

18 January 2007

Reference: Customer Advisory - 07

Re: Ice Storms Cause Dangerous Failures of Solenoids with External Manual Latches

To Our Customers:

The recent ice storm that hit the Houston area has reminded me that ice storms can cause dangerous SIS failures, and if precautionary measures are not taken to prevent the failures then remedial actions should be taken immediately after the storm to remove the ice build up on critical instrumentation.

Ice storms are very common in the Midwest where Kenexis' corporate offices are located. When an ice storm occurs, a combination sub-cooled liquid rain, sleet and snow precipitate and contact all surfaces that are exposed to the elements. When the precipitation contacts a surface, the sub-cooled liquids very rapidly solidify. If the precipitation occurs for a substantial period of time, the solidified precipitation forms a solid coating of ice. In the case of some severe storms, the coating of ice can become very thick.

While the ice coating is actually quite beautiful on tree branches, it can cause a devastating effect. The weight of the ice that develops on the exposed surfaces can become very large. In some cases the weight of ice that develops on tree branches is often far greater than can be supported, resulting in the branches breaking off. A storm in Southern Ohio and Northern Kentucky and Virginia a few years ago resulted in a huge amount of trees being killed as most of their branches were snapped off by the weight of accumulated ice. Furthermore, communities with above-ground power lines (such as the one I live in) are guaranteed to lose power during ice storms due to the weight of ice accumulating on power lines causing the power lines to break.

What does this have to do with SIS? In addition to the effects of losing electrical power (which I hope you have already considered and designed for...), ice storms cause a solid coating to form on all instruments that are exposed to the storm. This will result in potential dangerous failure modes on all instruments that have exposed moving parts. While many of these instruments have enough power to break the ice to perform their action (e.g., shutoff valves should have enough actuator force to break any ice accumulation on any exposed part of the stem), in some cases dangerous failure can still be developed. One specific failure mode that we are aware of, through actual failed response to a demand, the solenoid valves that have manual reset latches.

As many of you know, some models of manual reset latches on solenoid valves are capable of holding the solenoid valve open regardless of its electrical command if the latch handle is held up. This is why many of us have seen manual reset latches permanently bypassing valves that are prone to nuisance shutdowns by attaching a coat hanger to the latch so that it never drops. It turns out that an ice storm can cause this very same effect. If the ice coating of the solenoid is sufficient, then the ice coating will hold the latch in place regardless of the electrical command from the SIS. Again, this is not theory, this has actually happened to an operating plant!

Recommendations

Based on the information and incident history presented above, it is clear ice storms can result in conditions that could compromise the integrity of an SIS and should be considered during SIS design and operation.

1. For a number of reasons, including intentional bypass, a solenoid manual latch design that will allow the SOV to perform its intended action even with the latch held in the up position should be considered.
2. If a plant is built in an area that is prone to ice storms considerations should be made during the design of the plant to protect against failures due to ice storms, including the placement of critical equipment that is prone to ice storm failure into weather-proof enclosures.
3. If a plant is not in an ice storm prone area, but is exposed to a storm, immediately after the storm has passed, all critical instrumentation and control equipment that is exposed should be inspected and have any ice coating quickly removed. (Seek manufacturer assistance in determining the best method for ice removal, some instrument designs may not be compatible with being doused in hot water or common industrial de-icing chemicals).

Keep Safe,

Edward M. Marszal, PE, CFSE
President, Kenexis

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