

# Tech Bulletin

**Moisture Issues:  
The Importance of Clean, Dry Air**

Page 1 of 4

## **The Importance of a Clean, Dry Air Supply for Micro-Abrasive Blasting**

The micro-abrasive blasting process uses compressed air to propel extremely fine abrasive media through very small nozzles. It is a relatively simple process, but because of the small size of the abrasive media, even a small amount of moisture contamination can cause the powder to “clump up” and prevent it from flowing freely from the tank – bringing your entire operation to an abrupt halt.

**More than half of all technical service calls have nothing to do with the machine at all. Performance problems can usually be traced to moisture or oil contamination in the abrasive powder.**

Two common symptoms of moisture contamination in the micro-abrasive blasting process are inconsistent flow, where the operator will get an initial stream of abrasive and then it will quickly taper off, or clumps forming in the abrasive tank that will completely restrict the abrasive flow, stopping all abrasive flow from the nozzle.

*The storage and handling of powder is described in detail in other documents. This bulletin focuses on clean, dry air.*

### **What can be done to avoid this problem?**

There are three very important things you need to do to prevent contaminated (wet) powder from slowing down or stopping your operation:

- 1. Store powder properly.** Always make sure containers (bags or bottles) remain tightly closed when not in use. Store powder in a cool, dry location avoiding wide variations in temperature to prevent the abrasive media from absorbing moisture from its surrounding environment.
- 2. Do not leave powder in the tank of your blaster for extended periods of time.** With the machine off and depressurized, the tank is NOT a sealed container. Leaving powder in the tank for a day or two can cause the powder to absorb enough moisture to cause problems.
- 3. Keep your air supply dry.** Dirty air from your air compressor is the single greatest source of problems, not only with abrasive powder but with your MicroBlaster as well. You MUST have an adequate compressed air treatment system installed to prevent contaminants including oil, water and other particulate matter, such as pipe scale, from reaching your machines. It is essential that you inspect and maintain your air compressor, air dryer, filters, traps and lines on a regular basis, carefully following all of the manufacturer’s instructions.

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## Where Does Moisture Come From?

No matter what the humidity, or time of year, atmospheric air **always** contains moisture (humidity). It becomes a problem, even in arid regions, because of the nature of the compression process. Atmospheric air compressed to 100 psi is one-eighth its original volume yet still **contains the same amount of moisture**. Additionally, the air gets hot as it is compressed, then cools as it leaves the compressor and travels throughout the system. Any significant drop in temperature or increase in pressure will cause moisture to condense out of the air. As you can see, the compression process causes both of these things to occur. Therefore, moisture condensation is inevitable.

Most people mistakenly believe that they don't need any added protection from moisture because their compressor has a separator filter or even a dryer already attached. The filters, or traps, on air compressors are totally inadequate when it comes to removing enough moisture from the air lines to protect your MicroBlaster.

Bowls, traps, or "drop legs" in the air line only allow for some of the condensation in compressed air to flow down and out of the main lines. They **may** capture a lot of large water droplets, but they do nothing to prevent the water **vapor** from going right on through to your machine.

Separators, which remove liquid by forcing the air stream to spin or change direction,

are efficient for removing liquid droplets but are not effective on sub-micronic oil aerosols and water vapor. Coalescing filters capture liquid droplets in a bed of fibers. The captured droplets move along the fibers, coalescing into larger droplets which drain to the bottom of the cartridge for removal. These fibers are adequate for providing virtually oil free air, but they are no more effective on water vapor than separators.

Refrigerant dryers are commonly found on air compressors. Most people mistakenly assume that this type of dryer is sufficient for micro-abrasive blasting. Refrigerant dryers operate on the basis of cooling the compressed air dramatically and removing the condensation that forms. Most common refrigerant dryers yield a compressed air dew point of +35° F. This is still six times more than the amount of water vapor required for trouble-free operation of the micro-abrasive system.

Deliquescent dryers contain a chemical that melts away as it absorbs water vapor. The resulting water/deliquescent solution is removed and additional deliquescent added. These types of dryers can only drop the dew point by about 20 degrees from inlet temperature. That means, if used in conjunction with a refrigerant dryer, you may get a dew point of somewhere between 0 and +10 degrees. This is still not adequate for micro-abrasive blasting operations.

## The Significance of Dew Point

Most air dryer manufacturers rate their equipment for dryness on "dew point." Dew point is a figure derived from a complex formula based on relative humidity, temperature, air pressure and flow rates. Simply stated, dew point describes how cold the air supply can get before water condensation begins to form. The greater the volume of moisture

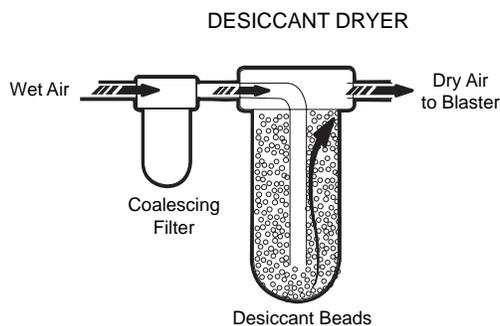
in the compressed air line, the higher the dew point.

Some types of abrasive media may be more or less susceptible to moisture than others, but the micro-abrasive blasting process requires that the water/air ratio be below 200 parts per million (PPM). This corresponds to a dew point of -25 degrees F.

## Point-Of-Use Air Dryers

There is no need to replace your refrigerant dryer unless you need absolutely dry air throughout your entire facility. The solution to most micro-abrasive blasting operations is a point-of-use air dryer next to your blasting unit. This is a much more cost effective solution, since the air dryer needs only to be sized according to the machine needs, rather than an entire facility.

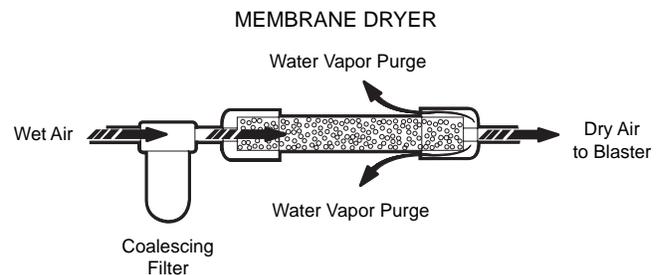
Several types of compressed air treatment systems are available which may be used instead of, or in conjunction with, a refrigerant dryer, including **Membrane** and **Desiccant** air dryers.



**Desiccant dryers** use a super-absorbent bead that literally “pulls” moisture out of the compressed air as it passes through the dryer. When the beads are fresh they can achieve dew points < -35° F. The beads have a limit to the amount of moisture that they can absorb. Most manufacturers will use a bead that changes color when the bead becomes more saturated, typically blue to clear. When the beads become clear they will need to be either regenerated or replaced in steady use. This may be required as often as once per week. To regenerate the beads, the moisture must be driven off with heat. Each recharge causes the beads to lose some of their water holding capacity. This significant amount of maintenance normally limits the use of a desiccant dryer to intermittent applications where the amount of air being dried is minimal and low cost is critical.

**Regenerative desiccant dryers** use towers containing the same type of desiccant bead as a standard desiccant dryer but are able to recharge the desiccant during operation. There are two styles of regenerative dryers: heated and heatless. The heated dryers use heat to drive off moisture from the saturated beads.

Air in a heatless dryer alternates between two towers containing zeolite; one tower removes moisture from the air line while the other tower regenerates it. Typically they will switch every 30 seconds to one minute. This “boot strap” operation can achieve a dew point as low as -75° F on a continuous basis.



**Membrane dryers** use a semipermeable hollow membrane of fibers in which water vapor will diffuse through the fiber walls (osmosis). The moisture is removed from the unit through an automatic air purge. Membrane dryers can achieve dew points as low as -40° F. This air purge continuously removes the excess water vapor from the system, eliminating the maintenance requirement associated with desiccant dryers. Typically the initial cost for a membrane dryer is higher, but in heavy use environments it is more than offset by the low maintenance cost.

### **Choosing the Correct Air Dryer:**

- **AD5100 Desiccant Air Dryer**
- **AD5300 Continuous Duty Membrane Dryer**

Comco offers two styles of air dryers for point-of-use operation. Choosing the correct air dryer for your application is easy. If you use your Comco blaster intermittently during the day, the AD5100 Series Desiccant Air Dryer (single tower) should suffice. However, if your operation requires continuous use of your machines in a production environment, then you will need the AD5300 Series Continuous Duty Membrane Dryer. Contact your Sales Representative or call Comco directly for more details on these air dryers.

### **Oil In The Air Lines**

MicroBlaster specifications require that oil in the air source be no more than 10 PPM. Since oil molecules are relatively large, this is easily and inexpensively accomplished with a simple in-line coalescing filter. Additionally, the oil will bond with the agents used to dry the compressed air, limiting their effectiveness. As the dryer becomes coated with oil it will not absorb moisture, allowing it to pass through to the MicroBlaster. Therefore, make sure the oil filter is installed up stream from the air dryer.

Oil contamination is a common problem caused by air compressors, especially older piston (reciprocating) compressors. As air compressors age, seals begin to fail and oil escapes into the air lines. Newer style rotary screw (vane) compressors and "oil free" reciprocating compressors are not subject to this problem.

### **Routine Maintenance Procedures**

There is one final, and very important, point you need to be aware of when it comes to air treatment systems. They must be well maintained in order to ensure proper operation and protection of your micro-abrasive blasting equipment. Water filter elements need to be replaced on a regular basis (about once a year), and the desiccant dryers need to be recharged when the desiccant becomes saturated. In extreme cases, this may be as often as once per week. Saturated desiccant beads will not absorb water vapor from the air, allowing moisture laden air to reach the MicroBlaster. Review the literature provided with your dryer to become familiar with its maintenance requirements.

### **Quality, Efficiency & Cost Effectiveness**

A clean air supply will go a long way in ensuring you enjoy many years of trouble-free operation from your MicroBlaster. The cost of using wet air far exceeds the cost of purchasing a dryer. With the proper compressed air treatment equipment, system pressure is maintained, operation expenses are reduced, and production quality is improved.