Allina Hospitals and Clinics reduce hazardous waste

Allina hospital and clinics hosted a summer intern to evaluate the use of hazardous chemicals in the maintenance department.

Allina Hospitals and Clinics based in Minneapolis, Minnesota, offers a full range of primary and specialty healthcare services. The healthcare system consists of 11 hospitals, 42 medical clinics, 23 hospital-based clinics, 12 community pharmacies, and three ambulatory care centers. This project was conducted at one of Allina's clinics and two of its hospitals.

Incentives/Motivation

Allina's industrial hygiene and safety staff track employees' chemical burn injuries. Through data analysis they discovered that 60% of incidents occurred in the housekeeping and maintenance departments. In the maintenance department, hazardous chemicals such as acids and caustics are often used for cleaning and repairs. The maintenance staff was using ethylene glycol as antifreeze in the air handling units, sodium hydroxide for cleaning air handler coils, and acid cleaners for ice machine upkeep. These chemicals are often considered hazardous waste at the point of disposal, resulting in significant compliance and disposal costs. Therefore, reducing their use would not only improve safety, but could reduce disposal and compliance costs as well.

To help reduce the amount of hazardous chemical used, Allina requested MnTAP assistance through the intern program. The intern worked with a MnTAP and Allina staff members to identify product and procedure changes that could be implemented to reduce waste, the impact on the environment, and employee exposure to toxic chemicals.

Benefits Overview

Waste Reduction Option	Waste Reduced/ Materials Savings	Annual Cost Savings
Reduce ethylene glycol by blowing out cooling coils in air handling units.	1,100 gallons ethylene glycol	$8,874
Cleaning ice machines in-situ.	6 gallons of 75% phosphoric acid	$823
Replace sodium hydroxide cleaner with Koil Klenz in air handler coil cleaning process.	17 gallons sodium hydroxide cleaner	$923

A MnTAP intern evaluated hazardous chemicals used in several maintenance procedures for Allina Clinics and Hospitals

Process Descriptions and Recommendations

Air Handling Unit Winterization

During summer months, water is used as a coolant in the air handling units. However, as winter nears, any residual water in the air handling coils must be freeze-protected by either adding an antifreeze solution or draining the coils completely. Due to the shape and length of the coils, it is nearly impossible to adequately drain them by using gravity. Additionally, it is not possible to gauge the extent to which the coils have been drained. If water is not able to be drained completely, the coils can crack when temperatures reach freezing. Therefore, the valves are closed around the air handling units and an antifreeze solution, ethylene glycol, is added to the coils for freeze protection.

The spill potential and subsequent employee exposure associated with moving of 1,100 gallons ethylene glycol, the equivalent of 20-55 gallon drums, through the facility was a concern. If a spill were to happen, inhalation and eye/skin exposures could lead to irritation, headache, and nausea among staff members.

The MnTAP intern investigated two options for reducing antifreeze use: wet storage, which is leaving the antifreeze in the handlers year round, or draining and blowing out the water with warm air to ensure the coils are dry. Both of these options

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can minimize the use of antifreeze, thereby limiting employee exposure to ethylene glycol. Upon further analysis and testing, the intern determined that for most of the air handlers, maintenance staff members can dry the coils with warm air, a process that eliminated most of the antifreeze use. By implementing this procedure, Allina reduced 1,100 gallons of antifreeze and saved nearly $9,000.

Air Handler Coil Cleaning

To maintain the heat transfer efficiency in the air handler coils, dirt and debris that accumulates over time must be removed from the coils. At Allina's facilities, coils are cleaned at least twice annually and more frequently during seasons with higher organic matter in the air, such as cottonwood seeds in mid-summer.

Prior to the intern project, Allina was using a sodium hydroxide cleaner with a pH of 13 and was diluted to a pH of 12 by maintenance employees on-site prior to use. Sodium hydroxide poses an exposure risk for staff members and can be associated with skin and eye burns, blindness, and corneal damage. During the cleaning process, the sodium hydroxide solution would run down the coils onto the ground, increasing the risk for employee exposure.

The MnTAP intern researched and tested substitutes for the sodium hydroxide solution. Koil Klenz, a heavy duty non-acid coil cleaner,with a neutral pH, is less hazardous to employees, and when tested on the air handler coils, it was found to be effective. By making this switch, Allina was able to reduce its use of sodium hydroxide by 17 gallons/year, save almost $1,000 in purchasing costs, and reduce risk-costs of employee exposure.

Ice Machine Maintenance

In ice machines as water freezes into ice scale can form from minerals in the water and deposits onto the machine. Over time these deposits can reduce efficiency and cause ice to stick in the ice-making chamber. The degree of scaling is dependent on local water conditions and pre-treatment of the water into the machine. For cleanliness and infection prevention, ice machines must be sanitized and de-scaled on a regular basis. Since the interior liner of the bin is in direct contact with ice, the ice machine manual recommends sanitizing the bin once a month. The manual also recommends removing scale a minimum of twice per year, but acknowledges that the frequency of de-scaling may be reduced by proper water filtration. Allina has installed in-line water filters to minimize scale-causing minerals from entering the machine.

When the ice machines need to be cleaned, they are either cleaned in place or moved to a maintenance area. Machines that are cleaned in place are first emptied and parts of the machine are removed. Then, the interior bin is wiped down. Prior to the intern project, this was done with a 10% bleach solution to sanitize. Then a solution of phosphoric acid cleaner and water was circulated throughout the machine for descaling.

When ice machines are taken to a maintenance area, they are taken apart; appropriate parts are cleaned and descaled by soaking in a solution of phosphoric acid cleaner and water. Prior to the intern project, Allina had no standard procedure for cleaning including a specific dilution of the acid used. Additionally, sanitizing with bleach was not done routinely.

The phosphoric acid cleaner used previously contained 75% phosphoric acid with a very low pH. Employee exposure to this chemical is a concern as splashes to the eye could lead to redness, pain, blurred vision, eye burns, and permanent eye damage. Skin contact may cause similar injury along with severe skin burns.

The intern worked with Allina maintenance staff members to develop a new protocol that calls for cleaning all machines in place, using a diluter for the acid cleaner, and substituting a hydrogen peroxide sanitizer for the bleach. This procedure was implemented and limited the use of the acid cleaner. However, infection prevention staff did not approve the hydrogen peroxide substitute for bleach. These changes resulted in cost savings of nearly $1,000 in chemical and potential exposure costs.

Benefit summary

All of the replacement chemical solutions were tested by the maintenance staff members and found to clean and maintain the various equipment at acceptable or comparable levels. Implementing these suggestions eliminated 1,000 gallons of ethylene glycol and saved almost $9,000 in purchase and disposal costs. Cleaning the ice machines in place eliminated six gallons of phosphoric acid. Additionally, the new solutions minimized employee exposure to chemicals and potential splash and burn injuries at an estimated cost savings of $2,500 annually.

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For More Information

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that maximize resource efficiency, prevent pollution, increase energy efficiency, and reduce costs. Our information resources are available online at <mntap.umn.edu>. Please call MnTAP at 612.624.1300 or 800.247.0015 for personal assistance or more information about MnTAP's Intern Program.

This project was conducted in 2005 by MnTAP intern Lara Michel a junior in chemical engineering at the University of Minnesota.