Servitization and digitization trends in offshore wind O&M

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Quick introduction: Innovation Eco-system around OWI-Lab
Supporting industry with expertise, knowledge, test & monitoring infrastructure and an innovation network

Expertise partners
- sirris
- VUB
- VRIJE UNIVERSITEIT BRUSSEL
- UNIVERSITEIT GENT

Access to:
- Knowledge
- Test-infrastructure

With support from:
- AGORIA
- economie
- BEFIA
- POM
- Tuawest
- EERA
- BIA
- Clusters for Innovation

Innovative Business Network (IBN)

www.offshoreenergycluster.be

Set-up in 2010

International wind energy (expertise) networks
Access to EXPERTISE:
- Knowledge
- Test-infrastructure
Quick introduction to the topic: trend 1 – costs of offshore wind

Projected evolution of the LCoE of offshore wind energy in Europe from 2015 to 2030 (source: BVG Associates for WindEurope)

CAPEX reduction / AEP optimization

CAPEX reduction / AEP optimization / OPEX reduction

Operational excellence
Design for Maintainability
Preventive maintenance
Reliability

Offshore wind farm project lifetime (20-30 years)

CAPEX reduction / AEP optimization / OPEX reduction

Operational excellence
Design for Maintainability
Preventive maintenance
Reliability

Servitization: Servicing (O&M) of offshore wind farms

Digitization: using digital technologies / tools to support O&M

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Quick introduction to the topic: trend 2

Combined order backlog (Q2-2018)

- **Wind turbines:** EUR 10.2bn
  - EUR +0.9bn*
- **Service:** EUR 12.8bn
  - EUR +0.5bn*

Source: Vestas Q2-2018 reporting

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**Key market trends**

- **Double-digit growth in global O&M market** (will nearly double by 2025)
- **Diversified requirements** in different regions and by different customers
- **Digitalization and data driven O&M gaining high relevance**
- Experienced utility customers shifting toward self-performance
- **Price pressure** in new service contracts to be offset by productivity initiatives

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* CAGR

1) MAKE O&M Report 2017  
2) 3 year average with the year before and after to avoid big yearly variations

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Clusters for Innovation
Consequences: Servitization – new business models

Which opportunities for Belgian companies?
- Harbors?
- Technology providers?
- Support services?
Consequences: new technology developments at OEM’s - example
Consequences: Servitization – new business models (example)

New technology providers:
Example image analysis software for drone inspection

Value driver: automated image analysis

Source: Finetune ApS

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Consequences: use of drones & robotics
Consequences: digitalization of the products – new business models

‘Smart’ / Connected Products

We make Products — Partnering — We deliver Services

We deliver Services

Consequences: digitalization of the products – new business models

We make Products

‘Smart’ / Connected Products

We deliver Services

Consequences: digitalization of the products – new business models
Quick introduction to the topic: trend 3

In Brazil this year, we took over the service contract from an existing OEM. Availability was very low – under 80% and the machines were in bad condition. By developing a recovery plan, putting the right team in place and investing in local spare parts storage, we increased the availability to above 97% after just 4 months’ operation. As you can imagine, we have now a very satisfied customer, who trusts us as a genuine partner.

And this is just one example. We’re servicing more than 8 GW of non-Vestas turbines in 17 countries and on five continents. Turbines from eight major OEM are covered by our services already, and we are adding continuously more turbine platforms to our service-portfolio.

www.offshoreenergycluster.be
Servitization / Digitization ≠ new!

New Scientist
Malaysian plane sent out engine data before vanishing

The missing Malaysia Airlines jet sent at least two bursts of technical data back to the airline before it disappeared. New Scientist has learned. The data may help investigators understand what went wrong with the aircraft, no trace of which has yet been found.
Servitization / Digitization → Digital twin = NEW → R&D topic

NASA: “A digital twin is an integrated multi-physics, multiscale, probabilistic simulation of a vehicle or system that uses the best available physical models, sensor updates, fleet history, etc., to mirror the life of its flying twin.”

Gleisspen & Stargent, (2012)

“A digital twin is a dynamic virtual representation of a physical object or system across its lifecycle, using real-time data to enable understanding, learning and reasoning.”


Each pair of GENX engines generates 1TB of information a day.
Digital twin = technology trend in many sectors

→ offshore remoteness = clear drivers to use these new technologies
Cases of Servitization & Digitization with link to Belgian expertise

Smart product

- Integrated sensor technology
- Bluetooth smart tags
- Advanced vibration monitoring
- Remote visual inspection
- Dynamic load monitoring & active torque control

Smart connected product

https://www.ZF.com
Cases of Servitization & Digitization with link to Belgian expertise

Smart bearing using optical fiber set-up for load monitoring

Application Jacking systems

https://www.skf.com
Cases of Servitization & Digitization with link to Belgian expertise

Underwater Strain Monitoring

Smart foundations using optical fiber set-up for load monitoring

https://www.24sea.eu
http://www.com-sens.eu
Cases of Servitization & Digitization with link to Belgian expertise

Cable burial depth monitoring

http://marlinks.com
Cases of Servitization & Digitization with link to Belgian expertise

- SCADA Monitoring data – 78 Wind Turbines
  72 channels (wind speed, rpm, gearbox temp, faults, …)
- Service history
  Data stored over 4 years

Data gathered and organized in MindSphere

- Neural Network (NN)
  Training Neural Network
  Failure prediction and detection

- Turbine Model (SWT)
  Digital Twin: Model creation and correlation
  SCADA load cases
  Remaining lifetime of gears and bearings for each wind turbine

Gearbox Remaining Useful Lifetime Prediction and Early Failure Detection

https://www.plm.automation.siemens.com
Cases of Servitization & Digitization with link to Belgian expertise

https://ncentric.com
https://www.engie-fabricom.com
Cases of Servitization & Digitization with link to Belgian expertise

Conclusion → Strong DIGITAL offshore wind energy value chain in development in Belgium!
RD&I projects in Operation & Maintenance in offshore wind energy

VLAIO funded VIS-project = “Vlaams Innovatie Samenwerkingsverband”

→ Support a collective group of companies with innovative solutions that can be used in a certain industry within a short timing period.

Support the transformation and developments towards innovative, proactive and performant O&M solutions + support market opportunities for the Belgian offshore wind value chain and maintenance companies

▪ Focus on smart & integrated O&M-tools (IOT / Big data / Smart Analytics/Decision support)

▪ Knowledge built-up for the development of smart O&M tools by setting up demonstration project

▪ Valorization in the (offshore) wind energy value chain
Thank you!

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www.offshoreenergycluster.be (looking for a network?)

www.owi-lab.be (looking for expertise?)

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