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2009 PDCA PIPP – Industrial Submission




Narrative: First Energy – Penstock Painting
New Jersey Pumped Storage Facility

FirstEnergy Corp. is a diversified energy company headquartered in Akron, Ohio. First Energy's seven electric utility operating companies comprise the nation's fifth largest investor-owned electric system, based on 4.5 million customers served within a 36,100 square-mile area of Ohio, Pennsylvania and New Jersey.

The New Jersey Pumped Storage Facility creates power by transferring water from an upper reservoir to a lower reservoir via a ½ mile (approx. 2,000 foot) long Penstock. The 2 billion gallons of water rushing down through this 20 foot diameter pipe each day, generate up to 400 megawatts of power for use during high demand periods during the day. Each night the turbines reverse and the water is pumped back up to the upper reservoir for the following day (picture #16).

This plant has been in operation since 1964 when the penstock was built. The original lead coating was removed from the exterior in 1985 and an Inorganic Zinc/Chlorinated Rubber system was installed. The coating system has performed well over the last 23 years, but was beginning to show signs of corrosion and was due for maintenance. Several coatings were tested from various manufacturers, but the epoxy/acrylic polyurethane system from Keeler & Long proved superior. Next, the process of selecting a contractor was very closely examined. Since this is the only Penstock of its kind in New Jersey, and due to poor performance of the last coatings contractor, First Energy took time to put together a list of some of the most experienced & well respected contractors in the region. After a long review process, Alpine Painting & Sandblasting Contractors was selected.

Since the Penstock is such a critical item to the operation of this facility, the plant manager developed a Bonus/Penalty clause to be added to the contract. Ten percent of the contracted price was either added or removed based on performance in these four areas: Safety, Quality Control, Schedule and Environmental Impact.

Both First Energy and Alpine share the philosophy that safety is paramount on every project. All workers attended site specific training provided by First Energy as well as a review of Hazards associated with this project and weekly toolbox meetings conducted by Alpine's site foreman. This project had many areas of considerable safety concern. Brush Fires, Fall Protection and Ladder Safety were among the highest. Fire was a serious concern since tall grass surrounded the Penstock and the plant was surrounded by one of NJ's largest State Park Systems. Tall grass was cleared from both sides of the structure (picture #18) as well as from any staging areas for equipment to limit the possibility of a fast spreading fire. Alpine used a 20 foot long steel storage container to store all flammables on site and we deemed it mandatory that a 20 lb. fire extinguisher was no more than 10 feet from any gasoline or diesel engine on site.

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To combat the problem of protecting workers from falls atop the Penstock, Alpine designed a unique wire rope positioning system. This design required workers to be tied off, with nylon lanyards attached to a full body harness, to both sides of the Penstock by horizontal wire ropes. This system kept workers atop 25% of the circumference of the Penstock without allowing them to be exposed to a potential fall. The highest section of the Penstock added an additional element of concern due to its significant pitch. On this area, workers used wire rope grabs while ascending the pipe, but not allowing a fall in the downhill direction (picture #20).

Ladder safety was a serious concern as well, due to the uneven ground and significant pitch of the Penstock. Only type I and type IA ladders from Werner were used on this project to help ensure stability and the comfort of our workers. It was required by Alpine that all ladders be tied off to the horizontal cables in case a ladder slipped on uneven ground. Finally, all ladders were retrofitted by Alpine with Werner automatic leveling legs and spreader bars to improve the speed at which work was performed while ensuring a stable and safe work platform (picture #9).

Quality Control was a daily routine for our onsite foreman. He was charged with all aspects of quality from recording batch information, conditions & inspection of paint mixing, to walking the Penstock during the pre-inspection of spot tooled areas (SSPC-SP3), and more. Daily quality reports were turned into First Energy (picture #26), while weekly inspections were performed by our in-house NACE and SSPC coatings inspectors. Even the maintenance of water purification system was critical since pressure washing water was being pumped directly from the reservoir for use on the penstock. Keeler and Long technical representatives were consulted with several times during important aspects of the coating process. On this project the manufacturer, applicator and owner worked as a team to make sure no item was overlooked and the project progressed on or ahead of schedule without lacking any detail of quality.

The schedule in fact, was consistently reviewed by Alpine's project management staff (PDF #27). The workforce on site ranged from 4 men during mobilization and touchups to more than 18 during times of peak workload. To keep the project moving quickly Alpine used small crews to perform one specific task on the entire Penstock. For example, a dedicated three man crew installed and removed all safety cables. One seven man crew performed all spraying operations (picture #12), while another seven man crew pressure washed the entire structure (picture #8). These small groups were able to perfect their techniques over the length of this structure without having to slow down due to a learning curve for a different part of the project. The whole project was scheduled to be substantially complete, not including touchups and demobilization, in 7 weeks. Alpine was fully complete in only 6 weeks, including touchups and demobilization. (As shown in picture #2, three inches of snow arrived one week after completion!)

Environmental Impact was a very important part of the overall scope of this project due to its proximity to State Park Systems and the fact that First Energy's property is one of NJ's best bird watching areas. Emulsifiers and Degreasers, such as TSP, were not allowed due to reservoir contamination issues. Alpine paid close attention to pressure washing quality, and consulted the manufacturer, since cleaning products were not allowed (picture #3). Alpine required the use of ground containment and spill pads around and under all gasoline and diesel engines as well as any other items that contained a potential for a spill (picture #14). Wind direction and speed was also regularly watched to determine as to whether car covers were sufficient protection from overspray, or if the spraying would need to be cancelled for the day.

Safety, Quality Control, Scheduling, and Environmental controls were implemented so well that First Energy granted Alpine Painting & Sandblasting Contractors the full 10% Bonus for excellent performance. Alpine will be testing several overcoat products for the First Energy's 320 Ton Crane painting project scheduled for 2009.

Besides the 4 factors in the Bonus/Penalty plan, the repainting of the Penstock was very complex and technical project due to the limited resources required for work to be performed. First, no potable water was available on site. The only water available must be pumped from the reservoir over 1000 feet from the lowest portion of the Penstock. We utilized a trailer with a 750 gallon water tank to transfer water to an 1150 gallon stationary tank approximately 4 times per day to sustain pressure washing operations. A three stage filtering system was used to ultimately remove particles down to 50 microns in size.

Lack of available electricity also presented problems since only 60 amps of power was available at one location about 2/3 up the length of the penstock. Extension cords cannot extend over a couple hundred feet so, Alpine supplemented this power with portable and tow behind generators with outdoor sub-panels mounted on them to provide mobile power able to supply the electric pumps and surface preparation tools.

Access to most areas was particularly difficult due to the limited space available to place equipment. Three main areas were available for equipment staging but, in some areas only 3 feet on each side of the penstock were available to walk. Steep slopes and vegetation limited vehicular access to less than half of the Penstock; so long walks were an everyday occurrence.

Finally, since the area around the Penstock is very infrequently traveled, snakes, ticks, bears and other animals presented a new array of hazards not considered on many other projects. This terrain is commonly Rattlesnake, Copperhead and Black snake country as well as having a high incidence of Lime disease from ticks. We were fortunate enough not to have any snake or tick bite incidents on the project, but a diseased Raccoon was removed from the jobsite.

Overall, the project was a success for all the parties involved. Alpine was able to meet our estimated budget and make a profit and First Energy was returned a Penstock with a new high quality coating system that should last them years of continued operation.

Project Facts: 117,000 SF of surface area
30 gallons of Spot Primer
550 gallons of Full Primer
500 gallons of Full Finish Coat
165 gallons of Thinner

Surface Preparation and Coating System: Full Pressure Wash to remove chalk and contaminants
Spot SSPC-SP2/3 (Hand/Power Tool Clean)
Spot Keeler & Long, KL1800 at 5 to 7 mils DFT
Full Keeler & Long, KLC1055/1069 at 5 to 7 mils DFT
Full Keeler & Long, KLNC160/1B at 2.5 to 5 mils DFT
Sika 1A – Elastomeric Sealant

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Thank you for your time in considering our application. If you have any additional questions, please feel free to contact me at any time.

Very truly yours,

Samuel Scaturro
Operations Manager/Civil Engineer, Alpine Painting & Sandblasting Contractors
SSPC – Protective Coatings Specialist (PCS), Concrete Coatings Inspector (CCI)
NACE – Certified Coatings Inspector