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*Michele Lahey, Chief Operating  
Officer of the WCM*

## WALTER C. MACKENZIE HEALTH SCIENCES CENTRE RESOLVES MAINTENANCE PROBLEM AND REDUCES ENERGY CONSUMPTION

### Maintenance Problems Can Be Severe

The Walter C. Mackenzie Health Sciences Centre (WCM) in Edmonton is a 279 000-m<sup>2</sup> (3-million-sq.-ft.), 800-bed facility. It is the principal structure in the University of Alberta Hospitals (UAH) group. The UAH is part of the Capital Health Authority, which provides health care to greater Edmonton and northern Alberta.

The WCM was experiencing severe problems caused by the fouling of cooling coils and other components of its cooling systems. Air conditioning was affected, medical equipment was deteriorating and the facilities management staff was facing large repair bills. Computer equipment operation was compromised, as were the process medical loads which, with the major air handlers required to ventilate

the building, are part of the chilled water systems load. The problem was traced to inorganic particulate from the WCM's own piping system as well as the District Cooling System and the over 100 buildings connected to this closed-loop system. The facilities management staff initiated the solution, which was eventually installed on multiple feeds in the UAH WCM facility and in multiple locations on the District Cooling System by the University of Alberta's Utility Group.

### Energy Management Directs Savings to Patient Care

Michele Lahey, Chief Operating Officer of the WCM, says, "Our continued focus on energy efficiency means we're making the best use of our resources, both financial and natural. We use large amounts of energy to operate this facility, and we want to be responsible stewards of these resources. In addition to providing an

efficient facility, financial savings are redirected into patient care rather than utility rate increases." This approach ensures that the maximum amount of funding is retained for patient care – in this case, it means thousands of additional patient-care dollars monthly.

### Energy and Maintenance Costs are Related

The relationship between maintenance and operational efficiency (energy costs) is well known. However, minimizing maintenance costs is sometimes achieved at the expense of increased energy consumption. Improperly maintained equipment will almost always result in higher energy costs and eliminate the benefits achieved by reducing maintenance expenditures. Interestingly, properly maintained equipment can also minimize energy costs by optimizing system performance.

One of the key activities in the investigations was a review of energy consumption, which highlighted the timing and nature of increases in energy use. Had it not been for the advance capability and focus of the in-house staff regarding both energy costs and maintenance requirements, the problem could have become more acute. The UAH staff is sensitive to energy costs, in part because the institution has been an Energy Innovator since 1994. Energy Innovators are organizations that have committed to saving energy and lowering greenhouse gas emissions through the Energy Innovators Initiative of Natural Resources Canada's Office of Energy Efficiency.



*The Walter C. Mackenzie Health  
Sciences Centre*



Natural Resources  
Canada

Office of Energy  
Efficiency

Ressources naturelles  
Canada

Office de l'efficacité  
énergétique



An inability of some of the WCM's major air-handling systems to meet their cooling requirements indicated capacity problems on some of the system's cooling coils. When UAH staff consulted the coil manufacturer, its computer simulations showed a drop in cooling coil efficiency. A field inspection of the coils and associated piping discovered particulate buildup, validating not only the reason for the drop in cooling system performance, but also the results of the coil manufacturer's computer simulation, which indicated a decline in performance at different scaling factors.

## Equipment Fouling Caused Increased Energy Consumption

Although the root of the problem in the chilled water system was sludge, silt and iron oxide in the cooling water supplied through the District Cooling System, it was initially not easy to identify. The particles were in the 5- to 90-micron range, and, despite its thinness, the layer of contamination that built up on the inside of the cooling coils and other equipment had an impact on their efficiency. Identifying the problem as silt and sludge fouling heat exchangers and plugging chilled water lines was the result of a process of elimination. The UAH resolved the problem through the installation of two 3312-L/min (875-gal./min) centrifugal separators in a side-stream configuration (to keep installation costs down) in the WCM. The utility supplier, the University of Alberta, eventually installed its own similar system in response to the increased efficiencies and energy cost savings that resulted from the WCM installation.



*Piping feeds and filter unit at the WCM*

By reducing the contamination of heat exchangers and by improving the chilled water flow rates in all lines, the heat transfer performance and the overall efficiency of all pumps, heat exchangers and other related equipment were dramatically improved. As the variable flow rates through the cooling coils increased (higher load equals higher flow), some of the particulate that was reducing heat transfer capabilities was eliminated, and eventually a portion of the heat transfer capability was regained. This improvement alone made the separators a worthwhile investment for the energy savings, even without considering the reduced maintenance time and expense.

The actual energy savings are difficult to estimate accurately, but a reduction in consumption of as much as 500 000 kWh per year, worth \$50,000, and reducing greenhouse gas (carbon dioxide) emissions by about 450 tonnes per year, is a possibility.

## Learn More

Contact information for the University of Alberta Hospital site and the Office of Energy Efficiency of Natural Resources Canada is as follows:

Doug S. Dunn  
Manager, Building Operations  
University of Alberta Hospital Site  
8440-112 Street  
Room ob1.51, WCM Building  
Edmonton AB T6G 2B7  
Tel.: (780) 407-8179  
Fax: (780) 492-8895

Energy Innovators Initiative  
Natural Resources Canada  
Office of Energy Efficiency  
580 Booth St., 18th Floor  
Ottawa ON K1A 0E4  
Tel.: (613) 995-6950  
Fax: (613) 947-4121  
Web site: <http://oeenrncan.gc.ca>  
Email: [info.services@nrncan.gc.ca](mailto:info.services@nrncan.gc.ca)



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