A game changer in value-based subsea inspection
Predictive CP survey

- Detailed knowledge about the integrity of the asset
- Eliminate use of divers

INCREASE SAFETY

REDUCE COST

- Reduced offshore vessel time
- Efficient & accurate subsea inspections
- Reduce retrofit cost

PREDICT RISK

- Predicted future condition of your assets
- Time to next inspection
- Life expectancy
FiGS® CP survey application areas

- Offshore wind & power cables
- FPSO / Hulls / Mooring lines
- Jackets / Semi sub & Jack-ups
- Gravity based structures
- Flexibles
- Pipelines (buried / exposed)
- In-field structures
Cathodic Protection Principle
Measuring a car battery (V), does not estimate remaining life!

It won’t even tell you if the battery is connected...
<table>
<thead>
<tr>
<th>STRUCTURES AND PIPLINES</th>
<th>Exposed</th>
<th>Buried</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabber/Proximity/ Drop Cell</td>
<td>Cell to Cell</td>
<td>Dual Cell (Field Gradient)</td>
</tr>
<tr>
<td>Potential profile</td>
<td></td>
<td></td>
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<tr>
<td>Anode current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anode wastage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coating damages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel current density</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current drain to e.g. piles, wells &amp; substructures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer sheath damage on flexible pipes</td>
<td></td>
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<tr>
<td>Correction of pipe routing</td>
<td></td>
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</tbody>
</table>
FiGS® – a step change in subsea CP Inspection

Non-contact CP survey, buried structures
- No need for removal
- No need for stops
- Continuous measurement

Rock dump & Concrete mattresses
- No need for cleaning
- Time-consuming with potential of destroying anodes
- No need for stabbing
- Time-consuming with potential of destroying anodes
- Electrically disconnected

Marine growth on anodes, no cleaning

Muddy waters & shallow waters – no issues
FiGS® – a step change in subsea CP Inspection

- Measurements of coating damages
- Avoid the use of divers in operations
- Accurate data and sensitivity of the sensor
- Vessel time efficiency

- Non-contact
- Faster CP inspections
- Reduced vessel time
- Inspection of all structures
- Shallow and deep waters

Potential (mV) | Location | Comments
--- | --- | ---
- | ABC-468 | Contact measureme possible
- | ABC-321 | Contact measurement possible

Note: snapshot of the status | knowledge regarding redundancy of the system
From the PAST to the FUTURE

Exposed structures & pipelines

<table>
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<tr>
<th>Depth (m)</th>
<th>Potential (mV)</th>
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<th>Comments</th>
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<tbody>
<tr>
<td>- 15</td>
<td>- 1000</td>
<td>ABC-123</td>
<td>Steel Contact</td>
</tr>
<tr>
<td>- 30</td>
<td>- 980</td>
<td>ABC-246</td>
<td>Steel Contact</td>
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Buried structures & pipelines

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Spot checks
✓ Only a snapshot of the status
✓ Lack of knowledge regarding redundancy of the system

Critical areas
✓ non protected/ protected
✓ coating damages

Accurate & detailed data
✓ current flow inside and around structures
✓ is the structure protected
✓ or is it protecting other structures/pipelines

Future predictions
✓ remaining life
✓ time to next inspection
✓ effect of modifications
✓ ~100% CP status
The combination of FiGS® & CP modelling provides full control of the CP system for all structures and pipelines.
FiGS® CP surveys – **actual** condition of the assets

- 20% of the anodes on a jacket were inactive
- Detected 80 new anode sleds on a pipeline
- Detected inactive anodes in a template – other surrounding structures were protecting it
- Invisible coating defects detected (2 mm gap in field joints)
- Measured buried anodes to be active – no need for expensive retrofit of a pipeline
FIGS® Survey = Return on Investment

**Typical pipeline retrofit cost broken down:**
- Design: 2-5%
- Materials: 20-25%
- Installation: 75-80%

Avoided the use of divers. Fast inspection
- ROI 3
- SAVINGS 1 MUSD

Reduced retrofit cost by 50% on a jacket!
- ROI 22
- SAVINGS 10 MUSD (Design, Materials and Installation)

Reduced the retrofit cost by 50% on a pipeline!
- ROI 77
- SAVINGS 12 MUSD (Materials)
Non-contact = New possibilities

Vehicles:
• Autonomous Underwater Vehicles
• Fast moving ROV
• Inspection Class ROV
• Autonomous Inspection Vehicles

FiGS® Operation window and spec
• 0-5 Km/h (2,7 Knot) (double speed 2019)
• 0-3 meters above pipeline
• Weight: 7,5 Kg (wet)
• Connection: RS232
• 24V DC and 20W each sensor
• Generates 1,5MB/hour
• Can be combined with TSS440
FiGS® survey – the fast way to prediction
Summary – FiGS® CP survey

Inspect all assets

No issues during inspection/reduced vessel time

Extensive amount of data

Detailed reports

Predict the future/optimise

Return on Investment
Year to date

Offshore days 2017 to date

- Total: 245
- Standby: 45
- Downtime: 9

Assets 2017 to date

- Jackets: 9
- SPS (3D): 46
- Flexibles: 40
- Pipelines: 80
CP SURVEY OF SUBSEA PIPELINES & STRUCTURES

- **HSE**: No divers reduces HSE risk
- **Value**: More value with less cost
- **Speed**: Speed up the survey
- **Life**: Predict service life
- **Excavation**: No need for excavation

**REDUCE COST INCREASE SAFETY PREDICT RISK**

[www.figs.no](http://www.figs.no)