

Reprint

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Breathing Life Into Fluid Power

by Jim Waller
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It is widely known that contamination is the biggest single cause of lubrication degradation. Reliability and useful life of fluid power equipment are directly related to contamination control. Less widely known is the ability of a quality air breather to assist in maintaining clean lubricants. A greater understanding of the role a breather plays will help in achieving desired cleanliness levels.

Prevention Through Exclusion

The vast majority of harmful contamination is ingressed from the atmosphere, with a common point of entry being the standard breather cap during normal operation. Despite this fact, most hydraulic reservoirs, gearboxes and/or storage tanks are equipped with a standard filler/breather cap that provides minimal, if any, protection against dirty air and moisture.

Since it costs ten times as much to remove a particle once it is in the machine's fluid as it does to keep it

out in the first place; common sense calls for a procedure to simply prevent entry of contaminants. One of the most economical and effective ways this can be accomplished is by equipping the reservoir, gearbox or storage tank with a breather that includes filtration and drying media. When a system is breathing properly, the ingression of contaminants is greatly reduced.

Problems Caused by Atmospheric Ingression

Atmospheric ingression of moisture (humidity) and particulate in air are a

primary cause of lubricant and hydraulic system deterioration. Both precipitate rapid oxidation of oil additives and base stocks, which in turn diminish the performance of these lubricants. Unwanted by-products are formed such as rust, sludge, free radicals and surface deposits. Water affects oil viscosity, reducing the lubricant's load carrying capability. Moisture-induced wear and corrosion affect other system elements, such as machine surfaces, bearings, valves and

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pumps. A chain reaction occurs whereby a few particles generate more and more particles that eventually lead to machine degradation and failure.

In addition to internally generated particulate resulting from air and moisture contamination, outside airborne particulate being drawn in poses a serious threat to the system. Ingressed particles cause surface

fatigue and abrasive wear. Even the smallest particles accumulate to impede motion and further system damage.

Anatomy of a Breather

Before entering a discussion on desiccant filter breathers, it is important to understand traditional breather caps. Most reservoirs are shipped from the OEM with breathers (sometimes referred to as vents) rated around 40-microns (a micron is equivalent to 1/1,000mm) with no drying capability. However, since the most dangerous contaminants are water and particulate matter ranging from 3- to 20-microns in diameter, a standard cap is not capable of effectively controlling contaminants being inhaled. As equipment tolerances tighten and technologies unfold, industry is beginning to embrace a new standard of breathers.

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The concept of a desiccant filter breather is to allow only clean, dry air to enter the system and to prohibit the entry of water

and even the most microscopic particulate matter. While there will be slight variations from different manufacturers, quality breathers should incorporate a hygroscopic or drying agent. The most commonly used agent is silica gel. This hygroscopic agent readily adsorbs moisture and provides a high removal volume as air passes through. Silica gel covers a wide range of temperatures and humidity and handles larger volumes of moisture than other desiccants.

An effective breather will also incorporate filter media to capture and release particulate matter. The breather rating should be at least 99% efficient at 3-microns, a level which exceeds most industry standards and provides the protection necessary to ensure maximum component life and system performance. Airflow patterns that allow for regeneration of the drying agent will also help extend the life of the breather.

A fail-proof method of determining when replacement is necessary is also important so that ongoing protection is maintained. A visual color indicator is a very common means of accomplishing this. Like a filter, a breather must be closely monitored and changed or rebuilt periodically

NASHVILLE ELECTRIC SERVICE BENEFITS FROM PROACTIVE MAINTENANCE MEASURES

by Trigg Minnick, Des-Case Corp.

Crew Installs Des-Case Breathers to Protect Mobile Transformers

Nashville Electric Service is looking to standardize desiccant filter breathers as part of the utility's aggressive quality assurance program. These steps align with the larger program NES introduced in March 1999 entitled 'Power Promise,' which ensures that customers receive the quality of service that they deserve and expect.

NES employee, James Mitchell, underground and substation supervisor, and Don Sweeney, field superintendent-substation, were looking for ways to protect dielectric oils in portable transformer units from moisture and particulate contamination. The possibility

There is an obvious cost benefit to having and maintaining clean oil in your load tap changers.

of facing the loss of one of these units because of a few impurities in the oil dictated that aggressive preventative steps be taken. Restoring power immediately is one of the goals of the "Power Promise."

"The potential consequences of a failing transformer are quite daunting. Consider the recent attention in the media surrounding blackouts in California," said Sweeney. "We must do everything in our power to minimize the possibility of an equipment failure due to impurities in the transformer units."

Sweeney says the issue is even more critical with the mobile units, which must remain ready to operate at full capacity at a moment's notice.

NES selected the Des-Case disposable breather model DC-2 to protect the \$1.2 million mobile substation transformers. The mobile units are used for emergency service only in the event of a major power outage at one of the substations. The breather protects the stored

and should be placed on a preventative maintenance schedule.

The service life of a breather will vary tremendously from application to application. This is due to many factors including operating environment, flow rates, regeneration factors, hours of equipment operation, breather size and adsorption capacity, and changes in relative humidity. It is important to note the initial breather may spend itself very quickly as it works to remove existing moisture from the system. Subsequent breathers will provide extended life.

First Line of Defense

The function of a properly sized, installed, and maintained breather is to prevent contaminants from entering, but its ultimate purpose is

“ . . . ultimate purpose is to extend the life of lubes, filters and related machinery.”

to extend the life of lubes, filters and related machinery. Protecting lubricants and equipment from the harmful effects of contamination starts with how the system breathes. Standardization of desiccant breathers is one simple step that can be taken toward positively impacting system life.

Jim Waller has 30 years of hands-on experience in filtration engineering and has authored two patents. He invented the first desiccant breather 17 years ago at the request of a Mobil Oil engineer. He then founded Des-Case Corporation in 1983. As the company's president and CEO, he remains integrally involved in all aspects of product development.

For additional information visit our website- www.des-case.com



Figure 1 - Nashville Electric transformer with Des-Case Breather

dielectric oils within the transformer by prohibiting the entry of damaging water and particulate (down to 3-micron), thereby preventing corrosion and keeping

“ . . . prevents water contamination and maintains oil at super clean levels down to 1-micron absolute.”

the oil clean and dry while the transformer is not in use. It aids in the prevention of premature tap changer failure by keeping the dielectric strength of the oil high.

The Des-Case steel breather model CS-6 is used to protect the oil tanker trucks that recondition oil. During the filling/emptying process, the heavy-duty carbon steel breathers ensure that only clean, dry air enters the tank. The breather prevents water contamination and maintains insulating oil at super clean levels down to 1-micron absolute. The steel breather is rebuildable, without interrupting service.

NES also uses bulk silica gel from Des-Case to protect \$600,000 transformers.

Each tap changer is protected using 1/2 gallon of silica gel, which adsorbs water. Additional Des-Case units, miniature disposable model DC-BB's (Button Breathers), are also being installed to protect the hydraulic accumulators and reservoirs in circuit breaker cabinets.

Des-Case breathers use a color indicator allowing NES maintenance crews to visually inspect the breathers to determine when replacement is necessary.

Maintaining clean transformer or insulating oil is a global issue in the power industry as electrical utilities work to minimize the volume of lubes purchased and deal with disposal issues. Clean oil minimizes arc duration and severity, extends contact life, and eliminates sludge

“ The breather is rebuildable, without interrupting service.”

deposits related to equipment service and failures.

“Ongoing protection of this kind ensures consistently clean, dry oil—the key to smooth operation in this type of

**Ask not what your lubes can do for you:
Ask what you can do for your lubes?**

Protect with Des-Case.
Your lubes are your lifeblood. That's why you should specify Des-Case breathers as your first line of defense against opposing contaminants.

Designed to replace standard filler/breather caps, Des-Case breathers prohibit the entry of life-threatening dirt and water contamination.

Your reward is a fruitful, lengthy life for your lubricants and all related machinery.

For additional information, please contact us at 615.672.8800 or visit our web site at www.des-case.com.

Patented airflow pattern ensures maximum protection.

Easily replaces standard filler/breather caps.

Color indicator signals need for change.

DES-CASE CORPORATION

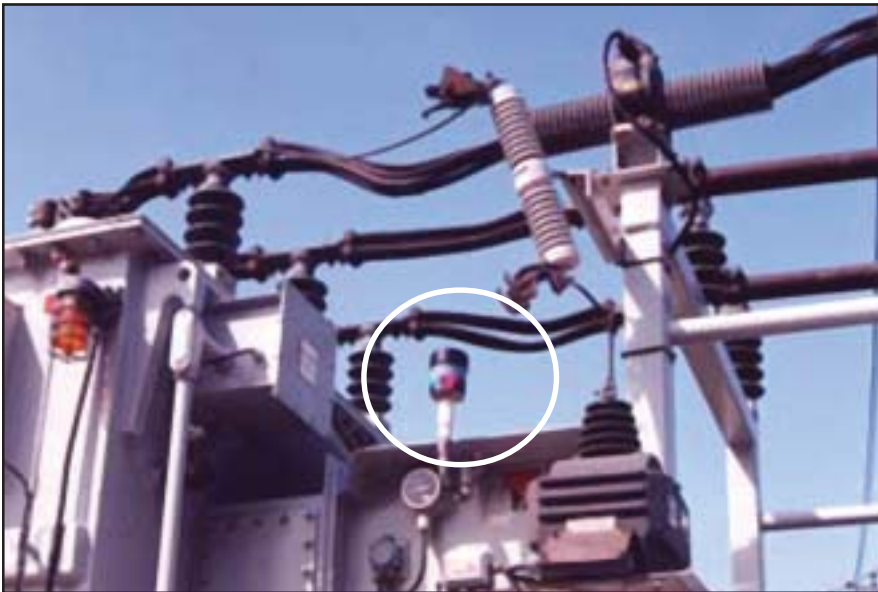


Figure 2 - Electrical equipment protected by Des-Case Breather

NES is one of the 12 largest public electric utilities in the nation, serving more than 300,000 customers in Nashville, Tennessee, and the surrounding area.

Headquartered in White House, Tennessee, Des-Case Corporation designs, manufactures and markets a complete line of desiccant breathers for a wide variety of industries. The company's products feature a design unparalleled in the marketplace and are protected by two U.S. patents.

machinery," said Mitchell. "There is an obvious cost benefit to having and maintaining clean oil in your load tap changers. These breathers will pay for themselves quickly."

For more information, please visit www.des-case.com or call 615.672.8800

