Plant Morrow Maintenance Crews Face Unique Challenges

During major planned outages and throughout the rest of the year, mechanical maintenance crews at Plant Morrow work continuously to inspect, repair, and replace equipment. Their responsibility is to ensure the overall reliability of the plant. More than 25 employees–including supervisors, mechanics, painters, laborers and a tool room issuer–work together to regularly examine each detail of more than 2,000 assets that contribute to the plant's complex systems, a responsibility not taken lightly by the crews.

"Each member of the maintenance team understands the significance of his work," said Mechanical Maintenance Superintendent Jeff Brown. "The plant's systems are so complex and interrelated that one malfunction can have broad consequences. Our responsibility is vital, and we take that role very seriously."

Coal is abrasive and corrosive by its very nature; therefore, most of the equipment at Plant Morrow requires frequent inspection and repair. From the coal pile through the conveying system and on to the bunkers, feeders, crushers, ball mills, and classifiers, the abrasiveness of the coal constantly wears away at the machinery. When the sulfur in the coal, fly ash, or un-scrubbed boiler exhaust gas mixes with moisture, sulfuric acid is generated. This causes a constant battle with corrosion.

"Much of the equipment that comes in direct contact with the coal is repaired or replaced during each outage," Brown said, "and not all of those repairs are easy to make. The crews must crawl into tight spaces in order to weld, repair, or replace much of the equipment. The conditions are not ideal, but the work must be done correctly in order for the equipment to operate properly and at its highest level of efficiency."

Even after the coal is pulverized and burned in the boiler, the by-products (fly ash and bottom ash) are abrasive to the equipment that it passes on the way to the precipitator or to the bottom of the boiler. Boiler repairs are frequently necessary because the ash, carried by extremely hot flue gases, comes into contact with the tubes inside the boiler. The components inside the duct work and precipitators are also affected.

Mechanic I Charles Gray grinds a part while making repairs to a classifier

(photo at left) A ruptured boiler tube gives an indication of the pressure and heat to which the tubes are subjected

But that is far from the beginning or end of plant maintenance. "From the coal pit to the control room and the turbine to the toilet, there are always maintenance repairs that need to be made," said Brown. "Recently during a scheduled outage, a tiny leak was found in a boiler tube, which emphasizes the need for regular detailed inspections. Had the small leak not been found, a major leak would ultimately have developed, causing a forced outage at some point in the future."

With nearly 57 miles of tubing in each boiler and 24 different types of tubes throughout the units, identifying and repairing boiler tube leaks are a major part of plant maintenance. The common causes of boiler tube leaks at the plant are corrosion, fly ash erosion, soot blower erosion, and thermal stress cracks.

"Every three years we perform non-destructive examination (NDE) testing on select areas of the boiler, headers, and high energy piping," said Brown, "but boiler tube leaks can occur at any time. During an outage, leaks can be found by identifying dark spots on the tubes where the steam has cleaned the fly ash from tube surfaces. We can also find leaks by performing air tests during an outage and listening for leaks while crawling through the boiler. When a tube leaks during operation, we can hear it; or sometimes we are able to see the result of the leak on the daily water usage. Leaks in the economizer area that are not detected in a timely manner can cause further maintenance activities downstream of the boiler."

Before repairs can be made on the tubes, the air temperature inside the boiler must be reduced to below 120 °F. This process can take 12 to 24 hours. When the repair is in the furnace side of the boiler and requires the use of the spider climber, the penthouse metal temperature must be below 250 °F to prevent damage to the safety ropes. This usually requires an additional 12- to 24-hour delay before repairs can begin. Repairs must be performed when the equipment is prepared for the work and with the conditions safe for the crews.

"During planned outages, we work hard to find small leaks and eroded areas that are potential leak points so that we can prevent a forced outage down the road," added Brown. "The forced outage rate due to boiler tube leaks at Plant Morrow is less than half of the national average for similarly sized coal units." *(Editor's note: From 2004-2008, Plant Morrow's forced outage rate was 1.33 per 8,760 operating hours, compared to 3.06 for all units 200-299MW.)*

Planned outages normally occur every spring and fall to perform preventive maintenance tasks that cannot be completed while the units are in service.

Major repair projects, which involve the plant's maintenance crews and outside contractors, are also completed during these times.

"Routine tasks for planned outages include oil and filter changing, greasing equipment and drive couplings, repacking valves, replacing damaged valves, and replacing worn components on critical equipment," said Mechanical Maintenance Foreman Jerry Nelson. "Over the years, however, our outage windows have become smaller and our work load larger due to power demand and the age of our plant. This is evident by the increased use of contract labor and the fact that our department has only three more mechanics than it did in 1978."

Last fall, the entire Plant Morrow team had a unique opportunity to inspect major components when both units were off line at the same time.

"The major reason for the total plant outage was to inspect the main circulating water system and refurbish the large butterfly valves," said Nelson. "This system is common to both units. The engineering department, operations group, and contractors were the most involved with this project. This project went well and we received a good report."

Mechanic I Landell Smith transports a primary air fan motor to be installed

"During the outage, mechanical maintenance crews removed access covers, installed ventilation fans, and replaced vent valves in preparation for the circulating water line inspection," said Tommy Mills, mechanical maintenance planner. "It was a unique experience being able to look inside the underground circulating water pipes when they were empty. It is hard to imagine the amount of water they carry to the plant every day. I can remember only two or three times when the plant was that quiet (with both units down) in my 31 years of service, with one of those being after Hurricane Katrina."

Also during the total plant outage, routine outage tasks were ongoing on both units. "We took this opportunity to repair several pieces of equipment in the dewatering building that could be accomplished with one unit operating, but it was much easier done with both units down," said Brown.

The crews remain busy throughout the year–even between planned outages. Crews are responsible for the day-to-day operation of each piece of machinery in order to maintain the performance of all the plant's systems and equipment. Work orders are submitted from every department at the facility, but a majority comes from operations, as they are the ones running the equipment. As work orders are submitted, Mills gathers the materials and develops a plan of action with the foremen, Nelson and Doug Hartfield. The foremen assign tasks to the crews and maintain the flow of work until the projects are completed. Often equipment can be repaired while the units are on line or by scheduling equipment that will be out of service for repairs by reducing a unit's load rather than taking a unit outage.

"A large amount of prep work is completed between outages," said Brown. "Materials are ordered, work scopes are developed, and contracts are issued for the major maintenance tasks. All work orders, routine and non-routine, are planned to determine manpower and material requirements. Whenever possible, items are pre-fabricated and materials are staged in the plant to reduce the workload during the outages. This helps to ensure that planned outages are completed on schedule and that spare parts and equipment are ready in the event of an unplanned outage."

As with other departments throughout the Association, preparing a workforce that can respond to future needs is an issue that must be addressed.

"In the last few years, the mechanical maintenance department has lost several veteran mechanics to promotions, retirement, and moving to other SMEPA facilities," said Nelson. "The training of our younger mechanics is a top priority and one of our greatest current challenges. We have talented employees who are accepting this responsibility."

"At Plant Morrow, the mechanical maintenance crews may be exposed to some of the most dangerous working conditions within the Association," said Hartfield. "We are required to work in very hot, dusty and noisy conditions and at heights that can exceed 200 feet. We work around piping and equipment with steam pressures of 2400 PSI and temperatures of 1000 °F. Safety is always the greatest challenge we are faced with, whether in a planned outage or just a routine day at work. During the outages the crews are faced with difficult deadlines that must be met. It takes talented and skilled people to meet the demands that the mechanical maintenance department is faced with on a daily basis."