Energy Innovators Initiative

Energy Innovators Case Study

April 2004

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DR. LEONARD A. MILLER CENTRE CUTS OIL CONSUMPTION BY 45 PERCENT

Introduction

When health care administrators in St. John's, Newfoundland and Labrador, were faced with the need to invest millions of dollars in a new boiler plant and other capital improvements at the Dr. Leonard A. Miller Centre, a solution was readily at hand in the form of a partnership with an energy management service company (EMSC). Five years later, the retrofit project has exceeded all expectations and is saving the Health Care Corporation of St. John's (HCCSJ) more than $330,000 in annual energy costs while contributing to a cleaner, healthier environment.

One of the project's biggest supporters was current HCCSJ Chief Executive Officer (CEO) George Tilley, who was Senior Vice-President of Corporate Affairs in the mid-1990s. "I wasn't in charge of facilities when the project started, but I was on the senior management team, and I certainly didn't need any convincing," recalls Mr. Tilley. "Seven or eight years ago, when I was CEO of the children's hospital in St. John's, we were one of the first to pilot an energy performance contract in Newfoundland. So I knew this was a viable strategy for dealing with a number of problems. I've been very impressed with the success of this approach. We've proven it sure can work."

Dr. Leonard A. Miller Centre

Natural Resources Canada
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Canada

Boiler room

About the Miller Centre

The Miller Centre is one of six health care facilities operated by HCCSJ that provides comprehensive health care services to some 200 000 residents in the St. John's region and tertiary (high-level) care to other residents of the province.

Located on Forest Road in the city's east end, the Miller Centre is unique. Some of its buildings date back to the early 1850s and were originally used as a military hospital. Over the years, various buildings and wings were added as the Centre developed into one of the main acute-care hospitals in St. John's.

In 1978, when the acute-care function was moved off-site, the focus of activity at the Miller Centre changed. Today, although the Centre maintains a 160-bed in-patient service, it is primarily a rehabilitation and long-term care facility. The Miller Centre is also home to the Provincial Public Health Laboratories, a prosthetics/orthotics service and the Centre for Nursing Studies, which admits more than 100 student nurses each year.

A call for action

"Because of the way the site evolved over time, when the acute-care function moved elsewhere, we were left with a mixed bag of buildings and uses," recalls Keith Bowden, Director of Facilities Management for HCCSJ. "From an operations perspective, we had a site that was running on an old boiler and other equipment, with low stacks, and burning bunker C (heavy) oil. We were using too much energy, we were polluting the neighbourhood, and we needed to do something about it."

In fact, the pollution problem was a driving force behind the Miller Centre's energy retrofit. Soot emissions from the outdated 1950s-era boilers were fouling the air, and there was growing pressure from local residents and businesses for the Miller Centre to "clean up its act." The Centre's close proximity to major tourist attractions in St. John's – most notably Signal Hill National Historic Site – reinforced the need for action, as emissions from the Miller Centre often shrouded the spectacular view from Signal Hill of the City of St. John's, the harbour and the Atlantic Ocean beyond.

Energy performance contract paves the way

Although the rationale for modernizing the Miller Centre's heating plant was solid, financing for such a project was scarce. Like many health care facilities across Canada, the Miller Centre faced the ongoing challenge of finding money to invest in needed capital improvements without reducing services to the public. At this point, administrators at HCCSJ decided to explore energy performance contracting as a possible solution for updating equipment and retrofitting the Miller Centre.

Under the energy performance contracting arrangement, an EMSC finances the project, supplies and installs new equipment, and guarantees a certain level of energy savings. The EMSC is repaid using the money saved through reduced energy consumption. After the EMSC has recovered its investment plus an agreed-upon profit, the owner of the facility retains all future savings from the energy retrofit.

Hospital administrators in St. John's were already familiar with energy performance contracting, thanks to successful projects completed at other local health care facilities in the early 1990s (including the children's hospital). So, in June 1995, shortly after the city's hospitals were amalgamated under the umbrella of HCCSJ, a request for proposals was issued asking EMSCs to identify how they would go about implementing energy retrofits of several facilities, including the Miller Centre.

Dr. Leonard A. Miller Centre

Four proposals were received, and Honeywell Limited was selected to complete an energy retrofit feasibility study of six facilities operated by HCCSJ. Based on the results of this study, the Corporation signed an energy performance contract with Honeywell in 1996. In addition to the Miller Centre, retrofits were to be undertaken at St. Clare's Mercy Hospital, the Waterford Hospital, the General Hospital (Health Sciences Centre) and the Dr. Walter Templeman Health Centre (on nearby Bell Island). HCCSJ decided not to retrofit the sixth facility – the Grace General Hospital – because it was slated for closure in 1999.

It was also at this time in 1996 that HCCSJ joined Natural Resources Canada's Energy Innovators Initiative (EII). The EII helps businesses, institutions and municipalities explore innovative options for financing and implementing building retrofit projects that will help lower energy costs and reduce greenhouse gas emissions that contribute to climate change. HCCSJ also registered an emissions-reduction action with Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.), based on the retrofit activities set out in the energy performance contract with Honeywell.

The retrofit plan

One of the key challenges that EMSCs had to address in order to win the contract was the need to reduce harmful emissions produced by HCCSJ from the consumption of fossil fuel in its heating plants. Honeywell's plan for reducing emissions was twofold:

1) Reduce emissions by reducing fuel consumption.

2) Further reduce emissions by converting the heating plants from No. 6 fuel oil to lighter and less-polluting No. 2 fuel oil.

To achieve the first objective, Honeywell recommended that certain buildings at the Miller Centre be closed down because they were either unoccupied or under-utilized. "At the time of the feasibility study, the Miller Centre had about 33 750 m^2 of space in its inventory," explains Mr. Bowden. "So part of the contract was to cut loose some of the older parts of the Centre, reducing the serviced area to about 27 000 m^2."

Although the original plan was to demolish the closed buildings, heritage groups vigorously lobbied officials to keep the buildings because of their historical value. As a result, responsibility for all but one of the buildings slated for demolition was transferred from HCCSJ to the provincial Department of Works, Services and Transportation. This allowed redevelopment of these buildings to be explored without delaying the main element of the Miller Centre retrofit – the construction of the new boiler room.

"Some of our energy savings are definitely the result of reducing the amount of space we heated," acknowledges Mr. Bowden. "But it's important to note that most of the space we cut loose was unserviced. There was a lot more to the project than simply closing some unoccupied buildings."

New boiler plant

By far the most significant aspect of the retrofit was the decision to replace the out-of-date heavy-oil boilers with a new plant that incorporated three high-efficiency boilers capable of burning No. 2 fuel oil. This strategy, while promising a significant reduction in emissions, carried a financial penalty – No. 2 fuel is not only more expensive than No. 6 fuel, it also produces less heat. Nevertheless, the need to address the emissions problem was paramount.

"It was pretty clear that we needed new boilers, since there wasn't much we could do with the old system," says Mr. Bowden. "Given the emissions problem, nobody

putting in a new plant would use heavy oil today. So we dropped a new light-oil boiler room into the middle of the site and then shut down the old boiler room."

New maintenance workshops, a new waste compactor and a new emergency generator were incorporated into the design of the boiler room. Mr. Bowden notes that much of the design work for the boiler plant and shops was done by the engineering consulting firm AMEC Inc. (formerly AGRA Inc.), under contract to Honeywell.

Direct digital control system

Another key element of HCCSJ's retrofit was the installation of a Honeywell direct digital control (DDC) system to monitor and control all aspects of the Centre's mechanical and electrical equipment. Among other capabilities, the system allows authorized individuals to adjust setpoints and change boiler schedules to match building requirements. These changes can be made from HCCSJ operator stations throughout the city.

The DDC system can also be programmed to ensure that equipment runs only during occupancy periods. As well, heating pumps are automatically shut off when sensors indicate that no loads exist. The system can track sensor data, allowing operators to identify potential problem areas and take preventive action. All critical plant systems are monitored, and the DDC system has the ability to alert operators to problems by sending an alarm to a pager.

Honeywell also installed zone dampers to shut off airflow to unoccupied areas. Insulation was added to prevent pipes from overheating, and valves were installed to change the heating system from a zone type to an individual room control.

Energy-efficient lighting

The third major element of the energy retrofit was the installation of a new energy-efficient lighting system. Specifically, the Centre's T-12 tubes and magnetic ballast fixtures were replaced with more efficient T-8 tubes and electronic ballasts.

Impressive results

The total cost of the Miller Centre retrofit was just over $4 million, including all financing and administrative expenses. Although some elements of the project were only recently completed, the new boiler room was commissioned in June 1998 and has quickly surpassed the energy savings and emissions-reduction targets in the energy performance contract.

Oil consumption at the Miller Centre has dropped from 1 777 643 litres of No. 6 fuel oil in the base year (1997) to 991 460 litres of No. 2 fuel in the 12-month period ending February 28, 2001 – a reduction of 45 percent. This betters the savings target set by Honeywell and HCCSJ by close to 174 000 litres of oil per year.

Despite increased fuel costs, lower-than-predicted fuel consumption resulted in fuel-cost savings of $314,256 in the year ending in February 2001. The drop in electricity consumption has been more modest, with annual savings of $19,000 over the same period.

"When you consider oil and electricity together, we saved more than $333,000 in energy costs in the 12-month period ending February 28, 2001, which was basically three times our target of $108,000," says Mr. Bowden. "These savings are all the more dramatic when you consider some of the other changes that have occurred at the site. For example, the Centre for Nursing Studies moved onto the site during this period, which has increased the demand for heating, ventilation and air conditioning. We've also installed electric steam generators to provide high-pressure steam for some procedures, and the general level of activity at the site has increased over the past five years."

The new boiler plant has also reduced staffing needs in the boiler room. Honeywell provided training for some engineers on the new boiler plant, whereas others were retrained for other positions with HCCSJ. With energy and operational savings totalling $785,000 per year, the Miller Centre project has a payback of slightly more than five years, compared with seven to eight years for the retrofits at other health care facilities in St. John's.

Emissions reductions

In addition to improving the payback period for the project, the lower-than-anticipated oil consumption in the new boiler plant has helped the Miller Centre exceed its targets for emissions reductions.

"Our projections were that carbon dioxide emissions would be reduced by 43 percent and soot emissions by more than 97 percent," remarks Mr. Bowden (see the table below). "According to our most recent calculations, carbon dioxide emissions are actually down by more than 51 percent and ash emissions are down by almost 98 percent."

A winning proposition

The Miller Centre retrofit was completed at the end of 2000 (although an on-site technical resource manager provided by Honeywell continued to look for additional savings). Mr. Bowden reports that no significant problems were encountered in completing the work, aside from the need to remove asbestos in certain areas and a few "teething problems" with the new boilers. In addition to saving energy and reducing emissions, the project has improved the indoor environment and comfort conditions for patients and staff alike.

As for Mr. Tilley, the success of the Miller Centre project has only confirmed his views on the merits of energy performance contracting. He notes that many hospitals in Canada were built when energy efficiency was not an issue, so there are tremendous opportunities for energy retrofits that will quickly pay for themselves and then free up money for medical services. Mr. Tilley also maintains that health care institutions "can't lose" by at least having their facilities audited by an EMSC.

"Having your facilities upgraded without incurring additional costs has to be a winning proposition," says Mr. Tilley. "We've been able to improve the indoor environment for our clients and staff – and help protect the environment – because we have better, more efficient mechanical systems in place. We're saving hundreds of thousands of dollars in energy costs, and after the project is paid for, we'll be able to start pumping those savings back into clinical services. I can't wait for that day – I only wish we had started this project earlier."

Table 1. Emissions-Reduction Targets for the Miller Centre

	Base Year Emissions (kg) (assuming consumption of 1 777 643 L of No. 6 fuel)	Target Emissions (kg) (assuming consumption of 1 153 379 L of No. 2 fuel)	Estimated Pollutant Reductions (kg)	Estimated Pollutant Reductions (%)	Actual Pollutant Reductions (kg)	Actual Pollutant Reductions (%)
Carbon dioxide	5 404 035	3 067 988	2 336 047	43.2	2 787 159	51.6
Sulphur dioxide	105 414	5 881	99 583	94.5	100 518	95.4
Oxygen	2 214 054	1 351 183	862 871	39.0	1 052 559	47.5
Nitrogen	25 514 510	15 582 150	9 932 360	38.9	12 120 094	47.5
Ash	17 599	461	17 138	97.4	17 215	97.8

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The Office of Energy Efficiency of Natural Resources Canada strengthens and expands Canada's commitment to energy efficiency in order to help address the challenges of climate change.

Cat. No. M144-36/2004E
ISBN 0-662-36293-4
Aussi disponible en français sous le titre : Le Dr. Leonard A. Miller Centre réduit sa consommation de mazout de 45 p. 100

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