



## DOWTHERM™, DOWFROST™, and DOWCAL™

### Taking on the Tarmac

#### **DOWTHERM™ SR-1 Fluid Helps Cut Aircraft Cooling Costs at Miami International Airport**

While at the gate, a commercial aircraft's air conditioning system keeps you cool and comfortable. But while you're taxiing before takeoff, it can get warmer in the cabin. Once airborne, you notice a fresh rush of cool air. Why the differences in performance? There are, in fact, at least three ways to make cool air come out of that little nozzle above your seat.

Changes in aircraft operating economics and environmental regulations are encouraging use of high-efficiency ground-based cooling systems that keep flight crews and passengers comfortable before takeoff.

Among major U.S. aviation facilities, Miami International Airport (MIA) ranks in the top tier for reliance on air conditioning systems, both within terminal spaces and for keeping aircraft cool on the ground. As part of a \$4.8 billion expansion and refurbishment program, MIA is reconfiguring terminals, adding gates, and upgrading mechanical systems throughout the complex. Installation of ground-based air conditioning systems to serve aircraft at the gates is an important part of the total expansion, and DOWTHERM™ SR-1 Inhibited Ethylene Glycol-based Heat Transfer Fluid is playing a key role in keeping one new system reliable and performing at peak efficiency.

#### **Minimizing Use of Onboard APUs**

In the 32 to 39°C (90 to 100°F) summer heat and humidity of Miami, an aircraft interior can quickly become uncomfortably hot. Air conditioning is required to keep cabin air and the thermal mass of an aircraft's internal structure cool while on the ground.

In flight, a typical aircraft air conditioning system uses "bleed" air generated by the main engine turbines to power compressors in the air conditioning packs that serve various sections of the plane. However, on the ground, this bleed air is not available and a different solution is required.

Until rising fuel and maintenance costs radically altered the economics of aircraft operation, it was quite common to employ onboard Auxiliary Power Units (APUs) to serve the power needs of aircraft at gates or during taxiing. APUs supply compressed air and electricity to run onboard air conditioning and electrical systems. But an APU relies on a small turbine engine that consumes increasingly expensive jet fuel while generating emissions and noise. APUs are also subject to the expense of FAA-mandated routine maintenance based on operating hours. These factors are driving the airline industry to increasing reliance on centralized, terminal-based air conditioning and power systems.

There are a number of options, but a preferred approach is a chiller system

supplying thermal fluid to exchangers in air handlers that are typically mounted on passenger bridges. The air handlers are coupled to the aircraft at the gate and supply chilled air directly to the aircraft's air conditioning manifold.

#### **MIA Concourse D Extension**

In the North Terminal Development project at MIA, Concourses A through H extend radially from a central arc. Part of the project includes the demolition of Concourses B and C, with an extension of Concourse D by 1,100 feet, including a ground-based aircraft chiller system.

The contract for the chiller system in Concourse D was awarded to the Florida Division of John J. Kirlin, Inc., a diversified commercial and industrial mechanical contractor.

According to Jules Roberts, a mechanical systems engineer with John J. Kirlin, the aircraft cooling system serving the Concourse D extension is made up of three 460-ton Trane chillers, two 10,000-gallon thermal energy storage (TES) tanks, pumping and control equipment, and the plumbing required to deliver and return glycol-based heat transfer fluid to the air handlers at the individual gates. The system uses 17,000 gallons of a 25% solution of DOWTHERM™ SR-1 Inhibited Glycol-based Fluid.

Known as Plant Three, the system currently serves nine gates on the D concourse and will ultimately serve

13 gates. It delivers the glycol-based fluid at  $-7^{\circ}\text{C}$  ( $20^{\circ}\text{F}$ ) to the gate air handlers, which in turn deliver  $-3^{\circ}\text{C}$  ( $26^{\circ}\text{F}$ ) air through 18" quick-couple hoses directly to aircraft A/C system manifolds.

At the heart of the cooling system are the three chillers and the two thermal energy storage tanks. Only two of the three chillers are required at peak load; the third chiller remains on standby. Each thermal energy storage tank contains 287,000 dimpled polymer balls filled with water.

"Like many new cooling systems," says Roberts, "the thermal energy storage system on this one is designed to build ice in the polymer balls at night when off-peak power costs are lower, then 'burn' ice during the day to supplement the capacity of the chillers. The glycol-based fluid returning from the individual gate service points enters the thermal energy storage tanks at about  $16^{\circ}\text{C}$  ( $60^{\circ}\text{F}$ ), and is cooled to about  $4^{\circ}\text{C}$  ( $40^{\circ}\text{F}$ ) before it reaches the chillers. This results in a very significant reduction in the daytime load on the chillers."

#### **DOWTHERM™ SR-1: A Proven Fluid**

According to Roberts, the decision to specify DOWTHERM™ SR-1 Fluid for the Plant Three system was based on a variety of performance and service factors. First, DOWTHERM™ SR-1 Fluid is already used at Miami International Airport in a variety of internal air conditioning and aircraft service applications, so in the eyes of operations and maintenance personnel it is a familiar and proven product.

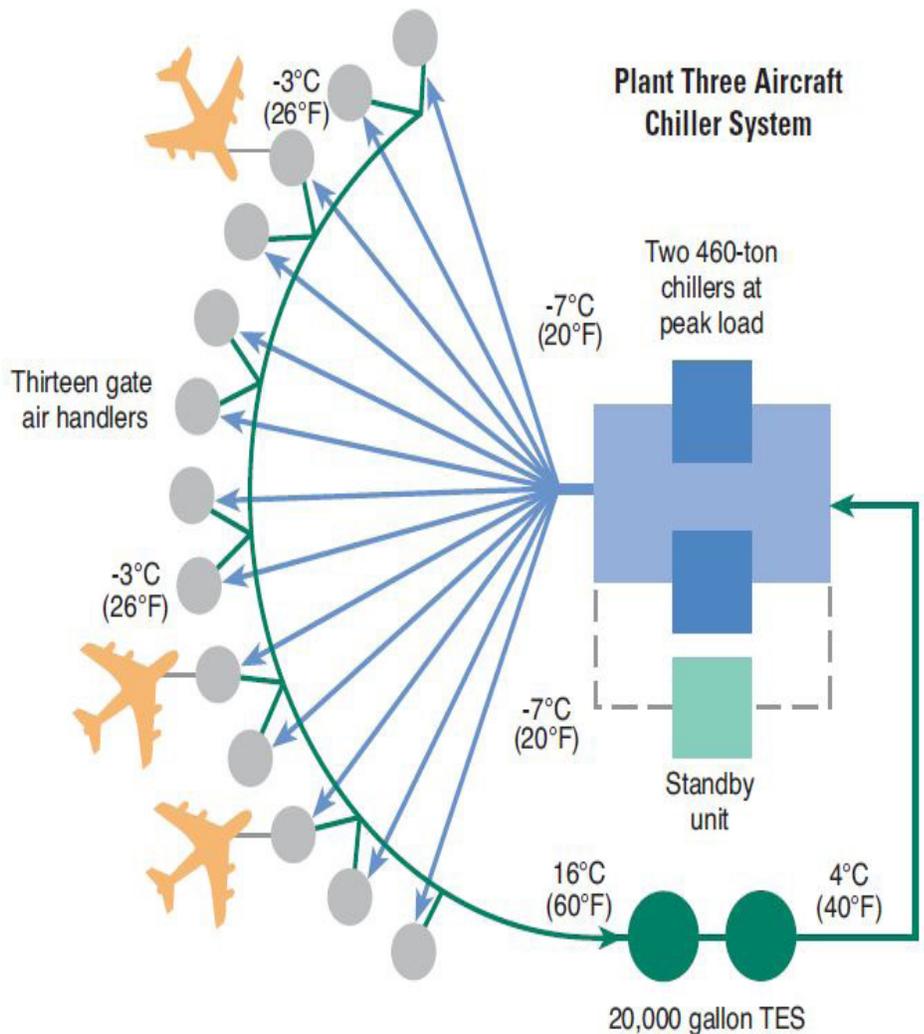
Roberts says both the working properties of the fluid and the services available to support it were very important factors in the choice of DOWTHERM™ SR-1 Fluid. MIA is very dependent on air conditioning, and systems like the aircraft cooling

system are very large and complex. The working fluid needs to offer the right level of freeze protection to keep the thermal energy storage tanks and circulation lines working efficiently. A 25% solution of DOWTHERM™ SR-1 Fluid provides effective freeze protection to  $-12^{\circ}\text{C}$  ( $10^{\circ}\text{F}$ ), which is below the system's design limit. Also, the long-term reliability of the corrosion inhibitor package in DOWTHERM™ SR-1 Fluid provides good assurance that the very complex piping, control valves, and pumping equipment in the system will be consistently protected from corrosion damage.

After the events of September 11, 2001, greatly heightened airport security measures make product delivery and support logistics especially important.

Says Roberts, "Dow's transportation department does a great job of nailing down the details of product delivery beforehand, and then making sure their delivery vehicles arrive right on schedule. That makes it much easier for us to make the necessary arrangements with airport security. And, when they deliver product, they have the skills and supplementary equipment to make trouble-free product transfers even if they get surprised by unusual fittings or other unforeseen details."

Next time you fly, pay a little extra attention to the air nozzle above your seat. At the beginning and end of your journey, it's just possible a Dow inhibited glycol-based heat transfer fluid is working reliably and effectively to keep you comfortable.





The ground-based aircraft cooling system delivers -3°C (26°F) air directly to aircraft A/C manifolds.

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**For more information, contact us at your convenience:**

[www.dow.com/heattrans](http://www.dow.com/heattrans)

**North America**

+1 (800) 447-4369

**Latin America**

+55 (115) 188-9000

**Europe**

+8 (003) 694-6367

**Asia-Pacific**

+8 (007) 776-7776

**The Dow Chemical Company**

2030 Dow Center

Midland, MI 48674

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