Small Lumber Mill Gets Big Energy Savings

Lumber mills and sawmills have many electric motors, many of which are belt operated. Increasingly, these mills take advantage of scrap wood and sawdust from their operations to fuel a biomass boiler. Belt-driven motors and combustion processes are good opportunities for energy savings.

The Alabama Industrial Assessment Center, located at The University of Alabama, performed an energy efficiency study at Sullivan Lumber Company in 2013. Dr. Keith Woodbury and a group of four students visited the plant and identified five key recommendations for cost savings.

Operation of a sawmill at Sullivan Lumber Co. *Photo from Sullivan Lumber Co.*

Company Background

W.G. Sullivan Lumber Co. began in 1955 as a small sawmill operation owned by Glendon Sullivan and his uncle, George "Cap" Skelton. Sullivan became the sole owner in 1956, when his uncle retired, and through his efforts it grew into a company that ships lumber throughout the United States, Europe, and the Caribbean Islands, yet still remains a family-run and staffed operation.

Summary

Through the Department of Energy's Industrial Assessment Center located at the University of Alabama at Tuscaloosa, Sullivan Lumber, a manufacturer of commercial and residential lumber, was able to realize significant monetary savings from reductions in energy consumption. Sullivan Lumber implemented five of the nine assessment recommendations, which resulted in savings from reductions in electricity and wood fuel usage. Through the implementation of these five recommendations, Sullivan Lumber was able to save approximately $23,732, which is about 10% of their direct energy costs. The overall average payback realized was 1.6 years.

Plant Operation

The facility consists of two main process lines, the saw mill and the planar mill. At the saw mill, the pine logs are retrieved from the staging/storage field. Once stripped of its bark, the log is cut into uneven strips by the band mill. The strips are then conveyed to either the re-saw or the gang mill, where the wood is cut into even dimensions. Both computer software and manual selection are used to determine the attainable sizes of lumber for each log. A batch of lumber from the saw mill is first placed into one of the two drying kilns. After drying, the lumber is sent through the planar mill, which provides final dimension to the lumber. The finished lumber is then packaged, and staged for shipping. The facility consists of one 100,000 square foot building, and annual utility bills for the facility totaled approximately $248,623.

Less Airflow to Less Fuel

Combustion requires minimal oxygen and low stack gas temperatures. Wood-fired boilers are challenged to achieve these goals because they are also subject to environmental oversight to minimize emission of unburned fuel and ash. In a simple wood-fired combustion system, with minimal automatic controls, diligence is required to find the lowest forced-draft fan setting to supply only the necessary air for combustion. Lower combustion airflow translates directly into fuel savings.

Energy Conservation Awareness

Prior to the visit, Sullivan Lumber was employing several good energy conservation practices. Lights are turned off in the facility when they are not in use. Some daylighting panels are present in the planar mill. Wood waste is used to fuel the boiler onsite.

Long-lasting, low-friction synthetic lubricants are used for lubrication and cooling in the air compressors. The air compressors are turned off during nights and weekends. Both kilns in the planar mill are well-insulated.

Energy Conservation Assessment

Reducing the combustion air flow will reduce the amount of excess oxygen leaving the exhaust stack, and will increase both the combustion efficiency and the overall efficiency of the boiler. Also, several motors throughout the facility currently use standard V-belts. Cogged V-belts reduce energy use because the segmented interior of the belt require less power to turn through the motor's pulley. Therefore, the energy savings are realized through an increase in motor drive efficiency. Finally, replacing metal halide and high pressure sodium (HPS) fixtures with compact fluorescent lamps (CFL) can deliver the necessary levels of light while consuming much less energy.

Compressed Air Assessment

The facility's equipment does not require an operating pressure as high as is currently used in the plant. A reduction in the system pressure will minimize operating costs for the air compressors by reducing the input power to the compressors. The facility was maintaining their compressed air system at 105 psi in the saw mill, and 117 psi in the planar mill. It was found that both could be reduced to 90 psi. This would still provide the facility with the amount of pressure needed.

The IAC identified several compressed air leaks caused by leaky valves and fittings in the distribution system. A program to repair the leaks and regularly check the air distribution components to detect leaks could be implemented to avoid the energy loss of compressed air leaks for $7,400/yr.

Tabulated Savings Quantified

The following table shows the annual cost savings that Sullivan Lumber obtained by implementing these energy conservation opportunities identified by the IAC team during the assessment. Based on these results, the facility can reduce energy consumption by 6,324 MMBtu/yr thereby saving the facility $23,8732 per year. The total estimated implementation cost of these recommendations is $37,078 yielding an overall simple payback of approximately 1.6 years.

Implemented Recommendations

Assessment Recommendations	Annual Resource Savings	Total Annual Savings	Capital Costs	Simple Payback
Reduce Combustion Air	5,439 MMBtu	$3,045	$23,550	7.7 years
Replace Standard V-Belts with Cogged Belts	140 MMBtu	$3,270	$1,654	0.5 years
Replace MH and HPS Fixtures with CFL	96 MMBtu	$2,244	$4,074	1.8 years
Reduce Compressed Air System Pressure	76 MMBtu	$1,783	$400	0.2 years
Reduce Leaks in Compressed Air System	574 MMBtu	$13,389	$7,400	0.6 years
Total	6,324 MMBtu	$23,732	$37,078	1.6 years