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Stored Heat in Concrete Cuts Warehouse Gas Costs

By Pat Raffaele

PITTSBURGH - By taking advantage of the thermal retention properties of liquid concrete sealer stored in a local warehouse, a contractor here has designed a system that has reduced the facility's heating costs by about 40 percent in its first year of operation, using the concrete sealer as both a heat sink and a buffer to stabilize temperature flow throughout the building.

Jim Behr, vice president of Energy Savers, Inc., said the control system he designed and installed on the existing gas heaters at the AR Chambers and Son Inc. warehouse would have produced "approximately one third less savings" had the concrete sealer not been stored there.

The \$4,500 project involved the installation of two indoor temperature sensors manufactured by Thermisor Limited, Oak Brook, ILL, a microprocessor manufactured by American Stabilis of Lewiston, Maine; seven flue dampers, also manufactured by Thermisor; and a floor fan manufactured by Heat Trierer, Fairport Harbor, Ohio.

The 14,000 square foot warehouse contains from 1,500 to 2,000 five-gallon cans of liquid concrete sealer, which have an average thermal capacity of approximately 2 million Btu, according to Behr. Because the concrete sealer retains heat, maintaining indoor temperatures at 40 degrees requires less use of the heaters, which had previously been controlled by thermostats.

Behr said he developed the idea to take advantage of the concrete sealer during a survey of the warehouse, and said he "felt secure in relying on the material because their stock remains relatively constant."

Following a latent heat analysis of the cans to assess how well they would retain heat, and in light of heat loss calculations which proved that existing gas heat equipment was oversized, Behr said that a system designed to employ the cans to store latent heat would serve the warehouse adequately while saving on natural gas.

Terry Chambers, president of AR Chambers, said payback on the system, which was installed last November, is expected in 13 months, with the greatest amount of saving realized over last year's heating season. For example, the warehouse's gas bill for

January 31, 1985 was \$1,860 and the bill of January 31, 1986 was \$1,074, for a saving of \$786.

The cans of liquid concrete sealer absorb heat during the day, and release it at night as the temperature drops, Behr said. By installing air dampers in the flues, the warehouse has managed to retain more heat. Prior to the installation, the warehouse was overheating in order to compensate for heat escaping through flues.

Each damper is a rectangular plate that fits inside the flue and has an orifice that automatically controls the amount of heated air vented from the building. The warehouse installed seven dampers: a 3-inch unit, a 6-inch unit, and five 10-in units, all placed in the flue as close to the heater as possible in order to maximize the heat transfer between the air and the heater.

Two temperature sensors, one on the outside of the building and one inside, turn on four auxiliary gas-fired space heaters if the temperature drops below 35 degrees. The heaters will shut down once the warehouse temperature has reached 40 degrees. The sensors control the heaters through an 84-program capacity microprocessor.

Last winter, Behr said, the temperature inside the warehouse never dropped below 42 degrees F, due to the heat held in by the flue dampers; so auxiliary gas heaters never had to be turned on, which Behr said accounted for the savings.

Had an identical installation been performed on a similar warehouse without the presence of the concrete sealer, Behr said he "would have been able to produce savings, but on a more limited scale."

A Heat Trierer fan, manufactured by Heat Trierer Systems Inc., Fairport harbor, Ohio, was purchased from Behr a few months ago, and Chambers said the \$1,100 fans should add 10% percent to the savings. One half-horsepower fan measures 4 feet by 4 feet by 10 feet, and is fixed to the floor of the warehouse. Behr said after the heat is brought to the floor by the ceiling fans, the fan will circulate the heat across the warehouse floor.

Ceiling insulation was considered for the warehouse, but was not feasible. Behr said because the sprinkler system piping runs across the ceiling. He said the sprinkler's themselves are 6 inches from the roof.

Behr said he is currently working on other warehouse projects which would use canned food to collect heat, and said the canned food would have similar thermal properties compared to the liquid concrete sealer.