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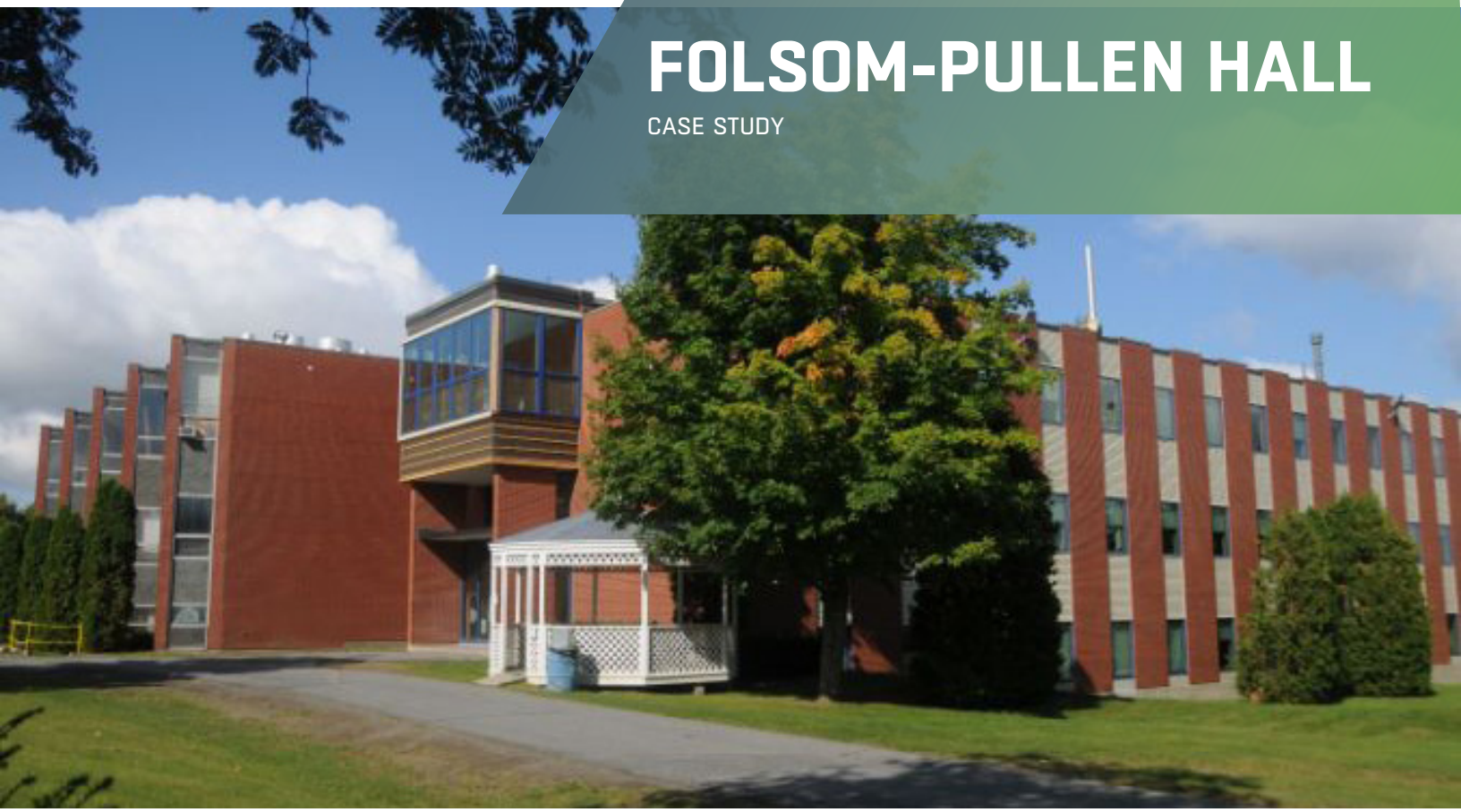
FOLSOM-PULLEN HALL

CASE STUDY



CHALLENGE:

Reducing the University of Maine at Presque Isle's carbon footprint.

As an early adopter of the American College and University Presidents' Climate Commitment, University of Maine — Presque Isles's president, Donald Gillman vowed to reduce the campus' carbon footprint. Deeply commited to this cause, Gillman drafted plans to reduce the university's carbon footprint.

One of the first plans of attack was to overhaul the outdated HVAC system in Folsom-Pullen Hall. Folsom-Pullen Hall is home to the university's largest lecture hall, as well as other smaller classrooms and labs. The building had not seen any major mechanical upgrades since its opening in 1966, and for decades students, faculty, and administrators have complained about the building's excessive mechanical noise, fluctuating temperatures, and high energy bills.

Mechanical Systems Engineers of Yarmouth, Maine, was brought in to perform an in-depth evaluation of Folsom-Pullen Hall and discovered a heat loss of 1,604,188 BTUH for the Folsom wing (assuming 15 cfm/occupant) during occupied cycles. The steam heated unit ventilators located on the outside wall in every space, did not incorporate any heat recovery. This, combined with insufficient sealing around the ventilators, accounted for 51% of this total heat loss when the units were in operation.

Not only were the unit ventilators an energy sieve, they were the source of some very disruptive rattling in classrooms and required constant maintenance. Replacing the ventilators and an outdated oil-fired steam boiler serving the Folsom wing, would be a huge help in reducing the university's carbon footprint.

APPROACH:

Installing a FläktGroup® SEMCO® FV-5000 energy recovery ventilator with an electric preheat coil.

Several options were considered for upgrading the HVAC system in Folsom-Pullen Hall, but ultimately Kurt Magnusson, PE, of Mechanical Systems Engineers opted for a combination of a central energy recovery ventilator (ERV) and a variable refrigerant flow system (variable speed heat pumps) by FläktGroup® SEMCO®. This combination would result in the best payback for the university, while affording students and faculty the added benefit of air conditioning during summer classes.

Adding an ERV and decoupling the ventilation from the HVAC units in Folsom-Pullen Hall would provide a couple of different advantages. Firstly, a separately ducted ventilation system would eliminate most of the noise associated with conditioning the building. Secondly, it allows for maximum energy recovery from exhaust air. Bringing Magnusson to the conclusion that a FläktGroup SEMCO FV-5000 energy recovery ventilator with an electric preheat coil would be ideal for this cold climate application.

HOW IT WORKS

The FV-5000 uses FläktGroup SEMCO's True 3Å total energy recovery wheel to recover both sensible and latent energy. As a result not heating and cooling loads are reduced and air is humidified in the colder months and dehumidified in the warmer months. As the wheel rotates in the True 3Å between the opposing supply and return air streams, the higher temperature air gives up its sensible energy to the wheel's aluminum substrate. A molecular sieve desiccant coating captures the water vapor in the air stream and transfers the moisture to where it is needed.

The FV-5000 is ideal for cold climates, because its energy wheel can operate at full capacity without risk of frost as long as outdoor conditions do not drop below -10°F and indoor design conditions are at 70°F and 25% relative humidity. As a precaution due to Maine's extreme winters, an electric preheat coil was included on the unit. An SCR controller modulates heat output in accordance to outdoor air temperature, so that the coil operates only as needed to prevent frosting.

RESULT:

Fuel consumption have drastically decreased and comfort levels have drastically increased.

Minimizing fuel consumption was a key component of the overall design — something that the variable refrigerant systems excel at. Folsom-Pullen Hall's new HVAC system responds to indoor and outdoor temperature fluctuations by adjusting the compressor speed to optimize energy usage. Inverter technology allows the system to heat and cool simultaneously, in essence transferring heat from the warm side of the building to the cooler side. The system is supplemented by the operation of new oil-fired boilers during the heating season.

"The variable refrigerant flow system and the SEMCO system work very well together. This approach reduced the total amount of ductwork we needed because we're using smaller air handlers. That results in significant fan energy savings, which is important in any project," said Kurt Magnusson.

Since the renovation, fuel consumption at Folsom-Pullen Hall has dropped from 55,000 gallons of oil used in 2007-2008 to 22,000 gallons of oil used in 2008-2009. Even more incredible, is the fact that

the HVAC renovation applies to only half of the total heating load. Both wings of the Folsom-Pullen Hall share the same boiler room, but only the Folsom side was renovated, while the Pullen side awaits financing. Although there were significant improvements made to the thermal envelope of the Folsom wing, Magnusson attributes most of the fuel savings to the heat pumps and FläktGroup SEMCO ERV combination.

According to David St. Peter, Director of Physical Facilities at the university, electrical consumption only increased by $5,000.00, even though the Folsom wing is now almost entirely electric. That amount is expected to decrease with the completion of a campus windmill project, another giant step in the university's carbon reduction.

CONCLUSION:

A carbon footprint reduction of 63% at the University of Maine — Presque Isle.

The renovation was such a success that the University of Maine at Fort Kent decided to take the very same approach for a 8,000 sq. ft. residence hall after seeing the Folsom-Pullen system in action.

Kurt Magnusson is proud of the role that the Folsom-Pullen renovation has played in the university's environmental initiatives. "The building was a real energy hog before," he said. "Now, we've reduced its carbon footprint by 63%."

> **"Everything works very well, and the constant temperature makes people feel much better in class." — David St.Peter**

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