

Michigan Wood-based Thermal Energy Veteran's Administration Medical Center

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VAMC Power Plant.

Through Presidential Executive Order, the Department of Veterans Affairs is among federal agencies charged with adopting renewable energy technologies to reduce greenhouse gas emissions. The Battle Creek VA Medical Center (VAMC) received funding to install a 2 mW power station that uses wood chips as fuel. Calculations indicate the Combined Heating and Power (CHP) Plant will contribute significantly in meeting these renewable energy goals. The Battle Creek VAMC is approximately one million square feet, located on a 206-acre campus. The primary goal of the installation is to generate 85 percent of the facilities' electric demand from wood. The excess steam generated in the process is utilized to heat the campus reducing natural gas consumption by about 60 percent. As necessary, natural gas boilers generate the remaining steam load to campus.

The system was designed by utilizing a [Nexterra](#) gasification process and a [Babcock & Wilcox](#) boiler that delivers 24,000 pounds per hour, 600 psi steam to the turbines. The major design components are wood chip bins, a conveyor, gasifier, oxidizer, electrostatic precipitator (emissions), and a steam turbine. The power plant footprint is approximately 11,000 square feet and was constructed and installed by [DeMaria Building Company](#) of Michigan. The system was commissioned in 2015.

Pulp-grade chips are required, free of dirt, bark, leaves, and other fines. About 41,000 green tons are used per year averaging 2.5 trucks delivered per day. The plant runs year-



Steam Boiler.



Wood Chip Bins.



Oxidizer and Gasifier.



Gasifier Chamber.

round. Chips are bought on the open market at 10-40 percent moisture. Four chip bins use a raking floor to move chips onto a conveyor to the gasification combustion chamber.

The gasifier process utilizes a start-up natural gas burner to preheat the inside of the oxidizer and syngas transfer duct. Once temperatures are met and the gasification chamber has reached operating temperature of 600-900°F, utilizing wood chips as fuel, the oxygen flow is regulated and governs the gasification generation of the syngas. The syngas is then combusted in the oxidizer producing a hot flue gas reaching temperatures of 2,000 °F. The flue gas is the heat foundation for the boiler where treated water is made into steam. The boiler can also utilize natural gas in the event that the gasification process is inoperable. The process emissions are cleaned using an electrostatic precipitator while ash is gathered in dumpsters to be landfilled. Both water and excess steam are reused in the process.



Steam Turbine.



Natural Gas Hook-Up to Gasifier.

When the CHP process is inoperable, an adjacent boiler plant, consisting of two 40,000 lbs/hr boilers and one 20,000 lbs/hr, fueled by natural gas, provides 100% of the steam to the VAMC while Consumers Energy provides 100% of the electrical load.

Operational records over the next few years will determine empirical outcomes. With the price of wood chips, electricity, and natural gas, impacting the overall cost savings.