

Unlocking Hidden Maintenance Costs

TRANSFORMER BREATHERS

Many transformer owners – utilities and industrial alike – are looking for new ways to reduce operational costs or free up capital for use elsewhere. Often the simplest solutions to implement can also be the hardest to find.

Transformer Dehydrating Breathers are one such area, where the maintenance costs are often significantly underestimated and hence overlooked. We open the lid on these costs and provide some comparative data using Self-Dehydrating Breathers.

MOISTURE IN TRANSFORMERS

Firstly, some background. Moisture in transformers is a bad thing. It degrades the insulating (dielectric) and mechanical properties of the oil and cellulose insulation, resulting in accelerated aging and eventual insulation failure. In other words, it substantially reduces the performance and life of the asset.

PREVENTING MOISTURE

So what is to be done about this? A number of passive and active measures can be taken, including the design of the transformer (hermetically sealed, inert gas blanket), online monitoring and moisture extraction, as well as oil sampling and reconditioning. However, one of the most common and simplest of tools is a dehydrating breather.

CONVENTIONAL BREATHERS

Breathers are designed to absorb moisture during intake of air into the transformer by thermal contraction of the oil mass. They commonly contain silica gel that changes colour as it becomes saturated with moisture. Conventional breathers are generally quite basic in design, resulting in a low capital cost for the device. However, the maintenance costs are a different story.

Each breather needs regular inspection to determine how saturated the gel is. When it nears saturation point, the gel needs replacing and disposal. Depending on the climate and operating conditions, this is usually between every 3 to 12 months (1 to 4 times per year).

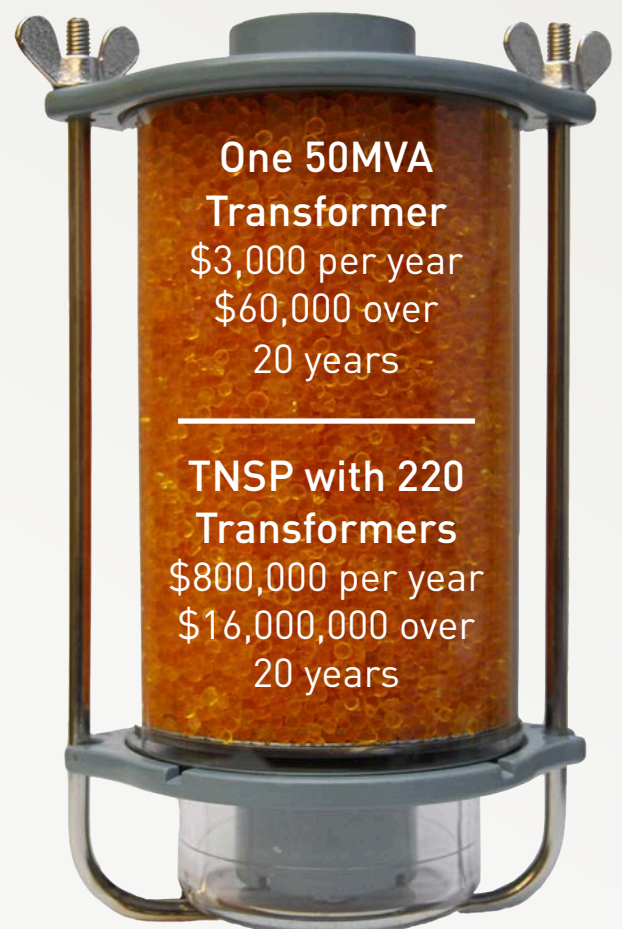
For a Single Transformer of 50 MVA, the following is a basic calculation of the maintenance costs:

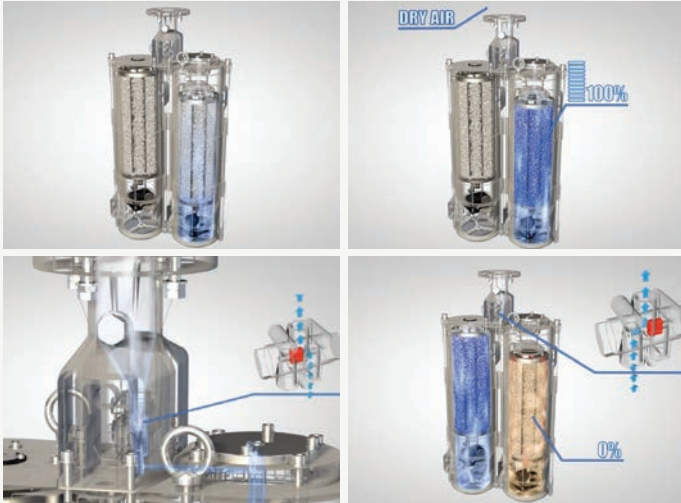
Gel Inspection <i>(4 x 0.5hr x \$85 / hr labour)</i>	Quarterly	\$170
Gel Replacement <i>(4 x 1.0hr x \$85 / hr labour + 34kg gel @ \$612)</i>	Quarterly	\$2,788
Annual Total		\$2,958
20 Year Cost		\$59,160

Across a Transmission Network fleet, these costs quickly escalate. As an example, a network with 220 transformers ranging from 10 MVA to well over 100 MVA, the maintenance costs equal \$788,340 in a single year or \$15,766,800 over 20 years.

Similarly, in a **Power Plant fleet** of 24 power transformers, the annual cost works out to \$80,744 (or \$1.6M over 20 years). And in a **Distribution Utility** with hundreds of power transformers over 10MVA dispersed across a state could well spend over \$1M annually.

These calculations do not factor in costs for rebuild or replacement of the breathers, risk of undetected loss of life, or remote location of transformers (extra labour, vehicle, fuel, etc).





THE SELF DEHYDRATING BREATHER

An alternative to the standard breather is a fully automated, self-drying breather. These devices self-regenerate their store of silica gel, thus eliminating the need to inspect or change the gel, greatly reducing maintenance costs.

Similarly, they are designed to be highly reliable and rugged, and generally can be monitored remotely, further reducing the need for maintenance.

In short, they are a more efficient and effective solution for the protection of a transformer from moisture.

For more information on these products visit:

www.insulect.com/products/self-dehydrating-breather

HOW DO THE NUMBERS STACK UP?

Using the Transmission Utility example from the previous page, to fit this entire fleet with self-dehydrating breathers would cost around \$1.10M.

Recalling that the maintenance spend was \$788K per year, gives a **repayment period of less than 2 years**. It also means the utility has freed up around \$15.7M of operation costs over a 20 year period.

DIY FINANCIAL ASSESSMENT

We have put together an Excel spreadsheet so you can calculate these costs accurately for your own network – as per the image on the right. It has allowed us to successfully estimate the costs for a number of customers, including TNSPs, DNSPs, Power Plants, Generation Companies, Smelters, etc.

Get this table in Excel format at:

www.insulect.com/products/self-dehydrating-breather

Company Name				
Labour Rate	\$/hr	85		
Cost of Silica Gel	\$/kg	18		
		Transformer Name / Category	Transformer Name / Category	Transformer Name / Category
Approximate Transformer Rating	MVA	100	50	33
Number of Transformers in Your Fleet	#	51	60	19
Breather Solution		Standard	Self-Dehydrating	Standard
Number of Breathers Required				
Breather Cost	\$			
Number of Visual Inspections of Gel per year	#			
Time Required per Inspection	hrs			
Visual Inspections Cost per year	\$			
Number of Silica Gel Changes per year	#			
Total Refill Weight of Silica Gel Required	kg			
Replacement Gel Cost per year	\$			
Time Required per Refill	hours			
Refill Labour Cost per year				
Subtotal Maintenance (gel plus labour)				
Total Annual Maintenance Cost	\$			
# of Years for Assessment				
Number of Years for Evaluation	#			
WOL Maintenance Cost				
WOL Total Cost				
WOL Cost / MVA				
Number of Assets in Fleet (of this type)				
Total Whole of Life (WOL) Costs, per asset type				
Total WOL Cost for Asset Group - Standard Breathers	\$	40,037,400		
Total WOL Cost for Asset Group - Self-Dehydrating Breathers	\$	1,026,000		
Cost Savings for evaluation period	\$	39,011,400		
Cost Savings per annum	\$	1,950,574		

Reduce Fleet Maintenance Costs and Redploy your OPEX

Significant whole of life cost reduction. No costs for replacement of saturated silica gel. No labour costs for regular silica gel changing or checks of breather saturation levels, ever. No requirement to rebuild the breather.

Fit and Forget

Reliable and autonomous; remotely monitors all instrument data and indicates faults (whilst still operating safely).

Condition Based Maintenance

Supports condition based monitoring for more efficient maintenance programs.

Easy to Fit or Retrofit

Multiple mounting options for simple new or retrofit installations.

Greater Safety

Guarantee greater safety and control over drying function; eliminates risk of moisture ingress due to saturated silica gel in a breather.