E3T Energy Efficiency Emerging Technologies

Washington State University Extension Energy Program

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EMERGING TECHNOLOGIES SHOWCASE WEBINAR:

HEAT PUMP CLOTHES DRYERS – WILL LIFE EVER BE THE SAME?

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Question and Answer session

Q: Is there some factor associated with the compact that makes it necessarily more efficient than standard size? Could the excellent performance from the compact HP unit be achieved in a standard size?

A: One factor is that putting more clothing in a drum creates more contact. I don't have any research to base that on other than the general physics of it and my background knowledge. The answer to the question "could excellent performance of a compact be achieved in a standard" is yes. We're testing the Blomberg unit with 4 lb, 8 lb, and 16 lb loads. The efficiency range is still really good when the drum is filled more, even at the 4 lb load, which is a pretty small load even for the Blomberg. Efficiency didn't have much impact on size. The opportunity for full size to achieve the same efficiency is certainly there. A lot of the technological gains that Blomberg achieved could be applied to a full size product.

Q: Concerning the issue of a full load being measured by weight or volume – is a large heavy load not necessarily a full load?

A: A full load is measured by weight, not volume. Very heavy clothing might actually not look like it's filling the drum, but weight-wise it might be full. These machines are only designed to carry 8 kg (about 20 lbs) of clothing. It's easy to have wet heavy jeans in one of these machines if the spin cycle of the washer doesn't spin well. Yet the drum wouldn't necessarily be full. It can be quite full in a compact design, though, if you put 16 or 17 lbs of clothing in it.

Q: What about inverter driven units?

A: At present, the Blomberg is the only one I'm aware of that's inverter driven. I don't know if the compressor is actually inverter driven. The drum rotation is variable speed. It can stop and reverse and do a variety of things. Actually changing the compressor speed is not all that relevant because the operation you really want out of the heat pump is to run it at peak operating conditions delivering as much dehumidification as possible for the full cycle. It's kind of a constant output device but with a little bit of modulation to get the airflow across it. The variable would be the airflow, not the compressor size.

Q: You mentioned rebates. Are there any incentives set forth with these new results and tier models? If not, when do you expect to have it finalized? Will there be a NEEA manufacturer rebate?

A: Yes is the answer to all of those. On the East coast there are a few utilities that are currently offering incentives for energy star and the hybrid model. Our approach here at NEEA is to provide manufacturer support for their rebates. It's a manufacturer-branded rebate at this point. They're trying to establish their brand position. We don't want to interfere with our utilities introducing their own branded customer-facing incentives. At present we have support for a manufacturer-branded rebate for Whirlpool, and one is under negotiation with LG and with Blomberg.

Q: We heard rumors about wrinkly clothes coming out of heat pump dryers. Is this true and is it an issue?

A: I have not heard of this. In our early investigation of field testing the LG (10 units in 10 homes running 20 loads each), there were no customers responses about getting wrinkly clothing. I don't know for sure, but it doesn't appear to be the case to me.

Q: Why is the Blomberg dryer so much more efficient?

A: The Blomberg unit is a seventh generation pure heat pump. Blomberg is not a small company, they're owned by Arcelik, based in Turkey. Blomberg, which is a German line, has been around since the 1800s. They produce 10,000 heat pump dryers per day. They run their US product line for just a couple of days out of the entire year. The product has such high efficiency because they have sorted out how to get the most out of their heat pump. Their heat pump is able to drive the condenser temperature down very low. They're able to extract a lot of moisture out of the air stream. They can operate their condenser at 25 degrees F. It's a very efficient dehumidification system with a variable speed fan so they can modulate the air flow across it and make sure the coil is wet all the time. One thing that is surprising is that they will periodically stop and reverse the drum direction just to disturb and shake up the clothing. It's a pretty sophisticated machine.

Q: Someone at Energy Trust has put NEEA's savings and costs into their cost effectiveness calculator and found BCRs much less than NEEA reports. All tiers are less than 0.7 with our calculator. Can you comment on this?

A: The cost effectiveness that we show in the presentation is what the RTF uses following the NW Power Planning Council's numbers. I don't actually know what the assumed value is per kilowatt hour. I assume that the ETO and the Council use the same cost increment. The net present value of the energy might be different between the two utilities. NEEA's role is not so much to define what is cost effective or not. We're here to make sure we get really good estimates of the energy and the incremental costs. Each individual utility will have to address their particular market and their particular business situation for what is cost effective. These incremental costs are a bit of a squirrely game, though, because many of these products come with a feature set that is different. The value proposition to the consumer is not solely on energy. The impact on clothing may affect pricing. For example, European products have a designation that's like a shrinkage reduction designation. That might be the whole reason it's selling at a premium price and has nothing to do with energy.

Q: Are any of the current products ventless?

A: Yes. The LG hybrid unit is vented and it's the only heat pump that I'm aware of that is actually vented. The Whirlpool is based on their German line. It is a ventless system and it is full scale, full size, and completely reengineered for the US market. The Blomberg unit is also ventless. Both the Whirlpool and Blomberg units (the LG as well) have a small tube that goes from the condenser up to the drain. They may vent air or not but they all vent and drain water. That's something we found in the seal test. Not all installers are expecting to have to hook up a hose, a drain hose, for a dryer. We've had a couple of scenarios where it wasn't done properly or wasn't done at all and the dryer ends up piddling on the floor for a while until they figure it out.

Q: Which retailers are selling hybrids now?

A: Albert Lee has them in their showroom. I think also Standard TV and Appliance in the Northwest. There are quite a few on the East coast that are now doing that. They are all independent retailers. They are not the four primary big box retailers. The big box retailers, apparently at this moment in July 2015, are doing online sales. They're actually selling quite a bit considering there is no showroom for the products, which is rather surprising.

Q: Are six tiers too many?

A: Six tiers are a lot. The principle reason why we're laying out six tiers is that at each increment it's a rational step from conventional to energy star. They all have about the same amount of incremental savings. We're laying out a roadmap so that manufacturers can see that as they progress and develop their technology, and there is opportunity to continue to work with utilities. Having six tiers is more about conveying the business proposition to the manufacturers. Consumers will only know if it's on the qualifying list and the amount that they'll save. A consumer is not expected to pay much attention to the difference between a tier 1 and tier 2. Nor would the manufacturers. They're more interested in what it's worth to the utility. I don't feel bothered by the fact that we have many tiers though it is a little break from convention.

Q: How loud are these compared to standard dryers?

A: We initially wanted to set a sound limit so we explored having 65 decibels or less as a threshold. That's how noisy the clothes washer is. The dryers are comparable in noise to a clothes washer at its loudest. It does have a different tone though. A couple of people have noticed that the sound of a compressor droning is different, and while some people have complained about that, others haven't said anything. There may need to be some consumer awareness value about letting people know that it will make a different noise than they're used to. It won't be any louder though.

Q: Is the Blomberg unit's level of efficiency indicative of the efficiency levels of heat pump dryers? Or is it an outlier, and we should expect efficiencies closer to the other units?

A: That's a good question. My level of understanding of the European product is that it's the top tier. It's the A++ European product line. There are A++ products from all major manufacturers in Europe so it's in the top efficiency class, but not a radical outlier. For its price point though, it is actually quite efficient. I showed data earlier of the LG and Samsung achieving a price point of about $1000 US. For that same amount or nearly the same amount, it would fall into tier 5, in my current estimation.

Q: Can you comment on the interactive effects of heat pump clothes dryers with HVAC?

A: The RTF did a good investigation of when ventless systems would contribute to space heating and when they would impact cooling. We're only talking about a 100 cfm airflow difference between vented and ventless and only operating for 300 hours a year. It's not a huge impact. If you close the vent off in a normal conventional dryer, and that much moisture is added into your house, it would be problematic. That's why conventional dryers are vented. For a heat pump clothes dryer, however, it would be a substantial amount of energy. The interaction, on a simplistic level, has regionally been evaluated as to the equivalent of about 6% of the dryer's energy use offsetting space heating and cooling loads. A ventless heat pump dryer used for 1000 kW hours, would offset about 60-80 additional kW hours on a regional average. That includes space heating systems of gas and heat pumps and electric resistance. In an electric resistance heated house, the savings would be substantially larger, potentially on the order of 500 kW hours, which are higher savings of the space heating than you get off of the machine itself.

Q: Related to that, are there any other advantages or disadvantages to the capability of the ventless options in regard to the indoor environment?

A: Ventless dryers can be located anywhere in the building. You just need to have a drainpipe routed to a sink or a drain of some kind. That can create a benefit for some designs. Not having a vent in a multifamily could potentially be a pretty good value because normally multifamily machines need to have their vents cleaned out annually for safety. Even in a single family house, there is some risk of fire if a dryer system gets clogged with lint. There are about a dozen deaths that are directly attributable every year in the US because of fires started from lint in the clothes dryer. This is a pretty contentious issue so I don't want to step too heavily into it. UL requires a test procedure to show that they can handle significant exposure to flame and fire and smoke. That's the principle reason why manufacturers of European products haven't shown up more in the U.S. The U.S. and Europe do not have the same fire tests because they don't have a heating element that gets very hot. The heat pump doesn't generate temperatures capable of igniting whereas a gas or electric resistance clearly can get hot enough to ignite lint. I should point out that the ventless do have two lint screens – one in the drum and one external on the base of the machine that have to be periodically cleared. That's to keep the condenser and evaporator coils clean of lint. That lint screen isn't exposed to any particular heat but it does need to be cleaned.

Q: You talked about the multifamily market. Has there been any drive to marketing heat pump dryers to the multifamily market? It seems that higher usage would lead to higher savings and better BCR.

A: We have not attempted to market anything. We were exploring the receptiveness. And it seems that the multifamily market is actually quite interested. Multifamily is the primary beachhead market with which Blomberg is seeking to establish itself. The average US household size is only 2.6 people. In multifamily it's probably less, especially in high-end condos and small apartment buildings where these dryers would make a lot of rational sense. In this case we would probably change the basis of an average 2300 lbs per year of drying to a lesser amount. With large family households, the savings would be considerably more. We haven't finetuned the BCR based on how many people are in the household, but that's a possibility.