



Lakeland School District in Minocqua, WI is geographically one of the largest school districts in the State of Wisconsin. The Lakeland High School is over 283,000 sq. ft. and serves 840 students with a staff of 125. The High School has 2 separate boiler rooms.

Both boiler systems were older, but were well within their usable "life cycle". One of the boiler rooms contains (1) Kewaunee 400 HP wood burning boiler that had been converted to natural gas 19 years ago. The other plant has (2) 250 HP Iron Fireman scotch marine boilers. Both plants had reasonably modern, modulating burners that provided approximately 4:1 turndown.

Boilers systems are designed by code to meet "Design Conditions" or the worst case scenario heating load. For Lakeland High School this is -20° Fahrenheit. However, when you look at the BIN data (degree days), Lakeland experiences these conditions less than 1% of the heating season. The majority of the heating the loads are 20% to 30% of design condition. Coupled with the internal heat load gains from lighting, equipment, and people, Lakeland High School had a significant opportunity to save energy and precious dollars by finding a solution to boiler cycling.

Lakeland High School explored options to increase the efficiency of its heating plants. Options included:

- Installing smaller tracking boilers to reduce cycling during lower load conditions.
- Upgrade the existing burners with "linkageless retrofit kits" to increase efficiency and turndown.
- Replace the existing burners with Riello high efficiency burners.

Installing tracking boilers is an excellent option, however, the costs compared to "upgrading" an

existing boiler is often very expensive. Upgrading the burners with Linkageless controls was a viable option; however, the efficiency and turndown did not match that of replacing the burners with new high efficiency Riello burners. Although slightly more than linkageless upgrades, the Riello option was less than 1/3 the cost of installing tracking boilers. The Riello burners are designed to operate efficiently at 15% excess air throughout the complete 10:1 firing range providing peak efficiency. The burner heads are heavy gauge stainless steel and the flame pattern is designed to direct the heat away from the head which is crucial for low load conditions.

Lakeland High Schools installed Riello high efficiency burners and the savings have been remarkable. In the first six months of operation (the burners were installed in November of 2009) the District saved 26,751 therms over their seven year average usage equating to \$28,089 in savings. The return on investment will be under 3 years.

The District has benefited from efficiency gains and reduced maintenance costs. It takes considerable less time to maintain a linkageless burner due to the elimination of "slop" in the linkage and the required adjustment to ensure efficient fuel-air mixture.



	NOV	DEC	JAN	FEB	MAR	APR
Therms Used (7 yr. avg.)	26,735	35,028	38,147	33,020	28,606	17,862
Therms used after install	20,830	32,835	33,970	28,522	20,871	15,620
Therms Saved	5,905	2,193	4,178	4,498	7,735	2,242
Savings in Dollars (\$1.05/therm)	\$6,200	\$2,303	\$4,387	\$4,723	\$8,122	\$2,354
Total Savings						\$28,089
Project Cost						\$72,000
ROI						2.5 years

"The Kewaunee boiler used to sound like a jet engine. You could hear it running throughout the hallways. Now you walk past the boiler room, and you don't know the boiler is running. It sounds like a quiet breeze coming off the lake. Our annual savings are \$21,000 over the original estimate. The burner upgrade has been a huge success for the District. We couldn't be happier with the savings and performance."  
~Dave Arnold, Facilities Manager, Lakeland School District