COMMERCE DEPARTMENT
DIVISION OF ENERGY RESOURCES

Commercial dryer retrofit technologies can improve efficiency

Commercial gas dryer technology has not changed much over the last several decades. There is not even an efficiency test standard for commercial dryers at this point, although California is currently looking at the possibility. While the majority of residential gas-fired dryers have moisture sensors, only a select few commercial models are sold with moisture sensors. In addition, dryers with modulating capabilities are more common within the largest industrial class of dryers (250 lbs. capacity or greater), but this functionality has generally not been brought into commercially sized dryers.

Even if high-efficient commercial dryer replacement options existed, it is often difficult for facilities to approve the expensive purchase of a new dryer. Instead, older dryers are more likely to be repaired than replaced. As a result, it is a lot less expensive and more opportune to retrofit an existing commercial dryer with new technologies to improve the efficiency.

The Gas Technology Institute (GTI) estimates that there are over 10,000 inefficient gas commercial dryers installed in Minnesota that could benefit from the installation of a retrofit moister sensor (MS) and/or modulating valve (MV). This CARD project set out to investigate the potential of these two technologies in a field demonstration. The objective was to determine the energy savings and payback period for the modulating dryer technology, the moisture sensor technology, and both operating together across a variety of test sites and dryer sizes. The final goal was to work with partner utility CenterPoint Energy to use the data to create a prescriptive rebate for the advanced dryer technologies.

Retrofit Technologies

Figure 1 and Figure 2 respectively show an MS and an MV that can be installed as a retrofit on dryers already in the field. The Self Propelled Scientific DrySmart MS (installed for $200-$500 per dryer) saves gas and electricity by determining when the load is done and stopping the dryer before the load is over dried and more energy is wasted. The Bio-Therm MV technology (installed for $525 per dryer) saves energy throughout the drying cycle by reducing the firing rate around a flue temperature sensor when less heat is needed. This wastes less heat out the flue and improves the dryer efficiency. Both of these retrofit technologies were only available from these manufacturers at the time of this study.

Figure 1. Retrofit Technologies-Self Propelled Scientific DrySmart Moisture Sensor

Figure 2: EZ Efficiency Bio Therm Modulating Valve

Dryer Field Demonstration

The target market for these new technologies is the commercial sector, specifically laundromats, dry cleaners, and hospitality and healthcare facilities. Additionally, any other facilities with on-premise laundry (OPL) may be a suitable fit, such as gyms, universities, or even multifamily housing. These facilities often have commercial dryers sized between 30 and 250 lbs.

GTI installed monitoring equipment and the retrofit technologies at six field test sites and 12 dryers. Pilot sites included four dryers at two hotels (Figure 3), two dryers at one healthcare facility, one dryer at one university, one dryer at one dry cleaner, and four dryers at one laundromat (Figure 4). The MV technology was installed on all 12 dryers; the MS technology was only installed on the four laundromat dryers.

Figure 3: Laundry room from one of the two hotels in the study

Figure 4: Laundromat from the study

GTI conducted monitoring for at least two months in four phases: baseline, MV, MS, and both MV and MS together. In addition, GTI conducted a standard load test at each site where the dryers were operated in baseline, MV, MS, and both modes together drying the exact same load of laundry.

The long-term test results are provided in Table 1. The results were similar for the standard testing. The MV and MS were operated without additional run time programming for the long-term testing, which resulted in energy savings. Overall, both technologies worked well on their own, but not a lot of additional savings were seen when the two technologies were operated together. This was because the MS had difficulty recognizing the end of a cycle with the dryer having an MV in place. In addition, for laundromats the MS had small savings because it cannot stop the load early but only run the burners less frequently since customers pay for a given drying time. The MS was only tested on two OPL dryers, but when combined with results from dryers tested in the Chicago area under a separate project, savings in the 20% range can be expected.

Table 1: Long Term Test Results

	% Gas Savings	Annual Savings (Therm)	% Electric Savings	Annual Savings (kWh)	Cost Savings	Payback (Years)
Modulating Valve (12 dryers)	12.3%	161	0	0	$101.73	5.16

	% Gas Savings	Annual Savings (Therm)	% Electric Savings	Annual Savings (kWh)	Cost Savings	Payback (Years)
Moisture sensor – Laundromats (4 dryers)	2.5%	28	0	0	$17.75	11.26
Moisture Sensor – OPL (2 dryers)	30.9%	552	42.5%	560	$403.20	1.24
MV&MS – Laundromats (4 dryers)	14.3%	160	0	0	$101.01	7.18
MV&MS – OPL (2 dryers)	19.2%	303	18.0%	236	$213.94	4.79

The MV savings were consistently in the 12-15% range for long-term, standard testing and for a separate study in the Chicago area. This demo showed an average of 161 therms saved across 12 dryers, but several sites and dryers had much lower usage than previous testing in the Chicago area, and GTI would expect that same savings percentage to equate to 300-350 therms on average for most sites.

Potential state impact

According to census data, there are 3,315 nursing and residential healthcare facilities, 860 hotels and motels (excluding casino hotels), 209 non-coin operated dry cleaning and laundry services, and 98 coin operated laundry services in the state of Minnesota. It is conservatively assumed that two dryers are located at each facility with the exception of laundromats, which are assumed to have 16 dryers each. This results in 10,336 dryers in Minnesota that could benefit from these technologies.

Table 2 provides an estimate of the annual savings potential of these dryer technologies with varying annual gas savings and adoption rates across the state. A Chicago area study of 11 dryers using the MV technology produced 333 therms on average, and the Chicago study of the MS at four OPL locations showed 460 therms of savings on average. Based on all of the studies, GTI believes annual savings in the 300-350 therm range is a good estimate for these technologies, which would translate to 1.2-1.5 million therms saved in Minnesota with a 40% adoption rate.

Table 2: Estimated Annual Therm Savings across the State

Annual Therms Saved Across the State of MN						
		Adoption Rate				
		10%	20%	40%	60%	80%
Annual Gas Savings (Therms)	50	51,680	103,360	206,720	310,080	413,440
	100	103,360	206,720	413,440	620,160	826,880
	150	155,040	310,080	620,160	930,240	1,240,320
	200	206,720	413,440	826,880	1,240,320	1,653,760
	250	258,400	516,800	1,033,600	1,550,400	2,067,200
	300	310,080	620,160	1,240,320	1,860,480	2,480,640
	350	361,760	723,520	1,447,040	2,170,560	2,894,080
	400	413,440	826,880	1,653,760	2,480,640	3,307,520
	450	465,120	930,240	1,860,480	2,790,720	3,720,960
	500	516,800	1,033,600	2,067,200	3,100,800	4,134,400

550	568,480	1,136,960	2,273,920	3,410,880	4,547,840
600	620,160	1,240,320	2,480,640	3,720,960	4,961,280

Recommended next steps

- Offer a prescriptive rebate on the technologies in Minnesota. A prescriptive rebate is already available on the MV technology in Illinois based on findings in the Chicago area.
- Additional data with the MS on OPL dryers would be helpful. This additional data could possibly be gathered as part of early rebated installations under CIP.
- Additional work could be done by the MS company to see if it can recognize the end of a cycle with the dryer having an MV in place. If they are able to develop a unit that could be installed with the modulating dryer without causing issues, then the two have the potential to save even greater annual gas totals.

Detailed results are available in the final report, Advanced Commercial Clothes Dryer Technologies Field Test. For more information, contact project manager Anthony Fryer or CARD program administrator Mary Sue Lobenstein.