

## The Removal of Oil from Redundant Oil Filled Cable Systems

### 1.0 Introduction

Elmeridge Cable Services is known as an expert in the design, operation and management of oil filled cable systems. During the lifetime of a system there is an ongoing requirement for maintenance, repair and diversion of the cable and accessories. Elmeridge Cable Services has the staff and plant to be able to provide these services, materials and ancillary equipment to ensure that the asset continues to operate satisfactorily throughout its useful service life.

At the end of the useful service life it is usual to leave the cable in the ground and in an inert condition, disconnected and isolated from the electrical network and the hydraulic scheme de-pressurised with surplus oil removed and disposed of.

Elmeridge Cable Services provides a service for flushing the cable system to remove the free oil from the cable and accessories and dispose of the pressurised oil tanks in a safe and environmentally considerate manner.

This “first stage” flushing process removes the free oil in the system, i.e. the oil in the cable ducts, under the sheath and oil channels in the accessories. The oil that is trapped in the impregnated papers remains in the cable and will over time drain from them into the free spaces left by the flushed oil.

Elmeridge Cable Services can now provide a service to remove up to 95% of the oil from the cable system, including that trapped in the impregnated papers using a “second stage” flushing technique and a water soluble modified hydrogel compound. The hydrogel is formulated to push the oil from the cable forming an emulsion which is collected and, on settlement, separates to be fully recoverable from the oil.

For additional environmental security a catalyst can be added to the compound when flushing to form a solid gel entrapping any remnants of oil in the cable.

### 2.0 The Process

To flush the cable a connection point is required on to the hydraulic system. This can be a drain plug on a termination, a flushing line on the joint or directly onto the cable at a cut and capped cable end.

Depending on the circuit hydraulic design a length of approximately 2000m can be flushed, longer lengths need to be divided into 2000m sections. At the feed end of the circuit the modified hydrogel is pumped into the cable at a controlled rate to ensure that the compound floods the free spaces and impregnated papers. A specially designed pump and control system is used, housed in the rear of a medium sized van. The hydrogel is pumped into the cable pushing the oil ahead of it until it exits at the collection point at the far end.

At the collection point the oil and hydrogel is an emulsion which is allowed to settle. The two fluids separate quickly allowing the hydrogel to be fully recovered and re-used, the waste oil being disposed of in the normal manner for hazardous waste.

Hydrogel is pumped into the cable until the emulsion at the collection point can be seen to no longer contain oil. At this point the cable system can be considered to be substantially free of oil and inert. The hydrogel left in the cable is fully water soluble, any leaks from the system quickly dissipating into the environment. If additional environmental security is required a catalyst can be incorporated into the flushing process forming a gel which is solid, encapsulating any remaining oil.

The quantity of catalyst can be varied to speed up or slow down the gelling reaction to ensure that all areas have been penetrated and sealed before setting takes place.

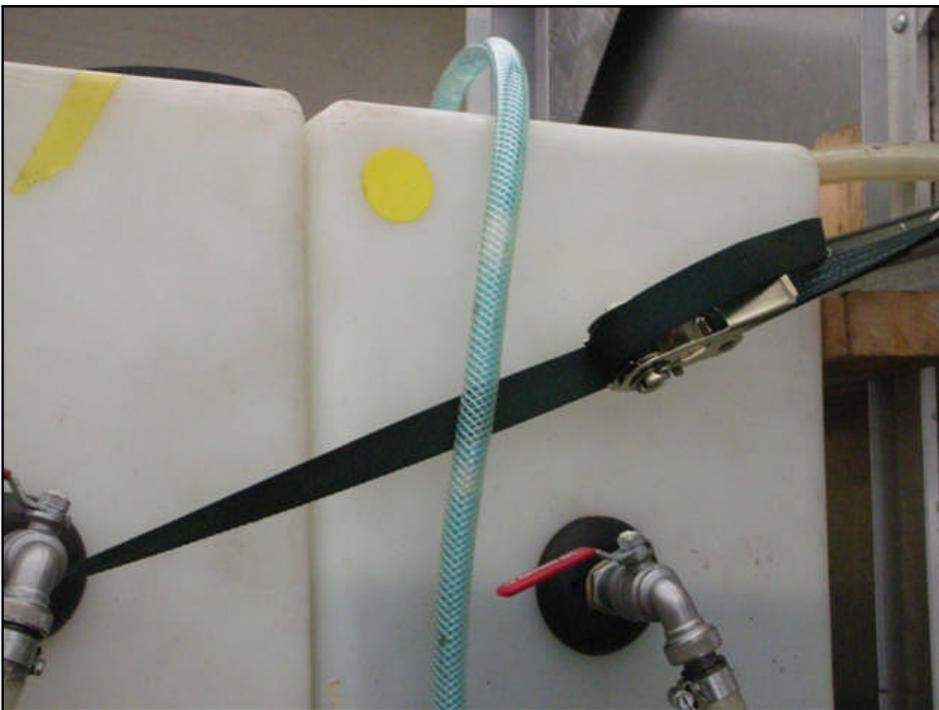
The process of flushing must be conducted in a controlled manner to ensure full penetration of the hydrogel into the cable construction. However once started the process is continuous and would generally clear a 2000m length of cable in approximately 2 days (depending on cable design and hydraulic design).

### 3.0 Plant and Equipment

The plant can be delivered to site in a medium sized van. The main requirements are dispensers for the hydrogel, pumps and control system for flushing the compound through the cable and modified IBC containers for collection and separation of the hydrogel/oil mixture at the receiving end.

At the receiving end the hydrogel/oil mixture is firstly collected in a settlement tank. The two fluids quickly separate leaving the hydrogel on the bottom and the oil on top. The two can then be diverted into separate holding tanks, the oil being taken for waste disposal, the recovered hydrogel returned to the start of the process for reintroduction into the cable.

The photograph below shows the hydrogel/oil mix entering the settlement tank near the end of a flushing process. The transparent oil being clearly seen in the blue of the hydrogel material.



Using this fully patented system Elmeridge Cable Services can provide a solution to the problem of making oil filled cable systems at the end of their useful service life inert and secure, protecting the environment from potential future damage from leaking, un-maintained and redundant assets.

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