Simplification by Innovation

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Introduction to speaker

• Mark Lauder
  • Chartered Structural Engineer
  • Expert structural decommissioning
    • WHPS decommissioning
    • Caisson removal
    • Mattress removal / reuse
Mattress decommissioning

- Exposed / superficially buried mattresses - removed
- buried >600mm – leave in place
- Derogation case - CA
- Survey
Locations

- SNS
  - 4 sites
  - Standard - polyprop
  - Large link-lok - steel wires
  - Sandy seabed
Survey option

- Divers/ROV
  - Pipe tracker
  - Divers - probe
  - DSV
  - Time consuming
Survey option

- Sub-bottom profiler
  - Not from sea surface
  - WROV
  - No examples - concrete in sand
  - No guarantee – buried mattress
Search - simpler solution

- Pangeo
  - Sub-bottom imager (SBI)
  - UXOs & buried objects
  - + WROV or
  - + ROGE
  - ROGE + SBI not done before
Survey option

- Sub-bottom imager (SBI)
  - Good results
  - Not looked for mattresses
  - Found concrete in sand
  - Confident
SBI typical results

Cable freespan

Buried objects - archaeology site
ROV options

• Traditional WROV
  • Used with SBI
  • Free swimming
  • Tides - bottom time?

• ROGE ROV
  • Not used with SBI
  • Suspended
  • Work through tides
ROGE ROV

- Removed rocks
- Transition piece
- Non heave compensated crane
- Heave affect results?
Vessel
Survey

- Waves 2.0m
- Worked tides
- Vertical - crane
- Horizontal - ROGE + vessel DP
- Highly manoeuvrable
Data
Results

- Seafloor and concrete mats digitized to 3D surfaces
- Surfaces compared to determine depth of burial
Conclusion

- Powerful tool + simple deployment = increased efficiency
Now

- Smaller SBI & vessel
- Bibby d’ROP (ROV)
- Trials - Lowestoft
- Many applications
Future

- SBI now = 420Kg
- 2016 = 300Kg
- Smaller ROVs / vessels
- Surface towed – similar results?
Simplification by Innovation

Thank you for listening

Mark Lauder
DECOM North Sea 2015

Simplification by innovation

18/11/2015
WHAT?

Subsea services

- UHP AWJ & diamond wire cutting
- HP demolition, dredging, cleaning
- ROV & Drone services
- Professional diving
Technical challenges

**AWJ cutting:**
- Offsets: how to bridge water gaps
- Jet control: fight energy dissipation
- Large depth cuts – Composite structures
- Low visibility – Difficult access

**Dredging:**
- Grout
- Stiff Clay
- Rock

**General:**
- Simpler, more & faster
- Cheaper
Innovation Focus

Grout & rock cutting & dredging

Increase AWJ performance

Integration of personnel
Grout dredging: Maurice
Maurice: WHPS structures
Maurice: Technical data

Dredge pin piles:
Grout 6m, sand, London clay 4m
Dredge to 4m below seabed level
Grout up to 135 MPa

Method:
Spirographic jet: 1000 bar, 260 l/min
Airlift
Maurice: Advantages

Simpler!
Dredge time 3–4 OH per pile
No seabed dredging or disturbances
No diving
Internal cutting below –3m
## Maurice: Advantages

<table>
<thead>
<tr>
<th>Situation</th>
<th>Classic approach</th>
<th>Maurice</th>
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</table>
| Seabed excavation    | Complex excavation  
>4m, slopes 1:7  
How?                 | N/A                                                        |
| Cutting              | External: charges  
External diamond wire  
External AWJ  
4 tools? Losses?     | Classic internal cutting                           |
| Diving               | Extensive diving in structures  
High currents      | N/A                                                        |
| Safety               | People in excavation  
Stability of structure  
What with botched cuts? | N/A  
N/A  
Classic fall back |
| Tech risk            | Weather  
High currents  
Sedimentation  
Pile 3 and 4?  | New technology                                      |
| Programme risk       | Weather delay  
High Currents  
Technical malfunctions  
Sedimentation  
Consequential weather delay | Technical malfunctions  
Some consequential  
weather delay |
| Environment          | Massive seabed disturbances  | N/A  
Uses seawater |
Maurice: Granite 184 MPa
Maurice: Grout 135 MPa
Maurice: Limestone 116 MPa
AWJ Steel Cutting power (i)

150 mm steel
200 mm water gap
60 mm steel

Obtained speed increase:
from 70 to 95 cm/OH
AWJ Steel Cutting power (i)

- Faster
- Complex structures
- New scope
AWJ Steel Cutting power (ii)

450 mm rudder shaft

Progressing:
from 450 to 1000 mm
AWJ Steel Cutting power (ii)

Faster
Complex structures
New scope
AWJ Concrete Cutting power

1050 mm concrete
2 x 3 x 30 mm rebar

Progressing:
from 1200 to 1500 mm
Faster
Decom larger concrete structures
Brent Delta
AWJ Long distance transport

Typical 100–130 m

Progressing:
from 150 to 500 m
AWJ Long distance transport

Multi platform decom
Large depths
In-pipe decom
  Minimal disturbance
  Limited dredging
  Limited diving, if any
AWJ Nested conductors

36/24/20/13” nested conductor

Decrease cutting time:
From 90’ to 45’ O–min
AWJ Nested conductors

Faster
Multi string conductors
Rigless decom
In-pipe decom
Simpler

Underwater
No packers
No compressed air
New low profile, high performance 120 mm cutting head
AWJ Miniaturisation

Attack complex structures from 7 " service pipes
Multi string conductors
Tight spots
Personnel integration

One team carries out multiple tasks:

- AWJ – Diamond cutting
- Dredging
- Cleaning
- ROV
- Drone
- Diving

*Your* tasks: welding, reporting, deckhand,…

- Less interfaces: quality goes up
- Wide range of experiences
- Smaller headcount: cost savings
- Smaller headcount: space savings
- Integration w/ onboard team
- Embracing your project
Our view of DECOM future

Expand cutting envelope
More possibilities (rigless!)
More complex structures
Faster

Expand dredging envelope
Easier sub-bottom decom
More complex structures

Multifunctional teams
Better service&quality
Headcount/space/cost down