

Energy Saving Initiatives

Introduction

In 1992, the University evaluated its facilities and energy usage to determine where improvements could be made. The evaluation determined that:

- Utility systems could not support future building growth.
- Utility infrastructure was obsolete and inefficient.
- Central steam plant was coal-fired, labor intensive and environmentally unfriendly.
- Steam losses exceeded steam loads during summer operation.
- Electrical capacity was near its limit.
- Electrical distribution was unreliable.
- Many buildings on the Danforth Campus were not air conditioned.

Objectives and Plans

The University created the following objectives for improving the utility operations, reducing the use of energy, increasing the capacity for future growth, and reducing the utility operating :

- Increase the reliability and capacity of the utility systems.
- Update the systems technology.
- Reduce energy consumption and operating cost.
- Become more environmentally friendly.
- Accomplish changes with the least disruption and cost.

To achieve those objectives, the University created the following goals:

- Initiate energy conservation and reduce operating costs.
- Install central air conditioning in all buildings.
- Shut down central steam plant in the summer.
- Replace single high pressure steam plant with distributed low pressure plants located near loads.
- Install computer-based campus energy management systems.
- Increase electrical capacity and improve reliability.
- Design for maximum flexibility and future growth.

Current Projects

Danforth Campus

- Shut down the boiler plant in the summer.

- Replace coal with natural gas, using oil as an alternate, thus reducing operations cost. The University has reduced the boiler plant staff from 13 to 6 through attrition and transfers.
- Upgrade the steam distribution system.
- Install boilers on the South 40. The steam produced on the campus and piped to the South 40 was only 48% efficient — for every dollar of fuel purchased, the University lost 52 cents, a significant loss.
- Initiated a campus energy management system.
- Decentralize the steam distribution system by installing smaller low pressure steam plants in locations on campus to have the steam generation closer to the use, reducing steam loss.
- Installed a new main electrical feeder.

Medical Campus

- Conversion of coal to gas to reduce operating cost, improve efficiency, and become more environmentally friendly.
- Replace boilers with more efficient units.
- Instituted a Power Plant summer-time weekend steam shutdown program.

Challenges

A major problem facing the University is the large increase in the cost of natural gas. On the Danforth Campus in 2002, it took 3.5 million therms (a measurement of gas usage) to handle the then 3 million square feet of buildings. By 2006, the energy usage only increased to a little over 4 million therms to handle 4.7 million square feet of building area.

On the Medical Campus, the savings was just as dramatic. In 2002, it took approximately 6 million therms to support 3 million square feet of building. By 2006, a little over 7 million therms supported a building area of approximately 4.55 million square feet.

However, the total natural gas cost has increased dramatically even though the use of energy has remained relatively flat.

Challenges in the future will include:

- Increasing capacity demands.
- Increasing reliability demands.
- Aging infrastructure.
- Rising utility costs.
- Stricter environmental compliance.
- Limited manpower.

Improvements and Results

1. Electrical usage, has not increased as greatly as square footage. Electrical cost has remained relatively flat and has actually decreased on the Medical Campus since 2002.

Through a major building growth period, utility usage has remained essentially flat over the last few years, primarily due to cost reduction measures, updated technologies, and improved efficiencies. Capacity has kept up with demand. Reliability has improved and will continue to improve as further upgrades are implemented. Continued utility investment will be needed to keep up with future building growth, to keep costs at a minimum, and to provide reliable energy sources to the University.

Conservation

In an effort to increase the University's conservation of energy, the following steps were taken:

- The use of energy efficient lights was established. The University is a participant in the United States Green Lights Program, and has replace all fluorescent tube bulbs with T8 lamps and all ballast with electronic units.
- Large motors now use variable speed drives.
- Coal was replaced with natural gas as a source of fuel.
- Use of outside air has been minimized. Any time outside air is brought into a building, it has to be either heated or cooled. By reducing the amount of outside air brought into a building, there is a reduction in the use of energy. One method of accomplishing this was to install CO₂ detectors in large lecture halls and meeting rooms to detect the amount of CO₂ in the room, thus minimizing the amount of outside air required.
- The University has worked with fume hood vendors to reduce the amount of outside air required for fume hood operation by about 50%, thereby reducing the use of energy. This has become a standard in many other institutions.
- The University has established design standards to be used in the design of any new building or renovated space.

When comparing the Danforth Campus to other peer institutions in the midwest region as determined by CAPP (Central Association of Physical Plant Administrators), the overall energy usage is lower. The Medical School has reduced the use of energy significantly since 1992.