Electricity Transmission

Cable Oil DEContamination by bacteria (CODEC)

NIA2_NGET0047

10 July 2025

nationalgrid

bionrec

Oil Degradation by Bacteria
ODB-System®
In cooperation with TIBIO

Part of the Team at Bionrec

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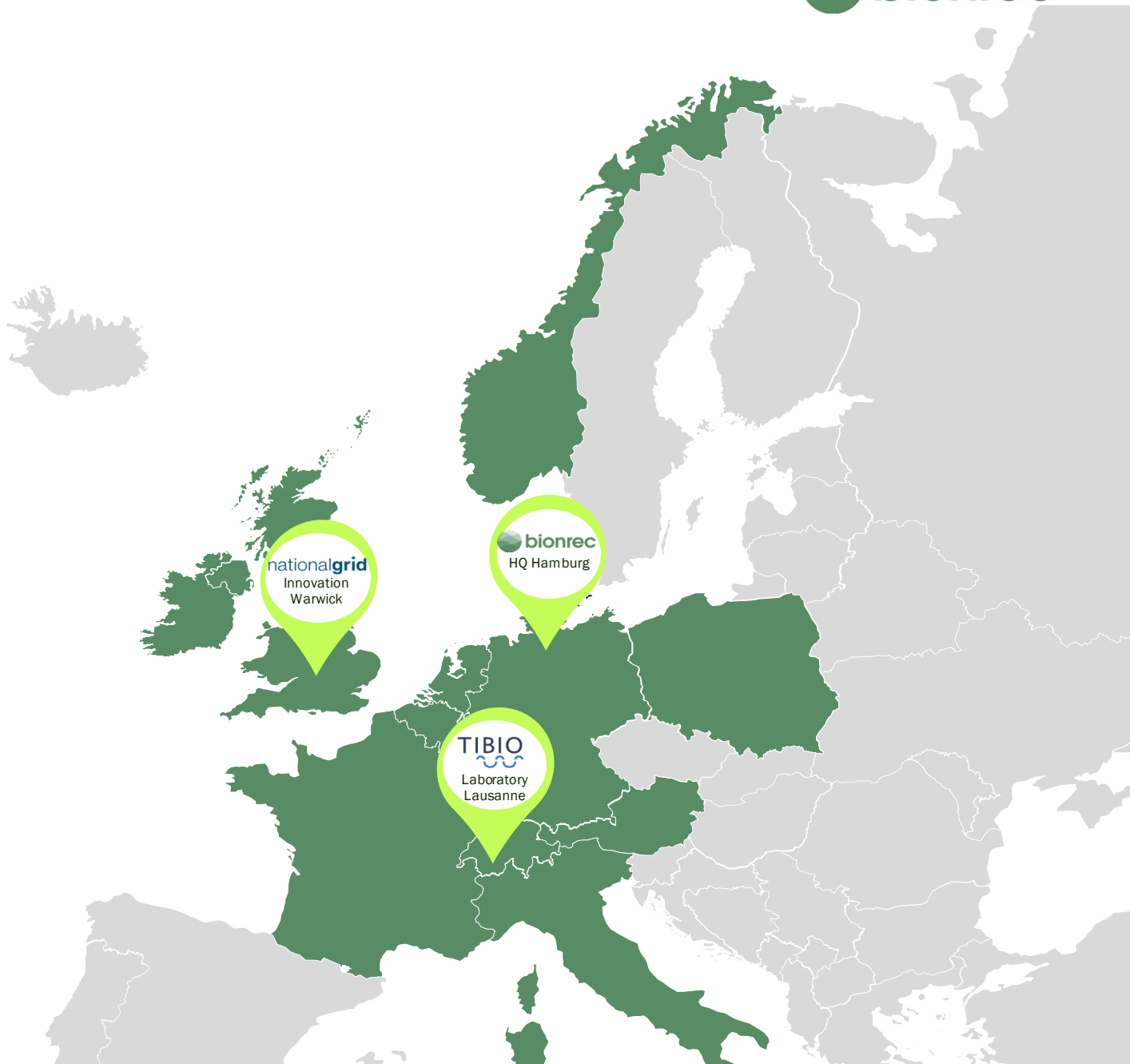
Pioneering Biological Oil Cable Decommissioning by Bacteria

At Bionrec, we develop biotechnological solutions using bacteria to safely decommission oil-filled cables in the ground - without excavation - eliminating underground pollution hazards efficiently and sustainably.



The Situation

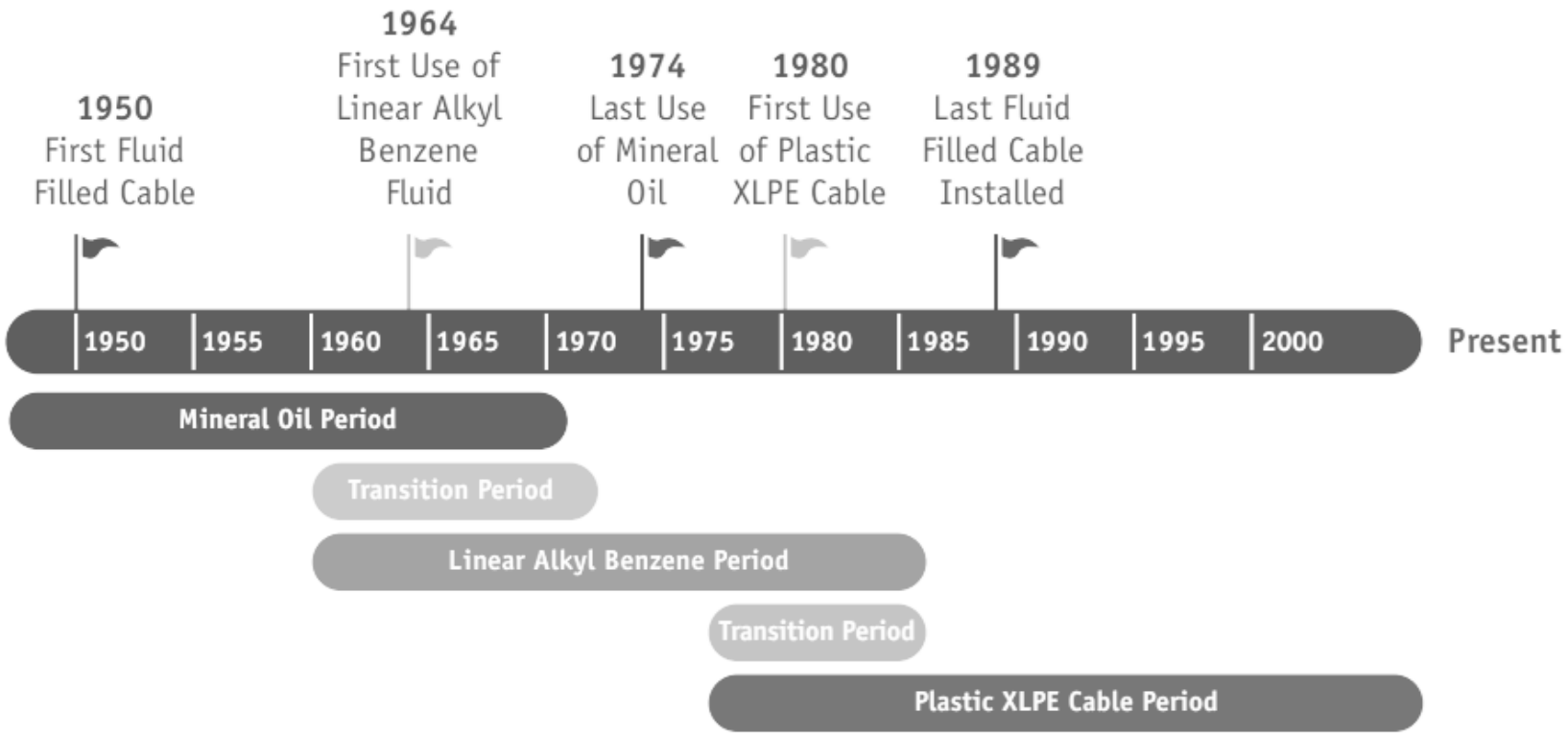
Old oil cables after decommissioning must be secured to prevent leaks, as insulating oil is hazardous to soil and ground water.

Decommissioning in the past was done by excavation, which is very costly and time-consuming due to complex civil works in urban areas. **Purging is not an option to clean cables of oil completely!**

Private landownership issues and traffic in urban areas are a nightmare to plan and organize for excavation works.

Examplary picture of 300kV cable from another Bionrec project – not displaying National Grid‘s assets.

A typical asset lifetime structure in Europe: Old oil/fluid cables = high environmental risks



ODB System advantages towards other decommissioning procedures

	Conventional Excavation	Cap & Drain	ODB System
Eliminates need for circuit excavation and physical removal	✗	✓	✓
Eliminates traffic control and inconvencience to homeowners and businesses along cable route	✗	✓	✓
Eliminates risk to other underground infrastructure	✗	✓	✓
Eliminates need for physical removal of old cables and associated cable oil leakage	✗	✓ *	✓
Eliminates risk buffer in case of damage through physical removal + treatment or removal of any contaminated soil	✗	✗	✓
Eliminates need for ongoing monitoring and service after decommissioning	✓	✗	✓
Complete risk elimination after work is done	✓	✗	✓

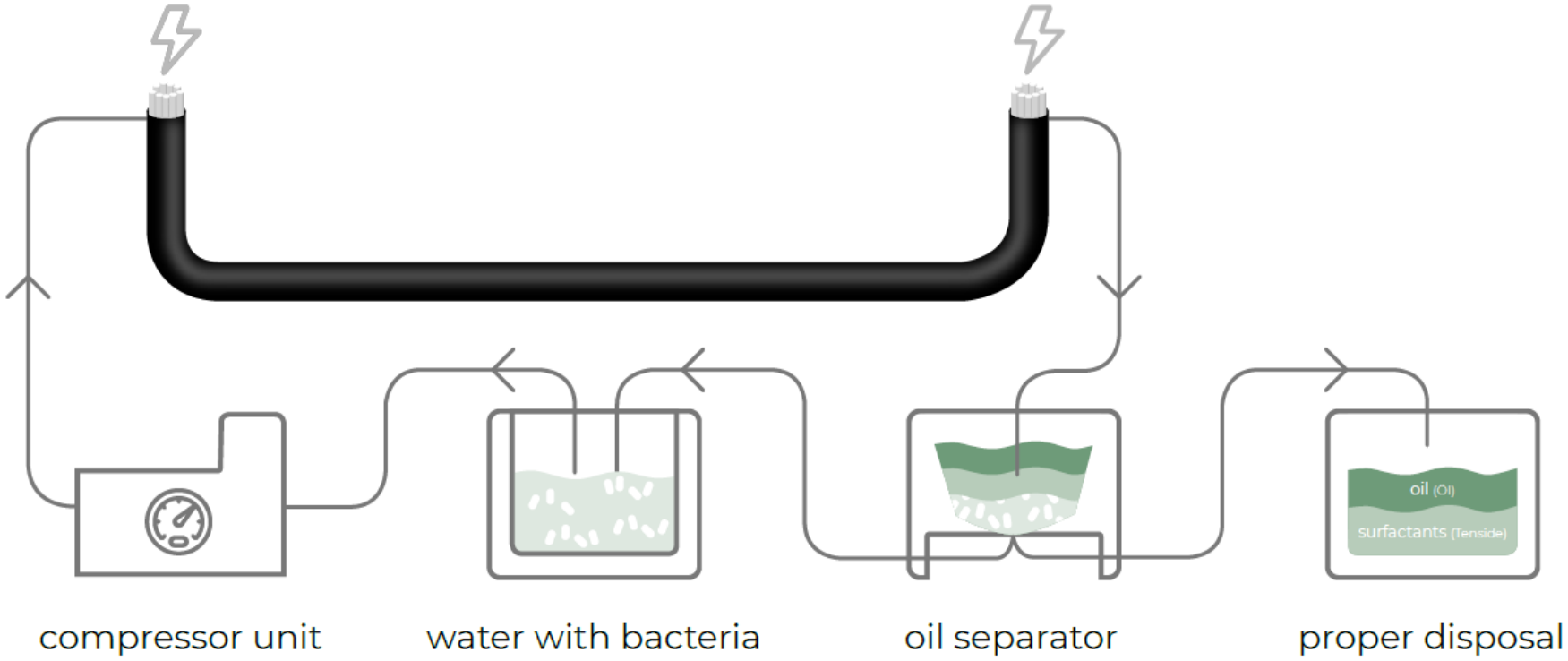
* Cap & drain leaves a significant amount of oil remaining in the cable. Certain jurisdictions do not allow these cables to remain in the ground.

Introducing ODB System:
The world’s first sustainable bioremediation system for the decontamination of oil filled cables up to 410kV.

How we are helping our customers to decontaminate and decommission oil/fluid filled cables

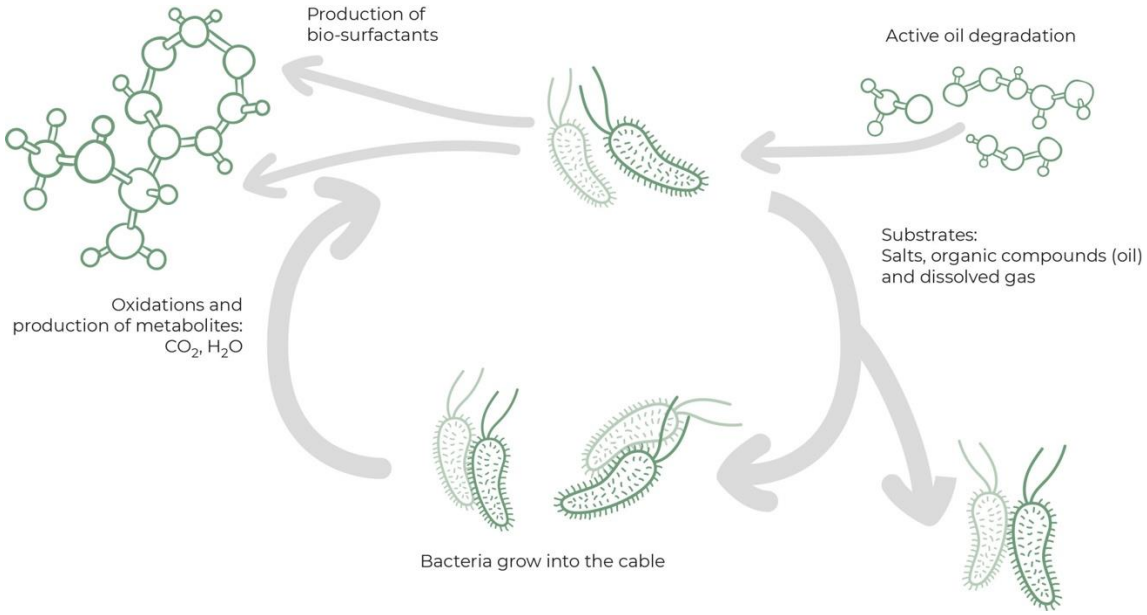
We have a unique solution for oil cable decommissioning.

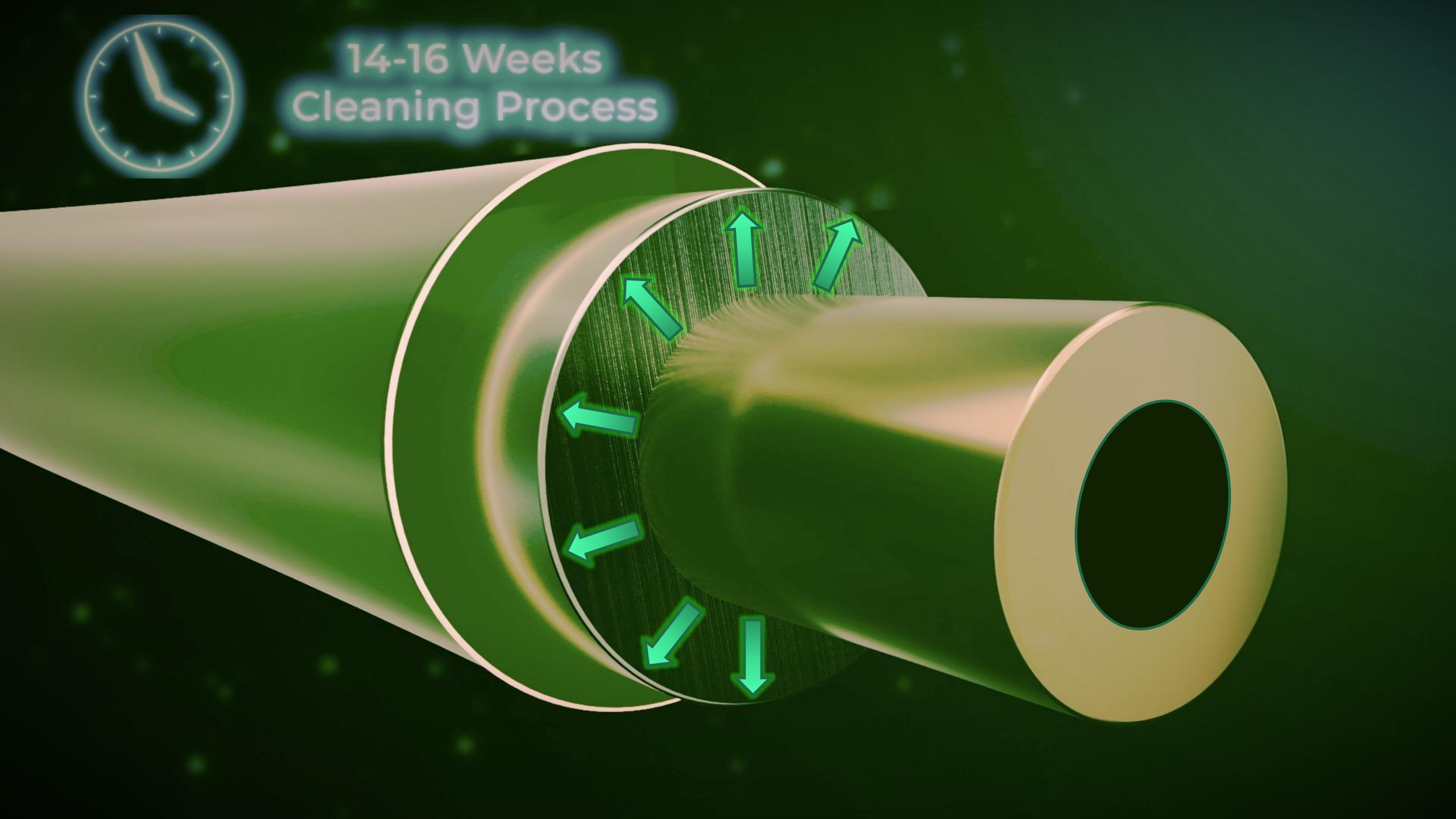
- **Oil-cable Decontamination by Bacteria: Our patented technology - ODB System™**

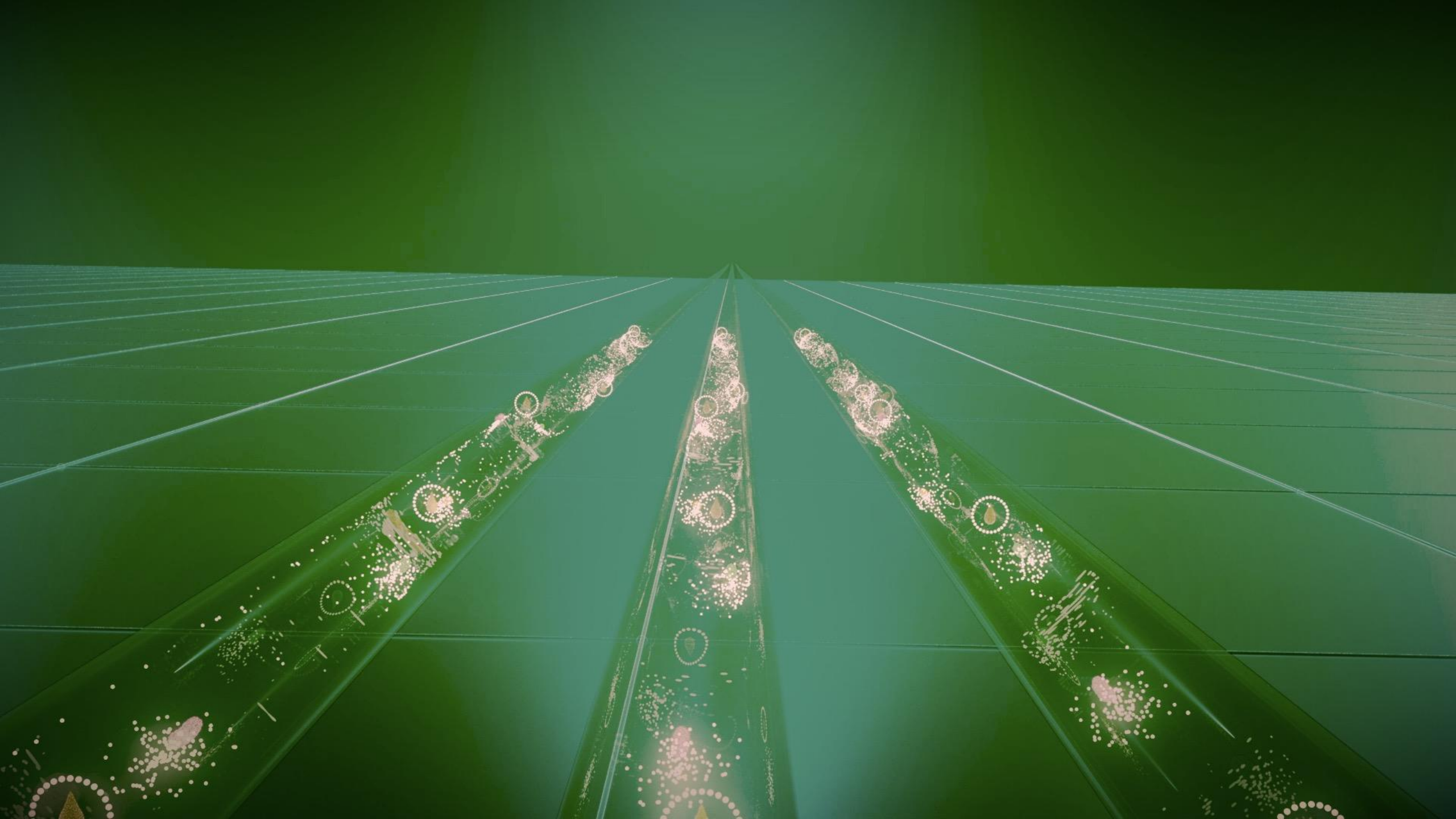


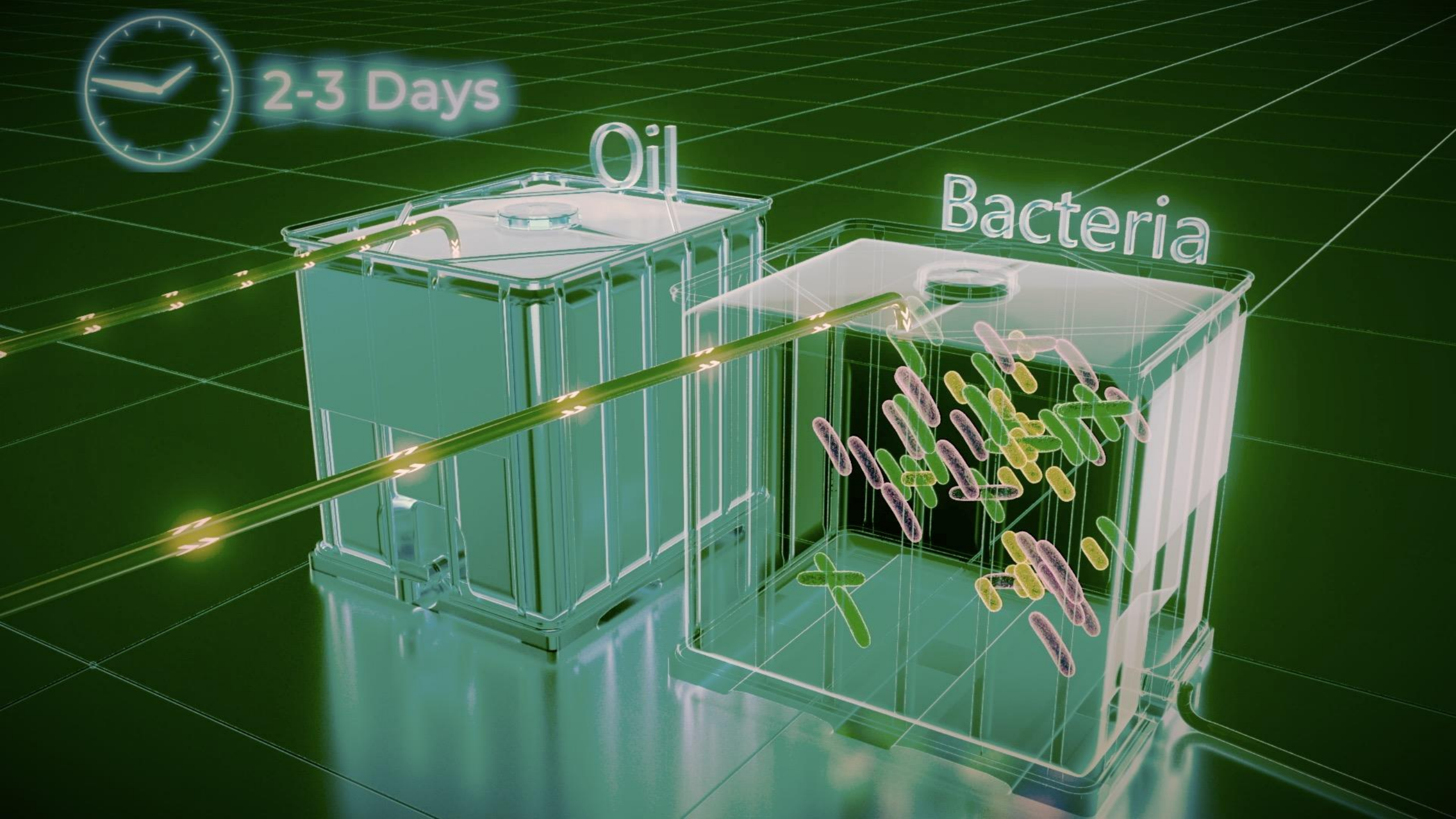
How?
Through bio-degradation of hydrocarbons.

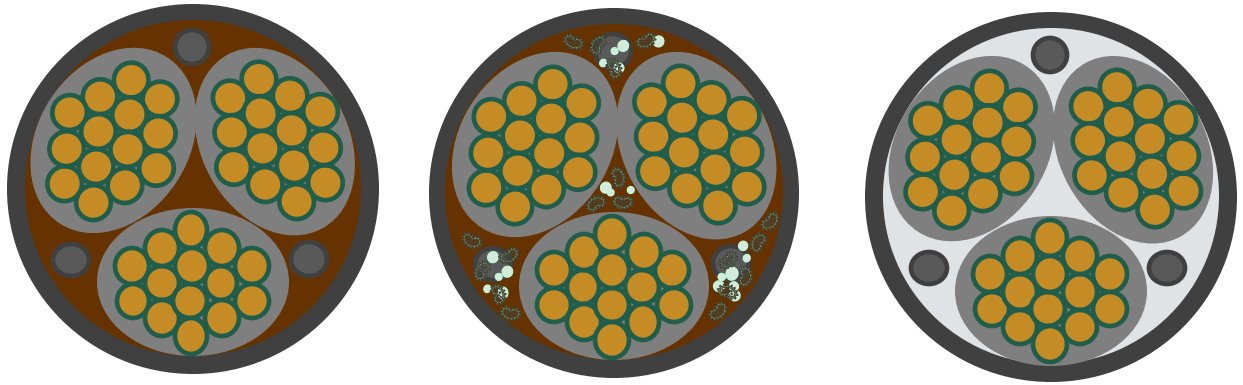
- Some species of bacteria are **very high performing** in the **degradation of hydrocarbons**, both from petroleum refining and synthetic types such as some lubricating and insulating oils.
- The bacteria used in the **ODB System** have been separated from hydrocarbon contaminated sites and **selected for their biodegradation capabilities**.
- The decontamination process is based on a **natural process** and is completely **environmentally friendly.**
- **Overpeformance and high speed of bacteria** is achieved by special strain selection, use of vitamins and low pressure environment – based on 10 years of laboratory and engineering research
- These bacteria are classified with the **risk group 1**, completely safe comparable with bacteria in popular yogurt.




14-16 Weeks
Cleaning Process




2-3 Days
Oil
Bacteria



Oil removal from cable paper matrix >95%
Guaranteed.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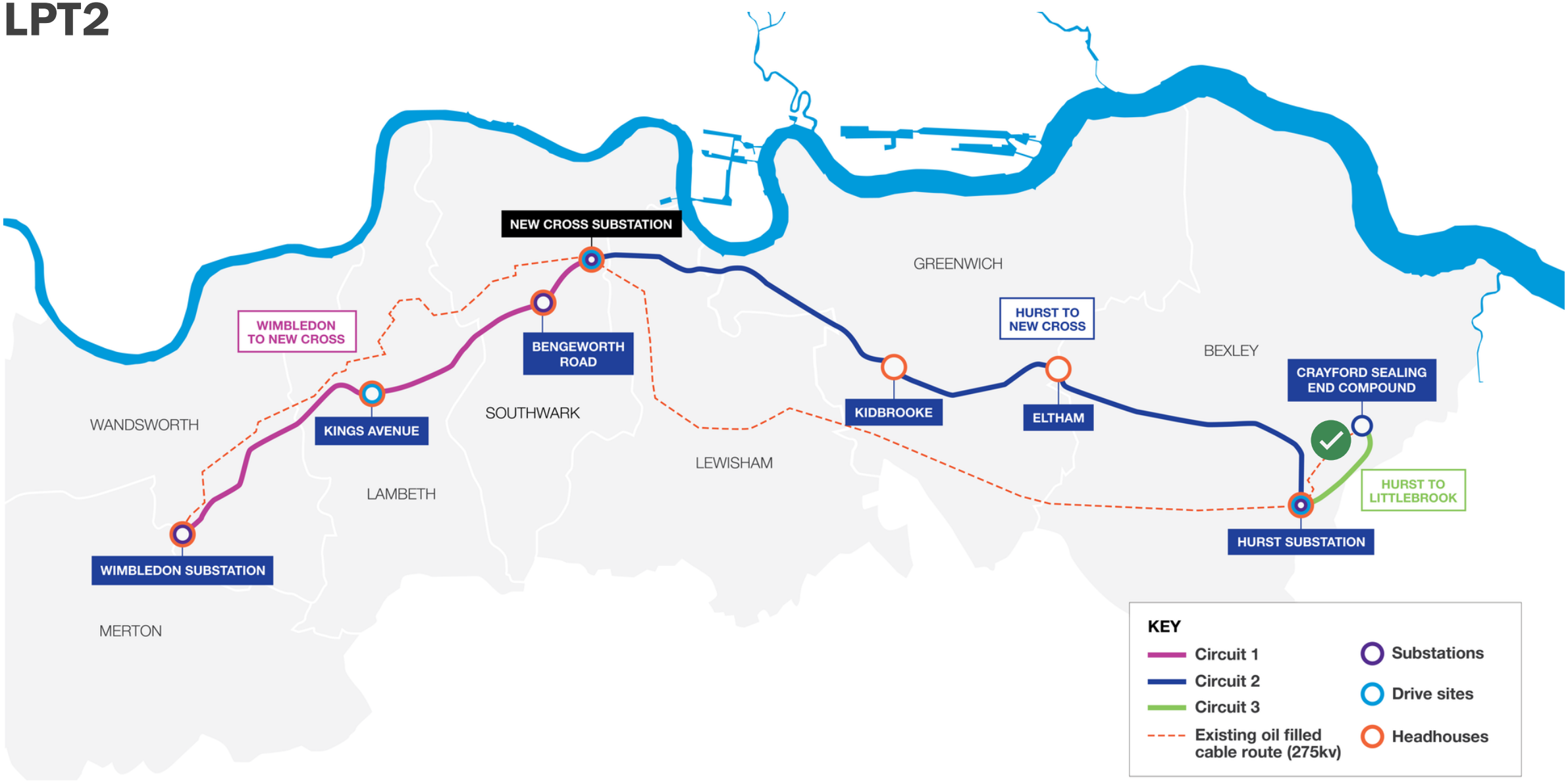
LPT2


NEW CROSS SUBSTATION
WIMBLEDON TO NEW CROSS
BENGEWORTH ROAD
HURST TO NEW CROSS
GREENWICH
BEXLEY
CRAYFORD SEALING END COMPOUND
KINGS AVENUE
WANDSWORTH
SOUTHWARK
KIDBROOKE
ELTHAM
LEWISHAM
LAMBETH
HURST TO LITTLEBROOK
WIMBLEDON SUBSTATION
HURST SUBSTATION
MERTON
KEY
Circuit 1
Circuit 2
Circuit 3
Existing oil filled cable route (275kv)
Substations
Drive sites
Headhouses

Plug & Play

Oil sampling

- Send in oil samples from each phase.

Bacteria design

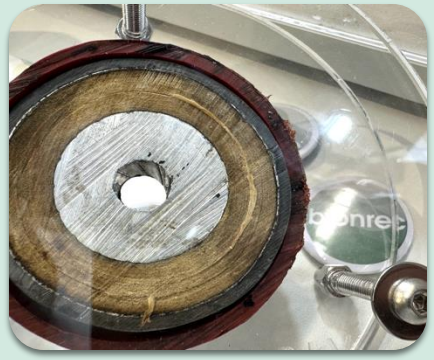
- Dedicated bacteria is selected in the laboratory based on the oil samples.
- Best performing strains „programmed“.

Hardware production

- Containers customized and programmed to specific project needs.

Connection

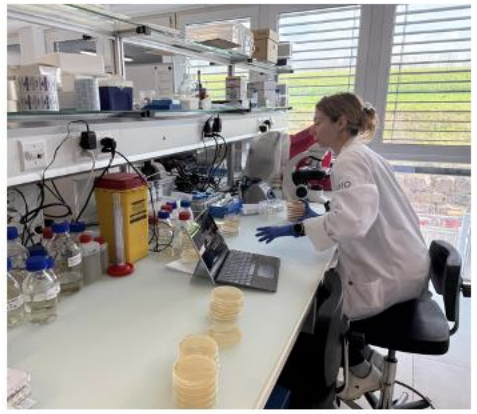
- Direct and fast connection to cable heads.



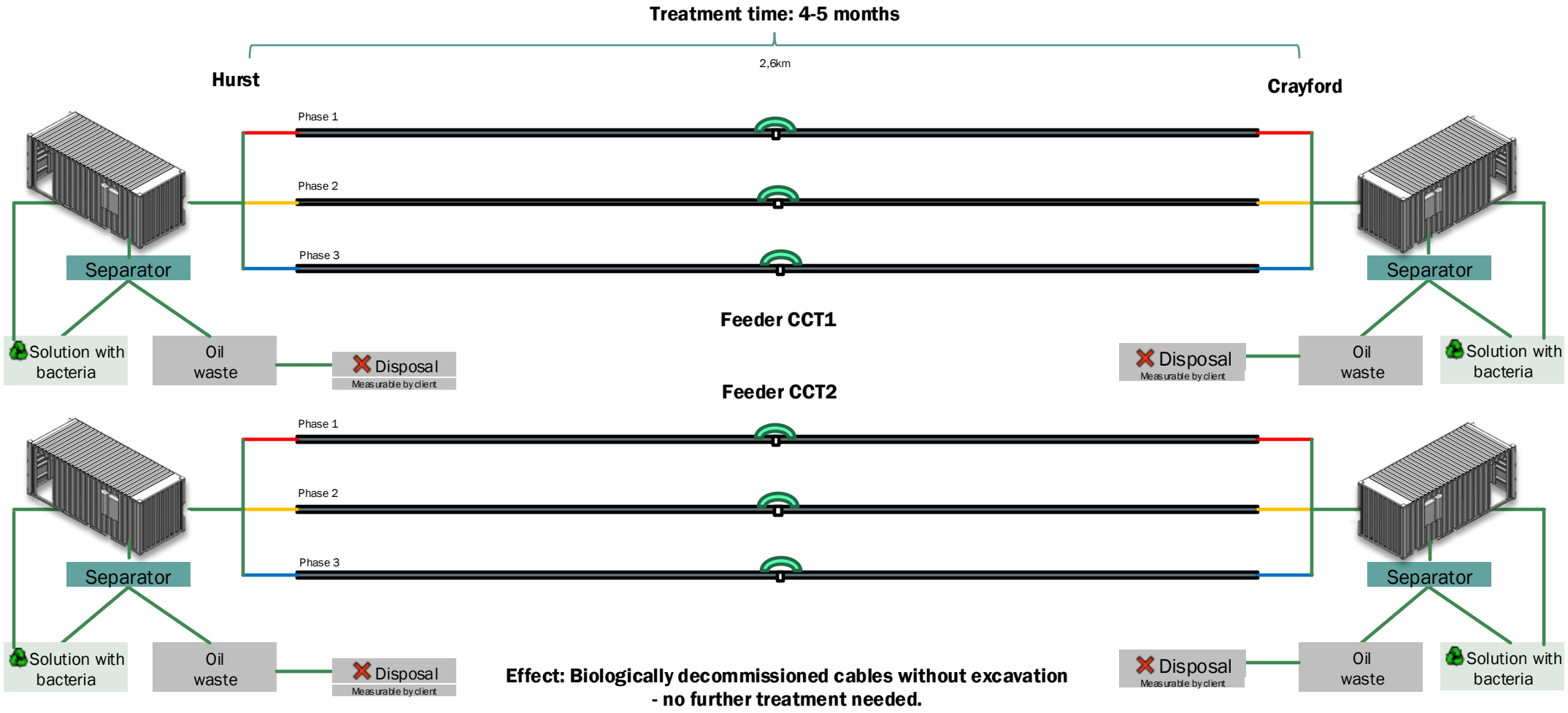
Completion

- Oil removal >95%.
- Scientifically proven result by ISO 17025 certified lab.

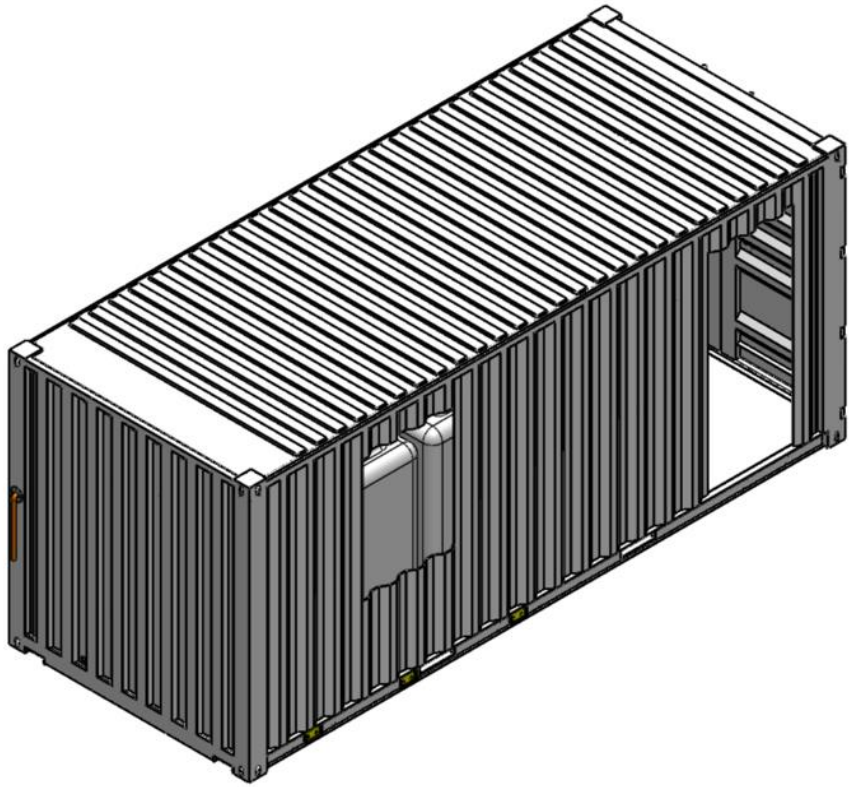
From oil samples to bacteria design

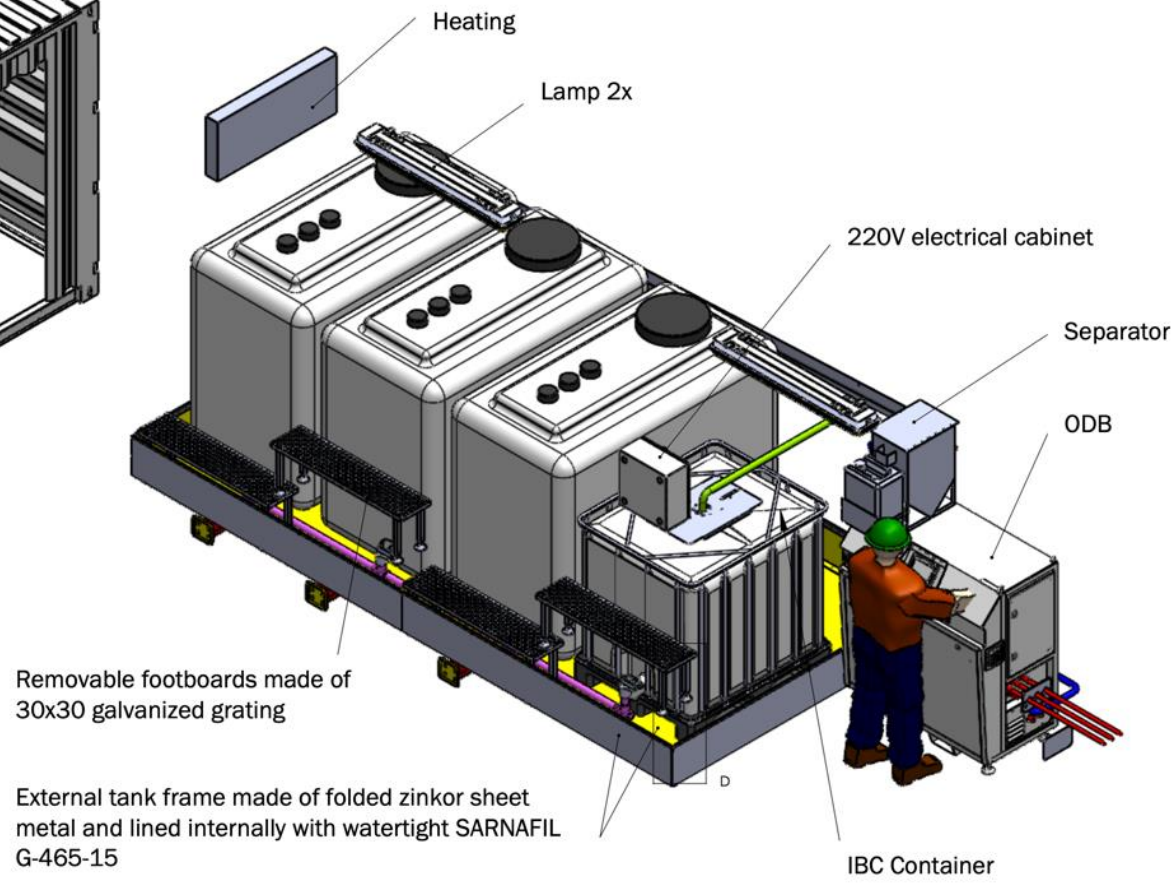


HURS-LITT Feeder 1 and 2 were first sections treated with bacteria at the LPT2 cable



ODB-Container prepared for treatment up to 410kV





ODB Systems are produced tailored to project needs and technical design

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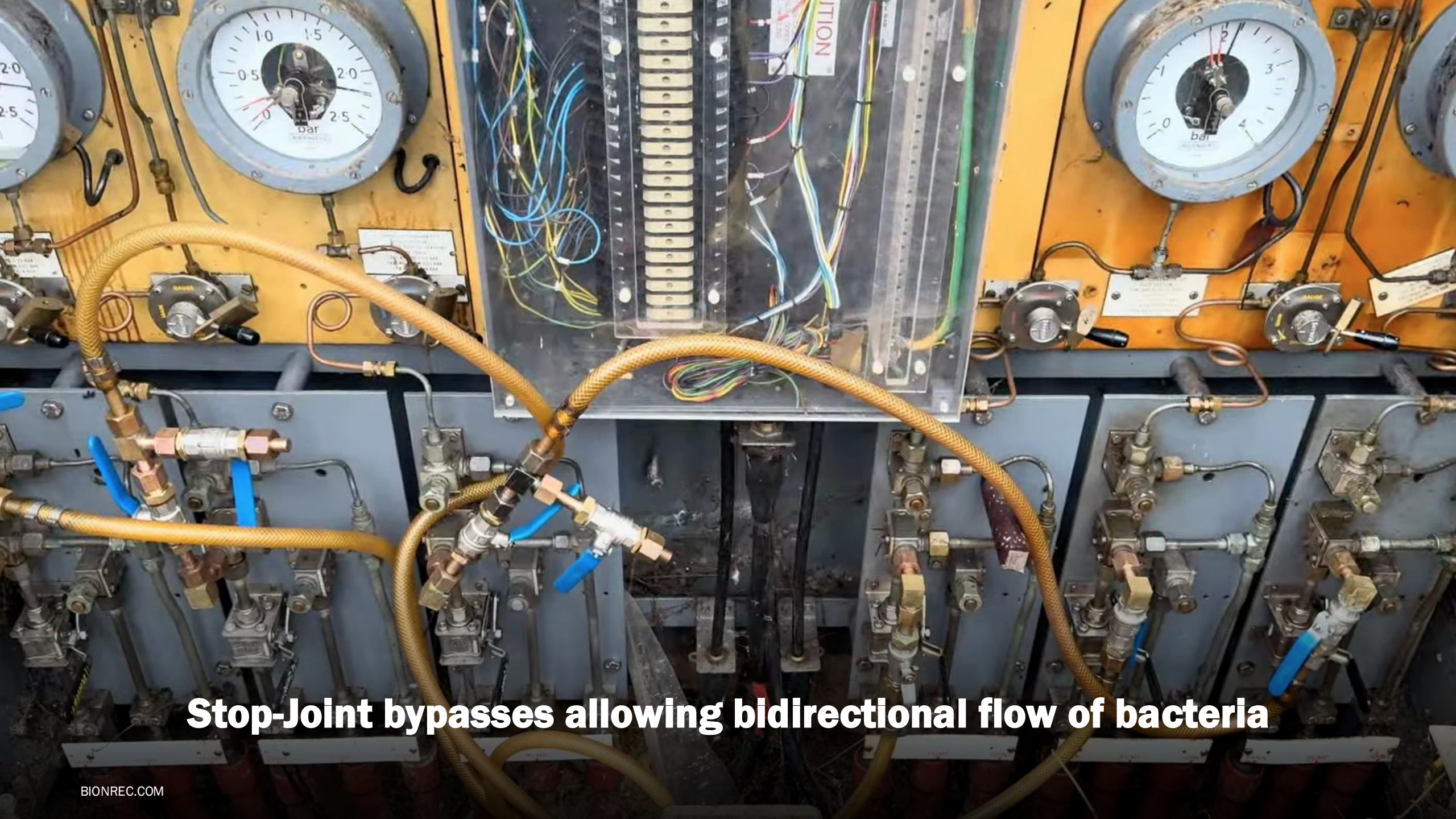


Stop-Joint bypasses allowing bidirectional flow of bacteria

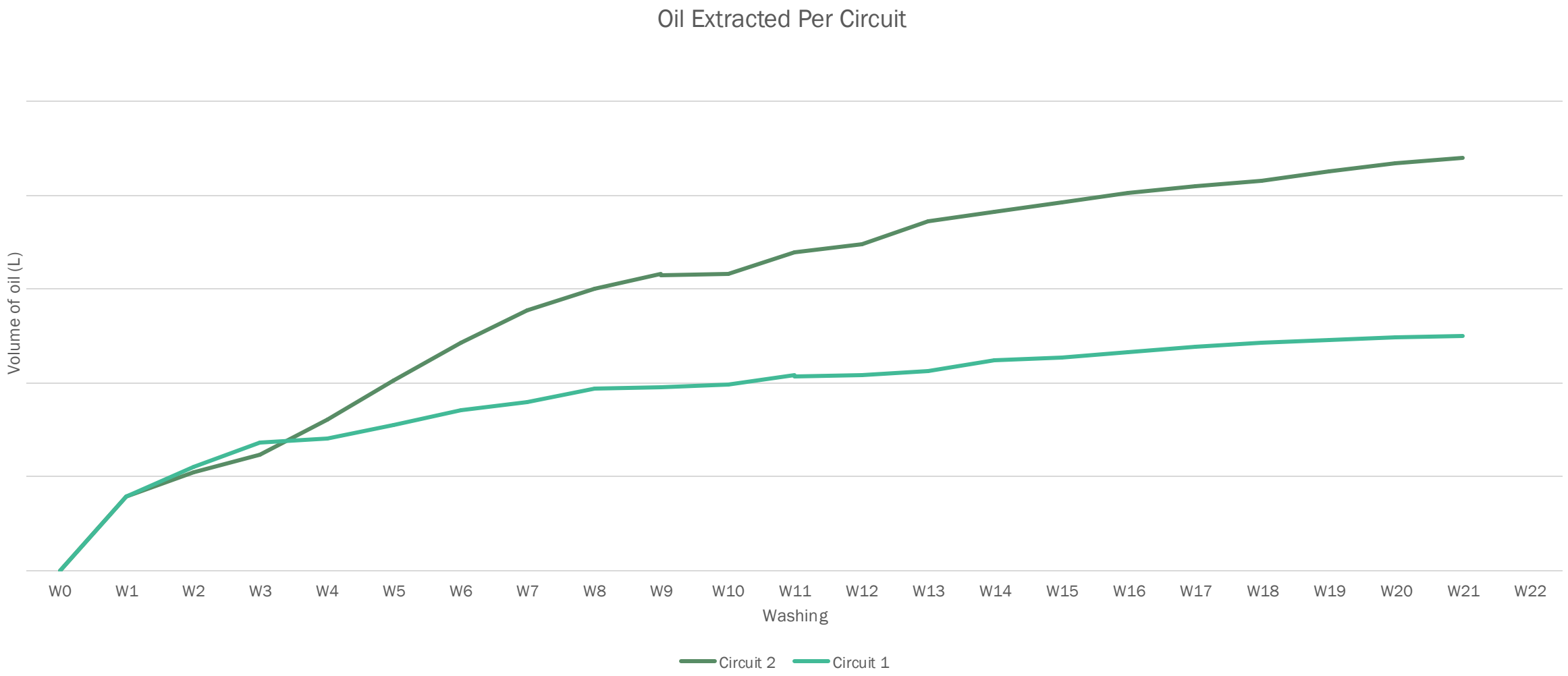
Connection to cable heads via valves

Ready ODB System installed for bacteria injection at NG substation in Crayford

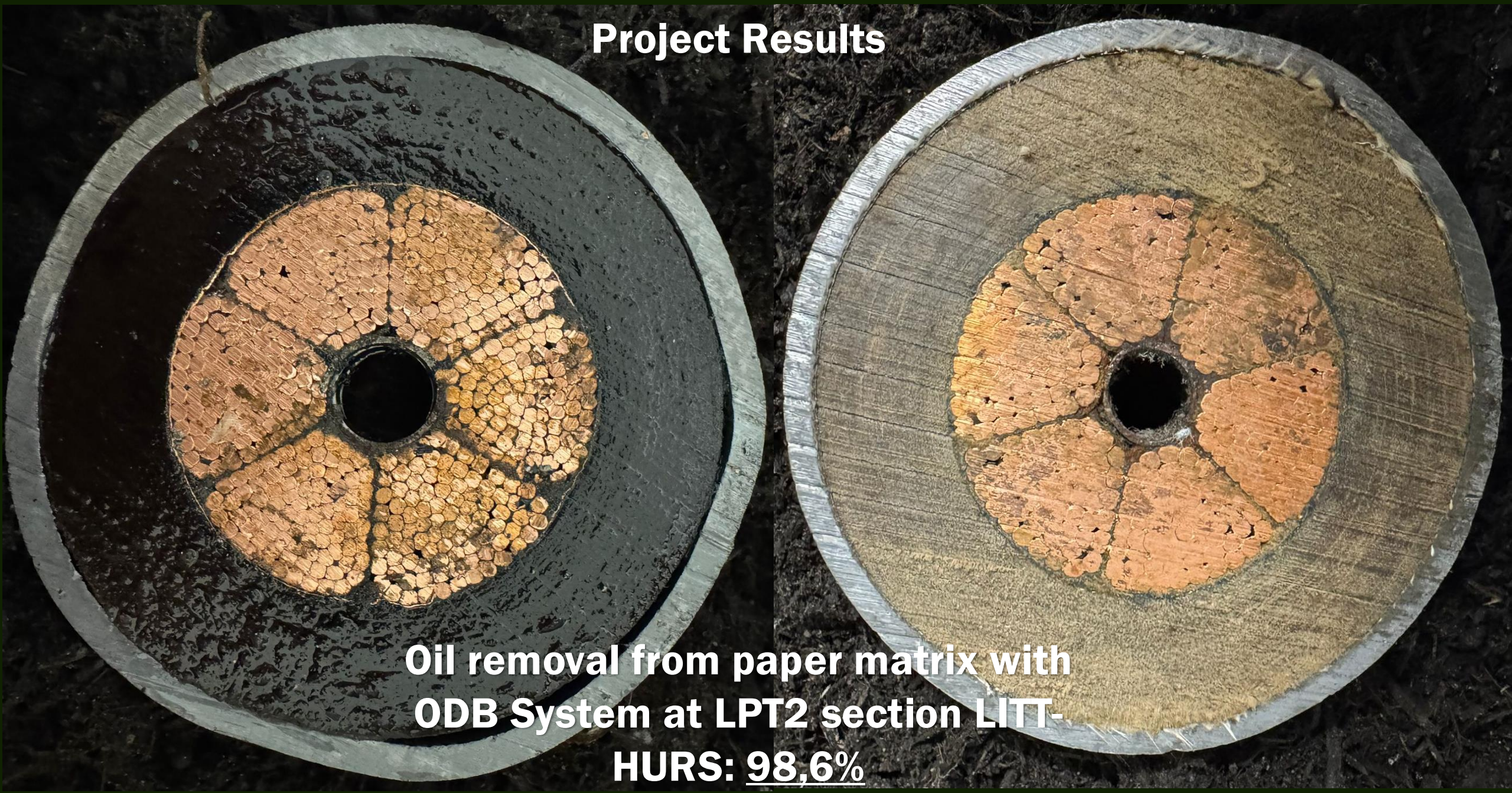
Operations

- Regular oil collections approx. Every 4 weeks.
- Each container has an oil storage tank of 1.000l inside of a IBC container, which is set on a oil retention unit.

Oil volume collected in circuit 01 and circuit 02



Project Results



Oil removal from paper matrix with ODB System at LPT2 section LITT-HURS: 98,6%

ODB System

1. **Excavation without any excavation works**
   No traffic redirection, no landownership issues, minimal invasive and remotely controlled.

2. **Net-zero**
   100% biological, sustainable net-zero innovation with real technical application.

3. **Increase of network asset value**
   Inreases asset value by de-risking the corroding oil cable infrastructure, associated leakages, groundwater and soil contamination.

4. **Favorite solution for private landowners**
   Simplifying the management of private property owners, not needing to dig up their land nor leaving potential hazards in the ground.

Q&A