



Dow Industrial Solutions

Trouble at the Juice Plant

Case Study



Several years ago, Dow's Thermal Fluids Technical Service and Development specialists were called in by a large juice manufacturer with a big problem at one of its main juice processing plants.

Corrosion had seriously damaged an ammonia chiller, one of five such chillers of varying sizes linked together in a system used for cooling pasteurized juice concentrate, then freezing it prior to final packaging.

The heads on the chiller had been almost completely rusted through, with handfuls of corroded metal lying in the bottom of the chiller head. The evaporator had to be

completely replaced, along with the heads and other components inside the chiller. When further examination revealed significant damage from corrosion in the other four chillers, the company was forced to shut down the system for extensive repairs and rebuilding, just four years after it had been installed.

The Dow TS&D specialists quickly pinpointed the source of the problem: uninhibited USP-grade propylene glycol, which the juice manufacturer had decided to run with its ammonia chillers after learning that USP-grade products are certified as food additives by the United States Pharmacopoeia. In addition to

saving some modest initial fluid costs, using such an uninhibited fluid would ensure the safety of their end juice products should the fluid accidentally come into contact with them, the company reasoned.

But as the Dow thermal fluid specialists explained, USP-grade glycol is actually not suitable for use in food processes. Because it is uninhibited, it can be very corrosive. Not only did the uninhibited glycol lead to the iron corrosion in the system, but the resulting corrosion allowed ammonia to leak into the cooling fluid, which in turn caused rapid corrosion of the copper piping within the chiller. Prior to that, tube failures caused by components' rusting through had hampered the operation of all the chillers.

As a result, just a few years after the cooling system had been installed, the corrosion from the heat transfer fluid had virtually destroyed it.

The juice manufacturer decided to replace the USP-grade fluid with DOWFROST™ Inhibited Propylene Glycol-based Fluid. Like all Dow glycol-based fluids, DOWFROST™ Fluid is specially formulated with an inhibitor package that provides excellent corrosion protection for most common metals used in HVAC or cooling systems, including copper.

But just as important, the Dow specialists showed that inhibited DOWFROST™ Fluid has both USDA and FDA approval for use where incidental contact with food is possible. They also showed that DOWFROST™ Fluid complies with government regulations on the use of secondary coolants in food processing applications. They then recommended

a solution of 40% DOWFROST™ Fluid and deionized water. The company not only accepted Dow's recommendation but also put in its own deionizing system to ensure quality water for the system.

After Dow's TS&D experts visited the other two plants at the site and conferred with the engineering staff at each plant,

both plants made the switch to DOWFROST™ Fluid. Since then, the company has been taking advantage of another Dow service – a free yearly analysis to ensure that Dow thermal fluid specialists identify any potential problems before they occur.

Corrosion Testing Results: Corrosion Rate[†]—Mils per Year

	Plain Water	Plain PG	DOWFROST™ Fluid	Plain EG	DOWTHERM™ SR-1 Fluid	Acceptable
Copper	0.08	0.16	0.20	0.16	0.12	0.50
Solder	3.14	34.70	0.03	56.50	0.14	0.50
Brass	0.22	0.20	0.16	0.46	0.11	0.50
Steel	9.69	9.80	0.04	44.50	0.30	0.50
Cast Iron	21.10	16.20	0.15	55.70	0.13	0.50
Aluminum	13.20	1.80	+0.26	19.80	0.44	2.50

Note: The test data listed are intended for screening purposes only. Rates in excess of 0.5 mil per year (2.5 mils per year for aluminum) are generally not considered adequate for corrosion protection.

Note: Samples with a + showed weight gain.

[†]Based on corrosion test ASTM D1384; 190°F for two weeks; standard ASTM test metals; 30% glycol in deionized water; air bubbling.



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