How to reduce maintenance costs by means of innovative lifting solutions?

1st Stakeholders Showcase Event

08/09/2016

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Project supported within the Ocean of Tomorrow call of the European Commission Seventh Framework Programme
Service and Maintenance in the Offshore & Wind Industry
Company Profile

O W A:
Offshore & Wind Assistance
Operation & Maintenance
Meet the fleet
GeoSea
OWA, partner in the LEANWIND project

OWA involved in work packages 2 to 9

WP2  • Construction, Deployment & Decommissioning
WP3  • Novel Vessels & Equipment
WP4  • Operation & Maintenance
WP5  • Integrated Logistics
WP6  • System Integration
WP7  • Testing and validation of tools & technologies
WP8  • Economic & Market Assessment
WP9  • Dissemination and Exploitation
WP10
Offshore Wind Challenges & Trends

Size and weight impact

- Bigger vessels
- Adapted lifting gear
- Port infrastructure upgrade
- More lifting capacity + reach
- On land transport limitations

Increased waterdepth impact

- Upgraded Installation Fleet
- Environmental conditions further offshore
- Transit and Transfer system implications
- Improved lifting equipment
- Transat and Transfer system implications

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O&M Challenges & Trends

- **OWF farther from shore:**
  - Focus on remote monitoring
  - Reduced more efficient site visits

- **Larger projects:**
  - Economics of scale
  - Reduced risk adversity

- **Larger turbines:**
  - Higher downtime costs
  - Heavier components
  - More capable O&M vessels

- **Higher availability:**
  - Technology Innovation
  - Expected increased reliability

- **Deeper waters**
  - Floating solutions being developed
  - Need for larger jack-ups
O&M Cost breakdown and cost levers

OWA's fleet and marine experience well positioned to optimize Logistics

Jackups and innovative technologies to optimize major correctives
Novel Lifting Equipment
some examples

- Liftra Blade Dragon
- Siemens B75 Lifting Yoke
- Ravestein Maintenance tower
- IHC Boom Based Blade Manipulator
- HighWind Boom Lock
Turbine installation, a seasonal activity?
Turbines have grown fast

Giant leaps are being made in turbine & blade development

Blade size has grown from 45 to 90 meter – Single blade installation is standard
A solution is needed to uphold current workability limits
Lifting operations: analysis

Wind Sensitivity vs. Controllability

- Load is free to move
- Wind is variable in direction and magnitude
- Object orientation cannot be changed in all directions while installing
- Installation requires careful communication, continuous iteration & correction & a lot of experience

Increasing controllability results in:

- **DECREASED DOWNTIME**
- **DECREASED RISK OF DAMAGE**
- **INCREASED SAFETY**
Downtime due to lifting: is it worth anything?

- Improvements in jack-up vessels have pushed weather downtime back to the lifting operation.
- 80-90% of Weather Downtime now relates to lifting operations.
- As much as 23.7% time can be saved during Summer installation.
- As much as 32.3% time can be saved during Winter installation.

Source: BVG Associates
The weakest link: lifting operations

- Weather downtime and installation risk is under pressure
- Installation tools and methods remain sensitive to wind and crane motions
- **A NEW FUTURE PROOF SOLUTION IS REQUIRED**

- Less transport time per vessel
- Optimised vessel lay-out
- Wave-resistant vessels
- Adapted harbour infrastructure
- Optimised supply chain
- Weather forecasting

Waiting on weather due to high wind speeds
Finding a solution: The High Wind ‘Robot’

How to ‘robotize’ WTG installation?

- 6 Degree of freedom control is required
- Needs to work with all components
- Low impact on vessel capabilities
- Make use of experience built up
- Low threshold for implementation and operation

→ CONCEPT???

Target

✓ Safer
✓ More control
✓ Less Downtime
The Boom Lock is a tool that allows an offshore crane to install WTG components in high wind speeds

- Improved stability & control
- All turbine components and parts
- Works with any lifting tool
- Easy to operate
- Short installation time
- No hinder to non-WTG operations
The “Boom Lock”
All turbine components and parts, all turbines

• Large heavy objects with large inertia make will not stop moving.
• Actions of the crane cause unwanted and potentially dangerous motion of crane and load

⇒ BOOM LOCK SYSTEM BRINGS MAJOR BENEFITS FOR ALL TURBINE COMPONENTS
First project finalized

Installation of turbines at Kentish Flats

• 15 x 3.3 MW V112 turbines
• 45 x blades + 15 nacelles
• Vattenfall, MHI Vestas and GeoSea joined hands in supporting this new technology
• High Wind provided training, support and data logging
Kentish Flats: conclusions

Successful first project finalized

- The Boom Lock lived up to its expectations (however limited to <12 m/s due to the blade yoke design)
- Proven to be technically reliable
- Increased safety for installation
- New technology was adopted fast

NEXT STEPS

- Simulations of larger blades sizes in higher wind speeds
- Offshore trails with new blade yoke designs
QUESTIONS?

Thank you very much for your attention