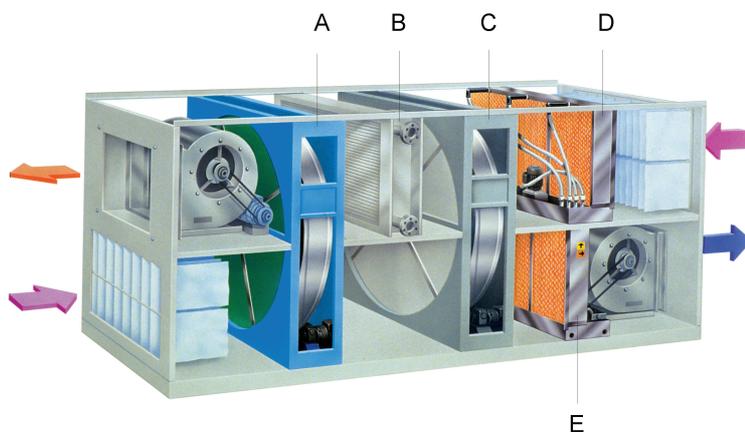


# Sandvik Wernshausen is saving 45% on energy using DesiCool instead of conventional air conditioning

Munters desiccant cooling system, DesiCool has recently been installed in Germany in Sandvik Wernshausen's new production hall and is designed to save 88,200€ per annum for the complete installation in energy running costs. Furthermore DesiCool achieves this using surplus heat from a water cooled air compressor and without using traditional compressor or refrigerant technology. Nature's own effective method for humidifying and cooling air is evaporation. Munters have reproduced this effect within their air conditioning technology in the form of desiccant cooling, a solution all the more effective as it is achieved by converting surplus heat. Heat which is often regarded as a waste product is converted into cooled and dehumidified air which is then distributed into buildings for better net process result and for people's comfort as is the case in Sandviks production hall.

Munters DesiCool air conditioning system uses this cooling principle to convert surplus heat into productive cooling within one unit, which contains neither a compressor, cooling surfaces or condensers. In winter, the system provides an extra bonus as a heat recovery unit. The result is typically a reduction in electricity consumption of 60% compared with cooling using compressors, and a heat recovery efficiency of 90% in winter. DesiCool is producing the best indoor climate in a building you can get, throughout the year. This is because DesiCool has no mixing of air between fresh air and exhaust air. It is always 100% fresh air from DesiCool. DesiCool processes the air by dehumidifying the air, then cooling it in a thermal wheel (rotating heat exchanger) and finally cooling it further using an evaporation cooler. The system uses heat as the primary energy source for the cooling process – not electricity. The desiccant section contains a rotating Munters desiccant rotor and reactivation coil in the exhaust air. The coil reactivates the desiccant wheel, i.e. expels the moisture it takes from the external air.



Inlet condition 32oC Outlet condition 17oC  
A= Desiccant rotor B = Regeneration coil C= Heat exchanger  
D and E = Evaporative air coolers

Reliable, economic and pollution free



- Better economy
- Heat recovery
- Tighter temperature control
- Avoid CFC's and HCFC's
- Fast payback
- No mixing air, 100% freshair
- Easy maintenance
- Evaporative cooler with hygienic certification VDI 6022
- 60% less CO2 compared with a traditional cooling coil



**Munters**

The Humidity Expert

At Sandvik Wernshausen, the average humidity of the outdoor temperature is 32°C. The more the exhaust air is heated, the drier the air on the other side, but, unfortunately, also warmer. After drying, the temperature of the external air is 40°C with a humidity of 7 g/kg.

The indirect evaporative cooling component consists of a rotating aluminium exchanger and an evaporative cooler in the exhaust air. The main task of the evaporative cooling component is to cool the exhaust air from the premises so that one can indirectly, via the rotating heat exchanger, cool the warm yet dry air that is generated after drying. Following this indirect cooling stage, the condition of the air is 27°C and 7g/kg

The evaporative cooler in the intake air now lowers the temperature of the cool yet dry air from the rotating aluminium heat exchanger to 17°C and 10.0 g/kg before it is fed into Sandvik Wernshausen's production hall. To run the desiccant cooling process, the desiccant rotor has been specially developed to provide sufficient drying at low air temperatures. This means that you can use water temperatures as low as 60-70°C for the reactivation coil. This also provides the opportunity for using surplus heat from Sandvik Wernshausen's water cooled air compressors. More surplus heating means more savings in energy costs.

In the DesiCool process, using an outdoor design condition in summer, the ratio between supplied heat power and the supplied cooling effect is a factor of 2. For 20°C increase in temperature in the exhaust air through the reactivation coil, a 10°C temperature reduction in the air supplied is achieved. At lower exterior temperatures, the requirement heat power is reduced and completely ceases at an exterior temperature of 20°C. The cooling effect is only generated by a combination of indirect and direct evaporative cooling.

The heat recovery in winter means that, under normal conditions - i.e. not below -16°C - the unit does not require extra energy to heat the supply air. Traditional

air conditioning units with heat recovery use rotating aluminium heat exchangers for heat recovery. However in Munters system, the motor speed of the rotating desiccant wheel is changed from 10 revolutions/hr in summer to 10 revolutions/min in winter. So the desiccant rotor becomes an enthalpy exchanger that transfers not only sensible heat but also moisture from the exhaust air. In tandem with the rotating heat exchanger this provides a temperature efficiency of 90 % and a humidity efficiency of 75 %.

The evaporative cooler works through water being added to Munters corrugated media designed with a very large surface area. The heat required for evaporation is taken from the air flowing between the "corrugated" laminate. This way, the air is cooled and humidified at the same time. For each gram of water evaporated per kg of air, a temperature reduction of 2.5°C is achieved.

There are more than 120 Munters desiccant cooling plants in operation in Europe, including the Sandvik Wernshausen plant. Sandvik compared Munters DesiCool systems performance against conventional air conditioning and on evaluating the calculations of production savings, coupled with the excellent experiences from Sandvik

Sweden who have been long-time users of DesiCool systems, Sandvik decided DesiCool was the most reliable, economic, maintenance and pollution free option.

Sandvik Wernshausen have now installed six DesiCool systems, with a combined cooling capacity of more than 1000 kW. Each system supplies 10 m<sup>3</sup>/s to a 6 m high production hall. The air is supplied into the hall at floor level through displacement ventilation inlets, shown below, keeping a pleasant climate in the hall the whole year.

An economic and technical analysis by Sandvik's independent consultants showed the significantly lower annual energy running costs of 45% mean the system pays for the added capital investment in 3 yrs. Munters designed the DesiCool system so the running costs are 45% lower than a conventional air conditioning system.

In winter when there is a need for heat recovery, there are great operating economies. The system is designed during production running for a heat recovery of 100 %.

Munters DesiCool air conditioning systems are the green alternative, avoid cooling based on CFC's and HCF's and are suitable for large offices and production premises.



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