

**2007 Construction Innovation Forum, NOVA Award Nomination  
Enrico Fermi One Piece MSR Component Replacement**

The Detroit Edison Company recently replaced the two Moisture Separator Reheaters at their Fermi Nuclear Power plant. The vessels are each 113ft in length and each weigh 300T. The existing vessel locations and the location for the new vessels are deep within the structures and piping of the power plant. Traditional methods for extraction of the existing vessels and installation of the new vessels would require extensive removal of plant equipment and structures and would require an extended plant outage to accomplish the work. A standard approach, and the approach used during the plant construction was to install each of the vessels in two half sections and to join the two sections by welding and then install piping to fit. In this case however, it was time and cost prohibitive to remove the now installed piping, and the vessels were now housed inside reinforced concrete structures. The project was further complicated by the fact that these components are within a radiological controlled part of the plant. They are not accessible when the plant is operating due to a high radiation environment. Therefore the new vessel needed to be made and moved to fit the existing plant within a very tight tolerance.

To accomplish the work the project team developed a one piece installation approach. This unique approach provided the shortest plant outage duration with all outage activity completed in a 35 day window. This saved over \$10 million in replacement power cost. However moving such large components from the fabrication facility in Oklahoma to the plant site in Michigan, and then moving those large components within the plant with clearances of less than 2” and to a final fit-up position within 1/8” tolerance was a formidable challenge. In fact, during initial planning for the project the one piece option was determined to be impossible. The team did not accept this and employed innovative methods and a unique project approach to implement the one piece approach and to achieve their goal.

First, the existing plant equipment was meticulously mapped using laser surveying technology. This information was translated to a 3D design tool. This produced a design tool that gave the team the ability to design and plan to the needed tolerances. A virtual construction plan was developed with 3D animation that simulated the heavy rigging path and proved that a one piece approach was in fact possible. The design data and the laser surveying tool were then used to first design the exact dimensions for the new vessels including nozzle locations for piping up to 48” diameter, and then to confirm through exacting measurement that the vessels were a fit for the plant equipment.

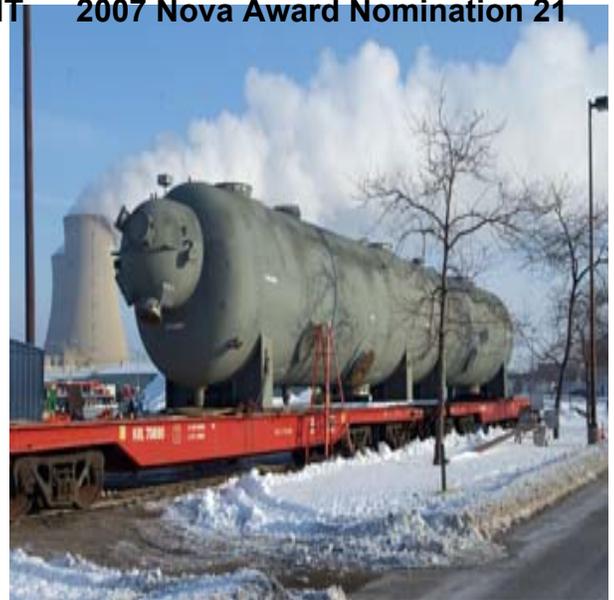
The unique construction approach included application of a full array of specialized equipment. A special rail car was adapted to move the new vessels from Oklahoma to Michigan. A modular lift tower and integrated slide system was designed and erected at the site to move the new vessels from the rail car up to and inside of the power plant. A unique cantilever lifting beam was used to remove large concrete wall sections to provide access for the new vessels. Once inside of the plant a hydraulic slide system was used to maintain positive control and to ease the vessels into their cubicles to the exact location required. The seamless hand off of the MSR from the module lift tower to the plant overhead turbine bay cranes further enhanced the overall project safety.

The project met all of its objectives. Over 300 building trades’ employees participated. The project was completed with exceptional safety results experiencing no lost time and no OSHA recordable injuries. The vessels were a perfect match to the plant piping and the 800 required pipe welds were completed within the 35 day planned window.

The project demonstrated the value of exceptional planning, exceptional teamwork, and application of innovation to develop and execute a first of a kind project to achieve best in class results.



Testing modular lift tower with water weights



New 113' long MSR spanning two rail cars



New vessel lift for move into power plant



New and old components on turbine deck



Sliding new vessel into place to 2" clearance



Welding new vessel to 48" piping