Nicor Gas Energy Efficiency Emerging Technology Program

1005: Ozone Laundry

Public Project Report – Executive Summary

November 11, 2013

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Full Report

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Executive Summary

Introduction

The Nicor Gas Emerging Technology Program (ETP), a part of the utility's ongoing energySMART Energy Efficiency Program (EEP), assesses new or underutilized technologies that have the potential to provide natural gas savings for the 2.2 million Nicor Gas customers in Northern Illinois. The Gas Technology Institute (GTI) implements the ETP for Nicor Gas. This report summarizes the findings from an evaluation of an ozone laundry system and its potential to provide a new energy efficiency measure to Nicor Gas commercial customers.

Background

Ozone laundry systems provide a great opportunity for natural gas savings as well as water savings. Ozone laundry saves gas by reducing hot water use during the wash cycle of commercial washing machines. Standard washing machines use hot water with detergents and bleach to clean laundered items by removing deposits and killing microorganisms. Ozone is a powerful oxidant and, when injected into the washing cycle, decomposes substances and kills 99.5% of viruses and bacteria compared to 97.5% with standard washing techniques. Savings are realized by reprogramming the washing machine to use less hot water and more cold water which is injected with ozone. Less water is needed overall in addition to less hot water being heated with natural gas by a water heater or boiler.

This technology can be applied to any commercial laundry washing machines that are programmable. This allows the machines to be programmed for less hot water use with the addition of ozone. The primary markets are expected to be in hospitality, healthcare (nursing homes, hospitals, etc.) and prisons. Other utilities such as PG&E have demonstrated the technology and shown significant energy savings with payback periods under a year. The Nicor Gas Energy Efficiency Program (EEP) has already had a limited number of applications of ozone laundry through the Business Custom incentive program in three nursing homes and a hotel. The Nicor Gas Emerging Technology Program (ETP) assessed ozone technology in two hotel applications – hotel #1 and hotel #2 - with more extensive monitoring in an attempt to move this measure into a broader, more prescriptive program role. Two different ozone companies were used by the hotels, referred to hereafter as manufacturer A and manufacturer B.

Results

ETP monitored two test sites, one larger hotel with 156 rooms (hotel #1) and one smaller hotel with 135 rooms (hotel #2) at two locations shown in Table 2. Cold and hot water use were recorded, along with hot and cold water temperatures, and electric use of the washer and ozone system. The gas and electric usage of the dryer was monitored along with the number of dryer cycles. The data was collected by a Logic Beach data logger which recorded data every five minutes. Data was remotely accessible via a cell modem which downloaded the data as well as allowed for real-time data monitoring of the sensors. One month of baseline monitoring was conducted prior

to the installation of the ozone system and three months of monitoring was conducted after the ozone installation. A financial incentive of $0.50/therm savings was offered to sites to participate in the project on top of the Business Custom incentive offered through Nicor Gas's Energy Efficiency Program which offered $0.75/therm savings, capped at 65% of the project cost with both incentives combined.

The ozone system at hotel #1 was monitored from February to May 2013 and was supplied by Manufacturer A. The system saved 2,251 therms of gas annually or 88% of the gas used for laundry hot water. In addition to gas savings, ozone systems have been known to save overall water use, but this site actually used 10,665 gallons of additional water. In addition, the washing machines combined with the ozone machine to use 1,593 kWh of additional electric annually. The ozone machine used 517 kWh annually and the washing machines used additional electric per load after the ozone installation. GTI does not know the exact cause of this but believes it is most likely due to the reprogramming of the washers. When an ozone system is installed, the washer must be reprogrammed for each type of cycle to use less hot water and more cold water, along with less water overall. GTI believes the most likely reason Site #1 used additional water was an error in the reprogramming of the washers. In addition, if shorter cycles are used in the reprogramming it will result in a reduction of the electric usage. Site #1 most likely saw an increase in electric usage because shorter cycles were not used in the reprogramming of the washers. The usage overall translates to annual operating savings of $1,491 and an initial cost of $10,688 resulting in an annual payback of 7.17 years. With the Nicor Gas Custom Business program and ETP incentives the simple payback period would be reduced to 5.28 years. The results from this study combined with previous custom program studies on ozone led to a prescriptive rebate of $25/lb capacity that went into effect on June 1, 2013. With that new program this site would have qualified for a $5,000 rebate which would have changed the payback period to 3.82 years.

The ozone system at hotel #2 was monitored from March to June 2013 and was supplied by Manufacturer B. The system saved 3,033 therms annually, or 70% of the gas used for laundry hot water was being saved. In addition to gas savings, ozone systems have been known to save on water use, and this site did save 187,560 gallons of water annually. The ozone did cause the washers to use slightly less electricity (probably due to shorter cycles), but the ozone machine itself used 988 kWh annually. This led to 697 kWh annually of additional electric use overall for the complete system. This translates to annual savings of $2,959 and, with an initial cost of $10,838, results in a simple payback period of 3.66 years. With the Nicor Gas Custom Business program and ETP incentives the payback period would be 2.38 years. As mentioned above the results from this study combined with previous custom program studies on ozone led to a prescriptive rebate of $25/lb capacity that went into effect on June 1, 2013. With that new program this site would have qualified for a $3,500 rebate which would have changed the payback period to 2.48 years.

The results for both hotel sites are summarized in Table 1.

Table 1. Summary of Results by Pilot Site

	Hotel #1	Hotel #2
Manufacturer	A	B
Ozone Annual Hot water Savings (Therms)	2,251	3,033
Ozone Annual Electric Savings (kWh)	-1,593	-697
Ozone Annual Water Savings (Gallons)	-10,665	187,560
Ozone System Installed Cost	$10,688	$10,838
Annual Therm Savings	$1,693	$2,280
Annual Electric Savings	-$120	-$52
Annual Water Savings	-$82	$731
Total Annual Savings	$1,491	$2,959
Payback Period (Years)	7.17	3.66
Nicor Gas Custom Incentive ($0.75/therm saved)	$1,689	$2,275
Nicor Gas ETP Incentive ($0.50/therm saved)	$1,127	$1,517
Payback period after incentive (Years)	5.28	2.38
New Prescriptive Measure Rebate($25/lb capacity)	$5,000	$3,500
Payback Period with Prescriptive (Years)	3.82	2.48