In 1998, the **Rebuild Duke University Facilities** partnership successfully completed lighting and water conservation improvements to 114 academic buildings. Now, the Energy Team of Duke's Facilities Management Department has shifted its focus to HVAC systems and controls and the need to renovate inefficient and aging systems in many campus buildings.

## *Heating and Cooling at War*

Thirty-year-old variable air volume (VAV) boxes in Duke's Perkins Library were wasting energy due to broken and jammed dampers, causing the boxes to stick – often in the cooling position. The substantial energy drain from overcooling was made worse by an electric reheating function that wasted even more energy as it strained to normalize the temperature. The Energy Team replaced each box with a working system that responds to heat and cold and keeps a stable room temperature with minimal energy required. Although the library VAV project will cost $125,000 when complete, the electrical savings are expected to exceed $25,000 annually. Thus, the measure will pay for itself in five years and will remove a continual source of maintenance headaches and customer complaints.

## *Variable-Speed Efficiency*

The Energy Team installed variable-speed-drives on fans along with premium efficiency motors to get the most out of their energy input in the Perkins Library and other campus buildings. Keeping a room at a stable temperature does not require the same amount of cooling or heating at all times. For most of the time, building cooling and heating loads stay at only a percentage of their full capacity. Variable-speed-drives enable computers to control air flow as needed during the day to maintain a standard temperature as well as in the evening, when buildings are generally vacant and call for less energy. Premium efficiency motors are built to higher standards and convert electrical to mechanical energy more efficiently. The variable-speed-drive project in Perkins Library cost $40,000 and is expected to have a 5-1/2-year payback.

Duke's Energy Team also introduced a regular steam trap maintenance program. Though not nominally an energy conservation measure, regular steam trap maintenance can result in the prevention of significant amounts of steam loss. Steam traps function to separate the steam from condensate and noncondensate gases. An integral part of every steam distribution system, the traps require periodic inspection and replacement. Traps often fail in the open position, releasing raw steam. Losses to a system the size of Duke University's could run up to tens of thousands of dollars per year.

During fiscal year 1998-99, Rebuild Duke University Facilities' Energy Team saved the university almost 10 million kwh of electrical energy, over 42 million pounds of steam and over 7 million cubic feet of water. Duke is on track to equal these savings in the current fiscal year. As the Duke partnership continues to expand its HVAC efficiency upgrades, the university's energy and water expenses will continue to drop at an even more impressive rate. The vigilance and expertise of Duke's Energy Team provides the key to operating buildings at optimum efficiency.

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