Desiccant Breather Filters Maximize Equipment Life

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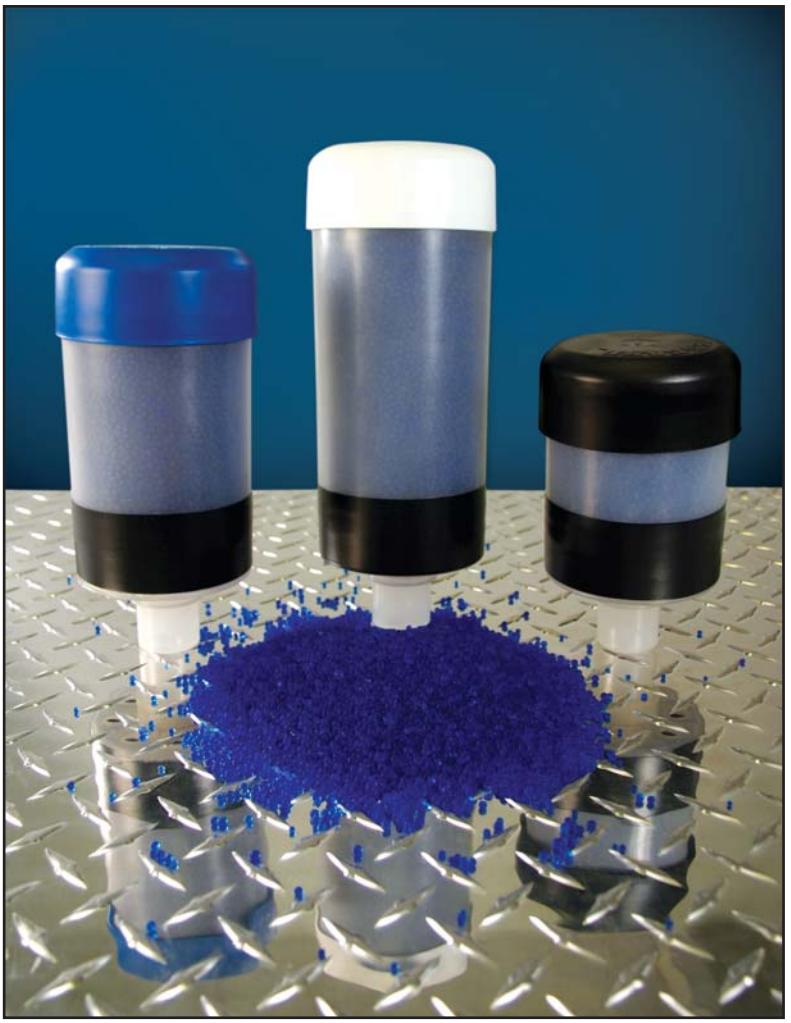
It's doubtful that anyone working in less than pristine surroundings would be surprised to learn particle contaminants cause lubricant and hydraulic system deterioration. What may be surprising though is that many experts consider moisture accumulation in lubricating oils a chemical contaminant, which can be even more destructive than particle contamination.



As with particle control, maintenance personnel must take care to minimize entry of moisture to curtail damage within hydraulic systems, turbines or gearboxes to prevent downtime, the expense of labor and having to replace oil and damaged parts.

One of the most cost-effective ways to prevent contaminants from entering machinery is by using a breather. Numerous kinds are available, including oil coalescing, expansion chamber/bladder, desiccant and hybrids. Finding the right breather for an application is a good first maintenance consideration when attempting to extend a system's life. Recently, many original equipment manufacturers (OEMs) have chosen to supply desiccant breathers on their products to accomplish such a task.

Removing Moisture Extends Oil and Equipment Life

Every manufacturing industry creates its own unique environment, resulting in contamination peculiar to that industry, which in turn, requires appropriately designed breathers. Desiccant breathers are particularly useful in environments that contain high dust and humidity levels.

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There are a number of ways that contaminants can enter equipment, including poor oil top-up and sampling methods, improper handling practices, inadequate or poorly maintained seals and the lack of breather filters. The abrasive effects that particles have on hydraulic pumps, turbines or gearboxes are obvious. The effects water has on moving parts are much less understood.

Solid, Liquid and Gas

Water can exist in oil in three states: dissolved, emulsified and free. Individual water molecules dispersed throughout oil are considered to be dissolved. New lubricating oil can retain dissolved water at levels between 200 ppm to 600 ppm, and new motor oils can retain three times this amount before any evidence of moisture is evident. The older the oil, the more water it can hold. At some point the oil becomes saturated and the individual water molecules begin to coalesce, creating microdroplets and a cloudy appearance. As the amount of emulsified water in the oil increases, a layer of free water is produced, which settles to the bottom of tanks and sumps.

Once water has mixed with oil, chemical reactions occur between the water, base oil and various additives, including extreme pressure and wear resistance agents, oxidation and rust inhibitors, and viscosity improvers. The chemical reaction is called hydrolysis. Water can accelerate the oil's aging rate tenfold. These chemical reactions result in varnish, sludge, organic and inorganic acids, surface deposits and polymerization (a thickening of the lubricant). As little as one percent contamination can reduce bearing life by as much as 90 percent. Additionally, vaporous cavitation, the implosion of water vapor within pressurized systems, can produce honeycomb pitting on mechanical surfaces.

How Desiccant Breathers Work

Even though the basic concept for desiccant breathers has been the same for more than 20 years, they have evolved into numerous products that can handle a multitude of applications.

Comprised of a hygroscopic agent—silica gel that can attract and retain up to 40 percent of its weight in water—and a synthetic filter media, desiccant breathers are an important element in an effective preventive maintenance program. They are designed to prevent moisture and particulate contaminants from entering fluid reservoirs as pressures occur through thermal expansion and contraction of the fluid, and through level changes caused by filling and emptying of reservoirs.

With the addition of carbon (to the silica gel), desiccant breathers can capture oil mist and evenly disperse incoming air to ensure efficient use of the synthetic filter in combination with the silica gel. As the air passes through the synthetic filter, ideally it will retain all particulate matter down to three microns, and 70 percent or more of particulate matter down to 0.5 micron. Moisture is absorbed as air passes through the silica gel. A second filter can give added protection, as clean, dry air continues to flow through the breather vent. The air then passes again back through the silica gel, partially regenerating it and extending the life of the breather.

By capturing the oil mist, the breather drastically reduces pollution in the work environment. If the breather is designed with more vent holes to allow variable airflow patterns, the filtration media and the desiccant's drying properties will be increased. This simple design allows the desiccant breather to be more efficient and reduces the amount of desiccant gel that each breather must contain. In applications where there are minimal volume changes and the environment is damp and dirty, the newer expansion-type breathers can control the breathing and permit expansion and contraction of the airspace. Knowing when to change desiccant breathers is obvious because manufacturers have added dyes to the silica gel that changes colors as the gel becomes saturated.

When choosing the size of a desiccant breather, consider the amount of air exchanged

(the required cubic feet per minute) for each application. Airflow capacity must match or surpass the tank's fill and drawdown rate. As the flow rates increase, so should the size of the desiccant breather. It's recommended to consult with the breather manufacturer when trying to determine the correct size for an application.

Additionally, consideration for the operating environment is important when choosing which breather housing (steel or plastic) to select. While plastic housing can be sufficient for many industrial settings, steel housings are appropriate in hot, dirty environments.

A few suggested applications for desiccant breather filters include:

- stationary and mobile hydraulic systems
- switch gears
- gearboxes
- turbines
- feed pumps
- agriculture equipment
- oil cooled transformers
- diesel fuel storage tanks

Desiccant breathers are powerful preventive maintenance tools that can protect industrial and commercial equipment, yet they are only as good as the entire contamination control and maintenance practices used with them. Proper sampling techniques, the use of the system filters, application of the correct seals, and the appropriate lubricant storage and disposal systems all come into play along with desiccant breathers, in preventing lubricant contamination. Used together, these solutions can maximize machine and lubricant life while minimizing capital and operating expenses, ensuring the greatest return on investment. ML