



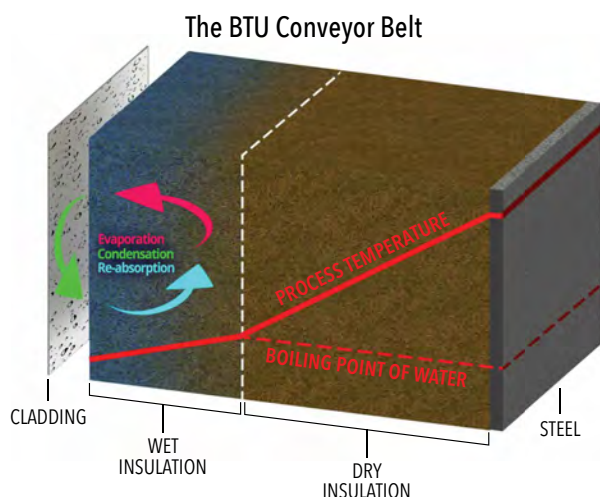
Keep it Dry | Prevent CUI

# Wet Insulation Dragging You Down?

You're not the only one. Wet insulation can be found in any place, and in any application, causing corrosion, wasting energy and money, driving up steam demand, destabilizing your processes, and endangering your people.

## Wet Insulation is Everywhere

Regardless of your local climate, there are many ways for water to get into your insulation. These include snow, rain, fog, condensation, flooding, steam leaks, cooling tower overspray, and testing of deluge systems. Contrary to popular belief, wet insulation isn't just confined to low-temperature systems. Even on systems operating well above 100°C (212°F), much of the insulation's volume can still be operating below the boiling point of water (see chart below). The resulting evaporation, condensation, and re-absorption cycle within this wet, outer layer is like a "BTU conveyor belt", stealing energy and money from your facility.



## CASE STUDY

### Driving Up Steam Demand and Destabilizing Processes

A refinery in Texas used to experience significantly increased steam demand during rain events, but did not have enough cushion to meet the extra demand. To avoid the ensuing process instabilities and keep their plant running, they were forced to maintain a fleet of rental boilers on 24-hr standby. After wrapping their piping with Pyrogel® insulation, they were able to stabilize the plant and dismiss the rental boilers. The project saved \$6MM/yr., and paid for itself within a few months.

## The BTU Conveyor Belt

How is wet insulation so harmful? Because wet insulation isn't just a *little bit* worse, it's a *lot* worse. Studies have shown the effective thermal conductivity of fibrous insulation can be up to **50-times higher when wet**.<sup>1</sup> That's 50-times more fuel burned, 50-times more emissions up the smokestack, and 50-times more money flushed down the drain.

## A Danger to Piping and to People

On steam lines, wet insulation leads to excessive heat loss; excessive heat loss leads to more condensate; and more condensate can lead to water hammer. Water hammer can rupture pipe fittings, cause valve failures, crack steam traps, break pipe welds and supports, and lead to equipment failure.

## LESSON LEARNED

### Corrosion Under Insulation (CUI)

On the morning of April 29, 2006, a massive fire broke out in the light olefins unit (LOU) of Huntsman Chemical's facility in Port Arthur, TX. Miraculously, no one was hurt, but the shutdown and ensuing 14-month rebuild resulted in insurance payments totaling \$475MM. The post-accident investigation<sup>2</sup> identified an 8" hydrocarbon line as the initial fuel source. The section that ruptured was found to be so heavily corroded that only 5% of the original wall thickness remained. The corrosion was concentrated on top of the pipe, consistent with the known behavior of water-absorbent insulation materials.

The report goes on to note that the line in question was actually covered with two types of insulation. The heavily corroded straight section was covered with water-absorbent calcium silicate. The still-pristine elbows were covered with water-repellant insulation. The owner's No. 1 lesson learned after this catastrophic loss? Use "insulation that does not wick water and hold it against the pipe."

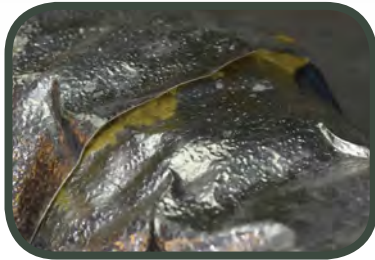
**We couldn't agree more.  
That insulation is called Pyrogel.**

<sup>1</sup> Chyu, M.C., "Effect of Underground Water Attack on the Performance of Mineral Wool Pipe Insulation," ASHRAE Transactions, v. 104, 1998.

<sup>2</sup> Prows, J.B., and Simon, R., "Killing Rattlesnakes Before They Bite You!," AIChE 21st Ethylene Producers' Conference, Tampa, FL, 2009.

# Here's How Pyrogel® Insulation Pulls You Back Up

Pyrogel's hydrophobicity acts as your facility's umbrella, keeping liquid water at bay. But water is tenacious, so in the event it finds a way in, Pyrogel's open-cell construction allows vapor to pass right back out again, acting as a breathable, protective membrane around your piping and equipment. And that's just for starters. See how else Pyrogel has you covered...



## Mechanical Toughness

The insulation death spiral often begins with dents and buckling of the metal cladding. These can open up gaps and "fish mouths" in the jacket's seams, allowing snow and rain water into the insulation. Pyrogel, although flexible in bending, is stiff in compression and offers excellent spring back, recovering even after major compression events. This helps support the jacketing whenever it's subjected to tool strikes, footfalls, and expansion-contraction cycles.



## Enables Faster and Less Costly CUI Inspection

While rigid insulations often crumble once the jacketing is removed, sections of Pyrogel and jacketing can be easily taken off and put back on again. Or you can incorporate it into removable pads that will last far longer than ones filled with fibrous insulation. This makes inspection and maintenance cycles faster, simpler, and less costly, so you can stretch your inspection budget further.



## Maintenance Friendly

Jacketing damage - and therefore CUI - is often found near frequently serviced flanges. Pyrogel's extreme thermal efficiency and thin profile often provide a finished diameter that is smaller than the flange's bolt circle. This allows insulators to run right up to the flange face, and operators to service exchangers, vessel heads, and piping connections without damaging the adjacent insulation.

## Mitigates Chemical Corrosion

While eliminating moisture-against-metal is the first line of defense in any CUI protection strategy, corrosion inhibitors can be a useful backup. Pyrogel is doped with corrosion inhibitors, so that any water entering the system will be buffered to a pH > 7. Pyrogel is also compatible with the Karne's curve for austenitic stainless steels.

**Pyrogel®**

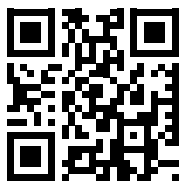
To learn more about how Pyrogel protects your people, processes, and profits, contact us at [aerogel.com](http://aerogel.com), [info@aerogel.com](mailto:info@aerogel.com) or 1.508.691.1111



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