Storage Tanks Containment & Spills

Secondary containment under severe winter conditions

Conventional secondary containment systems for oil-filled transformers, such as concrete pits, can be negatively affected in winter weather due to accumulation of snow and ice and/or the freezing of standing water in containment sumps and oil-water separators. The effects can result in:

- The containment volume originally designed to contain the spilled oil could be occupied by the standing snow/ice or water.
- The freezing pipes can prevent the flow through the system, flooding the containment area and causing the oil to spill into the surrounding area.
- Frozen pumps and other mechanical devices in the oil-water separator system will fail to operate causing the sump to overflow and discharge oil into the environment.

The potential problems inherent in conventional secondary systems are not present in the Sorbweb™Plus system. It is a passive oil containment system solution that offers continuous protection against oil spills from transformers. This secondary containment system is an engineered "smart" solution that allows water from rainfall and/or melted snow to drain through the composite, retaining any oil that might leak or spill from the transformer. Sorbweb Plus has been installed in extreme weather conditions from 40 degrees Celsius to –50 degrees Celsius.

Severe climate installation.

As this system is free-draining where water freely drains out, there is no ice formation in the interstices of the stones and, therefore, the void fraction of the fire-quenching stone layer remains empty. It is expected that fresh snow would cover a small fraction of the top layer of stones and not penetrate to any depth of the fire-quenching stone layer.

It is also expected that an area around the energized transformers would remain free or relatively free of snow due to the radiant heat from the transformer and the melting of the falling snow on the surface of the transformer. As snow falls down on the transformer surface, the snow is converted into liquid water on the transformer wall.

As the temperature of an energized transformer is in the order of 80 degrees Celsius and higher, the conduction of heat from the transformer to the liquid water will make the temperature of the water increase well above the freezing point. This warm liquid water would add to the radiant heat of the transformer, increase the snow free area around the transformer. The liquid water would subsequently drain through the Sorbweb Plus composite.

Based on the relative densities between the spilled oil (920 kg/m^3) and

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the fresh snow (160 kg/m^3), it would be logical to expect that oil would go through the fresh snow into the fire-quenching stones. In addition, the heat carried by the hot oil will allow the melting of snow and ice and the melted water to travel with the oil into the stones. As indicated earlier, the fire-quenching stones void area will remain empty, as only a small fraction of the top layer will be filled with snow.

As snow is typically 1/10th the volume of water, 1 m of snow would be about 10 cm of liquid water. The system is designed for the highest rainfall event over 24 hours in the past 25 years; therefore, the volume area within the void area of the fire-quenching stones will be over the capacity required for the snow melt that exists.

In event of a decommissioned transformer, based on the relative densities between the spilled oil (920 kg/m^3) and the fresh snow (160 kg/m^3), it is expected that the spilled oil from the transformer at a temperature of –50 degrees Celsius would pass through the fresh snow into the fire-quenching stones. The much lower temperature of the oil in this particular case makes the oil viscosity to be much higher than at 80 degrees Celsius, therefore the mobility of the oil would be much slower.

As oil and the snow would be at the same temperature, no thermal effects are expected.

With an energized transformer spill, the spilled oil would be able to migrate through the empty fire-quenching stones. Water from the melting snow, if it reaches the oil-absorbing mat before it is sealed with oil, would be able to permeate the system.

With a de-energized transformer, the spilled oil would be at a relatively high viscosity and would slowly sink through the fresh snow into the empty void fraction of the fire-quenching stones. The void volume of the stone layer is capable of holding all the oil from the transformer.

> This secondary containment system is an engineered "smart" solution that allows water from rainfall and/or melted snow to drain through the composite, retaining any oil that might leak or spill from the transformer

For more information on SorbWeb Plus, contact Scott Lucas. Albarrie, www.albarrie.com www.sorbwebplus.com

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