

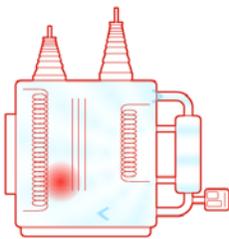
Delphi Application Note: Principal of Operation

Introduction

This application note looks at the principal of operation of a fuel cell based sensor and the need to apply such sensors at a place where there is adequate oil supply. The Doble Delphi addresses the problem of poor oil supply through an incorporated oil pump.

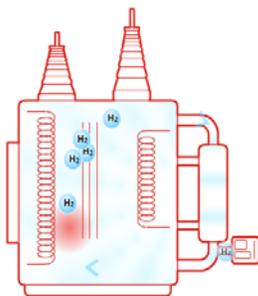
Transformer Oil Cooling

Transformer oil is circulated through both natural convection of hot oil through radiators (thermo-cycling) and through forced circulation using oil pumps. A DGA sensor on the return from the coolers means that the sensor will be exposed to oil from any point within the unit which has heated up. A fault within a transformer will lead to by-products in the form of key gases. The key gases will dissolve in the hot oil at the site of the fault and be circulated naturally (or forcibly with pumps) through the coolers.



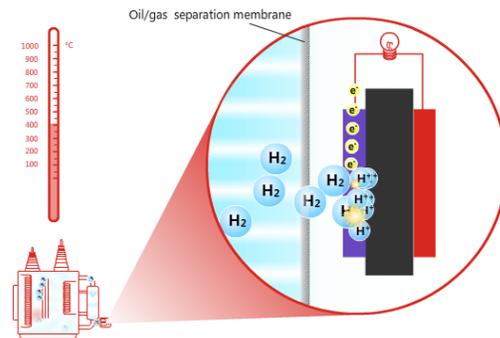
Fault Gas Development

Different fault types develop different gases; hydrogen is generated at all temperatures. And is a fairly common diagnostic for detecting many forms of fault – including PD, corona.

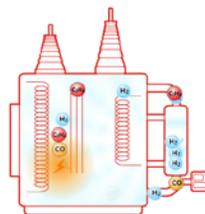


Fuel Cells Need Fuel!

The fuel cell sensor takes the dissolved gases in the oil and uses them to generate an electric current. The larger the volume of hydrogen in the oil, the more the sensor will generate electricity – the sensors are designed to respond to a range of key gases.



Various Fault Gases



Different faults have different fault gas signatures – Doble Delphi are designed to be either highly selective to Hydrogen only or to respond to a range of key gases. The gases are detected by the patented fuel cell and provide indication for different fault types.

Doble Expertise

More than any other company in the world, Doble experts have been dealing with issues in transformers and insulating fluids for over 80 years. Doble is always willing to help our customers with the equipment that we provide and interpretation of data from the *DELPHI* sensors.

For more information, contact: delphi@doble.com

Doble Engineering Company

Worldwide Headquarters
85 Walnut Street
Watertown, MA 02472 USA
tel +1 617 926 4900
fax +1 617 926 0528
www.doble.com