Güntner dry coolers in PCA units for aircraft air conditioning

Each passenger boarding or deboarding at the Munich Airport can take a glance at a Güntner FLAT Vario model for aircraft air conditioning. These condensers are part of units named PCA units (Pre-Conditioned Air) that supply aircrafts on the ground with conditioned air. A plant contractor specialised in these applications installed 72 stationary units for the passenger boarding bridges at the Munich Airport. In addition to these firmly installed solutions, there are also mobile PCAs integrated into lorries.

As soon as an aeroplane at the Munich Airport reaches its parking area at a passenger bridge – also referred to as jet bridge – the pilot switches off the turbines. From this moment, the infrastructure of the airport supplies the aircraft so that electricity and conditioned air do not have to be generated, as was previously the case, from kerosene in an inefficient and very noisy way by auxiliary power units. Although it is not always necessary to provide passengers with conditioned air, it is requried to cool, for instance, the avionics while the plane rests on its parking position.

Overview

Business line:	Air Conditioning
Application:	Air Conditioning
Country/Region:	Germany/Munich
Fluid:	R134a
Product:	Güntner GVH FLAT Vario condenser
	Güntner GCO heat exchanger coil

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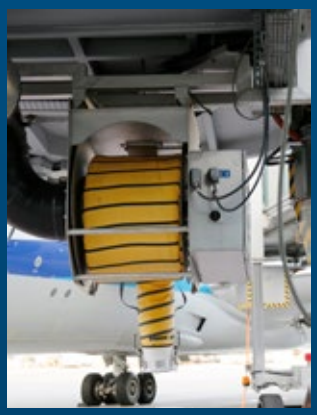
▲ The Güntner FLAT Vario unit is fully integrated into the PCA unit.

▲ The PCA forces the air to flow into the tight air distribution systems of the aircraft at high pressures via the combination of a fixed tube and flexible hose system.



▲ The hose connection between aircraft and fix tube system is rolled up under the jet bridge after the PCA's end of operation.

Between the on and off block times (the span between the plane's arrival at its parking position and departure), stationary as well as mobile solutions are used for aircraft air conditioning at the Munich Airport. You will find a stationary PCA unit under all the jet bridges close to the building.

The PCA's task is to supply – against an overall resistance of up to 8,000 pascals – filtered, tempered and dehumidified air into the plane. Background: The air distribution systems in aircrafts are optimised for minimum weight and volume so that pressure drops are very high in the tight duct cross sections.

Maximum performance during boarding and deboarding

To prevent the cabin air from becoming sticky due to the high density of passengers during boarding and deboarding times, an air change of at least eight to ten times per hour is required – this is equivalent to an air volume of up to 5 kg and 3.8 m^3 per second respectively to be exchanged.

The air conditioning capacity installed in a PCA unit each corresponds to the need of the largest aircraft to be handled at the passenger boarding bridge (full load operation). All the smaller machines require less conditioned air. This means that with large long-haul aircrafts, a PCA unit at the Munich Airport operates at full load during boarding and deboarding times and provides conditioned air for the aircraft cabin, the cockpit and the control engineering of the aeroplane.

For the rest of the time, the PCAs operate at reduced capacities and feed the plane with correspondingly lower air quantities, for example during maintenance and repair works, during fuelling and loading and unloading. The span between arrival and departure (and thus the PCA's period of application) depends on the size of the plane.

A PCA unit operates independently of the ambient temperatures as the aggregates are designed for application at temperatures ranging from -15 °C to +50 °C and for a relative humidity of up to 100 per cent, which makes the units highly versatile as they could be operated anywhere in the world. The supply air temperatures are at max. 70 °C in heating mode and at about 5 °C in cooling mode.

Güntner keeps things cool

While in the main building of the Munich Airport heat is provided by the energy supply centre for heating the aircrafts, the PCA units generate the required cold air for the aircrafts locally. Transfer stations connect the large supply network of the airport with the individual PCA units.

The enclosed PCA technology consists of six major components: Screw compressor, air diffuser, air heater, dehumidifier, condenser and controls. The screw compressor of the PCA – continuously adjustable and connected to the existing building management system – generates need-based cold that is subsequently piped by the PCA alongside the mobile passenger boarding bridge to the plane. The insulated combination of fixed tube and flexible hose system then conveys the conditioned air to the tight ducts of the air conditioning plant of the aircraft.

One GCO heat exchanger coil in a PCA unit serves as air heater and a second one as dehumidifier. A Güntner GVH FLAT Vario condenser with special varnishing (designed so that it suits the dimensions of the PCA enclosure and painted in the enclosure's colour) is mounted on the top of the PCA. From there, the GVH dissipates the waste heat to the environment.

All the Güntner heat exchanger coils have excellent heat transfer characteristics and are highly capable of withstanding environmental and climatic influences, thanks to their epoxy resin-coated fins.

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Fully automatic control

The PCA units are controlled fully automatically. Thanks to an interface to the flight plan data, the plant „knows“ which type of aircraft is docking and which operating state currently prevails. When operated at partial load, the plant either increases the evaporating temperature or reduces the air volume to be conveyed, depending on the requirement. This makes the plant highly energy-efficient – only the required air volume is cooled and conveyed. For heating, all the PCA systems are connected to the central hot water circuit via a small plate heat exchanger.

Compared to the operation with an auxiliary turbine, the PCA plants operated at the Munich Airport save about 23,500 tonnes of CO_2 per year already today.

Central cold air supply of the Munich Airport

The cooling concept of the airport is designed to provide electricity as well as the by-products heat and cold for own needs in a combined heat and power system. The CHP has an efficiency of over 80 per cent relating to the primary energy used.
The airport‘s annual electricity consumption is 220 GWh, 60 per cent of which is provided by the CHP. The CHP also generates, as far as possible, the 130 GWh of heat that are consumed per year, and the supply centre provides the cooling demand of about 40 GWh, mainly produced by absorption refrigeration plants.

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