INNOVATIVE ENGINEERING PRODUCTS AND SERVICES FOR THE INTERNATIONAL SUBSEA OIL, GAS AND OFFSHORE RENEWABLES INDUSTRIES.

V-LIFE: A means of rejuvenating failing umbilicals and subsea electrical distribution systems

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Subsea electrical failures in ageing systems

Subsea electrical failures are caused by:

- Tin whiskers causing short circuits $\approx 2\%$ of all subsea electrical failures

- Dendrites in electrical connectors $\approx 5\%$

- Electrical component failures in Subsea Electronic Modules $\approx 20\%$

- Water ingress into umbilicals, cables and connectors $\approx 73\%$
Water ingress into electrical cables

Moisture Intrusion can occur in long-term wetted cables in the majority of commonly used insulation materials. The intrusion results in:

- Decrease in dielectric strength
- Increase in leakage currents
- Continual degradation leading to eventual failure

The cost of subsea electrical failures is significant –

- Marine intervention costs
- Replacement hardware
- Lost production
A scientific breakthrough to reverse low insulation resistance

- **The Solution –** V-LIFE

- **The Process –** Utilises electro-kinetic & electro-chemical phenomena to increase the resistance of the conductive path between the copper conductors and ground.

- **The Result –** Increased Insulation Resistance, extending the life of the failing cable / connectors, increasing system availability and reducing the need for subsea interventions and equipment replacement.
V-LIFE hardware – in portable form
**Example of restorative effect**

V-LIFE IR Results System 4

<table>
<thead>
<tr>
<th>Commissioning Date:</th>
<th>31/12/2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial IR Value:</td>
<td>151kΩ</td>
</tr>
<tr>
<td>Current IR Value:</td>
<td>100MΩ</td>
</tr>
</tbody>
</table>

![Graph showing Insulation Resistance in Ω over time]

- **Insulation Resistance in Ω**
  - **Date**: 31/12/2013, 05/01/2014, 10/01/2014, 15/01/2014, 20/01/2014
**V-LIFE benefits**

- Reverses the effects of water ingress into electrical cables and equipment
- Can extend the life of failing umbilicals:
  - ‘Buys time’ whilst a new umbilical is procured
  - Used instead of installing a new umbilical
  - Can be used to postpone field abandonment
  - Can increase technical margins to allow additional wells to be added
- Can rejuvenate other subsea distribution equipment and components