Boise Paper:

Process Pumping System Optimization Saves Energy and Improves Production

Benefits

- Saves more than $17,500 annually
- Saves 498,000 kWh per year
- Increases production reliability
- Reduces maintenance costs
- Achieves a 4.2-year simple payback

Applications

Paper mills are good candidates for process pumping system efficiency projects. In addition to saving energy, optimizing these systems can prevent production bottlenecks and ensure production reliability.

Project Summary

To improve the efficiency of the bleach plant's process pumping system, engineers at the Boise Paper mill in Wallula, Washington, implemented a system improvement project in 2005. The plant's process pumping system was evaluated during a course taught by Don Casada, a U.S. Department of Energy (DOE) Qualified Pumping System Assessment Tool (PSAT) Specialist. This assessment was supported by the Northwest Energy Efficiency Alliance (NEEA), and results were later corroborated by Tim Dugan of Compression Engineering Corporation in an evaluation funded by the mill's electric utility, Pacific Power. This project greatly improved the plant's process pumping system efficiency. Based on measurements of the system's use, the project yields approximate annual electricity savings of 498,000 kWh, electricity cost savings of $15,157, and maintenance cost savings of $2,500. An incentive from Pacific Power brought total project costs to $74,000, resulting in a 4.2-year simple payback.

Plant/Project Background

Boise Paper manufactures specialty and premium paper products. In operation since 1958, the Wallula mill is an integrated pulp and paper manufacturing site with 400 employees; it produces 375 tons per day (tpd) of paper pulp, 370 tpd of corrugated cardboard, and 660 tpd of fine paper. The bleach plant is important to production at the mill because it converts brown wood fiber stock to white pulp.

In conjunction with the analysis process, a DOE-developed end-user training session on pumping system assessments was held at the Wallula mill; it was co-sponsored by NEEA, Washington State University (WSU), Boise Paper, Washington State Energy Office, Pacific Power, Northwest Electric League, Idaho Industries of the Future, and DOE. This training provided 22 employees with background knowledge on optimization opportunities for pumping systems and on the PSAT software, as well as an opportunity for hands-on application of the software tool to analyze a pumping system.

The bleach plant depended on a 150-horsepower (hp) pump to meet a variety of process requirements. However, when the plant was at peak production, there were periods when certain process requirements—such as providing make-up water for filtrate chests—could not be met, resulting in production bottlenecks. The evaluation found that the pumping system's capacity was inadequate for peak demand and that the system was experiencing suction recirculation, which led

to cavitation in the piping. The assessment recommended splitting the system by dedicating a 50-hp pump to low-head applications, using the existing pump for the high-head ones, and retrofitting both pump motors with variable-speed drives (VSD).

Results

This project greatly increased the efficiency and reliability of the bleach plant's process pumping system. The suction recirculation and the related cavitation problem have been eliminated, and the pumps can now operate more optimally. These changes are yielding approximate annual energy and energy cost savings of 498,000 kWh and $15,157, respectively. In addition, the pump bearings and check valves do not have to be replaced as frequently, resulting in about $2,500 in annual maintenance cost savings. The system's more efficient operation has also improved production reliability by eliminating the occasional bottlenecks that caused the mill to lose up to 100 tpd. Total project costs were $133,000, but a $59,000 incentive from Pacific Power lowered them to $74,000, yielding a simple payback of 4.2 years. These figures do not reflect the significant reduction in production losses.

Lesson Learned

Configuring pumping systems efficiently can lead to both energy savings and more reliable production. At Boise's Wallula mill, the bleach plant process pumping system was undersized and could not meet the process requirements of four separate applications at peak demand. The system thus wasted energy, created excess stress on process piping, and caused occasional production bottlenecks. Adding a smaller pump and dividing the system so that high- and low-head processes are served by different pumps maximized the system's efficiency while ensuring production reliability. This project was initiated after a DOE training course and subsequent screening analysis that made use of PSAT.

David Tobin

Project Partners*

Boise Paper
Wallula, WA

Northwest Energy Efficiency Alliance
Portland, OR

Diagnostic Solutions LLC
Knoxville, TN

Partner Profile

David Tobin, an energy engineer at the Boise Wallula mill, has worked on various energy efficiency initiatives for approximately 6 years. He frequently uses PSAT to evaluate scenarios such as installing VSDs on pump motors and redesigning inefficient pumping systems. Since participating in DOE's training, David has promoted the mill's use of DOE techniques and tools to evaluate energy efficiency opportunities, particularly SSAT and 3E Plus, as part of an energy savings assessment under the Save Energy Now program.

Industrial Use of DOE System Assessment Software

Industry professionals involved in system or plant operations, engineering, and management often use DOE software to evaluate their plants' motor and industrial systems. DOE offers one-day training workshops in compressed air, electric motor, fan, process heating, pump, and steam systems that teach the DOE assessment software tools (AIRMaster+, FSAT, MotorMaster+, PSAT, PHAST, SSAT, SSST, and 3E Plus). These workshops assist attendees in identifying cost-cutting and efficiency opportunities in their plants.

*Additional project partners include Compression Engineering Corporation, Beaverton, OR; Idaho Department of Water Resources Energy Division, Boise, ID; Northwest Electric League, Bellevue, WA; Pacific Power, Portland, OR; and the Washington State University Energy Program, Olympia, WA.

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