenge was the customer wanted it done quickly," said Bob Grundmann, Nooter Construction Contracting Manager.

Another challenge was the size of the four condensers at each unit which were housed in narrow concrete pits 20 feet below

grade. The condensers are actually shell and tube heat exchangers containing thousands of 40 foot tubes. The heat transfer tubes needed to be demolished-in-place and the debris removed before new components could be installed. Nooter's solution to this problem was to flatten the tubes into a ribbon while they were being extracted from the tube sheet, then simultaneously feeding the flattened tubes into a cutter for easier removal and recycling. The remaining tube sheets and inlets were then flame cut and removed while new components were installed.

The Pressurized Water Reactor (PWR)



PWRs keep water under pressure so that it heats, but does not boil. Water from the reactor and the water in the steam generator that is turned into steam never mix. In this way, most of the radioactivity stays in the reactor area.

CONSIDER IT DONE.



onboard in less than 10 days, Nooter Construction used its nationwide resources to locate qualified welders who could pass welding tests locally before going to Florida for training to work at the nuclear facility.

“We were able to find an additional 60 qualified welders in less than two weeks . Both Florida Power and Light and Bechtel told us they were lucky they went with a national contractor with the resources to meet the task at hand,” Walling said.

CREATIVE SOLUTIONS

Bechtel selected Nooter in large part because of a detailed plan assembled to do the work. But the team needed to modify that plan from the outset at Turkey Point-3. They found the condenser floor to be a relatively thin layer of concrete unable to support the weight of a point-loaded crane without reinforcement. So the team devised a miniature railroad whose cars hauled away demolished condenser components while displacing the weight of the crane and its payload across the surface area.

“The main thing is that we like to take on our customer’s challenges. We have cultivated a can-do attitude that fosters an environment that allows a person to think outside the box and come up with solutions,” said Marc Hackstadt, Nooter Construction Senior Rigging Engineer.

When the scope of Turkey Point-3 abruptly changed to require an additional 60 certified welders to be brought

INNOVATION THROUGH LEARNING

The original plan to complete the condenser change out at Turkey Point 3 experienced numerous unforeseen issues that emerged during the course of the project. However, at a key mid-point in the project a Lessons Learned review took place and the entire project team agreed to significant adjustments in inspection and quality control procedures to ensure key components arrived at Turkey Point-4 ready for installation ensuring critical outage dates were met.

Additional Lessons Learned meetings held between the completion of Turkey Point-3 and start of Turkey Point-4 ultimately were the most critical discussions of the entire project leading to the overall success of the combined phases. The results enhanced efficiency, lowered cost and reduced the overall length of the second phase of the project. One of the major suggestions came from the field crew itself. The Turkey Point-3 condensers were essentially removed from the outside of each unit

working inward in a process that many judged to be successful. But the field team believed they could work faster by starting from the inside and working outward. The new logistics allowed installation on improvements at the top of the condenser to begin more quickly on Turkey Point-4. Other recommendations that were incorporated modified weld rod movement, piping fabrication, fab shop inspection criteria and speed of badging process to gain access to the facility.

“That is how we were able to cut so much time out of the second job compared to the first one. We didn’t have to hold off making the improvements up above until everything was demolished. The field staff brainstormed a bit on how to do it and were able to come up with a plan,” Hackstadt said. “By the time we had the entire condenser demolished, we had two thirds of the improvements already installed.”

The new plan also called for the tubes to be cut into smaller pieces, which allowed the mini-railroad to be replaced by low-profile carts for debris removal. It proved to be faster and more efficient. As a result of the collaboration and expertise of the combined Bechtel/ Nooter Team, the four condensers at Turkey Point-4 were removed 36 days quicker than those at Turkey Point-3.

“Coming up with new innovations during the project was important. Even though it wasn’t exactly executed as planned, we adapted and modified our execution to make it work better,” Grundmann said. “When you have an identical project, you can take advantage of the learning curve by incorporating efficiencies discussed in the Lesson Learned meeting.”



PUTTING PEOPLE & SAFETY FIRST

At its peak Nooter had nearly 300 employees at Turkey Point, all of whom needed to be trained to work at a nuclear facility and were subject to rigorous security benchmarks of the NRC, Homeland Security and FPL. The process took an average of four weeks initially. But acting on Lessons Learned feedback, the training process was restructured with the help of an off-site facility that dramatically reduced training time. Employee transportation across the vast distances from parking lots to the work site was also improved, resulting in better efficiency and morale.

“It was those subtle nuances that give people a more positive attitude to the product we were expecting,” Walling said.

Turkey Point also contributed to Nooter Construction’s overall safety record, which at the time the project was complete stood at 20 Million Man-hours without a Lost Time Injury.

“We are most proud of our safety record. We didn’t have any major safety incidents,” Grundmann said.

Successful heavy construction projects depend on a myriad factors coming together to deliver quality, value, and safety. Those factors include the ability to deliver on time, working collaboratively to meet milestones, and meeting or exceeding expectations for safety, construction performance, technical expertise, and environmental compliance.

CUSTOMER BENEFITS

Successful heavy construction projects depend on a myriad factors coming together to deliver quality, value, and safety. Those factors include the ability to deliver on time, working collaboratively to meet milestones, and meeting or exceeding expectations for safety, construction performance, technical expertise, and environmental compliance. In fact, those were the criteria used to select Nooter as the 2012 Bechtel Power Subcontractor of the Year for its successful work at Turkey Point. Make them part of your next project.

“We work on things that were never designed to be torn apart and worked on. Each job is different. But that’s our business. We have the teams that can create innovative solutions for complex and monumental projects,” Hackstadt said.

“Get us involved early. Make sure we are an active part of the project from the early stages and we’ll help deliver the project customers desire with the efficiency they need,” Walling said.

INDUSTRIES

For 118 years, Nooter Construction has been a leader in industrial construction services for our country’s energy infrastructure. This commitment has created a unique understanding of the complexity and advanced technologies involved with the construction of alternative fuel and energy facilities.

We collaborate closely with your team to encourage sustainable long-term production including the reuse of equipment and incorporating value engineering, phased implementation, and unique construction problem solving.

Nooter Construction provides the same construction services and capabilities to the alternative energy industry that we do to the other industries we serve, including new plant construction, facility expansion, and installation and relocation of process equipment.

Put our experience and ingenuity to work, ensuring that your nuclear, natural gas, wind or solar plants meet or exceed output expectations.

MARKETS

NUCLEAR
NATURAL GAS
WIND
SOLAR
WATER

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