

## Cable Fault Location

in

## Oil Filled Cables

*THE EASY WAY*



Traditionally fault location in **Oil Filled Cables** has been a long, expensive, potentially damaging (to the cable) and environmentally unfriendly process.

**High Voltage Diagnostics Sarl** (HVDSA) have pioneered an **innovative** method of locating the position of faults in oil-filled cables that addresses the problems associated with the traditional method of exposing and freezing portions of the cable until the fault is isolated.

In the most current project completed in December 2009 (which ran over 6 months from June to December) a total of 26 cable leaks were located. This on a cable network that first needed to be tagged before leak location could take place.

Our process is a three step process:

### 1. Tagging

All oil-filled cables in your system must first be tagged with our **special chemical tracer elements**. The tracer elements are introduced into the oil using our proprietary systems which carefully control the dosing concentrations to minimum levels. At these levels it has been shown that there is no impact on the dielectric properties of the oil yet the concentration of the tracer chemicals are sufficient to be detected by our super-sensitive detection systems even below the soil or tar and concrete pavings.

There is little economic sense in not tagging all the cables in a system in advance.

There are a number of methods of introducing the tracer elements into the oil offline or online. Our preferred method is to introduce the tracer elements **online** whilst the oil is being treated or introduced. This can even be done with an operational cable under certain circumstances.

The **speed** of the tagging process depends on the speed at which the tagged oil can be introduced into the cable. The order of these delays is typically days per cable and it is therefore important that all cables in a system are pre-tagged rather than waiting until a cable is faulty before tagging.

The tracer chemicals are non-naturally occurring and are used in such small quantities for the dosing levels required that they do not impact on the **environment**.



### 2. Fault Location

Finally the fault is located with our advanced tracer detection systems. A **vehicle** is fitted out with sampling, concentrating and analysis tools that will automatically sample the atmosphere as the cable route is traversed. The position of the samples is recorded using a GPS receiver and the sample analysed to detect the presence of tracer elements.

The concentration of the tracer elements is compared to **baseline readings** taken before the start of the fault location process and alarms are raised when the tracer components are detected at the required concentrations.

Our systems are capable of detecting 10 parts per quadrillion ( $10^{15}$ ) of the tracer elements. This **extreme sensitivity** means that most leaks can be detected by slowly driving the cable route and sampling.

Extreme environmental, routing and other conditions may mean that samples may need to be collected from **bore-holes** drilled into the tar/concrete and these samples manually presented to the vehicle for analysis.

#### **Fault Detection**

As with all oil-filled cable systems the presence of a fault is detected by dropping pressures or oil levels in the oil storage vessels. HVDSA can assist with **online systems** to detect level or pressure changes and report these changes to a centrally located control or service centre.

#### **Case Studies**

We have a number of case studies from our experiences within **Eskom** where this system has been operational since early 2009. Ask us for copies of these case studies.

#### **Demonstration**

We invite interested parties to visit our facilities where we can demonstrate the efficacy of our systems and, if available, arrange interviews with Eskom where you can experience and discuss the **benefits** with the users of the system.

#### **Environmental Impact**

The system has a massive impact by **reducing** the amount of oil that is spilled into the ground because of the ability to locate leaks so much faster than by way of the freezing method.

#### **Costs**

Costs will vary depending on the solution chosen but typically there are **no direct costs** involved per fault. The system will pay for itself in fault location savings (excluding clean-up savings and outage costs, fines etc) after typically 10-15 faults have been located.

#### **Time savings**

Typically our experience has been that cable faults are accurately located within **3-4 hours** of the arrival at a fully tagged cable. Obviously the time taken depends on the actual fault location, the accurate cable route being known, reasonable environmental conditions being present and depends upon the cable installation specifics.

#### **Cable damage**

Cable damage caused by the exposure and freezing processes is **entirely eliminated**.

#### **Our System**

At HVDSA we offer a **tagging solution** to initially tag all the cables in your system. The cost of this will depend upon the location, length and the type of cables installed. Our team will initially travel to your locations and will tag and

document the cable installations for use in future fault location activities.

During the tagging process we will begin the customisation of the **detection vehicle** for your application. The lead time on this process is typically 6-12 months depending on the level of customisation and the availability of resources.

The detection vehicle is **leased** to the utility for a period and the monthly lease cost includes the training, scheduled vehicle and equipment maintenance and assistance with fault location. The maintenance plan excludes consumables but we are happy to customise a plan that suits your budget and your requirements.

Your operators will be **trained** on the use of the system which they will operate to do the actual fault location.

New cables can be tagged at any stage in the future and pre-tagged cables can be **“topped up”** as required by our operators. The costs will depend upon the location and tagging requirements.

When available (applied on a first-come first-served basis) we have a detection vehicle available **for hire** during the tagging process.

**For more information please contact us on +27 11 782 1010 or +64 226 817 589 or on email at [sales@hvdsa.com](mailto:sales@hvdsa.com)**