Nicor Gas Emerging Technology Program

1069: Moisture Sensor Retrofit

Public Project Report

May 1, 2017

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Full Report

The following executive summary is made publicly available by Nicor Gas as part of their Emerging Technology Program (ETP). The detailed Nicor Gas ETP report is available to qualified state and utility run energy efficiency programs upon request. Please contact the Nicor Gas ETP administrator at NicorGasETP@gastechnology.org to find out how to access the full report.

Background

Moisture sensors have been widely applied by manufacturers for years as a factory installed feature in residential dryers to determine when the load is dry and shut off the dryer before additional energy is wasted. Some new commercial dryers offer moisture sensors, but many new models still do not. Those that include moisture sensors are often operated in a timed dry mode, which does not utilize the moisture sensor and thus misses the energy savings opportunity offered by the moisture sensor technology. The moisture control dryer retrofit technology that was tested by ETP would work even when in a timed dry mode and could be applied to those dryers that already have a moisture sensor that is not being utilized.

There are a substantial number of commercial dryers currently installed in Nicor Gas service territory that could benefit from a retrofit moisture sensor kit to determine when the load is dry and stop the cycle before additional energy is wasted. GTI estimates an initial market of around *1,800 commercial dryers* in hospitality, healthcare, dry cleaning and laundromat applications alone that could benefit from this technology in Nicor Gas service territory.

Results

Table 1 summarizes the pilot results for the four dryers that had just the moisture sensor installed. Table 2 summarizes results for the three dryers that had both the moisture sensor and modulating valve technology installed. The savings with both technologies running together are compared to a baseline with just the modulating technology running.

GTI conducted both long-term monitoring with at least two months in baseline and three months in technology monitoring modes, and a one-time standard load test where GTI dried the same load with the moisture sensor off and then again with it on. The measured energy savings of the tested moisture sensor in long-term monitoring was 460 therms (17.1%) of natural gas and 410 kWh (15.1%) of electricity per dryer. This results in a 1.37 year payback at $0.71 per therm and $0.089 per kWh on the $499 installed cost of the technology. The measured energy savings in a single point standard load test was 180 therms (6.7%) of natural gas and 175 kWh (6.4%) of electricity.

Table 1: Only Moisture Sensor Results

	Long-Term Monitoring	Standard Load Test
Average Annual Gas Savings	460 therms	180 therms
% Annual Gas Savings	17.1%	6.7%
Average Annual Electric Savings	410 kWh	175 kWh
% Annual Electric Savings	15.1%	6.4%
Annual Cost Savings	$363	$143
Payback Period	1.37 years	3.48 years

Table 2: Moisture Sensor and Modulating Valve Results

	Long-Term Monitoring	Standard Load Test
Average Annual Gas Savings	-445 therms	-885 therms
% Annual Gas Savings	-16.1%	-31.9%
Average Annual Electric Savings	-304 kWh	-1,116 kWh
% Annual Electric Savings	-10.5%	-38.4%
Annual Cost Savings	($343)	($728)
Payback Period	N/A	N/A

The long-term monitoring is believed to be the most accurate measurement. The standard load test is a single load of laundry dried both with the moisture sensor in place and in baseline mode. In other words, it reflects only a single data point, rather than the robustness of a larger dataset. That test load can have either a little or a lot of energy wasted depending on the size and type of load. It is not a good representation of the overall potential savings across all loads dried.

It is very clear from the data that the moisture sensor and modulating drying valve do not work well together. The result is increased energy use. The modulating valve caused the dryer heat to cycle off a lot less frequently as it dropped to low firing rate. This led the moisture sensor to not see as many heat cycles or be able to determine when the clothes were dry. In addition, when setting up the moisture sensor the dryer programming is changed to a longer base run time to eliminate loads stopping that were not dry with the dryer previously [the tested technology stops the dryer when the load is dry; the dryer does not run for the full base run time.] If the moisture sensor is working properly this will eliminate nuisance re-runs of loads that are not completely dry. However, with the moisture sensor not operating properly, due to the presence of the modulating technology, it leads to increased drying and energy usage compared to baseline. Both technologies working together results in an increase in energy use of over 30%. For these two technologies to work together the moisture sensor control scheme would need to be modified to work with the lower cycling rates that occur with a modulating valve.