

## PFT Solutions

### Fluid Filled Cable Leak Detection



## Linking the future

As the worldwide leader in the cable industry, Prysmian Group believes in the effective, efficient and sustainable supply of energy and information as a primary driver in the development of communities.

With this in mind, we provide major global organisations in many industries with best-in-class cable solutions, based on state-of-the-art technology. Through two renowned commercial brands – Prysmian and Draka – based in almost 100 countries, we're constantly close to our customers, enabling them to further develop the world's energy and telecoms infrastructures, and achieve sustainable, profitable growth.

In our energy business, we design, produce, distribute and install cables and systems for the transmission and distribution of power at low, medium, high and extra-high voltage.

In telecoms, the Group is a leading manufacturer of all types of copper and fibre cables, systems and accessories – covering voice, video and data transmission.

Drawing on over 130 years' experience and continuously investing in R&D, we apply excellence, understanding and integrity to everything we do, meeting and exceeding the precise needs of our customers across all continents, at the same time shaping the evolution of our industry.

## What links power grids to sustainability?

From Asia-Pacific to the Americas, and from Europe to the Middle East to Africa, Prysmian cable solutions sit at the heart of the development of power grids worldwide, helping major utilities in transmitting and distributing power to their customers.

Unmatched in our manufacturing capabilities and with unwavering commitment to R&D, we design, produce and install low, medium, high and extra-high voltage underground and submarine cables and systems, along with network components and value-added engineering services.

Always aware of the need to minimize our impact on the planet, we're constantly driving innovation in our industry, aiming to optimize supply chain processes, reduce total cost of ownership for our customers and help them achieve sustainable, profitable growth.

# Introduction

Many utilities and transmission operators still have a significant quantity of Fluid Filled cables in their networks, despite the fact that this technology has been largely superseded by the advent of XLPE cable systems.

Fluid filled cables have proven to be reliable “work horses” provided fluid pressure and metallic sheath integrity are maintained, however leaks can always occur, typically through metal fatigue, external corrosion or third party damage.

Leaks are generally identified through the activation of low pressure alarms, when they occur. To ensure that the cable remains operational new fluid is pumped into the system pressure tanks to keep pace with the leak volume until a repair can be undertaken.

Traditionally the main method for locating fluid leaks has involved de-energising the cable circuit, excavation to gain access and then applying a liquid nitrogen freeze. Fluid pressures are monitored which then indicate which side of the freeze the leak is occurring. This process is then repeated at different locations until such time that the leak is found. It is not uncommon for this process to take many attempts before the leak is identified.



## What is PFT?

PFT stands for Perfluorocarbon Tracers.

These highly volatile compounds, with excellent electrical insulation properties are added to the cable fluid in minute quantities. Where the cable system is damaged, the fluid with the PFT tracer leaks into the environment and the volatile PFT compounds permeate through the ground and can be picked up using highly sophisticated detection equipment.

Prysmian Group's PFT Solutions enable fluid filled cable operators to locate fluid leaks, without deenergising their cable circuits and therefore network down times. It also reduces the environmental impact and can extend the usable life of the fluid filled cable system.

Prysmian Group PFT Solutions offers all the essential services, tools, equipment and specialist knowledge required for modern fluid filled cable maintenance.

# Injection of PFT

In order to cater for this technology Prysmian Group have developed specialised methods of mixing PFTs with cable oil and then injection into the cable system. Through Prysmian's unique position in continuing to manufacture accessories for fluid filled cable systems we have developed bespoke tagging equipment which is modular and easily deployable to site.

Two types of injection are available:

## PRYSMATAG

*Tagging a cable circuit with PFT cable fluid during an outage.*

This method has the following advantages:

- Vulnerable cable systems that have high environmental impacts -if they leak- can be pre-tagged so that should a leak occur it can be located and repaired within a few days.
- Cable systems that have on-going small leaks can be tagged during an outage period and leak detection can take place whilst the system is energised.
- Many fluid filled cables have poor quality cable fluid. Replacing the loose oil with modern alkylbenzene oils offers greater bio-degradability should these fluids leak into the environment and the knowledge that the new fluid within the cable has superior electrical qualities and greatly improved gas absorption properties.



## PRYSMATAG LIVE

*During routine cable pumps any lost oil is topped up with PFT tagged oil, whilst the circuit remains live.*

This method has the following advantages:

- The cable system does not have to be de-energised.
- The LIVE injection system targets all cable leaks (fluid is being pumped into systems that already have leaks).
- The LIVE injection system can take a number of routine pumps before the PFT Tracers reach the cable leak dependant on the location of the leak in relation to the distance from the pumping location and the leak rate.
- Another benefit of the PFT Solutions technology is the location of leaks in gas compression cables.

# Detection of PFT

Perfluorocarbons are a man-made substance which are present in the atmosphere at very low background levels, typically 2-3 parts per quadrillion (ppq).

Prysmian Group have developed an advanced mobile laboratory, which can detect such background levels in the atmosphere. Prysmian's mobile laboratory will sample the air over the cable route and detect any PFT which has permeated through the subsoil from the leaking cable fluid. The level of PFT above a cable leak is incredibly small, typically 40-100 ppq, however using our specialist equipment is readily detectable above the background levels of perfluorocarbon.

Our mobile laboratory is synchronised with a GPS system which records locations on an electronic map to signify high levels of PFT. To cater for locations that are not easily accessible to vehicles or that pass through fields, parkland and footpaths the Prysmian Group have portable air-sampling equipment.

Upon identifying a high level of PFT the next stage is to pin point the location to within one/two metres of the cable leak. This is achieved by undertaking a number of shallow barholes in the ground surface and then analysing the air from within those holes.

The main advantage of Prysmian Group's PFT Solutions mobile laboratory is that the analysis time between taking the air sample and gaining the result is 90 seconds, this means that detection results are achieved in real time. This compares very favorably with other technologies which require air sample tubes to be set, samples to be sent by courier to laboratories and then results received one/two weeks later.

The PFT Solutions detection process is carried out with the cable circuit energised, this avoids the problems associated with porous lead sheath cables where the leak rate often reduces following cable de-energisation and cooling.



# Repair of cable fluid leaks

Prysmian Group have many decades of experience in the installation, maintenance and repair of fluid filled cables. Specialists from the Group are available throughout the world, including fluid filled cable maintenance engineers, high voltage jointers and oil mechanics supported by teams of skilled civil workers.

By combining all available skills and resources within the Group, which consist of fluid filled cable accessories manufacture, high voltage test facilities, cable jointing engineers, system/installation design engineers and the large portfolio of specialist tooling held within our logistics department, Prysmian Group is unrivalled in its ability to provide the complete service.

## Summary of essential services:

- Injection and detection of PFT
- Leak location
- All aspects of fluid-filled cable repair undertaken
- Supply and installation of fluid-filled cable accessories, including transition joints
- Electrical testing and fault finding capability
- Cable jointers and oil mechanics trained in Prysmian's dedicated jointer training schools



# PFT Equipment

At Prysmian we recognise above all the environmental benefits of this technology and as such are prepared to sell under a license agreement the equipment required for this service into international markets.

Prysmian will support new purchasers of this equipment with full technical training with the aim of building an international PFT Solutions community to share the benefits of this cutting edge technology.



# Linking power grids to sustainability

## **Prysmian Cables & Systems Limited**

Chickenhall Lane  
Eastleigh  
Hampshire  
SO50 6YU  
United Kingdom

[www.prysmiangroup.co.uk](http://www.prysmiangroup.co.uk)

## **Cables & Accessory Enquiries**

Tel: +44 (0) 23 8029 5048  
Fax: +44 (0) 23 8029 5146

## **Information hotline**

Tel: +44 (0) 23 80 8664  
Fax: +44 (0) 23 80 8627  
[networkcomponents@prysmiangroup.com](mailto:networkcomponents@prysmiangroup.com)

## **Prysmian Group**

Viale Sarca 222, 20126 Milan, Italy  
Email: [marketing.energy@prysmiangroup.com](mailto:marketing.energy@prysmiangroup.com)

[www.prysmiangroup.com](http://www.prysmiangroup.com)

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