

# NEBRASKA MEDICAL CENTER



**JASON CHASE**  
MECHANICAL ENGINEERING, THE UNIVERSITY OF IOWA



## COMPANY BACKGROUND

"Serious Medicine. Extraordinary Care." These words embody the scope and purpose of the Nebraska Medical Center. It is one of the region's premier medical providers, a position it has maintained through unceasing dedication to the highest levels of academic and private practice medicine, customer service, clinical care, process improvement and employee satisfaction. The center has received numerous awards, commendations and distinctions for its accomplishments in cancer, cardiology, and neurological illnesses and disorders. The Nebraska Medical Center is comprised of 5,000 staff, and sees more than half a million patients a year.

## PROJECT BACKGROUND

The Nebraska Medical Center is successful and growing, despite the challenges of today's economy. Older facilities and equipment contribute significantly to the hospital's energy consumption. The hospital is evaluating several energy improvement opportunities and in its three years of partnering with the Pollution Prevention Intern program has been compiling cost and energy saving data to help prioritize the projects. This year's intern focused primarily on steam traps and a utility metering system, but also provided additional evaluation of efficiencies in the heating, ventilation and air conditioning system.

## INCENTIVES TO CHANGE

Optimizing efficiencies of the facility's energy-consuming systems would significantly decrease costs and save resources. Ongoing preventative maintenance, equipment upgrades and continuing implementation of energy-saving projects will move the facility toward optimization of these systems. An effective metering system would provide valuable financial and usage information of individual systems to aid in prioritizing these projects.

## RESULTS

**Steam Trap Preventative Maintenance:** A steam survey conducted in 2010 indicated significant opportunities for savings in the facility's steam utilities. Preventative maintenance of the steam traps on a campus of this size is very time consuming. It is difficult to dedicate staff to the task when needed for more pressing facility needs. Establishing an improved steam maintenance program would significantly reduce the amount of steam lost each year to failed and leaking steam traps, resulting in significant energy and cost savings.

An upgraded maintenance plan would incorporate several features to help make this a more timely process and keep

the steam trap systems and associated equipment operating efficiently. The new maintenance plan should include upgraded leak detection equipment for faster and more accurate assessment of the steam traps. A preventative maintenance schedule should also be included in the plan.

**Utility Metering System:** Meters are currently used to record the utilities serving each of the five campus buildings surveyed. Because of the size of the facilities and the amount of their utility consumption, it is difficult to determine the effectiveness of energy improvement projects. In many cases, the energy reduction from those projects is less than the daily and hourly fluctuations in a building's utility usage. Monitoring utility usage on a more localized level would provide more useful data for evaluating system efficiency and prioritizing projects.

Depending on utility usage, metering could be structured in two different ways. Steam and chilled water are used primarily in HVAC systems such as air handlers and heat recovery chillers. By installing meters on steam and chilled water systems, a baseline can be established for investment return calculations and post-upgrade data can be trended for future maintenance and planning. Electrical usage is divided among HVAC, lighting, medical equipment, and a number of other areas. The most effective way to put an electrical metering system in place would be to install the entire system based on the existing electrical distribution network.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS					
Total for all sectors					
CO <sub>2</sub>	SO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	CFC	PM-10
5210.99	22.13	733.05	226.99	51.21	0.60



The U.S. Department of Energy estimates large savings associated with metering projects as part of a retro-commissioning process. The aid they provide in identifying potential projects creates a consistent and quantifiable value.

**Energy Model:** The intern developed an energy model to calculate true project savings and return on investment of various improvement and efficiency projects. The model utilizes known energy usage information and operating parameters specific to the equipment on the hospital campus. Moving forward, Nebraska Medical Center will be able to

utilize this model to accurately calculate projected savings for a wide spectrum of efficiency improvement projects.

**HVAC Projects Return on Investment:** Nebraska Medical Center used the developed energy model to accurately project savings on two large HVAC projects previously identified, but the return on investment was unconfirmed. Trend data from the control system was used to estimate the return on investment on upgrade projects but with marginal accuracy, highlighting the benefits of a comprehensive metering program.

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
STEAM TRAP PREVENTATIVE MAINTENANCE	\$119,544	106,073 THERMS 1,957,600 GALLONS	RECOMMENDED
UTILITY METERING SYSTEM	\$345,500	27,600 THERMS 736,900 GALLONS 4,259,000 KWH	RECOMMENDED
ENERGY MODEL	\$9,000	MEASUREMENT ONLY	IMPLEMENTED
HVAC PROJECTS RETURN ON INVESTMENT	\$256,241	170,500 THERMS 26,225,500 GALLONS 5,406,200 KWH	RECOMMENDED

