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Dredging and mining

Offshore oil and gas

Offshore wind
About IHC > markets

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About ihc > markets

- Dredging and mining
- Offshore oil and gas
- Offshore wind
Royal IHC knowledge

Turbine installation
- Marine Operations Engineering
- Design of WTIV, HLV's
- Method statements
- Motion analyses
- Blade handling engineering
- Design and build of blade tools

Foundation installation
- Equipment for piling
- Driveability analyses
- Design, build and rental of piling equipment
- Marine Operations Engineering
- Vessel choice
- Conversion engineering
- Motion and lifting analyses

Maintenance
- Maintenance logistic optimization
- Design of Service Operations Vessels
- Design and build of gangway systems

Design
- Design of MP's
- Design of Jackets
- Design of Substations

Cable lay and burial
- Integrated design and build of inter-array, export, interconnector and telecom cable lay vessels
- Cable lay equipment; carousel, tensioner, loading arm
- Cable burial equipment; ploughs, trencher
- Cable lay engineering and analyses
Foundation installation - trends -
Trend - floating foundation installation
2 HC development supporting floating installation

Double slip joint

Dynamic outrigger frame
Grouted connection

Bolted connection

Double slip joint connection
Weight split 50%

- 200 ton, 25 m
- 1200 ton, 80 m
- 700 ton, 45 m
- 700 ton, 55 m

Conventional bolted TP

Typical foundation for 8 MW turbine

With Double Slip Joint
Prototype monopile manufacturer SIF

Length 15m + 6m
Weight 12t + 5 t

Scale 1:5 for 8 MW
(or full scale 500 kW)
MAIN Benefits double slip joint

1. Less weight monopiles
2. Less demanding heavy lift vessels
3. Much lower installation costs (18% - 34%)
4. Much less project risk
DYNAMIC OUTRIGGER FRAME
**DYNAMIC OUTRIGGER FRAME**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP Diameter</td>
<td>6.0 – 10 m</td>
</tr>
<tr>
<td>(1500mt – 2000mt)</td>
<td></td>
</tr>
<tr>
<td>Compensation stroke</td>
<td>+/- 3.0 m</td>
</tr>
<tr>
<td>Compensation speed</td>
<td>0.30 m/s</td>
</tr>
<tr>
<td>Load (lowering)</td>
<td>350 mt</td>
</tr>
<tr>
<td>Load (compensation)</td>
<td>250 mt</td>
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<tr>
<td>Vessel roll</td>
<td>3 degrees</td>
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<tr>
<td>Vessel yaw</td>
<td>5 degrees</td>
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<tr>
<td>Horizontal deviation</td>
<td>1 m</td>
</tr>
<tr>
<td>Verticality</td>
<td>0.2 degrees</td>
</tr>
<tr>
<td>Pile orientation</td>
<td>2.5 degrees</td>
</tr>
<tr>
<td>Level of MP top</td>
<td>0.1 m</td>
</tr>
<tr>
<td>Clearance hull – 10m pile</td>
<td>5.5 m</td>
</tr>
</tbody>
</table>
MAIN Benefits dynamic outrigger frame

1. Creates possibility to install (heavy) monopiles from heavy lift vessel while on dynamic positions

2. Possibility to use on existing heavy lift vessels

3. Significantly reduces foundation installation time with 30% as no mooring operations are required.
Floating wind - maintenance -
Maintenance OF FLOATING TURBINES

Tow back $$$

Heavy lift semi-sub $$$

Alternative?
TAUT WIRE TRANSFER SYSTEM
Taut wire transfer system

TAUT WIRE TRANSFER SYSTEM

• No tow needed
• No large semi subs needed
• ‘Standard’ heavy lift vessel
• Low cost solution