

Innovative Technology Conserves Resources and Generates Savings: A Case Study from the Sunnybrook Regional Processing Centre

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Abstract

The regional processing centre at Sunnybrook Health Sciences Centre recently faced the substantial challenge of increasing cleaning capacity to meet the current workload and anticipated future demand without increasing its operating budget. The solution, upgrading its cleaning and decontamination system to a highly automated system, met both objectives. An analysis of the impact of the change found that the new system provided additional benefits, including improved productivity and cleaning quality; decreased costs; reduced water, electricity and chemical use; improved worker safety and morale; and decreased overtime. Investing in innovative technology improved key departmental outcomes while meeting institutional environmental and cost savings objectives.

Background

Sunnybrook Health Sciences Centre (SHSC) is a major tertiary care hospital and teaching institution in Toronto, Ontario, that operates at three sites (see sidebar “Sunnybrook Statistics”). In 2010, the Women and Babies Program will move from its current location to the main campus, adding perinatology, gynecology and three more operating rooms (ORs). It became clear that this service expansion would exceed the capacity of the Sunnybrook Regional Processing Centre (SRPC) (see sidebar “Sunnybrook Regional Processing Centre Overview”) for decontaminating and cleaning instruments and medical devices. In fact, SRPC would need to increase its capacity by 30% to meet the demand expected from the addition of new services and ORs.

The then-existing Castle Model 7662 tunnel washers, which could be likened to a car wash, were old, and the technology required presoaking for all instruments and hardware before loading them into the washer. A steadily increasing instrument- and hardware-processing volume was already stretching

the SRPC capacity. SHSC had added three ORs, and central management of instruments from the hospital clinics was progressively growing. Previously, many clinics had washed and sterilized their own instruments, using flash sterilization. The outbreak of severe acute respiratory syndrome in 2003, however, changed infection control practices. In addition, the 2007 *Annual Report* of the Auditor General of Ontario recommended that flash sterilization not be used in non-emergency

Sunnybrook Statistics

Sunnybrook Health Sciences Centre (SHSC) has 1,206 beds, including 671 acute care beds. Services are located at the main SHSC Bayview Campus, except for the Women and Babies Program and the Holland Orthopaedic and Arthritic Centre. At the main SHSC site, Sunnybrook Regional Trauma Centre handles approximately 750 cases every year. Twenty-one operating rooms handle over 19,000 in-patient and outpatient cases annually.

situations (Office of the Auditor General of Ontario 2007). The absorption of additional reprocessing tasks from the Women's College Hospital Endoscopy Unit and the Holland Orthopaedic and Arthritic Centre further increased the SRPC workload. As a result, 40% of the SRPC workload was composed of clinic instruments and hardware processing. The ORs also removed seven flash sterilizers, retaining two for emergency use only. Central instrument processing improved patient safety and decreased overall costs, but the increased workload further challenged SRPC.

The Ministry of Health and Long-Term Care directives to reduce wait times for orthopedic, cardiovascular and ophthalmic surgeries required the hospital to increase the number of cases performed per day to meet provincial targets. One way of achieving this objective is to minimize the time between cases. From the perspective of SRPC, this meant reducing cleaning and sterilization turnaround times. Fully booked ORs always need clean instruments right away, but the small washer cycle capacity and 20-minute cleaning cycle times frustrated attempts to process instruments faster. Staff in decontamination rushed to sort instruments and prioritize those needed quickly, while staff on the clean side waited between loads.

Improperly loaded or overloaded baskets would jam the washers. When this happened, the jammed machine had to be shut down and emptied by climbing into the machine and pulling out heavy, loaded wash baskets. A jammed washer always caused delays. Equipment breakdowns worsened rush situations, significantly increasing the amount of handwashing of instruments needed to turn them around quickly. Frequent breakdowns resulted in costly repairs. An understaffed and overloaded SRPC was dealing with rising overtime and depart-

mental costs, and capacity was already a problem.

This case reports on the solution identified and implemented by SRPC and an analysis of the impact of the department's choice on measurable outcomes.

Need for Innovation

In 2007, SRPC began looking for an efficient and cost-effective solution that would not require an increased operating budget and that would fit the space available. Space limitations meant that a new cleaning system could not just simply be added – it would have to replace the existing machines, so small size and high cleaning capacity were critical. Other important criteria included improved worker safety and reduced resource consumption, in compliance with the hospital's environmental sustainability strategy ("Sunnybrook Unveils Energy and Facility Renewal Program" 2009).

As older cleaning technologies use a large amount of water and energy, require a lot of floor space and do not differ substantially from the existing equipment, an innovative technology seemed to provide the best option to meet the SRPC criteria. SHSC fosters a culture of innovation, and within the hospital, the SRPC has been a leading department in developing and adopting best practices and state-of-the-art technologies. The department was a major contributor to provincial *Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings*, a document that has now become a national standard (Ministry of Health and Long-Term Care 2006).

SRPC identified a new technology that best met its criteria for a new washing and disinfection system, and in October 2008, SHSC became the first hospital in North America and the third in the world to install a bank of Getinge 88 Turbo washer/disinfectors. This leading-edge washer/disinfectors resembles a sophisticated dishwasher, uses the tornado principle to clean and disinfect and is paired with an automated basket loading and unloading system, the Air Glide System.

SRPC faced several challenges during the installation of the new system. The room is relatively small, and during construction staff had even less room to move than before. Noise and dust were problems, and keeping clean instruments clean was difficult.

Whereas the old system was mechanical with limited cycle controls, the new washer/disinfectors are highly computerized, requiring staff to select the correct cycle for the instruments or hardware being cleaned. During the first few weeks after installation, SRPC staff felt the new machines were more complicated

than the old ones. Once they adjusted to the change, they found the new system easier to operate. Overall, staff felt the change was positive, and they welcomed the scheduled training sessions.

Analysis of Impacts

Capital investment decisions are complex and must be justified by demonstrating the value of the choice using measurable outcomes. In January 2009, SRPC analyzed the impact of the new system on several measurable outcomes: cleaning capacity, departmental productivity, cleaning quality, effects on occupational health and safety, costs and environmental impact.

Cleaning Capacity

Replacing the existing equipment with a more efficient technology significantly increased the cleaning capacity without increasing staffing levels – SRPC cleaning capacity has quadrupled to 72 trays per hour. The system easily manages the larger workload, with enough capacity to handle major trauma cases effectively and an adequate reserve to deal with the increased demand expected in 2010.

A substantial increase in automated processes and load size ensures that cleaning capacity is available when it is needed, primarily during the day and evening shifts. Approximately 80% of the day's work is completed between 10:00 a.m. and 9:00 p.m. Less maintenance is required, and excellent reliability has reduced the need for loaner equipment. In addition, separate washer/disinfectors allow staff to respond to urgent processing requests rapidly.

Departmental Productivity

Previously, decontamination required four people to presoak, handwash and load the instrument baskets on the dirty side. Increased automation significantly reduced the amount of instrument handling and handwashing, allowing three people to manage the dirty side efficiently, even during peak times. Increased cycle capacity – eight to 12 trays rather than two – increased the processing speed and reduced the number of loads so that staff on the evening shift could be reallocated to the clean side.

The clean side is now busier than the dirty side as the waiting time between loads has decreased. The work reorganization speeds the preparation and packing of instruments. The faster this step can be performed, the faster instruments can be sterilized and case carts stocked and delivered. With the new cleaning system, SRPC reduced the turnaround time for reprocessing stat instruments from three to two hours. Improving the

turnaround time is an important way SRPC can contribute to decreasing the turnover time between cases. The more efficient use of surgical staff time and of ORs and clinic procedure rooms allows the hospital to increase the number of cases performed without increasing the instrument inventory or number of case carts, an additional cost savings.

The new system allows SRPC to process instrument trays and laparoscopy sets from the three new ORs and additional hospital clinics (dental, ophthalmology, otolaryngology and dermatology); this represents an increase of approximately 30% over the previous workload.

Sunnybrook Regional Processing Centre Overview

Several times a day, the Sunnybrook Regional Processing Centre (SRPC) receives dirty instruments, devices and hardware, such as stainless steel bowls and trays, from operating rooms (ORs) and clinics. SRPC decontaminates, washes, disinfects, dries, packs, sterilizes and cools instruments and returns them to the ORs and clinics as fast as possible. A bar-code system ensures delivery to the appropriate OR or clinic. SRPC provides a critical service at the heart of infection control as it ensures that all equipment used on patients is safe and sterile. In other institutions, a sterile processing department provides the same services.

Cleaning Quality

Reduced instrument handling, automated pre-cleaning and a high-flow, low and controlled pressure cleaning process provide excellent cleaning quality, including the cleaning of all the channels in specialty laparoscopy instruments, inside and out. The removal of bacteria, spores, body fluids and contaminants has improved. A monitoring and recording function provides data on cycle cleaning and disinfection performance to ensure compliance with Canadian Standards Association (CSA) and infection control standards. Quality control has improved, and complaints about “sterile dirty” instruments are no longer received.

Effects on Occupational Health and Safety

SRPC staff are trained to work safely around hazards in decontamination, including blood, body fluids, chemicals and sharps, and when lifting heavy objects. Previously, instrument and hardware presoaking routinely exposed workers to hazards. In addition, physically demanding repetitive tasks caused injuries and increased absenteeism, leading to increased overtime costs.

In decontamination, physical tasks included lifting full instrument baskets, weighing 11 kilograms or more, onto the tunnel washer conveyor and pushing them into the chamber. On the clean side, baskets were unloaded and then lifted onto the conveyor returning them to the dirty side. Baskets that jammed

Table 1. Quantities: utilities and chemicals

	Tunnel Washer	Automated System	Increase (Decrease)
Per cycle			
Water (L)	194.6	283.6	89.0
Electricity (kW)	12.0	2.5	(9.5)
Detergents (mL)	310	180	(130)
Lubricant	40	20	(20)
Per tray*			
Water (L)	97.3	23.6	(73.7)
Electricity (kW)	6.0	0.2	(5.8)
Detergents (mL)	155	15	(140)
Lubricant	20	1.7	(18.3)

*Tunnel washer: 2 trays per cycle; automated system: 12 trays per cycle.

Table 2. Operating costs in dollars: utilities, chemicals and presoaking

	Tunnel Washer	Automated System	Savings
Per cycle			
Utilities	3.12	1.75	1.37
Chemicals	1.42	0.93	0.49
Total	4.54	2.68	1.86
Per tray*			
Utilities	1.56	0.15	1.41
Chemicals	0.72	0.08	0.64
Subtotal	2.28	0.23	2.05
Presoaking	0.75	0.18 [†]	0.57
Total	3.03	0.41	2.62

*Tunnel washer: 2 trays per cycle; automated system: 12 trays per cycle.

[†]Based on presoaking 20% of trays.

inside the chamber had to be freed manually by opening heavy doors, leaning or climbing into the washer, removing the baskets and reloading them. The interior of the machines also required regular cleaning by hand, exposing workers to fumes.

The SRPC staff felt that the work was both physically hard and unsafe, and absenteeism was frequent after a few days spent working in decontamination. The physical demands of the job caused turning and twisting injuries, back strain, shoulder and elbow pain and carpal tunnel problems. Injuries resulted in at least five days off work, at a cost of approximately \$1,000. If the injured person's work had to be modified for an additional four to six weeks, costs increased further. From September 1, 2007, to September 30, 2008, SRPC reported six decontamination-related injuries to the Workplace Safety and Insurance Board of Ontario.

Automation has eliminated routine presoaking, and only 5–10% of instruments, such as microsurgery and power instruments, must now be washed by hand, as per manufacturers' recommendations. Automation has also eliminated the need to lift and push heavy baskets and clean the inside of the machine manually, making work on the dirty side safer and far less physically demanding. Noise and heat have also decreased. In fact, staff no longer find working in decontamination difficult. No injuries have been reported since October 30, 2008, and morale has increased.

Costs

A cost-comparison model found the new automated system decreased utility and chemical use (Table 1) and operating costs compared with the tunnel washer (Table 2). Reductions were generated through increased cycle capacity and efficiency; decreased use of water, electricity and chemicals; and automation.

Automated functions reduced the significant labour costs associated with presoaking. In fact, had the old equipment been retained, two additional staff members would have been required to achieve a 30% increase in productivity. Not only has SRPC avoided hiring two extra people, but staff time has been reallocated to the clean side, increasing efficiency. Automation-related savings were calculated using a conservative presoaking reduction from 100 to 20% of all instruments.

The new automated washing and disinfection system has reduced annual SRPC operating costs by \$342,204.19, with \$196,212.89 of this figure saved primarily in the reduced use of utilities and chemicals. Automation and elimination of overtime saved an additional \$145,991.30.

Not included in the model are savings from fewer injuries and less overtime and from eliminating costs associated with equipment downtime and repairs. Reductions in SRPC operating costs have allowed the hospital to channel more money into direct patient care.

Environmental Impact

SHSC has implemented a comprehensive environmental strategy (SHSC 2007). During the past few years, SHSC has adopted several environmental stewardship initiatives to reduce waste and the consumption of energy and water. These initiatives have resulted in cash incentives from its energy supplier and the 2008 Green Toronto Award for water efficiency ("Sunnybrook Unveils Energy and Facility Renewal Program" 2009). The hospital is investing savings from conservation efforts in upgrading patient care infrastructure.

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Since installing the new automated cleaning system, SRPC has substantially reduced water consumption by approximately 7.7 million litres annually, and electricity consumption by 9.5 kW per cycle. SRPC is committed to sustainability initiatives and resource conservation.

Discussion

SRPC is now implementing a real-time paperless tracking system for the washer/disinfectors, sterilizers and other equipment. The tracker uses a bar-code system to record the route of all instruments through SRPC to their destinations, information that is important for infection control and patient safety. The bar-code system can also generate instrument processing costs by clinic, and an electronic module incorporates quality assurance functions for the steam sterilizers.

This initial analysis has demonstrated several benefits accruing from the installation of an automated washing and disinfection system, including substantially increased cleaning capacity, increased departmental productivity with elimination of overtime and better use of staff time, excellent cleaning quality, decreased operating costs, reduced resource use, improved worker safety and increased staff morale. The investment in a new system will provide additional benefits in the future. Reserve capacity is adequate to handle the anticipated increase in demand in 2010. In fact, instrument-processing volume would have to double before additional equipment would be required. The elimination of most of the presoaking allowed two sinks to be removed from the decontamination area. The resulting space can be reconfigured for other uses.

Key Learnings

Before implementing a cost-saving new technology, it is helpful to decide how the savings will be used. Targeting a specific clinical area allows the institution to monitor improvements in

the selected service and department staff to see their contribution to improving patient care.

In this case, reduced presoaking allowed a reorganization of the work in SRPC to increase productivity, reduce turnaround time for stat instruments and reduce overtime. Utility savings were absorbed into the hospital budget and applied to patient care.

After installing new equipment, follow-up analysis is necessary to verify system performance and to quantify outcomes. This case study demonstrates that innovative technology may provide solutions to both typical management challenges, such as reducing costs, and emerging challenges, such as meeting targets for resource conservation. **HQ**

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References

- Ministry of Health and Long-Term Care, Public Health Division, Provincial Infectious Diseases Advisory Committee. 2006. *Best Practices for Cleaning, Disinfection and Sterilization in All Health Care Settings*. Toronto, ON: Author. Retrieved March 1, 2009. <<http://www.health.gov.on.ca>>.
- Office of the Auditor General of Ontario. 2007. *2007 Annual Report*. Toronto, ON: Author. Retrieved March 1, 2009. <<http://www.auditor.on.ca>>.
- Sunnybrook Health Sciences Centre. 2007. "Sunnybrook a Leader in Environmental Stewardship." *Sunnybrook News* 3(10). Retrieved March 1, 2009. <<http://www.sunnybrook.ca>>.
- "Sunnybrook Unveils Energy and Facility Renewal Program." 2009. *Energy Management Magazine*. Retrieved March 1, 2009. <<http://www.energymanagementcanada.com/index.php/News/Sunnybrook-unveils-energy-and-facility-renewal-program.html>>.

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