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[Blue Air Systems' energy-efficient mould dehumidification](#)

Low Energy Mould Drying with DMS

Product innovation: waterless DMS-technology for energy-efficient mould area dehumidification in a closed loop

Programme expansion for aseptic production

Kundl (Austria), 12.10.2023: Injection moulding, thermo forming and blow moulding without condensation is possible. Blue Air Systems' basic range of MSP-Dehumidification units (with process air volumes between 1.000 and 10.000 Nm³/h) was complemented with the new DMS series (Dry Mould System), a dehumidifier which works without the need for chilled water. An enclosed production area is supplied with dry air with a dew point of 4°C (39,2°F). The DMS dehumidification units with process air volumes ranging from 500 to 5.000 N³/h are now available.

The mould dehumidification units MSP are used mainly for supplying dry air to a central dehumidification system. The DMS series are specialized to be used for single production machines (up to 3 units). The newest DMS system for high demanding injection moulding, extrusion blow moulding or thermo forming applications has just been presented to the public. As inventor of this game-changing technology, Blue Air Systems has spent many years developing, testing and improving the system. The DMS units provide year-round, condensation-free production conditions, independent of ambient conditions, without the need for chilled water needed for pre-cooling. This energy-efficient technology guarantees the users of injection, blow moulding or thermoforming machines to run the shortest possible cycle times, therefore guaranteeing higher production output. The DMS series has

been installed in various climatic areas, proving its performance. Several references prove their efficiency and effectiveness.



Newest DMS system – DMS 10 air cooled

The phenomenon of condensation on tempered moulds

When the surface temperature of an object sinks below the dew point of the ambient air, condensation builds on this object. This problem especially occurs on moulds of plastic processing machines that are cooled by chilled water. The cooling time, usually the longest part of the cycle time and one of the most sensitive steps of the manufacturing process is an important figure that influences the cost factor of the entire production process.

By reducing the cooling water temperature of the mould, a shorter cycle time and subsequently a higher production output can be achieved. If the water temperature sinks below the dew point of the ambient air, the moisture in the air will condensate on the surface of the mould. To avoid this condensation in facilities located in hot and humid climate zones, process engineers of manufacturing plants tend to increase the water temperature above the ambient dew point of the air. This standard procedure has a crucial disadvantage - the efficiency confines the effectiveness: increasing the cooling water temperature extends the cooling time of the item in the mould, thus

reducing productivity and profit (rule of thumb: 1°C increase in cooling water temperature = 2% reduction of productivity).

In many cases a longer cooling time increases the crystallization rates in the moulded plastic resulting in inferior product quality. Furthermore, condensation on the mould leads to possible water marks (“orange skin”) on the final product causing rejects or low product quality.

Limitations of conventional technology for mould dehumidification

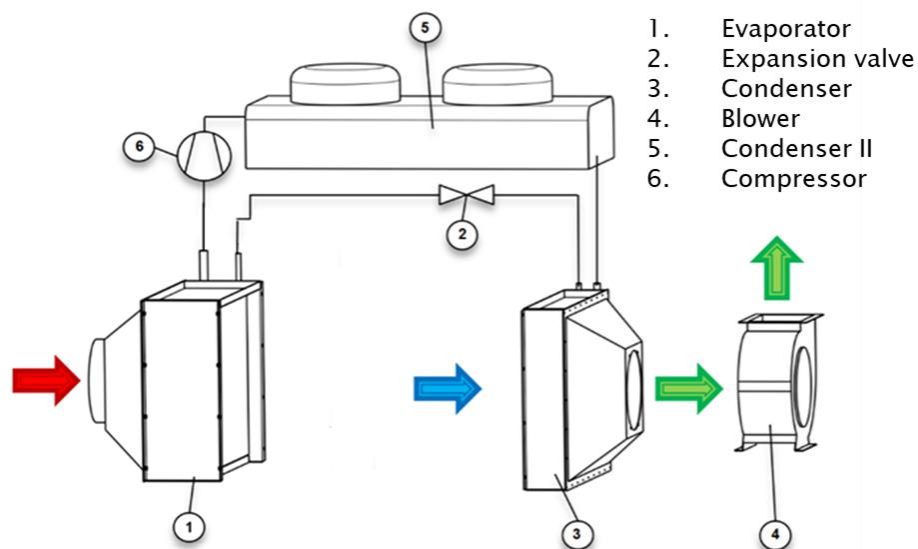
A popular way of drying air for mould dehumidification is with the adsorption system. This technology, that uses a desiccant wheel for dehumidification, needs a comparatively high amount of energy. The energetic inefficiency occurs due to the use of large regeneration heaters, ventilators, motors and pre and after cooling with the need for chilled water. Mould dehumidification with the condensation technology, using a refrigerant system, is an alternative to the desiccant system. The MSP (Mould Sweat Protection) units based on this technology have been the backbone of Blue Air Systems for years. Many MSP units have been installed in facilities worldwide. Thanks to their reliability and stability, these units bring their full performance even after many years and allow a condensation-free production with the optimal cooling temperature in the mould. A disadvantage of all dehumidifiers, whether they operate based on adsorption or condensation drying, is that relatively large cooling loads are needed to pre-cool the ambient air.

In many cases, the chilled water capacity of the facility is not dimensioned sufficiently to supply the necessary cooling load of chilled water. When investing in a new dehumidification system, besides the cost of the dehumidifier, the manufacturer also needs to take the cost of a new chiller, or the extension of the existing chiller system, into his investment calculation.

A look at the new, waterless DMS (Dry Mould System) in a closed loop

The DMS unit dries air based on the condensation principle. The main difference to the standard systems is that the DMS is not constantly dehumidifying hot and humid ambient air. Instead, dry process air is circulated around the mould in a closed loop, bringing the air back to the DMS unit. By doing this, there is no necessity of using high cooling loads to dehumidify air, as the air returning to the DMS unit is partially dried. This procedure allows the DMS to work without a pre-cooler (chiller) and therefore no chilled water is needed for the DMS dehumidification.

A state-of-the-art refrigerant compressor of the newest technology automatically reduces the needed cooling capacity as soon as reduction of moisture in the air is detected. Therefore, the DMS only uses electricity for the actual cooling need of the refrigerant system.



Principle of DMS air cooled

Model calculation: mould dehumidification with up to 85 % lower energy consumption, compared to conventional systems

Standard dehumidification systems on the market are supplied with a water pre-cooler. The DMS units do not need the chilled water for pre-cooling, which automatically reduces overall investment costs for such a system between 15.000 and 20.000 Euros. A pre-cooler in standard systems, requires up to 66 % or less of the overall energy normally needed.

By cutting out the pre-cooler, immense cost and energy savings can be achieved. In production, the actual savings can be seen: For example, a dehumidification unit with a desiccant wheel and a process air volume of 1.800 Nm³/h needs a cooling capacity of 38.700 kcal/h (45 kW) (calculated at ambient conditions of 35°C/ 60% rel. hum.), which adds up to $45 / 3 = 15$ kW of electrical energy needed to run the chiller. For the regeneration heater, blower and motors, an additional 20 kW of electrical energy is needed for the dehumidifier. The total electrical consumption of the dehumidification and the electricity for the chiller adds up to $15 \text{ kW/h} + 20 \text{ kW/h} = 35 \text{ kW/h}$. This is a large amount of energy when compared to the DMS unit, which runs with an average of 5 kW, as only electrical energy is needed for the refrigerant compressor and the ventilators. The difference of 30 kW/h or in other words, 86 % reduction, is extreme.

If you calculate for example 0,15 EUR/kW and consider a 24/7 production with 168 hours production time per week, the immensity of the savings becomes clear: $30 \text{ kW} \times 0,15 \times 168 \text{ h} = 756 \text{ EUR per week}$, or 3.024,00 EUR per month (à 4 weeks). Hard earned money is saved so easily, day by day, every day. It is just as easy to calculate the short amortization time of the DMS unit.

Effective mould drying with the DMS means you save large amounts of energy too

The installation of the DMS unit is easy and effective. The installation of insulated water pipes to and from the chilled water source is no longer necessary. Only the connection to the electricity supply is required. With the application of refrigerant compressors and ventilators of the youngest generation, significant energy savings can be achieved. These systems control and adapt the required cooling capacity to the ambient conditions, with the help of intelligent sensor technology. If the chilled water capacity is not enough, with the DMS application, no extra investment into an additional chilled water supply is necessary. The manufacturer has the advantage of saving double, once with the investment and a second time during operation. The DMS is a tailor-made system, allowing the manufacturer to choose to supply dry process air volumes from units ranging 500 to 3.500 Nm³/h.



Water and energy saving with DMS

Smart dehumidification with the DMS Series

The DMS units are made of high quality, perfectly balanced components to allow optimal energetic mould dehumidification. Until now, no comparable systems exist on the market. The process air is run in a closed loop, always brought back to the DMS unit for pretreatment and dehumidification of the air down to a 3°C dew point. The process air is dried by simulating a cold object in the DMS unit (like the mould) that allows the moisture in the air to condensate in the DMS unit before it reaches the mould. The DMS unit cools and dehumidifies the air in a 2-step refrigerant unit with the MPCSC technology (Micro Processor Controlled Segment Condensation). For this version, only electrical energy is needed. A DMS 15 supplies a nominal process airflow of 1.500 Nm³/h. The larger DMS 25 dehumidifies 2.500 Nm³/h and the DMS 25+ up to 3.500 Nm³/h. Just like the ecological footprint, the actual footprint left in the production hall with the dimensions of a DMS 15 of 900 x 1300 mm is remarkably small.

Sophisticated areas of application

The DMS units are designed for all applications where sophisticated, high-performance moulds are cooled with chilled water and which are in areas where moisture in the air can condensate on the mould. So all injection molding, extrusion blow moulding and thermo forming systems. Core areas in the plastics industry are packaging systems such as caps and PET performs, as short cycle times of the process and high production outputs require chilled water.

Bernhard Stipsits, managing director of Blue Air Systems: “The DMS units from Blue Air Systems guarantee condensation-free production conditions in a closed system, even when using very low chilled water temperatures for the moulds throughout the year, being independent from ambient climatic weather conditions. The MPSCS (Micro Processor Controlled Segment Condensation) technology always provides controlled parameters, making sure the optimal energetic conditions are automatically adjusted. What you get is higher productivity and consistent product quality in the production process at the lowest possible energy consumption. It’s time to start reducing our ecological footprint and the DMS is a huge step in this direction!”

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Subtitles:

Picture 1: Newest DMS system – DMS 10 air cooled

Picture 2: Principle of DMS air cooled

Picture 3: Water and energy saving with DMS

Contact

Blue Air Systems GmbH

Achenfeldweg 8
A-6250 Kundl/Tyrol
Austria

Tel.: +43 (0) 5338 211 71-0
Fax: +43 (0) 5338 211 71-20

Email: info@blue-air.at
Website: www.blue-air.at

Managing Director: Bernhard Stipsits

Blue Air Systems at a glance

Blue Air Systems GmbH, founded in 2010 and based in Kundl/Tyrol (Austria), supplies the plastics processing industry with innovative technology for energy saving. Blue Air Systems, the leading innovator, has over 30 years of experience with effective, air-based process solutions for plastics technology.

In the core field of **air-conditioning technology**, Blue Air Systems stands for solutions with cryogenic or dry air for **energy-efficient processing** for the plastics industry and other industries.

Blue Air Systems develops not only high-quality, but above all safe and easy-to-use solutions that require as little energy and maintenance as possible. The company's product-supporting services include **application and service-oriented advice** for processors.

The main products and applications in air conditioning technology include systems for **mould cavity dehumidification (BAS-MSP and BAS-DMS series)** and **internal product cooling (BAS-CAC series)** for effective cooling of blow-moulded parts using extremely cold and dry compressed air (-35°C) (process volumes 120 to 540 Nm³/h). BAS-CAC significantly reduces material stress and cooling times by up to 50%.

In the field of **material handling**, Blue Air Systems offers a comprehensive range of compressed air-based resin dryers for efficient and gentle **material processing (RDM, RDX and RDL series)** based on the **Venturi principle**. The use of the compressed air available from the company is a very economical alternative to conventional drying systems, such as adsorption dryers. The compressed air technology with process volumes from 0.5 to 1,000 litres guarantees the best drying results - grain by grain, with minimum operating costs and virtually maintenance-free production.

A worldwide **network of sales and service centres** through representatives ensures optimum support for users and long-term value retention of the solutions used.

Constant **growth, references in more than 35 countries worldwide, innovative technologies** and a **high quality** make Blue Air Systems a globally established and reliable partner for the plastics industry. Blue Air Systems has 15 employees (2023) and an export rate of about 98%.

Blue Air System – Total Energy Savings