



## THERMINOL

Heat Transfer Fluids by Eastman

# Sun, salt, and the Colorado highway

## A solar innovation comes full circle.

### PROBLEM

Salt is required to keep Colorado's mountainous roads clear during winter months, but the runoff can be damaging to surrounding grasses, trees, and vegetation.

### ANALYSIS

Storage and management of salt water at remote locations can be challenging and expensive.

### SOLUTION

Utilize newly developed small solar-powered units that incorporate established heat transfer fluid technology.

### RESULT

Solar units are successfully removing salt from water, keeping the environment green. Wastewater is clean enough to wash the trucks, creating a fully closed-loop system.

Colorado's spectacular snows bring skiing, sunlit mountain vistas, and yes, the need for salt. Lots of salt. Salt is one of the best ways to keep the state's wintry roads safe, yet there is a price to pay.

Salt takes an especially heavy toll on the Colorado Department of Transportation's (CDOT) huge fleet of plow trucks. Salt is very corrosive to metal, so routine washdowns of trucks and equipment are required. Storage and management of salt water at CDOT's remote facilities are both challenging and expensive. To address these challenges, CDOT installed small treatment units intended to treat and recycle the salt water for reuse at the facility. However, early generations of the treatment systems struggled to effectively lower salt concentrations, and the recycled water was not pristine enough to meet CDOT's standards. A new approach to water treatment was needed, but removal of salt from water is achieved by very few water technologies which tend to be expensive and require a lot of maintenance.

CDOT hired Denver-based environmental experts Tasman Geosciences to help find a cost-effective and robust water treatment technology that could remove salt and provide pure water for reuse. So the search for candidate treatment technologies began.

## Mobile units offer promise.

Far across the country in Pittsburgh, a small technology company called Epiphany Water Solutions LLC was busy working on a big idea for water distillation. The company designs, develops, and manufactures concentrated solar-powered water purification systems. Epiphany had just perfected a way to make small, solar-powered mobile water distillation units with an eye toward helping developing nations gain access to clean, safe drinking water. It was the unit's mobility and small size that piqued Tasman's interest. Because many of CDOT's locations are in far-flung areas, a centralized desalination plant was not cost-effective. But mobile units that could be trucked in could make all the difference.



*Epiphany designed concentrated solar-powered water purification systems which are now used by the Colorado Department of Transportation.*



## Blend new technology with reliable science.

Epiphany's concentrated solar power units, called E5Hs, are a high-tech blend of cutting-edge engineering and innovative use of solar product components. Epiphany's patent-pending solar concentration technology allows mass production of high quality, dual-axis tracking concentrators without the need for specialized equipment or exotic materials. The solar units use stamped-steel (instead of glass) parabolic dishes with field-replaceable reflective inserts, making them a fraction of the cost of other systems. "With any new technology, tried-and-true system components can provide peace of mind, so we looked for vendors like Eastman," says Tom Joseph, cofounder of Epiphany. "We needed a proven heat transfer fluid, an essential part of the E5H technology. We knew Eastman Therminol® 55 heat transfer fluid could provide us with a reliable way to exchange heat efficiently in a compressed space. As the Therminol 55 pumps through the system, we can monitor the entire closed-loop system on a computer."

Therminol 55 fluid is virtually ideal for this application, which requires only a nonpressurized/low-pressure, indirect heating system. It can

deliver efficient, dependable, and uniform process heat with no need for significant pressurization. "Eastman is a global company, and long-term access to reliable Therminol heat transfer fluid supplies beyond the U.S. was also important in making our decision as we were developing this product."

## A surprising end to the story

In the summer of 2017, Epiphany and Tasman tested mobile units. "We artificially adjusted the influent salt concentrations to very high and low levels—and the results were fantastic," Joseph explained. The units in Colorado are hybrids capable of using grid power on overcast days and solar power whenever possible. Approximately 90% of the remediated water can be used to wash the trucks. And when the team was deciding how to deal with the remaining 10%, they did a chemical analysis of the concentrate. Surprisingly, they found the chemical composition to be extremely close to the salt brine solutions being used to melt snow already—and they could recycle that as well. The end result: 100% of the recycled water is now being used. "It's truly a closed-loop system in every way," concludes Joseph.



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