
Bioremediation of decommissioned oil-filled cables: ODB System® - Oil Degradation by Bacteria System

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ABSTRACT

Oil cables pose an environmental pollution risk, generally necessitating expensive and complex management and excavation work. The Oil Degradation by Bacteria System (ODB System®) is a patented biotechnological approach to remediate decommissioned oil-filled cables. ODB System technology acts specifically in the paper matrix, which contains up to 75% of the whole oil in the cable. Thanks to this application, more than 95 % of the oil in the paper matrix and 100% of the oil inside oil channels are eliminated. After treatment, cables no longer pose an environmental hazard and can remain in situ without the need for further action.

KEYWORDS

Bacteria; Bioremediation; Environmental hazard; Microorganisms; ODB System; Oil-filled cables

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INTRODUCTION

Oil-filled cables are a type of high and medium voltage cable widely used in the past century, both on land and at sea. The management of the oil cable network has always been a complex problem in terms of maintenance and environmental risk management. Indeed, the liquid oil content in these cables poses an increased risk of hydrocarbon pollution in adjacent soils and waters in case of rupture and leakage [1-3].

These cables are part of the assets of electric utilities, and their management is a cost issue for both maintenance in operation and decommissioning. In general, when an oil cable comes to the end of its life and the line is replaced by a more modern line, the old cables are either removed from the ground by excavation operations or are abandoned in the ground[1, 4].

In this case, the cables can still be monitored, then remain under oil pressure so that we can make sure that there is no leakage or damage or, in the worst cases, abandoned

completely without any kind of environmental monitoring[2].

Abandoned oil-filled cables have been the subject of a variety of accidents in the past, with even major environmental consequences both on land and at sea. Therefore, companies tend to prefer their removal or in all cases the reduction of environmental risk. Removal and excavation work can be extremely complex, especially in urban settings, lake settings, or maritime settings. Not only is removal work a major cost, but it is also a source of CO₂ emissions from excavation and transport machinery. In addition, there is a risk of cable breakage during the work, resulting in oil spills.

There are alternative technologies based on the treatment of decommissioned oil cables by injections of compressed air or by injections of water and soap solutions, often combined with pressure alterations [5, 6]. However, these solutions generally only remove the liquid oil in the cable ducts and only marginally affect the cable matrix[5, 7].

The cable matrix contains the vast majority of the oil of electrical. In fact, up to 75% of the oil in a cable is collected in the matrix[5, 8]. Therefore, if a cable breaks, even if the oil in the conduits is removed, the oil in the matrix can leak out and cause environmental damage[9]. In addition, methods based on the use of aqueous solutions, solvents or air require relatively high pressures that are at the maximum tolerance margin of a cable. This is very problematic, especially since they generally work on old cables, in which the structure may be degraded and thus where the cable is, as a whole, fragilized[8]. Applying excessive pressure on old cables is often a source of cracking and breakage.

To address the environmental needs of neutralizing the danger posed by oil cables by taking these issues into account, a new biotechnological approach is proposed, resulting from 10 years of research and development. This approach based on the use of microorganisms is capable of mobilizing the oil contained in the cable matrix. The technology, registered under the name ODB System® (Oil Degradation by Bacteria System) and patented, it is based not only on an extremely innovative biotechnological approach, but also on a technical equipment particularly adapted to oil cables. Indeed, ODB System® combines a biotechnological approach with injection systems that guarantee injections even over long distances, yet maintain low pressures, thus without stressing the cable structure. More than 100 km of cables in Europe have been decontaminated with the ODB System® in recent years, and this technology is now experiencing a strong expansion, which is a response to the need to reduce environmental risks, part of the vision of many power and distribution companies[2, 8].