SHOWCASE PROJECT: DES MOINES WATER WORKS: PUMP POLYMER COATING APPLICATION IMPROVES EFFICIENCY

SOLUTION OVERVIEW
Des Moines Water Works (DMWW) is a municipal potable water utility authorized under provisions of Chapter 388 of the Code of Iowa. It is managed and controlled by the Board of Water Works Trustees of the City of Des Moines, Iowa. With three treatment plants, the annual production is 17 billion gallons. Pumping accounts for about 83% of their total electric consumption, so continuous effort is given to ensure pumps operate as efficiently as possible. Continuous wire-to-water efficiency percentages are calculated in the supervisory control and data acquisition (SCADA) system and displayed to operations staff on dedicated energy monitor screens. Reliability staff are notified if efficiency drops below the pump curve efficiency and corrective action is taken by the maintenance staff. DMWW decided to upgrade two pumps by applying a polymer coating to individual parts. The polymer coating helps reduce friction between the water and the pump and protects the pump from pitting and other corrosion damage that distorts the impeller blades and degrades pump efficiency and performance.

SECTOR TYPE
Industrial

LOCATION
Des Moines, Iowa

PROJECT SIZE
325,000 square feet

FINANCIAL OVERVIEW
$63,000

SOLUTIONS
DMWW first used polymer coatings to repair a 1923 era, two-stage diesel-powered pump that could generate up to 2,000-horse power (HP) and 30 million gallons per day (MGD). This diesel pump was used as a back-up pump and it had had severe tuberculation damage to both volutes that reduced its hydraulic capacity. Upon completion, the pump capacity increased by 3.4% over the original factory specifications. The improvement was attributed to the glass-smooth finish as opposed to the rough finish of a normal cast-iron volute. Since the diesel pump’s use was reserved for
emergencies, the decision was then made to coat a 1,000-HP electric pump that was used daily to see if the polymer coating would improve the wire-to-water efficiency for that unit. The seconds pump is one of two identical pumps side-by-side, pumping water into the same header, so comparative analysis of energy consumption and capacity would be easy to do. Additionally, the pump had been scheduled for rebuild, and disassembly had already begun. The polymer manufacturer recommended coating the impeller along with the volute and indicated that doing so would yield even better results than with the diesel pump. After a side-by-side comparison, the net improvement in wire-to-water efficiency was 7.2%, combined with a 3.2% increase in pump capacity compared to factory pump performance curves.

OTHER BENEFITS
In addition to improving efficiency, the polymer coatings reduced vibration, which results in longer pump life. It also prevents pump corrosion and tuberculation, which further improves pump life and reduces maintenance costs. Following this project, DMWW adopted a procedure to specify this type of coating on all new pumps and pump rebuilds. Due to the obvious energy savings and reduced maintenance costs, getting this policy in place was easy.
### Annual Energy Use

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<td>kWh/billion gallons</td>
<td>1,252,000</td>
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**Energy Savings**

22%

### Annual Energy Cost

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<td>$</td>
<td>1,075,000</td>
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**Cost Savings**

22%

1,000 horsepower electric pump
Top half of pump volute showing polymer coating


For more information, visit https://betterbuildingssolutioncenter.energy.gov
Polymer coated impeller