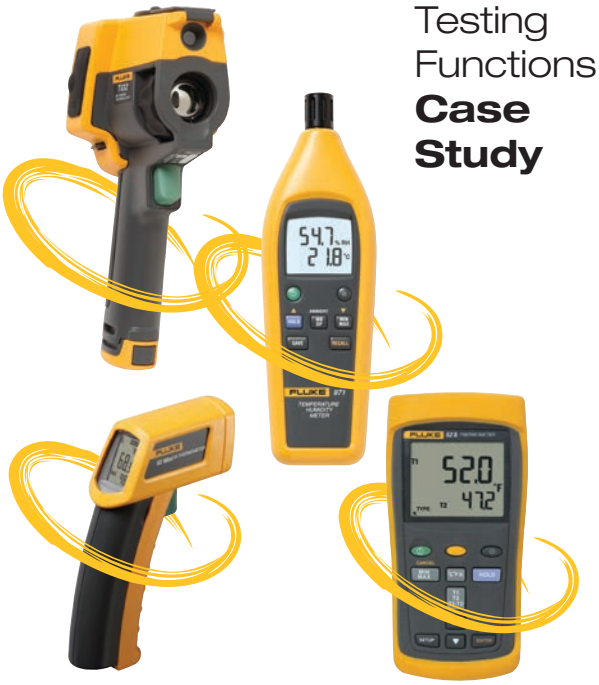
FLUKE®

A slippery slope? Not for curling's ice technologists

Application Note



Testing Functions **Case Study**

Tool: Fluke Ti32 Infrared Camera, 62 MAX IR Thermometer, 52 II Dual Input Digital Thermometer, 971 Temperature Humidity Meter

Operator: Dave Staveteig, Shawn Oleson and Quentin Way, ice technicians for USA Curling

Application: Checking air flows, applying water to form ice layers, monitoring humidity and air and ice temperatures

Creating quality conditions for competition

It's a game of ultimate precision played with 40-pound chunks of granite, where the tiniest changes in momentum and trajectory can bring victory . . . or defeat. And the success of every move starts and ends with the ice. It's got to measure up.

For Shawn Olesen and Quentin Way, volunteer ice technicians for USA Curling, creating the quality ice a successful curling competition demands can be a challenge—or an opportunity. It's all in how you see it.

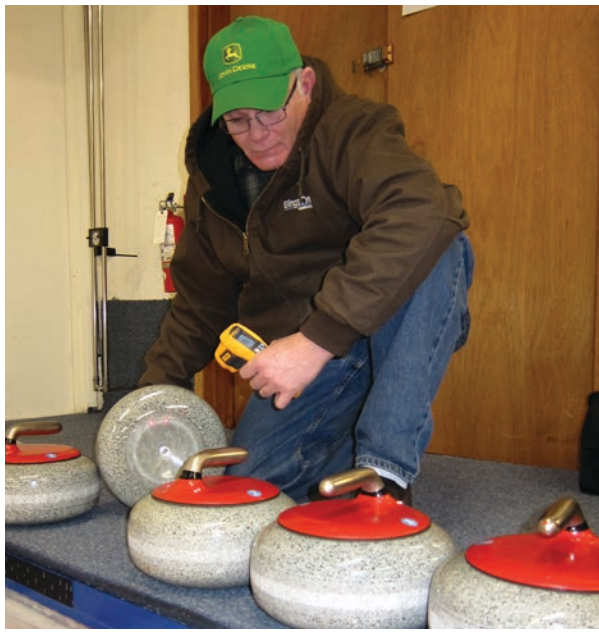
Starting with a clean sheet

Curling doesn't happen without cold, so it's no surprise that home base for Olesen, Way, and USA Curling's Head Ice Technician, Dave Staveteig, is North Dakota.

Getting ready for a major curling competition, like the US Junior Championships at the Granite Curling Club in north Seattle, starts literally with a clean sheet . . . of ice.

What makes great ice? The goal is "consistency through the event," said Olesen, "so the players can call the shots they want to try and they don't have any reservations because of the conditions of the arena. You should be able to throw the same type of shot with the same amount of curl and speed in the first game versus the last game."

Olesen, Way, and Staveteig start several days before an event to paint the ice, flood on a fresh layer of water, and ensure the sheet is perfectly level.



Dave Staveteig, head ice technician for USA Curling, uses the Fluke 62 Infrared Thermometer to check the temperature of a curling stone. Temperature is critical in the interaction between ice and the granite stones.

“If ice temperature rose just one degree, ice quality could be destroyed by mid-game ”

Water droplets are sprayed on the playing surface, where they freeze into “pebbles” that have two important jobs. As the sheet is leveled, the pebbles get shaved off the high spots, but remain visible to show where ice is low and more water is needed. When leveling is complete, fresh “game pebble” is sprayed on to help the stones glide smoothly and minimize drag.

Too damp? Too dry?

Making and maintaining quality ice is a multi-dimensional challenge. The facility’s refrigeration system controls the ice sheet’s temperature, but the technology and capacity of these systems can vary widely. When play begins and several dozen competitors start moving energetically up and down the sheet, they move air and generate heat. Anticipating this effect, the ice team will turn up the cooling system to maintain optimum ice temperatures.

Temperature is critical. Too warm means ice gets too soft; too cold is too brittle. Just right, according to Way, is 23.5 °F (-4.7 °C).

Managing air temperature and humidity is also vital. Ice acts like both a solid and a liquid; in some ways it is almost alive. It can move, grow (if frost gathers from moisture in the air) or, if the air is too dry, evaporate and shrink.

“We’re always checking dew point, just to keep from building frost on the playing surface,” said Olesen. “Temperature and humidity—if we can control it, we will.”

The ideal dew point should match the ice surface temperature, said Way. “When you get down to the 18 °F or zero degree dew points you’re actually losing ice surface.” When a facility’s HVAC system can’t deliver the right conditions—many northern facilities lack air conditioning to offset ambient heat—for the ice team, that’s not cool.

“Your pebble can deteriorate and break down, then you’re getting too much friction,” said Olesen. “You can have frost problems, or the ice changes during the play.” If ice temperature rose just one degree, ice quality could be destroyed by mid-game, Way added.

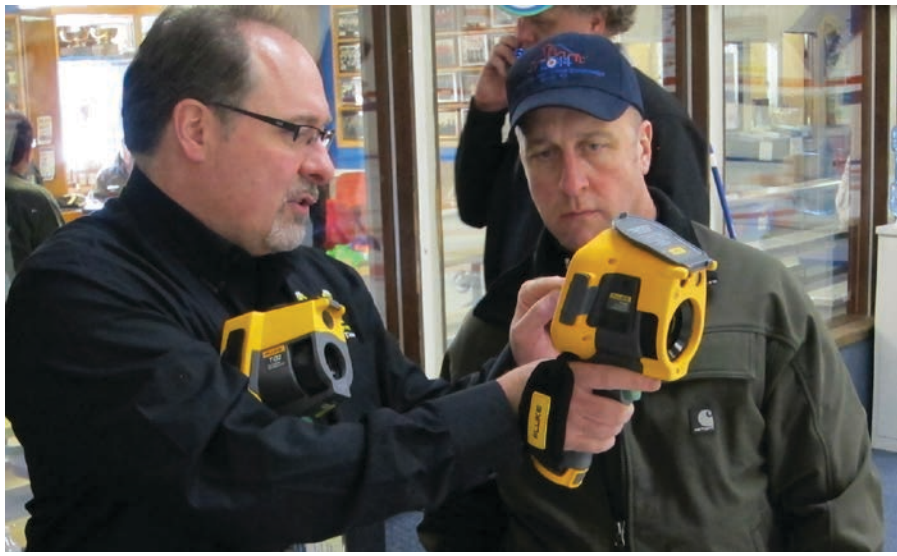
Conditions outdoors can make a difference inside. When outdoor temperatures drop to minus 20 °F (-6.6 °C) in Fargo, Way said, just opening the doors will help cool the building and the sheet. But if there’s a wet snow outside, open doors could admit damp air and lead to frost problems.

Air distribution can be another challenge indoors. How many heaters are present, where they are, and how they direct air all make a difference at ice level. Some facilities send heat to the center of the sheet, while others direct it to one side. To understand how this might affect the game and make adjustments, it’s essential for the ice techs to see what’s happening.

Measuring up

Ice control is founded on measurement, so the ice techs log readings of air, ice, and coolant temperature and humidity throughout the competition.

“Five years ago there’d be one thermometer out in the middle of the rink,” Olesen said, “and somebody’d have to walk out and check it every ten or fifteen minutes.”



Fluke thermographer Michael Stuart and volunteer ice technician Shawn Olesen discuss use of the Fluke Ti400 Infrared Camera.

Testing the Ice: Quentin's way

When it's time to prepare tournament-quality ice, technician Quentin Way takes a step-by-step approach. Here are the test tools he uses, and how he puts them to work.

Fluke Ti32 Infrared Camera

"One of the first things we would use is the Fluke Ti32," Way said. "We would scout out the arena and look for any out-of-the-ordinary air flows from HVAC ducting, exterior doors, or even air leaks in the walls.

"Next step would be to address any issues with the pipes in the arena floor that chill the ice. We have come across a few clubs with plugged pipe issues this season. Some were worse than even the local arena staff were aware of, upwards of ten pipes with little or no flow. If pipes are accessible, we would contact the local refrigeration company to clear clogs. This process could save almost two days of not knowing there is an issue."

Using an infrared camera in real time, as well as capturing still images along the way, the team documented the process of applying water droplets to form the pebble layer. "You could see the droplets hitting the ice and you could see the left stroke, the right stroke and see the water crisscrossing on the ice," Way said. "We'd like to use that in training pebbling techniques, to help improve the uniformity."

Fluke 62 Infrared Thermometer

"Once everything is set to start painting the ice, we use the handheld Fluke 62 IR Thermometer," Way continued. "When we spray the light mist of white paint, you have to wait until the paint reaches roughly 20 °F [-6.6 °C]. With a quick reading of ice temp, we are able to more accurately and quickly layer our four to six layers of paint and upwards of 20 coats of pure water mist to seal the white down. We can save 5 to 20 minutes per coat by knowing exactly where the temp is. We don't have to wait and be safe based on an educated guess anymore. When an event is starting four days from the time the ice techs walk in the building, minutes matter everywhere.

"The same applies to laying down our heavier amounts of water—we can't proceed with the next flood until we have returned to our base line temps, 22 to 24 °F [-5.5 to -4.4 °C]," Way said. "If the floods are done too soon you can risk cracking the ice. With the handheld Fluke 62 IR Thermometer, we know exactly when to go."

Fluke 52 Digital Thermometer

"Once the ice is in and now level and flat we will begin prepping the ice for play. We want to maintain control of our ice surface temperature at all times. The best way to do this is by monitoring it with the Fluke 52 Series with a K-type thermocouple frozen just beneath the ice surface. We now have enough data to know whether our air temp is too high or low, and whether we need to adjust the compressors to increase or decrease the cooling."

Fluke 971 Temperature Humidity Meter

"When the games are underway," Way continued, "we monitor all of our temperatures and humidity inside and even outside of the building. The Fluke 971 is great for instant feedback of our dew point temperature in the rink. We no longer have to resort to using psychrometric charts or online-based applications. Once we've attained our data, we will adjust dehumidifiers and air conditioners accordingly, if possible. If HVAC units aren't available, we will resort to exchanging air with the outside air if it is of an acceptable dew point."

"When it comes to monitoring atmospheric conditions we want to be as proactive as possible," Way said. "These Fluke tools have kept us on our toes in some major national events. We were able to know that something was going to change with the ice and adjusted for it before anyone playing would have even noticed."

Ice technician Quentin Way, using a wireless tool, checks the ice surface temperature. The all-important textured ice surface, or "pebble," required for consistent play is visible here.

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