CLOSE THAT DOOR

When it comes to controlling snow melt systems, the goal is to optimize the inherent inefficiencies to the best of your abilities.

BY CURTIS BENNETT

PHOTO: LOST IN THE MIDWEST/ADOBE STOCK

Sensors in snow melt systems can detect snow or ice on the pavement and trigger the process.

I can still hear my parents yelling at me in the winter: "Close the door, we are not trying to heat the whole world." And I'm sure many of you have heard something similar at some point in your lives.

I spent my childhood in rural Alberta where we would have "No School Days" because it was so cold outside that the propane in the school bus would start to gel. So leaving the door to the house open in those temperatures would cool the the place down pretty fast, and it could take some time to heat it back up. Now, as an adult myself, I totally get it, I'm not paying to heat the outside. But wait ...

Snow melting is a very big part of our hydronics industry in Canada. I'm not going to sit here and tell you that snow melt systems are all roses and butterflies, because each person reading this (and I hope there are more of you than just my mom) will start laughing and go on to the next article.

Snow melt systems are the most inefficient systems we in the HVAC industry have at our disposal. Each one of those Btu's that your boiler just made went straight outside, never to be used to heat your house. Poof, gone.

Now I am no mechanical engineer, but I know as a rule—and this will change from region to region—that it's about 250 Btu's per square foot to melt snow on a slab, but in actuality this number is not important. The important thing is that the pipes for said systems are in slabs of concrete THAT ARE OUTSIDE.

I did use upper case for a reason. I have told many people in my circle of friends and family about snow melting. None, as of yet, had ever heard of it. The first thing they say is: "Wow that must cost A LOT of money." Then the second thing is always: "That would be awesome at my house."

Now don't get me wrong, melting snow is a useful thing to do, I am just pointing out the heating aspect of it, that's all. Now let's take a look at a few things that can make snow melt systems use fewer Btu's overall.

Let's quickly go over the basic parts of the snow melt operation (if I miss something I apologize, this is for simplicity). We have the boiler, piping, pumps and controls. I'm not going to talk about pumps and pipes, although yes, you can gain efficiency there, and yes you "should" be trying for that, but, for now we will talk about the other two.

The boiler and controls will determine your system efficiency more than anything else, all else being considered equal. I am also assuming that everything is installed correctly, which is a whole other topic.

Let's start with the boiler. We have the necessary technology today, and that's condensing boilers, to be even more specific modulating condensing boilers, but in the case of a snow melt system the condensing part is the most important aspect.

As we should all know, you get the most efficiency out of the boiler when it is condensing, and in the case of snow melting your return water temperature is usually the temperature of the slab, yes I said usually. So if that is the case the max temperature that you should have coming back is around 50F (10C). You don't need much more than that to melt snow, realistically you can melt snow at 33F (0.5C), but to hasten the snow melting time I have seen many people try to get the slab up to 40F (4.4C) to 45F (7.2C).

Ok, so all that being said, a condensing boiler is perfect for snow melting applications. It's going to be your most efficient choice.

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Next, let's look at what the control does. A snow melt control has three parts: the CPU that makes all the decisions; the slab sensor, which is usually built into the next part; the snow/ice sensor—this sensor is what lets the control know that there is snow falling or ice forming on the slab.

SNOW SENSOR

The snow sensor can work in a couple different ways. The first is a continuity style sensor, and the other is an optical style. The continuity style sensor basically senses snow by a change in resistance between some metal fingers on the top of the sensor. As snow falls on the sensor it melts between the fingers and causes a "short" circuit in the fingers. This tells the control there is snow.

The optical sensor works by seeing an amount of snow falling. As the snow hits the top of the sensor it is able to see how much snow is falling. It can see the instant there is snow and the instant the snow stops and every variation in between. There is some efficiency that this sensor can provide, and we will hit that in a moment.

SLAB SENSOR

In a snow melt system the slab sensor is what runs the control. It is a big deal to get this slab temperature reading right. Place the sensor too close to any piping and it will get too hot of a reading and the control could shut off the system prematurely.

Likewise, if the slab sensor is not placed anywhere near any piping it may think the slab is too cold and continue to push heat. Sensor placement is something that really needs to be considered.

CONTROL STRATEGY

The control strategy for a snow melt is pretty simple. The main temperature we are controlling is the slab temperature, but we need to know the outdoor temperature as well, because

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the snow sensor does not actually see "snow" it sees moisture. We have to know it's cold enough outside that the "moisture" the sensor is reading is snow and not rain. Making sure the outdoor temperature sensor is placed in a good position to get an accurate reading is a huge deal.

The other temperatures we need are supply and return. We need to know the delta T of the fluid we are putting into the slab so we don't "Shock" it—which is what happens by putting too much heat to the slab. So when the snow sensor senses some moisture, and the temperature outside is cold enough, and the slab temperature is below the set target, then we start pushing heat to the slab and the snow starts to melt. Not instantly but eventually.

You may already know all this stuff, but it's important. We need to remember all this information in order to know where we can do better.

PHOTO: JASON/ADOBE STOCK

Correct positioning the sensors in the concrete will help system efficiency.

FINDING EFFICIENCIES

Since we are literally heating the outside, any improvements we can make to save energy and money should be looked at. But what can we do better?

System idling is the practice of keeping the slab just below melting point until the snow sensor sees snow, reducing the amount of time it takes to raise the temperature of the slab to start melting the snow. If you don't idle the slab it can take hours for the slab to heat up to start melting the snow. However, the amount of time that it's not snowing usually far outweighs the time that it is. Idling the slab consumes the most energy and money in a snow melt system.

I am not saying that it should not be done, but can we be more efficient? Idling even a couple degrees lower can save a huge amount of energy. Also, we now have the power of the internet at our fingertips and inside some controls. With internet connectivity we can use weather forecasts to do some predicting. Use the forecast to set the control into idle when we think snow is coming instead of idling all the time. We can also see if it is actually snowing in your area and use that along with the snow sensor to ramp up the slab temperature to melt. I won't get too much into this, just know that it's coming.

Another big energy hog is the amount of time we use to melt the snow after the snow has stopped. This time is usually called the melt time of the slab and is different for every system. It depends on slab thickness, slab size and the heat capacity of the boiler—things I'm not going to get into. Just know that they're all different when designed, so being aware of these specifications helps you know your melt time.

If your melt time is too long, then you are wasting valuable energy and money, too little and you still have snow on the slab. Keeping these times to the proper amount can save a lot.

The last item to help save energy is the time at which we know there is snow, and the time we know the snow has stopped. Accurately knowing this can save 15 to 20 minutes at the start of the melt cycle and at the end. It may seem insignificant for one cycle, but add up 20 minutes for 50 cycles a year for 20 years. Couple that with a 2 million Btu/h boiler. I think you see where I am heading. It's a lot of energy and money that can be saved.

This can be done with proper snow melt sensor placement. Too many times I have seen the sensor placed where the snow drifts at the side of the driveway. Take a look at the surrounding buildings and even vegetation to get a good idea of how the snow may fall in areas of the slab to be melted. Thinking of these things will give the most accurate reading for the snow melt control to use.

This also goes to my point above with the type of snowmelt sensor. The more information the snow sensor can give the control the better the control can make decisions.

Wow, I did not think I had this much to share about snow melting. Hopefully you will take a couple tips out of this article. Just remember, close the damn door, and keep those Btu's inside. <>

Curtis Bennett C.E.T is product development manager with HBX Control Systems in Calgary. He formed the company with Tom Hermann in 2002. Its control systems are designed, engineered and manufactured in Canada to accommodate a range of hydronic heating and cooling needs in residential, commercial and industrial design applications.