

Michigan Wood-based Thermal Energy

North Dickinson County School

Bill Cook, Michigan State University Extension, 2016.



North Dickinson County School
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North Dickinson County School serves a rural area that is not tied into the natural gas grid. Their district energy system connects three buildings; the school and two garages. Total area is about 108,000 square feet. A single 4 million btu per hour boiler and hot water system supplies heat for forced air to the school building and radiator heat to the two garages. The boiler is fueled by high quality hardwood chips delivered from local sawmills. There is a pair of 2 million btu propane backup boilers. The boiler plant is located next to the school.



The system was installed in 1991 by Messersmith Manufacturing at a cost of \$310,000, to replace LP fuels. The boiler consumes 600-800 tons of wood chips per year. Annual operating costs run about \$32,500 which includes wood chips, power, maintenance, and labor. One hour of maintenance is needed per day and electric costs to run the system are approximately \$500/month. Underground piping runs about 350 feet, and consists of a 4-inch pipe to the school and a 2.5-inch pipe to the garages. The system utilizes a 2500 gallon thermal storage tank. The in-ground wood chip storage bin holds about 32 tons and has a single moving auger to feed a short conveyor to the boiler. Both boiler ash and fly ash are disposed on-site at the school. During peak cold weather, one van-load of chips is needed every 7-10 days, and a 55-gallon drum of boiler ash is generated per week.



Heating plant & chip storage building.

Burning an equivalent amount of propane would cost more than twice as much.¹ An equivalent amount of natural gas would cost about 20 percent more than wood chips.¹ When using wood chips, the school



Concrete pit for chip storage and single walking auger.

maintains the thermostat two degrees higher than they would using propane. For a rural school district, these cost savings are significant.

The North Dickinson County School has a history of active forest management that dates back to 1932. The

school district owns a 1000-acre school forest and the school forestry board works with professional foresters to manage the forest. The school obtained several grants in 2014 to hire a consulting forester to develop a Forest Stewardship Plan, which updated the school's 1967 and 1932 forest management plans. The school uses the school forest for a variety of curriculum activities, including environmental science, English, tree planting, cone collection, an on-site tree nursery, and many other outdoor education activities. One project involved student photography, with enlarged posters placed in a conference room. The school has close ties with the rural community residents and businesses.



Thermal storage tank and circulation pumps.

"Time has proven that those who made the decision to install the wood heating system was the right one. Although at the time it was a major struggle to get the taxpayers to buy into the project. Given the current state of finances in K-12 education, I am not sure what our education offerings would look like at the school if it were not for the cost-savings this system has produced. The financial impact on the local community created by consuming local products for fuel is another win-win."

*Darrell Oman
Director of Support Services*



Walking auger and conveyor.



Cyclone separator, to remove particulate matter from the emissions stream.



Combustion chamber and boiler.

1 – Energy calculations use 5,740,00 btu/ton of wood chips at \$43 per ton, 71,000 btu/gallon for propane at \$1.25 per gallon, and 1,021,00 btu/1000 cubic feet of natural gas at \$9.33 per 1000 cubic feet.

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