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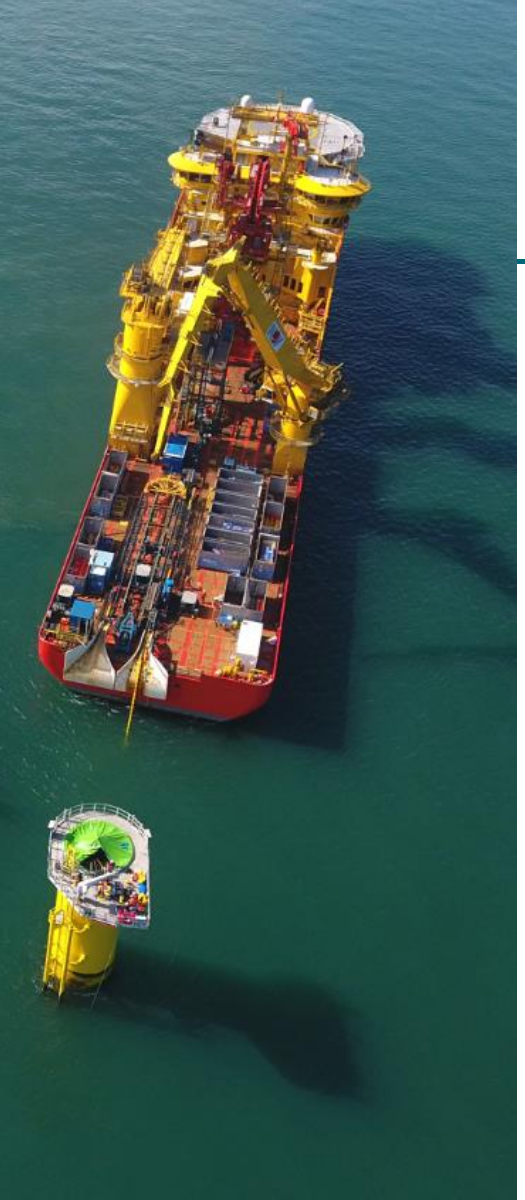
ADVANCING SUBSEA WELL ABANDONMENTS

Collaboration within Decommissioning



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COURAGE • TEAMWORK • ATTITUDE • DEEPOCEAN we live by our values

DEEPOCEAN – WHO WE ARE

The leading, pure play subsea services provider

Globally recognized, locally differentiated

Serving …

- Oil & Gas
- Offshore Energy

With …

- **I**nspection **M**aintenance **R**epair
- **P**roject Mgmt. **E**ngineering
- **S**ubsea **C**onstruction
- **C**able **L**ay **T**renching

Through life-of-field: Greenfield → Brownfield → Decom.

1,000+ employees ● 18 Vessels ● 50 ROVs ● Trenchers ● Extensive Tool Pool

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OUR TRACK RECORD IS SECOND TO NONE

More than **6,000** vessel days, over **100,000 km** of subsea product surveyed

17,000 km of flexible product installed and trenched **2,000 km** of power cable

900 km of large diameter pipeline trenched

More than **2,000** heavy-duty subsea cuts with full range of cutting tooling

DeepOcean has experience in the full range covering decom operations, offering Pre- and post- survey, cutting & recovery, pipeline removal by burial, removal of subsea structures and towing & transports

Our Services

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PROSERV

Topside & Jackets

- Deck Separation
- Module Separation
- Flare Stack Removal

Subsea Infrastructure

- Pre-Decommissioning Surveys and Sampling

Severance and Removal of:

- Pipelines
- Flowlines
- Bundles
- Umbilicals
- Risers
- Mooring Chains
- Manifolds
- Wellhead Protection Structures
- Pipeline End Terminals

Renewables

- Met Mast Removal
- Full Structure Decommissioning

Platform & Subsea Wells

- Intervention Services
- Subsea Well Severance and Recovery
- Conductor Recovery, Sectioning and Pining
- Wellhead Retrieval

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SCOPE

- **Two campaigns for two major clients**
- **7 + 9 wells**
- **90 – 187 m water depth**
- **November 2017 – January 2018**
  - 5.5 weeks + 3.5 weeks

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EXPERIENCE – MARINE OPERATIONS

EDDA FREYA

State of the art construction vessel offering a large working deck and high operational window – in this context providing a flexible and robust working platform performing safe decommission operations out of season.

- Length: 149.8 m
- Beam: 27 m
- Deck Area: **2300 m3**
- Offshore Crane: **600 Te AHC**
- Auxillary Crane: 70 Te AHC
- VLS: 150 Te Huisman w/3000 Te Below Deck Carousel
- WROVs: 2 x 220HP Constructor WROVs in moonpool L&R 7 m Hs
- Station keeping: DP3
- Power Management: Siemens Bluedrive – **Reducing fuel cons. by 15 – 20%**

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EXPERIENCE – MARINE OPERATIONS

Experiences - Utilizing the Edda Freya

- Large deck offering ample and safe working area for personnel & equipment
- Robust crane managed to safely brake bridges and overcome suction forces
- Two cranes used simultaneously – reducing number deployment and recovery operations;
    - Main crane used for wellhead retrieval
    - Secondary crane used for cutting tool operations

Operational Experiences - Improvements

- Deployment/recovery method of cutting tool
- Handling of reel and hose
- Not able to verify completed cut, left with bridges in cut

Observations

- Environmental downtime (EDT) caused by wind exciding crane limitations 40knts

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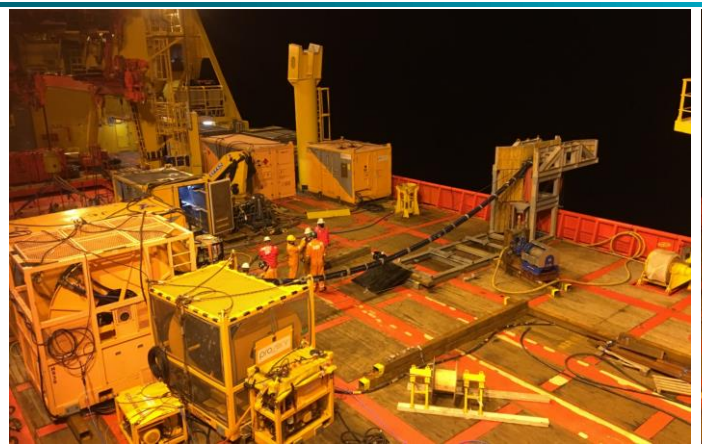
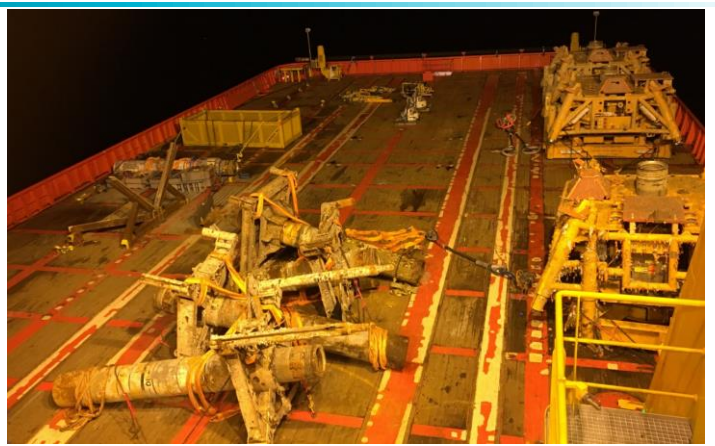
EXPERIENCE – MARINE OPERATIONS





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EXPERIENCE – CUTTING OPERATIONS

Positive Experiences

- All wells were cut and returned to deck
- Operations were successfully carried out during the winter season where typically weather would be a limiting factor
- Lessons were learned from the first campaign in relation to the well conditions and cutting operation and provisions put in place prior to the second campaign

Negative Experiences

- Issues were encountered during deployment and recovery of the cutting tooling
- Overall cut duration on deeper wells was in excess of predicted
- Issue with marine life and debris in wells due to lack of trash cap installation post XT removal therefore drift run was required prior to deployment of cutting tool

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EXPERIENCE – CUTTING OPERATIONS – LESSONS LEARNED

Issue

- Cutting performance was affected where STM 15 wellhead profiles were present, specifically down to location and number of flow by ports and extent of internal perforations.

Solution

- At bid stage, location and type of perfs and location and size of FBPs to be determined to enable sealing solution to be incorporated in tooling spread.

Issue

- Deeper wells (ca. 180msw) with STM 15 wellheads took significantly longer to cut than those in shallower locations (ca. 110msw).

Solution

- Increased air flow required from topside during dewatering required if perfs and FBPs are not plugged to maintain fully dewatered cutting environment.

Issue

- Tooling recovery and umbilical handling operations were problematic

Solution

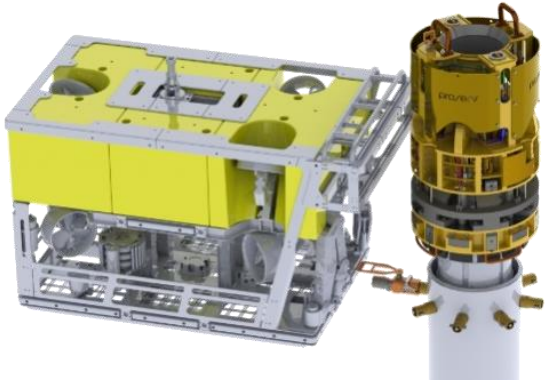
- Over braiding of umbilical to allow for ease of handling during deployment has been implemented. Hose reel now incorporates level wind system to aid recovery operations.

CUTTING OPERATIONS – TOOL DEVELOPMENT WORK

Development 1

External ROV installable flow by port sealing plugs have been developed to combat the issue of air escaping through ports during the process of de-watering.

Varying sizes available to cover majority of cases and all wellhead types.

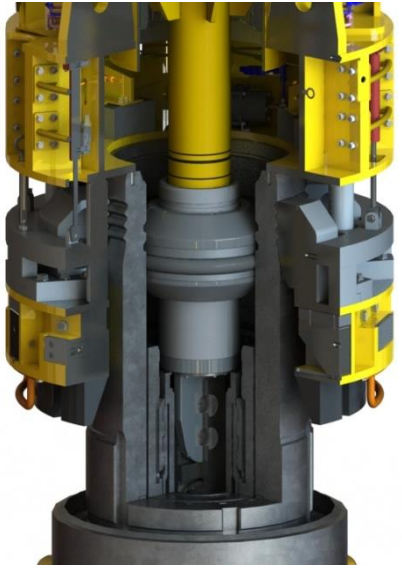


Development 2

Internal upper perforations seal for use where perforations are above planned cut line developed to solve the issue of air escaping the multi-string casing through perforations during the process of de-watering.

Two sizes of inflating Seal have been developed to suit two common sizes of wellhead:

- 18 3/4” Dia Seal
- 13 5/8” Dia Seal



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SUMMARY

- All wells successfully cut and returned to deck across both campaigns
- Issues encountered on first campaign were addressed jointly by DeepOcean and Proserv and solutions applied prior to mobilisation for second campaign
- Methodology is suitable for winter work from vessels during typically quieter offshore period for vessel activity.


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