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Latest Evolution of Vessel Lay Equipment, to Meet the Challenges of Deepwater Installations

SUT Perth, 14th February 2018

1. TechnipFMC Fleet
2. Skandi Africa:
   - Crane
   - Lay Spread

TechnipFMC Fleet

REEL-LAY VESSELS


Deep Energy


Deep Blue


Apache II

S-LAY VESSELS


G1200


G1201

DIVE SUPPORT VESSELS


Deep Arctic


Deep Explorer

LONG TERM CHARTERED VESSELS


North Sea Atlantic


North Sea Giant

RLWI


Island Performer

CONSTRUCTION VESSELS


Skandi Africa


Deep Orient

Plus 8 purpose built vessels for the Brazilian Market:

Skandi Vitoria*	Skandi Acu*
Skandi Niteroi*	Skandi Buzios*
Coral Do Atlantico	Skandi Olinda*
Estrela Do Mar	Skandi Recife*

*JV with DOF

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Skandi Africa Overview

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Skandi Africa

A state-of-the-art deepwater construction support vessel

- Length: 160.9 meters
- Speed: 12 - 16 knots
- Accommodation: 140 people
- DP3 and ICE-1B class notation for harsh environments
- 900 Te AHC main crane, 150 Te AHC knuckle-boom crane
- Large 2,700m2 main deck and 3,500Te under deck storage
- 2 TXLX ROV systems capable of operating to 4,000 m
- 650 Te Tiltable Lay System Tower (TLS) for flexible lay operations – product diameter from 50 to 630mm

50-630 mm

Maximum product diameter range

650 Te

Tiltable Lay System onboard vessel

3500 Te

Under Deck Carousel

Crane Developments

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Crane Developments

A fully programable system:

- At the push of a button

Main Stages of a Subsea Lift improved:

- Vessel to Vessel Lift Mode
- Splash Zone Mode
- Subsea Land-out Mode
- Deep Water Lowering Mode

Increased workability & reduce strain on system

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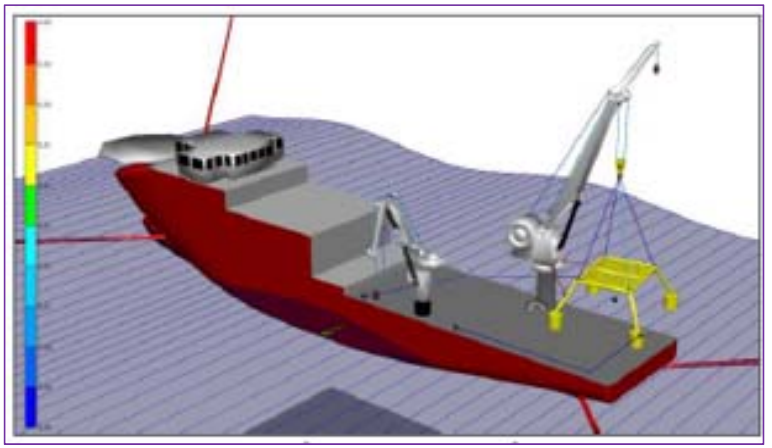
Crane Developments

1) Vessel to Vessel Lift Mode

- Main considerations:
  - Personnel Safety during rigging
  - Structure Integrity during ops
  - Structure control in-air
- Outcome:
  - Account for vessel to vessel relative motions
  - Remove ‘Snap-load’ risk
  - DAF reduced / optimised lifting configurations
  - Increased operability
  - Increased safety

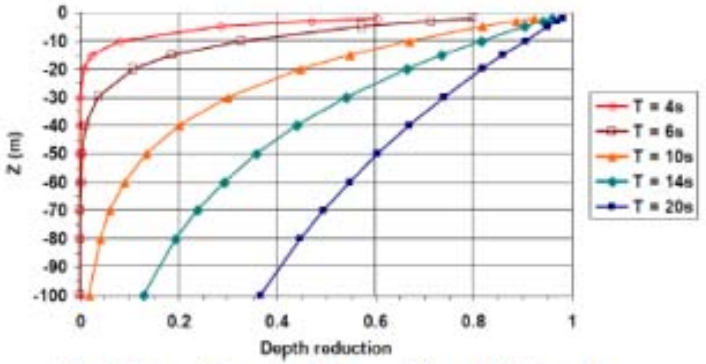


Crane Developments

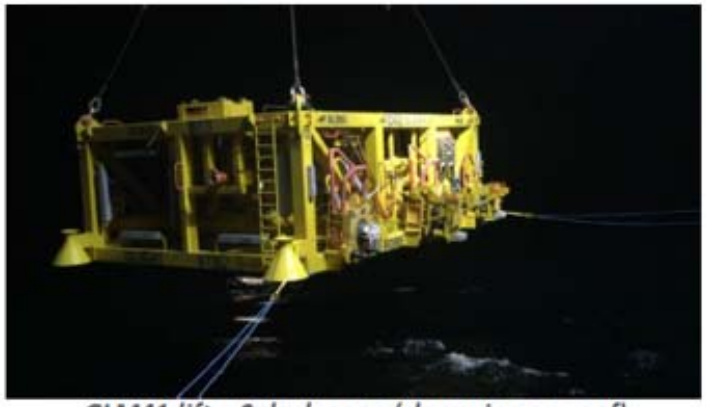
2) Splash Zone Mode

- Main considerations:
  - Maximise wave kinematics
  - Risk of slack-lining
  - Hull clashing

- Outcome:
  - Reduced exposure to slack slings
  - Increased vessel operability [Hs]



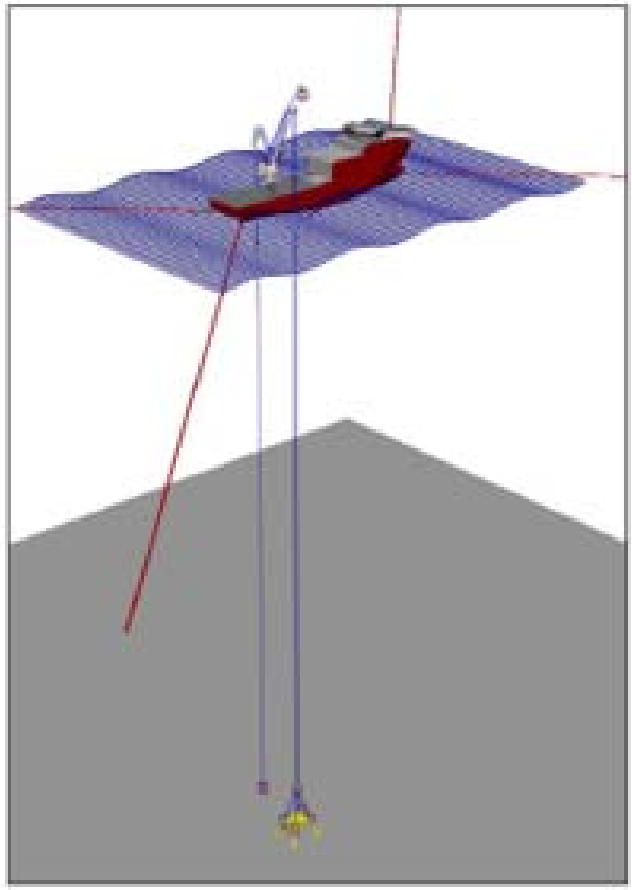
Variation of wave kinematics with depth


GLM41 lift – Splash-zone (slamming on roof)

Crane Developments

3) Subsea Land-out Mode

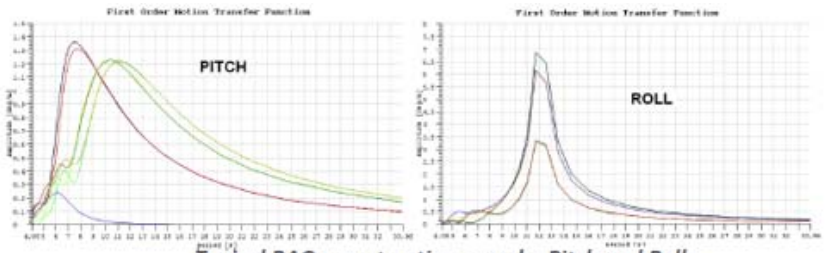
- Main considerations:
  - Structure designed for specific landing velocity [~0.5m/s]
  - Suction loads risk / overloading, landing on soft seabed
  - Structure position guidance
- Outcome:
  - Seabed recontact risk mitigated
  - Remove overload risk, crane attached to seabed
  - Increased vessel operability [Hs]



Crane Developments

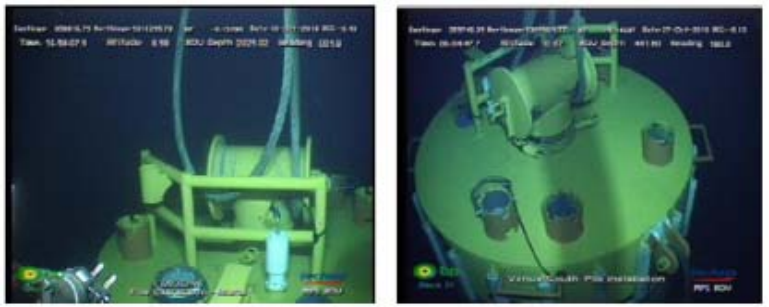
4) Deep Water Lowering Mode

- Main considerations:
  - Crane slewed forward & inboard
  - Resonance*



Typical RAOs construction vessel – Pitch and Roll

- Resonance Mitigation:
  - Natural period of resonance shifted outside wave period range
  - Traditional route: Pennants & PHC unit

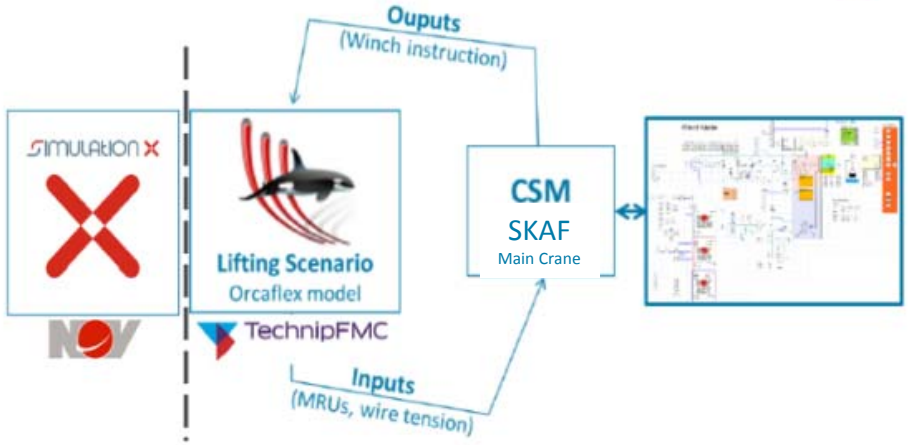

Block 31 – Resonance Issue Experienced

*Resonance – Excitation of the lifted package caused by the natural frequency of the hoisting system being near the wave period – generally more of an issue in deeper waters

Crane Developments

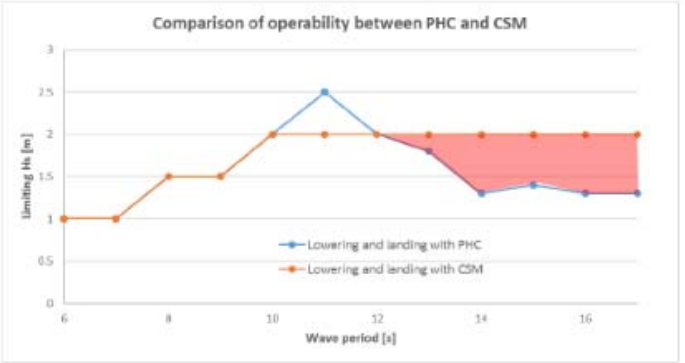
Crane Simulation Modelling [CSM]

- Crane manufacturer interface
- Orcaflex lifting scenario
- Fed into complex model



Resonance Mitigation Benefits

- PHC units removed
- Reducing risk of crane damage
- Reduced vessel time: ~ €1.0M saving on 1st Project
- Significant operability increase - 1.0m Hs to 2.0m Hs



- ***CSM cost only €15k***

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Lay Spread Development

*Special mention to Huisman for their input to these slides- *www.huismanequipment.com/en/*

Lay Spread Developments

A Drive for Innovation

- Changing infrastructure, remote, deeper waters
- Upscaling and improved handling
- Deeper water & Larger equipment = *Higher top tension*
- Safety and structural integrity consideration:
  - Longer, heavier & more end terminations
  - Improved efficiency, repeatability, safety

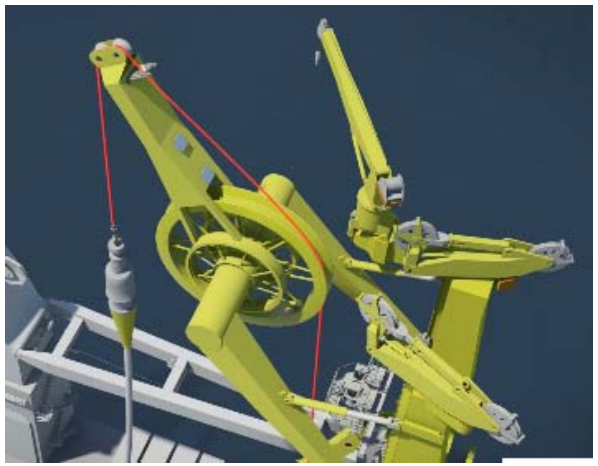
Efficient, safe installation = higher lay speed

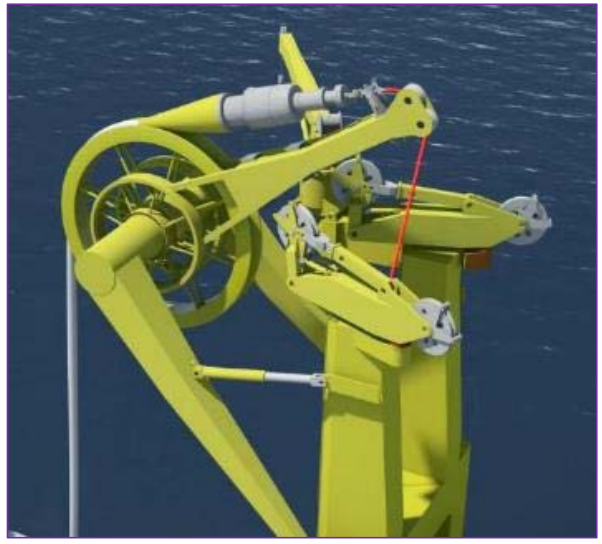
Lay Spread Developments

Lay Spread Developments

End Handling System [EHS] – 1st & 2nd End

- Improved efficiency, control & safety
- Chinese fingers, loose rigging & multiple winches removed
- Driven rigid arm, rotated around aligner wheel
- Hoisting pipe termination from deck - latching system
- 180° rotation into firing line
- Fully reversible for recovery
- Horizontal motions fixed





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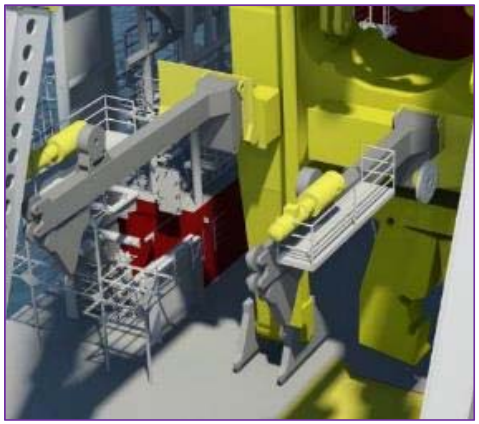
Lay Spread Developments

Retractable Dual Tensioners:

- Retract out of firing line when not required
- Full ramp height available

'XYZ' Hoisting Beams:

- Conventional hoisting beams setup set at fixed pitch
- Movable beams increase versatility & reduce rigging time
- Beams skid transversely & independently
- Heavy loads transported from side of ramp to firing line



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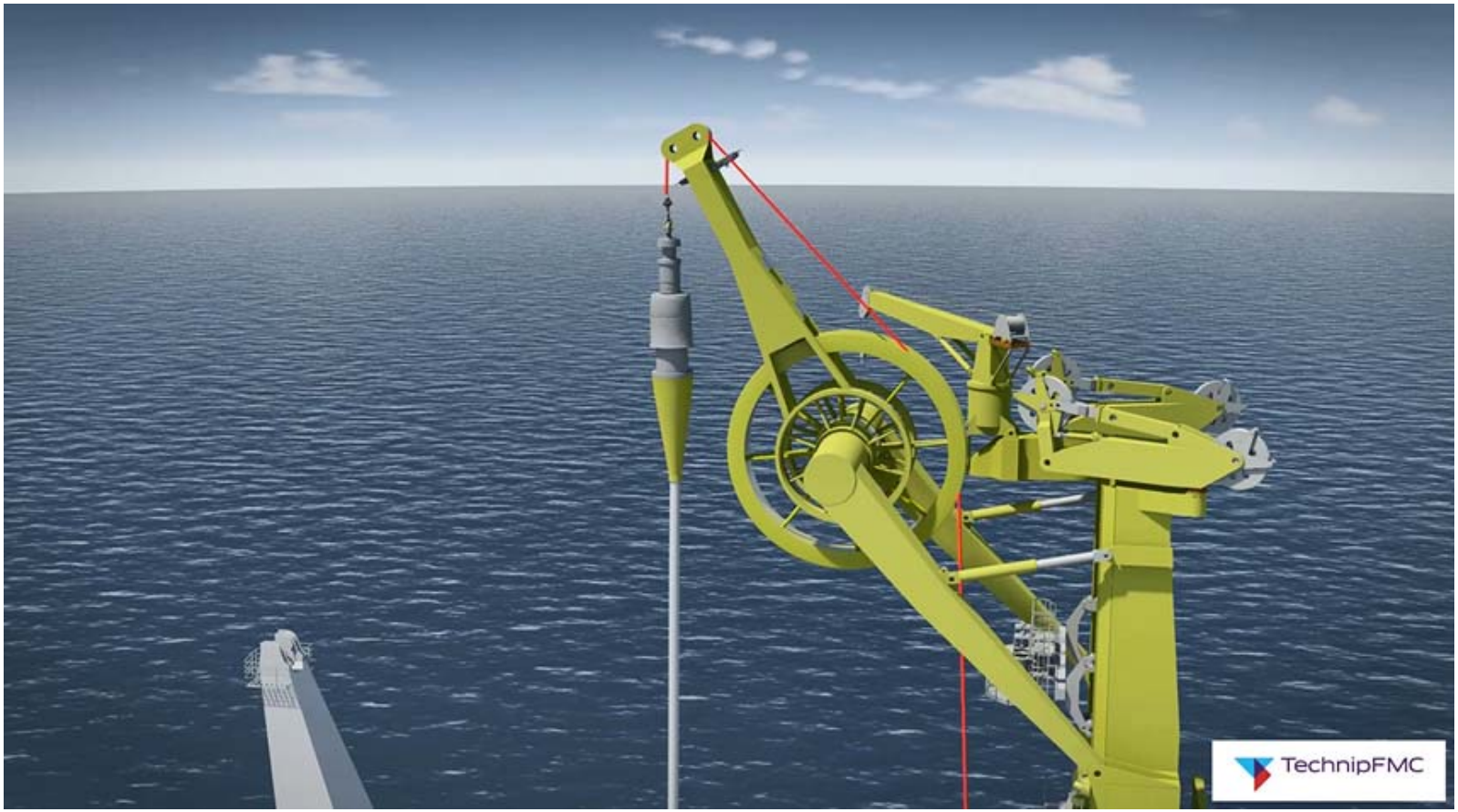
Lay Spread Developments



Successfully implemented on……

Total Moho Nord [Congo] - 1200mwd

- Large EPCI
- Over 21km of flexibles
- Associated Structures, Jumpers, etc

Total Kaombo [Angola] – 1900mwd

- 400 day SKAF campaign
- 500+ Team in 17 TechnipFMC centres
- 50+ Rigid Spools & Jumpers
- 18 Dynamic & Static Umbilicals
- 14 structures [manifolds & piles]

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Thank you

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