



Bemidji State University Replaces HVAC Energy System

By Lucy Rahn, The Minnesota Project

Bemidji State University received \$8.3 million in funding from the state legislature in 2006 to renovate their science building, Sattgast Hall. David Bahr, a professor of physics, saw the renovation project as an opportunity to replace the outdated and inefficient HVAC (heating/ventilation/air-conditioning) system. With funding received from CERTs, he and three students evaluated the existing ventilation system in the building and created a proposal for energy and money-saving improvements.

The current HVAC system was conventional back in the 1970's and 1980's but is not designed to optimally serve the building. The current system is comprised of twelve blowers (seven supply and five return) that work around the clock and either circulate too much air or not enough, resulting in both discomfort of the building's occupants and significant energy consumption. The current system consumes 84 kilowatts and uses 7220 kilojoules (2020 kilowatt-hours) of electric energy per day under peak ventilation load. David had reason to believe that conversion to a "smart" ventilation system could save a substantial fraction of that energy consumption (and money).

The objectives of the project were to: (1) study the use of the rooms and the supply and return needs for individual rooms and clusters of rooms; (2) investigate the ducting system; (3) determine potential savings in replacing the huge blower motors with small blowers with individual speed controls and on/off controls in each room (motion sensors would turn them on); (4) determine potential savings in installing CO2 and moisture sensors and controls to adjust ventilation rates based on levels of CO2 and humidity; and (5) plan next steps, including taking out large motors and installing room-by-room or suite-by-suite motors with controls.

Other components of the project included a student service learning project for three university students

Project Snapshot

Purpose: To evaluate Sattgast Hall's existing HVAC system and identify a cost effective, efficient alternative

Study Findings: The installation of a new, energy efficient HVAC system with smart controls should be pursued in building remodelling scheduled for fall 2008.

Grants: \$2,600 CERTs

Benefits: Study results show that great energy savings could be had. A database and plan will help to guide planners, architects, and engineers with development.

which entailed investigating the ducting system to determine what parts of it can be changed and using formulas to determine how much ventilation is actually needed based on occupancies of rooms.

David and his students concluded that the advantages to making changes are numerous. An effective HVAC system would ventilate the rooms at the levels needed and many blowers could be turned off when there were no occupants and at night or by auto-pilot blowers. Occupant comfort would be enhanced with optimal air exchange from smart controls, reducing the sleep-inducing rushing sounds from vents. The heating system would remain untouched because the steam plant provides heat to the entire University and it would not be efficient to bring in a new heat source. All in all, a significant portion of the energy currently being used in Sattgast Hall could be saved. In fact, David anticipates that the cost of the study will be covered by the money saved in one month of electricity spending.

Obstacles were few yet anticipated. Figuring out the duct system using blue prints was a foreseen and manageable challenge. Also, the time-frame of the project stretched out a bit due to students and David having other school-related responsibilities.

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Future ideas for the building include adding motion controls and fluorescent tubes to rooms that don't already have them. Other ideas include incorporating renewable energy sources such as photovoltaic solar panels and a wind turbine, of which there are other models in the state to look to. As the convener of the Environmental Advisory Committee at the University, David Bahr hopes to promote other sustainable and energy-saving efforts on campus, which is on par with the Student Senate's successful effort to power the student union with energy purchased from Otter Tail's Tail Winds program.

Outcomes of this project include a database that was created with cost comparisons to be used by a planner, and a detailed plan to be delivered to the administration for moving forward, to be used by architects and engineers. The building and remodeling is planned to begin in the fall of 2008. If the planners want to save energy and money down the road for the building, it is now clear that a renovated HVAC system must be a key part of the picture.

To learn more and to contact David Bahr, click here to visit Bemidji State University's Web site.

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