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# DPI
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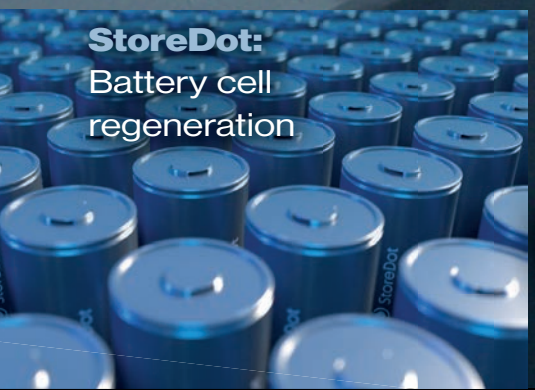
## Gen set cooling in the Canadian wilderness

# Arctic Star



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THE MAGAZINE FOR ENGINE DESIGN, POWER AND COMPONENTS ON A GLOBAL SCALE

Tim Bound, Transtherm

Gen set coolers with header tanks

# Cooling as required

**Julian Buckley** speaks with Transtherm's **Tim Bound** about fan-based gen set cooling

"When we first started the business over three decades ago, we would to sell anything to anybody," says Tim Bound, director of Group Sales and Marketing at Transtherm. "But we realised that was a flawed business model. We decided to sell only what we were manufacturing, the air blast coolers of different types, the dry coolers, adiabatic coolers, free coolers, together with pump sets."

Having successfully narrowed down the company product portfolio, Coventry, UK-based Transtherm now supplies closed-circuit, remote-mounted flatbed coolers, which can be mounted either horizontally or vertically to suit the application, and also V-coolers. The company delivers to OEMs and dealers (who create packaged solutions), and to various industries, including pharmaceutical, food and beverage, and aerospace. Unusually – but with unspoken necessity – the company also works with cremation firms.

Transtherm has also done a lot of work with data centres. These installations use a colossal amount of power, usually taken directly from the grid; such is the draw that they would sometimes need a dedicated substation. The grid supply would have been backed up with diesel gen sets, but Bound says that there has been a move to gas-fired gen sets as a primary energy source to take advantage of the efficiency and environmental benefits.

"An installation might have 10 gen sets as the main power source. Depending on the set up, that would require anywhere from one to a full 10 units as backup. Then those are backed up by the grid. Using the gen sets can fulfil related stipulations for using renewable energy, so it's attractive to the customer. In all areas, we're getting switched on to being green," says Bound.

## COOLING SOLUTIONS

Transtherm is a specialist manufacturer of gen set coolers and pump sets. The company can package that hardware with a control system which is prewired and preprogramed to customer specifications. If a pump set is also being delivered, the system can be set up to use a single control panel.

"The idea is single lift, single power supply and single water connection," says Bound.

The type of gen set being used will define the cooling set up, whether that's a single, double or triple bank cooler. Bound explains more: "In areas where the grid is a bit weak, a gas-fired gen set could be used to support the power supply. In that instance all that matters is the power, it's a boost. They're not taking advantage of the heat, it's really just a safety net. So a double-bank cooler is fine."

Switching to a combined heat and power (CHP) installation can require a modified set up, says Bound. "If the jacket water heat is being recovered and put to use, there won't be any heat going to the jacket water heat exchange coil in the cooler. However, if we're still dragging air across those coils to cool the intercooler circuit, it will be massively overcooling the jacket circuit. In cases like this it's preferable to go to two single-bank coolers with completely independent controls."

Essentially, the best solutions deliver cooling as cooling is required. This is particularly important when dealing with larger gen sets, where net electrical output should be as high as possible with minimal parasitic draw from the cooling fans. To reduce this effect, Transtherm now exclusively offers variable-speed fans.

Bound says that these fans offer a series of benefits, including the ability to speed up and down independently or as a unit. He says that power draw is relative to the cube of fan speed. To put this in perspective, if traditional fixed speed fans were being used and half of them were being run at full speed the power draw is 50%.

"However, when using variable speed fans all of

Variable-speed fan set

them would be operating at circa 50%. If we cube 50%, that's 12.5% power usage. In cases of fixed speed fans that are on a stage control, 50% of the area won't be getting any direct cooling, it's redundant and an efficiency reduction. Drawing half of the air over the whole coil is much more efficient, meaning we can operate the variable speed fans at circa 45% rather than 50% to get the same cooling effect."

## LOAD PROFILE

Bound says that the company uses other information to develop the most efficient cooling system. Local weather data, with a particular focus on high and low temperatures, is factored into the installation criteria to determine power draw at each degree of ambient air temperature. Those are multiplied by the frequency of ambient temperature to return an annual power consumption profile.

He says that the difference in load profile between fixed and variable fans is "staggering". And although Transtherm might not offer the cheapest solutions, Bound says that the company wins a considerable amount of business by delivering basic operational value.

"Depending on the tech, we will either look at the ROI in terms of how long it will take to pay off the difference in cost between our solution and that of a competitor, or in some cases we will just outline how long it will take to pay off the entire cost of our equipment. Often, that can be less than a year," he says.

The hardware supplied by Transtherm also supports flexibility in terms of gen set location, particularly when looking at diesel installations. Focusing on external remote cooling, the hardware can make or break plans to locate a unit within a limited space.

**Coil access panels and leg mesh**

"If a gen set has to go into a basement in central London because there's no other space, an engine-mounted radiator won't work. Instead, our coolers can be put on the building roof," says Bound.

In other cases, when mounted on the gen set container roof, space comes at a premium. If the gen set has a lot of hardware at one end, Transtherm can supply V coolers (single or double bank), which offer a much greater cooling density, allowing for a smaller footprint. These are of particular interest when there are fixed boundaries (walls, etc.) around the gen set.

Awkward site locations could see the external air temperatures increase by as much as 10°C above ambient and this information should be used when calculating cooler size.

Noise is another factor which can be added into the calculations. "The quietest equipment is no louder than room air conditioning, you might need to check if the machine is running," says Bound.

But he points out that while higher fan speeds can mean a greater amount of moving air, this also means a reduced amount of heat exchanger surface material is needed.

"There are a heap of factors determining how much heat you can remove, but the main two are material quantity and volume of air. Reduce the amount of air, you must increase the amount of metal. Some engine applications have a daytime and night-time noise requirements and that's another advantage of variable-speed fans, lower noise at reduced speeds - the noise drop off as the fan speed goes down is significant."

The biggest factor in successful cooling, says Bound, is getting the correct ratio of air flow and heat exchange material. "Taking into account fan speeds, the heat exchange coil for the high-temperature circuit has to be sized correctly. If there's not enough material, the engine will likely derate and possibly even trip." **dpi**

# Pump sets

Any water-cooled system needs a pump set, as without the related water flow there is limited cooling effect. Compensating for pressure changes is critical to successful cooling, as Tim Bound explains: "We use pumps rated for flow and any pressure loss in the system. As water flows through the system, we need to allow for the cooler pressure drop, which is typically up to 1 bar, and the system pressure drop which is generally up to 6 bar."

In some cases the gen set will have its own built-in pumps. While these can reduce parasitic load, the generally low performance of these units requires a cooling system with a very low pressure drop. Alternatively, Transtherm can supply an external pump set which can offer higher performance, in turn allowing for higher pressure drop coolers that could save footprint and/or cost.

"Deciding which hardware to use comes under our consultative approach," says Bound.

Engineers at Transtherm will help and advise customers as much as possible, using their knowledge and experience, but Bound says that the company rule is to stop short of saying 'yes' when we should be saying 'no'. "This could include the need for customers to use experts in computational fluid dynamics, modelling water and air flow, if there are serious concerns about warm air recirculation."