

# Michigan Wood-based Thermal Energy

## Mid-Peninsula School

Bill Cook, Michigan State University Extension, 2016.



Mid-Peninsula School  
5055 St. Nicholas 31<sup>st</sup> Road  
Rock, MI 49880  
<http://www.mpswolverines.com>  
Contact: Mary Brayak at [MaryBrayak@dsisd.k12.mi.us](mailto:MaryBrayak@dsisd.k12.mi.us) or 906-359-4387



Mid-Peninsula School is a small, rural school in the Upper Peninsula of Michigan with an enrollment of about 230 students, K-12. The single building footprint is about 54,000 square feet, plus the heating plant. The school is off the natural gas grid and uses fuel oil for a backup heating system. The school sits on an 80-acre tract of land.

A 2.7 million btu Messersmith wood chip system was part of the original school construction in 1984 using radiant heat. In 2009, the burning chamber was replaced and a new building erected, at a cost of about \$300,000. All piping is above-grade which includes 1500 feet of 3-inch pipe and 500 feet of 1-inch pipe. Fluid capacity is about 1000 gallons, a single circulatory system, and runs at a pressure of 15 psi, with no thermal storage tank. Domestic hot water is also produced.

Eight to ten loads per year of pulp grade wood chips are produced and delivered by a local contractor. The system uses 1000 to 1300 cubic yards of chips per year, or about 250 to 325 green tons. Feedstock costs run \$16,000 to \$18,000 per year, at around \$14 per cubic yard (\$56/green ton) in 2015. During subzero temperature periods, a load is consumed every three weeks. The combustion chamber produces about 30 gallons of ash per week or during cold periods that amount in two days. Annually, 15-20 gallons of fly ash accumulates from the cyclone separator. All ash is disposed in a local landfill. Maintenance takes about two hours per week.

Chip storage is indoors, near the boiler. The storage bin is 60 feet long with a single



*Messersmith boiler unit and control unit.*



*Storage bin/area,  
traveling auger,  
and conveyor.*

auger moving above the floor to move chips to a conveyor system feeding the combustion chamber. The entire system is monitored and controlled electronically. Warnings are delivered remotely to a cell phone.

The school has never used fossil fuels, except for the backup boiler. Empirical cost comparison data for fossil fuels are not available. However, using energy conversion factors, costs using fuel oil would run \$30,000 to \$35,000 for an equivalent amount of btus, about twice the price of wood chips. Propane would be less expensive than fuel oil, but still roughly 70 percent more expensive than wood chips. Natural gas would be about the same cost, or slightly less.<sup>2</sup>

*1 – Assumes 500 pounds per cubic yard.*

*2 – Factors include wood chips (5,740,000 btu/ton & \$56/ton), fuel oil (124,000 btu/gallon & \$2.50/gallon), propane (71,000 btu/gallon & \$1.18/gallon), and natural gas (1,021,000 btu/1000 cubic feet & \$9.93/1000 cubic feet).*

*Heating plant building  
with drive-in bay for wood  
chip delivery.*

