Evolving Subsea Power Cable Trenching Technologies and Techniques & New Markets

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SOIL MACHINE DYNAMICS

OVER 45 YEARS OF SUBSEA KNOWLEDGE, EXPERIENCE AND INNOVATIVE PRODUCTS

WORLD LEADER IN INTEGRATED REMOTE CONTROL SUBSEA VEHICLE AND INTERVENTION SYSTEMS

DELIVERED OVER 400 UNDERWATER VEHICLE SYSTEMS

AS PART OF MANY ‘WORLD’S FIRST’ OFFSHORE PROJECTS

PART OF CHINA RAILWAY ROLLING STOCK CORPORATION SINCE 2015
HISTORY OF SMD

• Video of timeline
Headquartered in Beijing, China

Largest rolling stock manufacturer in the world

£42bn Revenue in 2015

Over 175,000 employees
TMR - Trenching

90% of the world's subsea cable burial carried out by SMD remotely operated vehicles
Jetting Technology

Q-Trencher 600-1000  High Pressure jetting
10-17 bar jetting swords
Hard clay trenching over 100KPa
Inward facing nozzles for pipe trenching
Sword backwash for extended touchdowns
Cutting Technology
Cutting & Jetting Animation
Ploughing Technology

- Proven SMD Medium & Heavy Duty cable plough design
- Controllable vertical knife share design
- SMD patented power steering for precise control
- Drawbar for rapid tow rope deployment
- Share jetting for dense sands
- Multi-Depth ‘hinged’ chassis enables safe burial at range of depths
- Under chassis cable unloading and loading with Stepping stabiliser for offset landing
- Tension monitoring through cable trough load cell
Ploughing Technology

Plough landed on seabed
Ploughing Technology
Ploughing Technology
Ploughing Animation
Lay & Burial Tractor : LBT1100
Cable Handling Rules

1. Don’t touch the cable

2. If you have to touch the cable
   1. Manage the tension applied
   2. Manage the Minimum Bend Radius (MBR)
   3. Ideally - Don’t Touch The Cable
UK/EU Offshore Wind and Power Transmission...

- Onshore wind farms have an availability of 97-98%
- Offshore wind farms have around 67-95%, depending on project data interpretation
- Submarine cables still proving to be the ‘Achilles Heel’ of the industry
- >500 turbines and cables past 5 years in service
- Export cables, critical array cables and interconnectors are the highest risk to power transmission revenue
- Failure causes can be found from installation, during testing and/or during lifetime
SUBMARINE CABLE REPAIR – THE MARKET

- There have been 7 export cable failures in the UK offshore wind market to date (2017 data)
- Turnaround can be 3-5 months for back to service
- Revenue lost assuming 40% loading at £140/MWh - this has caused the industry an estimated £160million (50% being the repair cost)

<table>
<thead>
<tr>
<th>Repair</th>
<th>Cost</th>
<th>Source</th>
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<tbody>
<tr>
<td>Guernsey-Jersey (2012)</td>
<td>£8m</td>
<td>BBC News</td>
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<tr>
<td>Guernsey-Jersey (2015, pre-emptive)</td>
<td>£5.3m</td>
<td>Owners’ annual reports</td>
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<tr>
<td>Moyle (2011-12), 2 repairs</td>
<td>£15.5m average per repair</td>
<td>Owner’s annual report</td>
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<tr>
<td>Gwynt y Mor (summer 2015)</td>
<td>£10.2m</td>
<td>Ofgem (income adjustment claim)</td>
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<tr>
<td>Gwynt y Mor (2015-16)</td>
<td>£14.2m</td>
<td>Ofgem (income adjustment claim)</td>
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<td>Thanet (2015)</td>
<td>£11.7m</td>
<td>Ofgem (income adjustment claim)</td>
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NEW MARKETS

• We have several new offshore wind markets evolving around the world

• Investment in CAPEX for these markets is tentative

• Lessons Learnt
  – Right tools & people for the job
  – Pick the easy sites first
  – Partner with experienced collaborators
  – Mistakes are expensive, planning and execution must not be compromised

• SMD evolved from telecoms equipment in to power cables
  – There is the need for a offshore wind specific, low cost trenching solution
  – Needs to work well in shallow water, deeper water & where the cable come ashore
  – Must be easy to operate and not require high specification support vessels
NEW SHALLOW WATER POWER CABLE TRENCHER

- Animation
NEW SHALLOW WATER POWER CABLE TRENCHER
NEW SHALLOW WATER POWER CABLE TRENCHER
CONCLUSION OF NEEDS

• Low cost - high power - efficient trencher for array cable installation
• Beach to substation solution
• Support vessel can be low specification
• Reduces time, cost and risk in wind farm cable protection process

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