TRIP REPORT – HARVEY O. BANKS PUMP PLANT

Mike Meier
ENG-45, Properties of Materials
Department of Chemical Engineering and Materials Science
University of California, Davis
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Date: October 8, 1999, 6 - 9 pm

Location: Harvey O. Banks Pump Plant, 5280 Bruns Avenue, Byron, CA 94514

Contact: Chuck Morones, P.E., Associate Hydroelectric Power Utility Engineer
Phone: (209) xxx-yyyy

Purpose: Learn more about the practical engineering and materials issues involved in operating and maintaining a large water pumping facility that uses very large motors and pumps that are no longer manufactured.

About the Site

The Harvey O. Banks water pumping plant was built in 1964 as part of California's statewide water project. It has operated continuously for over 36 years. It is the primary facility responsible for moving water from the Sacramento River Delta along the Diablo Range and into the San Luis forebay. Maximum pumping capacity is 10,670 cubic feet per second, made possible by the nine 34,500 and two 11,250 horsepower electric motor driven Francis pumps. This facility is staffed by 18 engineers, operators, mechanics, electricians and technicians. The facility is operated by the California Department of Water.

About the Tour

The first thing we were shown was the worn parts of a pump that was being repaired. The parts were outside, about 50 yards from the main building. The parts were large, xx feet diameter, yy pounds, impellers. Close examination showed evidence of cavitation and erosion corrosion on the impellers that was severe enough to wear away the stay vanes. This pump had been taken out of service for scheduled inspection. Repairs were underway as required to restore effectiveness of the pump and impeller.

Inside the building, we were shown both the upper and two lower levels of this facility. On the upper level the large 40,000 horsepower motors were visible. One motor was partially disassembled allowing us to examining the 18 foot diameter rotor more closely. These motors operate at 400, 225 and 200 rpm and require 60 and 4.16 kV.

Our tour of the lower level gave us a chance to examine the pump sections and controls. Most of the pumps were closed but one did have a access port open and allowed us to look inside. This port, which measured approximately 30" x 30", was large enough to easily crawl through and into the pump itself. The cover to this port is normally secured by 60 1-inch bolts. Water pressures in the pump can reach 150 psi. The result would be a load of approximately 135,000 pounds on these bolts, or 2,250 pounds per bolt.

Our tour was at night so it was not possible to see where the water came into the facility and where it left. We also did not see where the electrical power was brought in.

Overall, the facility was quite clean, with everything painted, rust-free and dry. They pump millions of gallons of water per day here and don't seem to be spilling any of it on the floor.

Observations

This building was quite large, measuring 100 feet by 35 feet. Considering the size an importance of this facility, I was really impressed that years ago there was an engineer who was responsible for putting the whole design on paper and yet another engineer who helped put in a bid and then build the whole thing. That level of responsibility for a project is difficult to imagine.

As large as the facility was it appeared to be a fairly straightforward design. The main building housed all 11 pumps, all in one line running the length of the building. Controls were grouped together and tended to be away from the pumps, and offices and support facilities were located in different buildings.

Any repair of any pump would be difficult and expensive, especially since these motors and pumps are no longer manufactured and the company that made them is long gone. The importance of preventative maintenance, regular inspections and monitoring is clear.

Repair of these motors, pumps and smaller components necessitated in-house machine shops. The people and equipment in these shops make in-house repairs of practically any component possible.

The pump that was being rebuilt would take 1 month to complete. Once back in operation it is expected to run for another 5 years.

One of the surprise lessons from this visit was how the operation of this facility was effected by the Department of Fish and Wildlife. Operations were expected to have a minimal impact on the fish and crabs, and crabs taken from the pumps were subject to Fish and Wildlife limits, just like they would have been for fishermen.

Relevance

Several issues related to the operation and maintenance of this water plant are interesting and perhaps relevant to my job. The first is the size of the facility coupled with its importance to people who need the water. Decisions made at this plant will effect a lot of people. This is very different from this educational environment where errors are simply marked on exams and reports and then we move on. Within a few years our students will be in a position to be making critical, expensive decisions that have real consequences.

The work environment was quite different that what we normally see in California. It was located in a remote, almost outpost-like location, at the base of the Diablo Range. All facilities (lunch, gas, shops, etc.) are miles away and the nearest neighbor is about a half mile away. This might limit its appeal to the newer crop of engineering students, but on the other hand might be ideal for someone who grew up in a rural setting.

The existence of the plant itself speaks of the state government's recognition of the need for this facility and its willingness to build and operate this plant, presumably, forever. That is an interesting prospect in light of how engineering education is changing to emphasize the new technologies. While established technologies and infrastructure seem to be out of the lime light they are as important to us today as they have always been.