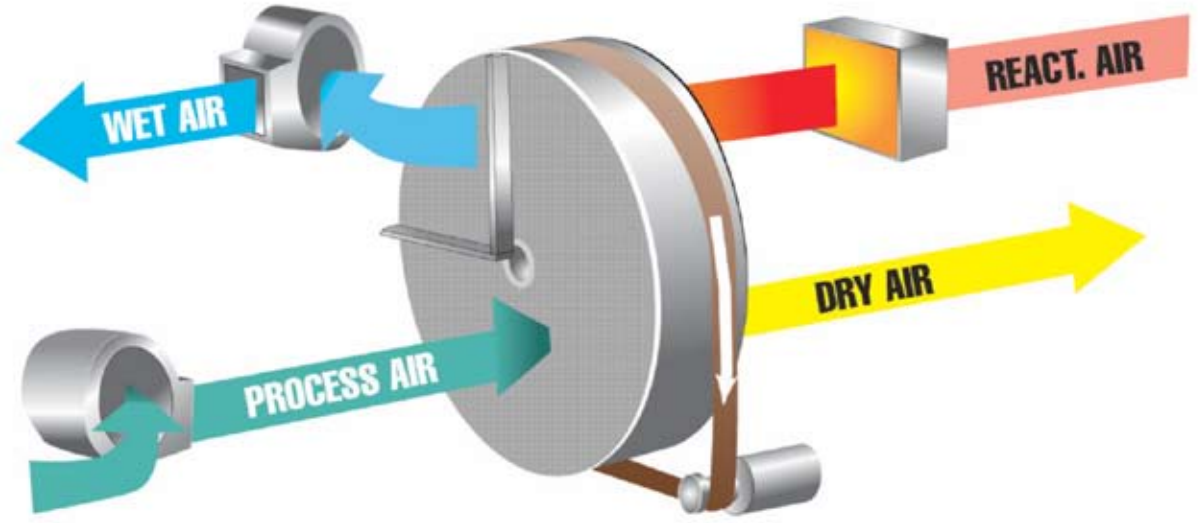
Dehumidification

Dehumidification is the removal of water from the air. Dehumidification equipment will take the ambient air and will "treat" it before it is exhausted into the enclosure. There are currently two industry accepted types of dehumidification:

Desiccant

The desiccant based dehumidification system uses a chemical to directly absorb moisture from the air while it is a vapor. Specifically, the moist air stream is passed over a desiccant material, typically lithium chloride or silica gel, that in its active state has a vapor pressure below that of the air to be dehumidified. Moisture is absorbed from the air stream. The desiccant material is then heated which forces it to give up the absorbed moisture, regenerating the desiccant material for continuous use. The heat of regeneration causes the temperature of the air entering the enclosure to be substantially higher than the ambient air. Due to this heat of regeneration requirement the power requirements to operate this type of unit are generally quite high. Ultimately the desiccant material will have to be completely replaced to maintain its performance level.



Refrigerant

The refrigerant dehumidification system directs incoming air over evaporator coils to reduce the absolute amount of moisture in the air via condensation. The air exits the cooling coil section of the dehumidifier at a reduced temperature, dew point, and absolute humidity. It thepasses over both the condenser coils and a series of reheat coils to (a) increase the temperature of the air and (b) reduce the relative humidity of this air. This system is advantageous when the ambient external air is comparatively warm with a high moisture content and the dew point is greater than 0 degrees C (32 degrees F). It has low power consumption requirements - approximately half that of a desiccant unit with an equal air flow rating.

Why you should use Dehumidification during Abrasive Blasting

It is generally accepted that for corrosion to occur all four of the following components must be present:

1. Anode - A metal, in contact with the electrolyte, which corrodes (gives up energy)
2. Cathode - A metal, in contact with the electrolyte, which does not corrode (gives up energy)
3. Conductor - A metal which connects the anode and the cathode to complete the circuit for current flow
4. Electrolyte - Conducts current

During Coating Application

Due to the U.S. Clean Air Act Amendment of 1990 and air quality regulations enacted by other governmental agencies, the majority of the coating/lining manufacturers are reducing the volatile organic compounds (VOC's) in their products. However, as long as there are solvents in the formulation, the following scenario can occur during the application of the lining material.

The coating material is atomized as it passes through the spray gun nozzle. This is the beginning of the solvent evaporation process. However, once the material has reached the surface and has become a "wetted" film, the solvent continues to evaporate. At this point in time two potential problems can occur:

- The air flow through the enclosure may have to be adjusted since it now must be capable of exhausting this evaporating solvent. This is discussed in more detail in the "During Curing of the Coating" Section.

- Solvent evaporation is a cooling process. Therefore, as the solvent evaporates from the "wetted" film, the coated surface has a tendency to cool and its temperature will actually be less than either the air within the enclosure or the surface to which it has been applied. Because of this phenomenon, most specifications include the phrase "...the surface temperature must be at least 3° C (5° F) above the dew point..."

However, if this surface temperature cannot be met due to external ambient conditions, one can either:

- raise the temperature of the steel surface
- reduce the dew point of the air within the enclosure

It is not practical, logical, or cost effective to raise the surface temperature of the entire steel tank – therefore the reduction of the dew point is the only option. This can be done only by the dehumidification procedures. Heating of the air does not reduce the dew point - it merely reduces the relative humidity.

During the Curing of the Coating

As previously stated, water vapor is present at all times in the air. Also, at a given temperature and atmospheric pressure this air can hold only a fixed amount of liquid in the vapor state. Or, to put it another way, each cubic foot of air can hold only a fixed amount of evaporated liquids.

After a coating has been applied, the solvent release ideally continues until the coating has cured. If it cannot be totally released and exhausted from the film, solvent will be retained in the film and premature coating failure will occur. There are two directions a contractor can go to resolve the above problem. Since a given cubic foot of air with a given relative humidity (a function of the amount of water in the vapor state that is found in the air) and temperature can retain only a fixed amount of solvent, the air flow can be increased so that more air passes through the enclosure and thus all the solvent can be removed. However, this could become prohibitive due to the required size and cost of the equipment plus the additional cost of power to run the equipment - especially if the exterior ambient air is almost saturated due to either (a) rain or high humidity or (b) low temperatures.

The second, and the most practical and cost effective solution, would be to utilize dehumidification equipment. In this scenario, the amount of water vapor in the air within the enclosure would be substantially reduced which in turn allows each cubic foot of air to retain additional solvent. This is true regardless of the exterior ambient air conditions. Typically a specification will call for 85% Relative Humidity, or less, during this operation. If this Relative Humidity figure were to be reduced, the curing rate could be accelerated and the tank could be returned to service even more quickly.

Applications

A wide range of applications are available to the users of Airblast multi-functional refrigerant based dehumidifiers in industries such as: marine, shipyard & petrochemical. Benefits include:

- to reduce the amount of time required for degassing of tanks
- to reduce the time required to dry a tank after steam cleaning, hydro blasting, or washing operations
- to minimize the formation of “flash rusting” after abrasive blasting
- to reduce the time required for the curing (drying) of the protective coating
- to reduce the time required to create a “workable” environment for personnel as they enter tanks
- to provide a safer, more productive work environment for personnel working within a tank
- to facilitate the application and cure of the protective coating material
- to provide a more ideal environmental condition for the coating to cure and thus lengthen the service life of the coating