ESA-060-2 Thilmany De Pere Mill - De Pere, WI
Public Report

Introduction:

The Thilmany De Pere Paper Mill manufactures a wide variety of light-weight specialty paper grades from purchased recycled and virgin fiber. The two paper machines at the facility produce 77,000 tons of paper per year. The plant uses natural gas for process heating and space heating.

Objective of ESA:

The goal of the ESA was to apply the PSAT program, associated screening, measurement, and analysis methodologies to several pumping systems in order to:

a) Train plant personnel on the use of the DOE tools and methods
b) Identify savings potential in the selected systems and perform a preliminary evaluation of the cost-effectiveness of implementing projects to reduce energy consumption.

Focus of Assessment:

Approximately 15 pumping systems were pre-selected by facility staff for assessment. From this list, the following pump systems appeared to be the best candidates for improvement.

a) The 200 hp #4 Fan Pump
b) The 75 hp #4 Large Chest Stock to Refiner Pump
c) The 100 hp Boiler Feedwater Pumps
d) The 75 hp #3 Tile Chest Stock to Refiner Pump

Approach for ESA:

General

The Thilmany Utilities Superintendent, Mark Szczepanik coordinated the Pump ESA effort and has scheduled a Steam ESA in two weeks at the Thilmany Kaukauna Facility. The plant lead, Jay Weigelt has many years of experience in all aspects of plant operation. The other ESA participants included Rodney Lasecki and Bruce Schoblaska from the De Pere plant and Wes Neal and Doug Duehring from the Thilmany Kaukauna Facility.

Specific Approach

#4 Fan Pump System

For the fan pump system, a schematic of the system was developed to determine static head based on tank suction and discharge elevations. Pump discharge pressures were determined using existing pressure transducers at multiple locations on the system piping. Amperage measurements were read at the pump MCC. The portable power quality analyzer was not used since the motor was medium voltage (4160V). Flow was determined using an existing magnetic type flow meter. The data was entered into the PSAT software tool to determine existing pump efficiency. The valve tool was used to determine the pressure loss across a control valve on the pump discharge.

#4 Large Chest Stock to Refiner Pump

For the #4 large chest stock to refiner pump, a schematic of the system was developed to determine static head based on suction and discharge elevations. Pump discharge pressures were determined using existing pressure transducers at multiple locations on the system piping. Power measurements were taken at the pump MCC using a Fluke 43 B power quality analyzer. We attempted to use a clamp-on Panametrics transit-time flow meter, however, we were not able to get a flow reading, so flow was estimated using the existing pump curves. The data was entered into the PSAT software tool to determine existing pump efficiency.

Boiler Feedwater Pumps

For the boiler feedwater pumps, a schematic of the system was developed to determine static head. Power measurements were taken at the pump MCC using a Fluke 43 B power quality analyzer. We were not able to use a clamp-on Panametrics transit-time flow meter since the pipes were insulated and the piping was too hot for the transducers. No pressure taps were available to determine existing system pressure.

#3 Tile Chest Stock to Refiner Pump

For the #3 tile chest stock to refiner pump, a schematic of the system was developed to determine static head based on suction and discharge elevations. Pump discharge pressures were determined using existing pressure transducers at key locations on the system piping. Power measurements were taken at the pump MCC using a Fluke 43 B power quality analyzer. We attempted to use a clamp-on Panametrics transit-time flow meter. However, we were not able to get a flow reading, so flow was estimated using the existing pump curves.

General Observations of Potential Opportunities:

Annual energy costs are in excess of $7 million.

General comments and observations

The plant staff was very knowledgeable and helpful during the ESA.

Specific opportunities observed

#4 Fan Pump System

Initially, the team did not think the fan pump was a good opportunity since the pump motor was 4160v. However, after collecting pressure measurements, and discussing system operation with plant engineers, the team discovered a substantial loss across an existing control valve when the pump flow was not directed through the cleaners (about 80% of the time). After the flow was determined using an existing flow meter, the PSAT valve tool was used to evaluate potential savings. Based on the field data collected, the valve tool identified approximately $35,000 in annual savings. The team then used the data to evaluate pump efficiency. Based on the PSAT, the existing pump was found to have an acceptable optimization rating of “84”. Team participants concluded that even though a variable speed drive would be expensive for this application, a similar project at the Thilmany Kaukauna Facility was determined to be cost effective and that the project should be pursued.

#4 Large Chest Stock to Refiner Pump

To identify cost saving opportunities for the #4 large chest stock to refiner pump, the team assembled data for three flow profiles, collected field data and developed a pump system curve. With this information, the team first used the PSAT tool to evaluate pump system efficiency. Based on the data the PSAT optimization rating was a respectable “83”. Next the team reviewed pump system flows and determined that the existing pump operation needed to be increased to meet new process requirements. The team decided to first evaluate the impact of increasing impeller and motor size to increase pump capacity and then determine what the energy use would be using a control valve for lower flows. Then a variable speed drive was applied and potential energy savings were evaluated using the developed system curves and efficiency values from the existing pump curve. Based on the analysis, we recommended the installation of a variable speed drive for this pump system after pump impeller and motor modifications were made.

Boiler Feedwater Pumps

The boiler feedwater pumps were chosen by facility staff based on the belief that two pumps provided too much capacity. The team decided to first see if one pump would provide adequate pressure. Unfortunately, when the second pump was shut off, the pressure dropped too low and the pump had to be re-activated. Next, the team evaluated the potential of having one pump operating at full speed and the 2nd pump adjusted with a variable speed drive. To determine the savings of this improvement, a system curve was constructed and two head curves were plotted. Based on the analysis, it appeared that savings were minimal (average savings of 7 kW) due to the shape of the system curve. This project was determined to not be cost effective.

#3 Tile Chest Stock to Refiner Pump

For the #3 tile chest stock to refiner pump, it was determined that almost 50% of the flow (500 gpm) was being re-circulated when the full capacity of the pump was not needed (about 4000 hours annually). Based on this, the team looked at the application of a variable speed drive to prevent flow recirculation. Calculated savings was over 130,000 kWh per year.

Calculations and assumptions for the individual systems are provided in accompanying presentation.

Management Support and Comments:

The plant support and coordination for this assessment was excellent. The plant lead was available exclusively during the three day site visit and the other participants actively participated in data collection and analysis. One of the most encouraging aspects to the assessment was the support of plant management, maintenance staff and plant engineers.

DOE Contact at Plant/Company:

Plant Contact: Jay Weigelt, Process Manager Power / Thilmany De Pere Mill
Company Contact: Mark Szczepanik, Utilities Superintendent /Thilmany Kaukauna Mill