WESTERN IOWA TECH COMMUNITY COLLEGE

SIOUX CITY

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COMPANY BACKGROUND

Western Iowa Tech is a community college located in Sioux City, Iowa. Founded in 1966, the college has since added remote campus locations in other western Iowa communities. More than 70 degree options are currently offered, and more than 7,000 students are seeking college credit with another 17,000 students enrolled for non-credit learning experiences. Western Iowa Tech employs approximately 325 employees at their main campus in Sioux City.

PROJECT BACKGROUND

The goal of the project was to find ways to reduce energy usage through modifications to the heating, ventilation and air conditioning (HVAC) equipment. The intern focused on changing the constant volume system to variable air volume and improvements to the 20-year-old equipment, some of which is nearing the end of its useful life. These represented the leading areas of energy consumption for the two oldest buildings on campus.

INCENTIVES TO CHANGE

Over the last 20 years the air distribution and hydronic systems have been "pieced" together due to constant use. Most of the equipment is nearing the end of its useful life, and as equipment ages it tends to be less efficient and consume more energy. Additionally, there are numerous ongoing performance and maintenance issues with the system throughout campus. The intern was charged with researching solutions that could save money and energy.

RESULTS

The intern project focused on buildings A and D on the Western Iowa Tech campus. These were identified as the buildings with the oldest equipment and the most potential for savings.

Variable Frequency Drives: Constant-volume HVAC systems run at full speed without a variable speed option to throttle back and use less unnecessary energy. Since the occupancy of educational facilities varies greatly throughout the year, a variable frequency drive (VFD) would be an efficient addition. The VFD would allow the motor to slow down, resulting in less energy consumed. For the air distribution system, a variable air volume box is added with a built-in damper that decreases airflow and increases the air pressure. The motor will then slow down to reduce the overall system pressure. For the hydronic system, the use of two-way valves will reduce the flow and increase system pressure to achieve the desired result.

Chiller Replacement: The current chillers in buildings A and D have a total capacity of 710 tons of cooling. As the chillers are now twenty years old, the estimated energy efficiency ratio (EER) is 8. The chillers also have high maintenance costs, and both use R-22 refrigerant, which is being phased out by the year 2020. It was recommended to invest in new chillers to improve both capacity and energy efficiency. With an EER as high as 24 with a 25 percent load, the new chillers also will eliminate non-routine maintenance costs and will use a more environmentally friendly refrigerant.

Window Retrofit: Window replacement is an easy way for immediate impact. The current windows on the two buildings assessed are single glazed with a U-value of 1. This is the highest and least efficient value for glass. As the U-value approaches zero, the glass will allow less energy through, thus improving energy usage by reducing the internal heating and cooling loads. A retrofit would fit inside the sill of the current window and could improve the U-value to 0.17.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN METRIC TONS

TOTAL FOR ALL SECTORS							
CO_2	SO_2	CH_4	N_2O	CFC	NO_x	VOC	PM_{10}
1137.42	6.14	45.18	0.58	13.98	2.92	0.10	0.15

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
VARIABLE FREQUENCY DRIVES	$49,000	1,138,000 KWH	RECOMMENDED
CHILLER REPLACEMENT	$110,000	1,442,000 KWH	RECOMMENDED
WINDOW RETROFIT	$4,300	3,200 THERMS 59,000 KWH	RECOMMENDED