TRIGENERATION PLANT TAKES OFF AT MILAN'S LINATE AIRPORT

MODERN TERMINAL BUILDINGS at airports place high demands on supplies of both electrical power and thermal energy. But airline schedules and the critical nature of an airport's health, safety and operational regulations make securing both of these, especially the power supply, of the utmost importance - regardless of external factors and conditions.

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Hot water produced by the Linate CHP plant is used for district heating and to provide cooling in air-conditioning systems.

Trigeneration plants supply electricity, heating and cooling to buildings, equipment and external lighting from a single captive plant located on site, providing significant operational and efficiency advantages and rendering separate individual units unnecessary.

So when the Wärtsilä and EuroPower consortium started up a 24 MW combined heat and power (CHP) plant at Milan's Linate Airport last June, sky-high expectations were met when these multiple requirements were satisfied without a hitch.

The customer for the turnkey plant was Malpensa Energia, jointly owned by SEA Aeroporti Milano, the company that manages both of Milan's airports, and AEM Milano, a utility company. Wärtsilä supplied three Wärtsilä 20V34SG engines with exhaust gas boilers and engine cooling modules for heat recovery, the SCR (selective catalytic reduction) system which reduces NOx emissions, and the plant's engine cooling radiators.

"A trick of thermodynamics"

The plant supplies a baseload, but as it produces both heat and electricity, its flexible design allows adjustment to meet seasonal variations in demand, minimizing fuel costs. Heat output can be as low as 72 MWth in summer or as high as 82 MWth in winter. The maximum electrical output is 24 MWe, and any surplus can be fed to Italy's national grid.

The thermal output of the plant provides hot water at 125°C which is initially used for heating the terminal buildings, hangars and other facilities. Absorption chillers employing water and lithium bromide absorbent use the hot water energy to chill water to just 7°C for use in the terminal's air-conditioning system. Comprehensive climate control is a major benefit of trigeneration.

"Thanks to this technology, and a trick of thermodynamics, we can generate chilled water from hot water. The principle involves evaporating water under a vacuum. Even though this technology is common, it's a great way of using as much residual heat as possible," says **Thomas Stenhede**, CHP/DE Applications Manager, Wärtsilä Power Plants.

Hot water is actually delivered at two temperatures, 70° and 125°C. The lower level is used to supply district heating to the airport complex and a nearby village while the higher is employed in the absorption chillers that provide cooling for the airport's air conditioning systems.

Flexible solutions

As the grid and the power plant's generating sets are interconnected, the two energy sources run in parallel and either source can act as an emergency standby, backing up the other to maintain airport services in the event of a supply outage. The term used by Stenhede to describe this is "improved redundancy".

One important way of reducing running costs in Linate's trigeneration plant is the two high towers which look like chimney stacks. They are in fact tanks for storing hot water. "Using hot water from the tanks means one engine can be shut down at night during periods of low demand, saving energy," says Stenhede.

While the Linate project is similar in many respects to an installation at Madrid's Barajas International Airport, there are some differences. At Barajas, the hot water is used to run chillers located within the trigeneration unit before chilled liquid is piped for use in air conditioning systems. At Linate, hot water is piped to buildings and the chilling process is carried out there. "This demonstrates the flexibility of this technological solution," says Stenhede.