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# Prepare Your Air

**Before shops convert to waterborne/low-VOC basecoats, they need to evaluate whether their compressed air systems will support the conversion.**

By MICHAEL CAMBER

**T**HERE'S BEEN A LOT OF DISCUSSION about changing to waterborne/low-VOC basecoats. Even though only a few areas currently have new laws limiting the use of volatile organic compounds (VOCs), these laws are expected to be enacted in a number of northeastern states in the next year or two and throughout the U.S. over the next 10 years. While they don't mandate the use of waterborne, the VOC restrictions are certainly pushing more and more shops in that direction.

One of the things shops need to consider when making the switch to waterborne is whether they should upgrade their compressed air systems to either provide more air or better air quality. I've met customers with all kinds of needs: those who needed to add capacity, some who needed to get

better dryers and filters, and others who didn't need to make any changes.

The information in this article will help you determine if your current compressed air system will support the transition to waterborne and will also help you identify the types of products that can improve system performance.

## **Air Supply and Quality**

THE TWO BASIC QUESTIONS YOU NEED TO answer are 1) will you need more air, and 2) do you have good enough air quality to avoid costly comebacks caused by contamination of the compressed air?

Spraying waterborne doesn't require more air than solvent-based paints, but flashing it might. It depends on your booth equipment. If you plan to use the compressed air "blow dryers" to reduce flash time, you'll almost certainly need another compressor or a larger compressor because they use a lot of air. I've seen models that use over 20 cfm (about equal to all the air from a 5-hp compressor). Fortunately, there are many models available, and some are much more efficient than



## Dryers are rated at a set of standard conditions. Without this set of conditions, suppliers could make performance claims based on installation conditions you never experience.

others. Pick your blow dryers carefully and don't use more than you need. In addition, consider blower/fan options available for your spraybooth as they won't require the purchase of a new air system and will use far less energy.

Waterborne is more sensitive to moisture than solvent-based, so you also need to evaluate your drying and filtration components. But the reality is that the solvent-based clearcoats you're still using are also sensitive to moisture. Moisture reacts with isocyanate hardeners to create carbon dioxide gas, which reduces the hardness of the clearcoat by breaking it down. Excess moisture will make it cloud up and possibly flake off. If you're getting good results with clearcoats, you may not need to make changes in your dryer and filters. If you're having issues, improving your air quality to prepare for waterborne will reduce your costs and give you the added benefit of harder, more durable clearcoats.

For both waterborne and clearcoats, removing moisture from your compressed air before it contacts the paint will reduce dry times. If you're using blow dryer guns, the dryer compressed air will reduce flash times even more. Another benefit is that the dryers, drains and filters that remove water also remove other contaminants that cause finish flaws.

### Moisture Misconceptions

THERE ARE STILL NOT A LOT OF technical specifications to help you select dryers and filters. Some paint vendors cite relative humidity as a measurement of moisture in compressed air. For example, some suppliers state that a relative humidity of 15 percent or less is optimal for

spraying waterborne. I think people understand this concept fairly well due to their daily experience with the weather, but it doesn't accurately reflect moisture content in compressed air. Relative humidity in compressed air can be misleading (even meaningless) unless other variables are known and accounted for.



**Routine maintenance is crucial to ensuring the consistent performance and longevity of your air compressor.**

The most accurate way to express moisture levels for compressed air is pressure dewpoint (PDP). PDP is the temperature below which moisture will precipitate out of the air (at a specific pressure). Compressed air dryer performance is stated in terms of pressure dewpoint at a set of standard conditions. For example, if a dryer is properly sized and has an outlet pressure dewpoint of 40°F, so much moisture has been removed that liquid water won't be present unless the compressed air is cooled below 40°F. Note that it's possible to measure different relative humidity levels at the same dewpoint. For

this reason, pressure dewpoint is the better reference.

The most common (and appropriate) type of dryer for body shops is the refrigerated dryer. It's simple, reliable and low-maintenance. A quality refrigerated dryer, in conjunction with a tank and proper filtration, will work fine for most shops. Look for one designed to reach a 40°F pressure dewpoint or better. Some refrigerated dryers are designed to handle the higher temperatures from piston compressors, but these are generally not designed to dry the air as much.

In rare cases, dryer air may be needed. One solution is a desiccant dryer, but this is usually only needed when the compressed air piping will be exposed to freezing temperatures after the dryer. Desiccant dryers provide super dry air (usually between 0° and -100°F PDP), and some high-end shops are willing to take on the extra purchase and maintenance costs even if they don't have freezing conditions.

Another way to achieve super dry air is to use a membrane dryer for the spraybooth. Membrane dryers don't have designated dewpoints but will suppress the dewpoint well below the compressed air temperature. This is very effective if used after a refrigerated dryer.

Keep in mind that unlike refrigerated dryers, both desiccant and membrane dryers consume significant amounts of compressed air. So if you feel you must have either a desiccant or membrane dryer, use it downstream of a refrigerated dryer and size it just for the spraybooth (not the whole air system) to minimize its air consumption. And don't forget to install a good coalescing oil filter



# There are a variety of filters out there, but they're designed to remove three basic things: liquids, particles and hydrocarbons. Filters should be installed in that order: remove liquids, then particles, then oil.

before you use these dryers, or they'll stop working and require expensive desiccant or membrane replacement.

## One Size Fits All?

AS NOTED ABOVE, DRYERS ARE RATED at a set of standard conditions. Without this set of conditions, suppliers could make performance claims based on installation conditions you never experience. Quality industrial dryers are usually rated at 100°F ambient temperature, 100°F compressed air inlet temperature and 100 psig. And, of course, they're sized according to the air flow (cfm) you feed into them.

Dryers must be appropriately sized, and unless you live in a fairytale world where your shop conditions are constantly the same as the dryer's rated conditions, you need to look beyond the cfm rating. You have to consider the temperatures in the compressor room, keeping in mind that if the compressor room is not climate-controlled, seasonal changes will directly impact dryer performance.

A dryer rated to dry 100 cfm to a 40°F dewpoint at standard conditions won't dry the air as thoroughly if either the compressed air or room temperature is above 100°F, the pressure is below 100 psig or you feed more than 100 cfm into it. In the body shop environment, compressed air temperature has the most impact. For example, if the compressed air temperature going into a refrigerated dryer is 120°F instead of 100°F, the dewpoint might rise from 40°F to 50°F or even 55°F, which means there's much more moisture remaining in the compressed air.

Your dryer vendor should be able to make some simple calculations to account for differences in flow, temperatures and pressure. If they look

at you funny when you ask, find another vendor.

## Filters

THERE ARE A VARIETY OF FILTERS out there, but they're designed to remove three basic things: liquids, particles and hydrocarbons. Filters should be installed in that order: remove liquids, then particles, then oils.

Technically, moisture can't really be filtered out of air. Any water in a

ters. They're essential for all paint applications and are critical to protecting membrane and desiccant dryers.

Automatic drains remove the trapped contaminants and should be installed on each of these kinds of filters. Another excellent option for filters is the differential pressure gauge, which measures pressure drop across the filter and can indicate when it's time to change one.

Some final thoughts on filters: Don't skimp when selecting them, and make sure they're on your maintenance schedule.

## Gotta Have Tanks

AIR RECEIVER TANKS ARE VITAL to compressed air systems because they store air for short periods of high demand and ensure smooth delivery of air at the right pressure and volume so tools and spray guns work properly. This buffer of air also prevents the compressor from cycling on and off too much, which saves energy and prolongs its life, especially piston compressors. Fortunately, all reputable compressor vendors provide tanks.

Tanks do two things: store air and remove liquids (water and oil) from compressed air. But if the liquids are not drained away, your tank will stop storing air, fill up with liquid and then put that liquid back into the compressed air stream to contaminate your tools and paint jobs. This will also lead to a huge increase in compressor run time/duty cycle. If this happens to piston compressors (and it often does), cooling time and compressor life will be shorter, and additional energy will be used regardless of compressor type. Avoid these issues by putting a reliable automatic drain on all tanks.



**Make sure changing your air compressor's filters is on your maintenance schedule.**

vapor state can only be removed by a dryer, but if it's liquid, it can be removed by a moisture separator that spins the water out. Some moisture separators include a filter element to remove particles, too.

Particulate filters remove dirt, dust, rust, fibers and other small solids that get into the compressed air stream.

Coalescing oil filters are designed primarily to capture fine oil mists, but they also remove very fine particles that pass through the earlier fil-



# If you're concerned about air quality or need to increase air flow, you need to look at your air piping.

## Piping

IF YOU'RE CONCERNED ABOUT AIR quality or need to increase air flow, you need look at your air piping. The tips below will help whether you're using waterborne or not.

◆ *Choose size and material for lowest pressure drop.* Pressure drop is caused by friction and turbulence in the pipe system. Too narrow a diameter is the most common factor, and taking one step up or down in pipe size can have a big impact on pressure drop.

◆ *Plan for growth.* Buying larger pipe now will reduce your pressure drop, help ensure good flow to all tools and spray guns, and lengthen how long you can go before replacing your pipe.

Swapping out compressors and dryers is much faster and less costly than replumbing.

◆ *Always pipe the system in a complete loop to reduce the distance air has to travel to reach the furthest tool.* Minimize the number of 90° angles and internal flow restrictions, and use full-flow ball valves. These measures all reduce pressure drop.

◆ *Select material for smooth flow and ease of installation.* Copper and aluminum are both excellent choices because they're smooth inside, won't rust and don't build up contaminants on the interior walls. Plus, they're lighter and easier to install than black iron or galvanized piping, less likely to leak at their joints and are much easier to change or add to in the future.

◆ *Think twice before installing PVC piping.* Though easy to install, it doesn't meet code in some places. It

can be weakened by contact with compressor oils and is also sensitive to sunlight. Finally, it's considered the least safe piping for compressed air.



**Buying larger pipe will reduce pressure drop and help ensure good air flow to all air-powered tools.**

## An Ounce of Prevention

IF YOU'RE USING WATERBORNE AND are experiencing problems or if you're making the transition now, use the points I just went over to review your system and identify what changes you might need to make. If you're not making the switch any time soon but are expanding or making system upgrades, it makes sense to get your system waterborne-ready. It will improve your system performance now and reduce your headaches later. 🛠️

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## Running on Nitrogen

There are some people who suggest using nitrogen to spray waterborne paints and even run other shop tools, arguing that nitrogen is dryer and cleaner than air. This is true, but only because you must dry and clean the air in the process of separating the nitrogen. Nitrogen separation systems include the compressed air filters and membranes similar to those mentioned above to remove moisture and other contaminants. The downside is that you pay much more for a nitrogen system than for a good coalescing filter and membrane dryer, and to be most effective, you still need a refrigerated dryer with the nitrogen systems. And don't forget: Nitrogen systems consume compressed air.





## There's no hiding from waterborne. Are you ready to make the switch?

Whether to meet new air quality regulations or to simply go green, shops all around the country are switching to waterborne paints.

Some will not need to make any air system improvements to achieve great results with waterborne. For others, the sensitivity to moisture or the additional compressed air demand of blow drying guns require better air quality or increased capacity.

We're currently offering a complimentary waterborne readiness evaluation. We'll determine if your system will support the transition. Visit [www.kaeser.com/paint](http://www.kaeser.com/paint) to register for this no-cost, no-obligation service.



Scan this QR code with your smart phone to see Charley Hutton talk about Kaeser and waterborne paints.

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