Air dehumidification eliminates weather impact in the spray drying process
Say “good-bye” to weather impact on your spray dryer

Spray dryer operators know how humid weather can cause problems in the spray drying process; product sticks inside the chamber and moist powder blocks conveying lines. Munters desiccant dehumidifiers remove humidity from the air, before it ever comes in contact with the product. The result is a significantly improved process, free of weather impact.

Munters Solution
Munters dehumidifiers control and maintain low inlet air humidity in many spray drying plants around the world. Weather no longer influences dryer performance and operators no longer need to continually adjust the dryer operation to combat weather changes. In this way, Munters creates “your perfect climate” for the spray drying process, supplying dry air no matter the season. Even in tropical climates, desiccant air dehumidification provides reliable and consistent low humidity, which improves dryer performance significantly everywhere, always.

Product sticking inside the spray dryer
During the spray drying process, as particles hit the internal dryer surface they may stick and, consequently, cause dryer fouling and blocking. Dehumidification of dryer inlet air prevents sticking, increases production capacity, reduces down-time and allows consistent high powder quality.

Some products are stickier than others, and as such, cannot be produced during hot and humid periods or in tropical areas, for that matter. The tendency to stick is caused by product composition, its moisture content and the air conditions inside the dryer.

When air temperature and humidity are high, product will stick; when either the temperature or humidity is lowered, the product will no longer stick. However, lowering dryer outlet temperature to avoid sticking is not really an option, as lower dryer outlet temperature causes increased evaporation from the product, worsening the problem. Operators are then forced to decrease dryer feed flow in order to reduce evaporation from the product, which stops the sticking, but the trouble-free operation is paid by reduced capacity, and the problem persists. Each time ambient humidity increases, dryer capacity goes down again and plant management must include such risk in its production planning.

Low air humidity at dryer inlet results in low air humidity even after water has evaporated from the product. The less water brought in with the drying air, the greater the capacity of the air to remove water from the product. This eliminates the risk of powder sticking.

Stop sticking and dryer fouling
Operating a spray dryer close to the sticking curve creates risk and vulnerability because sticking can occur with only minor weather fluctuations. Dehumidification of the dryer inlet air provides constant low humidity throughout the drying process and makes operation close to sticking safe. Air dehumidification increases dryer capacity on humid days, 24 hours a day, seven days a week, no matter the ambient weather. The more difficult the product is to dry, the more capacity gained, and capacity can easily increase by 20% - 50% for a great variety of products.
The term “spray dryer” covers a multitude of different dryer models and the way they operate. Each specific operation depends on product treated, required final powder properties and the available equipment.

The liquid feed to the spray dryer is prepared upstream of the spray drying process, here we shall only mention that a dry environment eases and improves storage, conveying, blending and many other upstream processes.

After spray drying, the powder either leaves the drying chamber together with the drying air for further downstream separation, or the powder continues to one of the next steps, and the air exits the drying chamber through ducts for downstream separation of particles.

If the air is either too hot, or its humidity too high, powder may stick inside the drying chamber or in the downstream treatment.
Munters dry air also improves cooling processes

Some spray dried powders must be cooled before conveying and packing and it is common practice to use ambient air cooled with chilled water for this purpose. The air then simultaneously dehumidifies, as humidity will condense and form water on the cooling coils. The air then passes through a de-mister and re-heater before being used for powder cooling. The minimum achievable air temperature is typically 7°C (44°F), and air humidity is 7g/kg or 100% Relative Humidity. The high Relative Humidity explains the need for reheating.

Dry air adds benefits to powder cooling; the lower the Relative Humidity in the cooling air, the more cooling can be applied to a product, without the risk of hygroscopic powders regaining moisture. Low air humidity from a desiccant process allows low final powder temperature and low powder moisture content which cannot otherwise be achieved with chilled water alone.

Hygroscopic products

Spray dried powder must meet certain specifications, including final moisture content. If a dried hygroscopic product is exposed to high Relative Humidity, it will reabsorb water from the air. To avoid such high Relative Humidity the air must be reheated. Air treated by Munters desiccant dehumidifiers has a very low humidity content enabling it to be used where traditionally cooled air cannot.

Final powder conveying and additional handling

Desiccant air dehumidification eliminates the risk of hygroscopic powders gaining moisture during: conveying, storage, dry blending, packing, canning, etc. The dehumidified air prevents powders from forming lumps and clogging product flow.

Improved hygiene

Munters desiccant air dehumidification process eliminates all condensation risk within the product environment and, as a result, eliminates risk of microbial growth inside the powder sections of the plant.
Almost too good to be true

Just over a decade ago, the infant formula industry began installing desiccant dehumidifiers to treat all incoming air to the spray dryer. Until then, the drying industry understood desiccant dehumidification would improve final powder cooling and conveying, but the many benefits to the drying process itself were, at that time, unexplored.

Thanks to the development of the high efficient Munters Quantum rotor, it is now possible to significantly improve dryer performance and production capacity, while at the same time reduce investment and operation costs.

In the spray drying industry, Munters dehumidification solutions are fully integrated with the drying process and heat recuperation programs whenever needed. In fact, development of our dehumidification solutions is conducted in close partnership with our customers to assure the most optimal solution for each individual project.

Munters dehumidifiers are applicable for both new and retrofit projects. Due to the increased capacity of dry air, often smaller units can meet required supply air specifications, resulting in investment and building cost savings. For existing air handling systems, Munters dehumidifiers can be installed without major changes to other parts of the dryer.

Improved energy utilization

During the dehumidification process, water is removed from the process airstream when it is adsorbed on the Quantum media. Now, when this airstream enters the spray dryer, it has a greater capacity for carrying water away from the product. The adsorption process also raises the temperature of the airstream, greatly reducing the amount of energy needed to warm the airstream to desirable operating specifications.

Compared to a chilled water dehumidification system, the Munters system does not require energy to cool and condense water from the airstream. Nor does it need additional energy to warm the airstream from a colder temperature. The result is a process with higher capacity, stability and lower energy consumption.

Reduced CO₂ footprint

The industry faces increasingly strict requirements to reduce carbon dioxide emissions from production. The reduced energy consumption related to air dehumidification reduces overall spray drying plant emission and it aids in improving the “green” profile of production. The dehumidifier itself uses heat from any source and easily integrates with heat recovery programs.
Munters is a global leader in energy efficient air treatment and climate solutions.

Using innovative technologies, Munters creates the perfect climate for customers in a wide range of industries, the largest being food, pharmaceutical and data center sectors. Munters has been defining the future of air treatment since 1955. Today, around 3,500 employees carry out manufacturing and sales in more than 30 countries. Munters reports annual net sales in the region of SEK 6 billion and is listed on Nasdaq Stockholm.

For more information, please visit www.munters.com.