Best practice:
Quality assurance along the value chain of offshore windfarms

Qualitätssicherung entlang der gesamten Wertschöpfungskette von offshore Windparks

Offshoretage 2017
Heiligendamm, 16.03.2017
Established in Germany with nearly 20 Offices today
Decentralized international network of experts in renewable energies

Wind Onshore
Wind Offshore
Photovoltaics
Biogas/Biomass
Grid Integration
Condition Monitoring
8.2 Expertise (a selection)

> 8.2 provides the asset owner with a depth of technical and engineering knowledge and expertise usually not available outside the turbine manufacturers’ area.

> With over 20,000 inspections across multiple OEM platforms we have created a vast data set. Constantly growing and learning, we use this data to assess the risk of failure, to target known issues on WTG platforms and advise developers and investors.

> It's a service designed to support and drive continuous improvement into the generating asset and ultimately reduce the levelised cost of energy.
What is behind
...weil die Schöpfung es Wert ist ....
…weil wir das Leben genießen ….
(Value Chain) Wert-Schöpfungs-Kette: stellt die Stufen der Produktion als eine geordnete Reihung von Tätigkeiten dar. Diese Tätigkeiten

- schaffen Werte
- verbrauchen Ressourcen
- und sind in Prozessen miteinander verbunden.
Asset Integrity throughout the projects Lifetime

Creating value

- DEVELOPMENT & DESIGN
  - Reviewing Concept
  - Selecting Turbine

CONSTRUCTION

- Production Surveillance
- Commissioning Inspections

OPERATION

- End-of-warranty Inspections
- Achieving operational excellence
- 4Y Periodic monitoring “WKP”

Earning

- Extending the turbine’s lifetime

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What we see from the “earning” phase
Results of „periodic monitoring“ Onshore

- turbines get older
- “savings” in maintenance
- modern turbines more complex
- new types come with new problems
- different evaluation criteria
Results of „periodic monitoring“ Onshore

Why should offshore be better?
• similar production conditions
• foundation structure complex
• highly corrosive atmosphere
• complex systems (climate..)
• rapid evolution
Why typical:
- Similar general findings over different turbines/types
- Similar findings since years - predictable trends
- The operator / owner is surprised!!!
Occurance of defects

Annual occurrence of defects

year of operation

year of production of WEC-type

chart: IWES Datenstand 2010
Damages: Costs involved

» Repair parts
» Direct repair costs
» Related costs (logistics etc)
» Business interruption
» Repair Engineering (RCA, methods, parts, …)
» Repair certification -> timeline!

Closed Claims revealed the following key Cost Drivers:

- **Vessel Charges** - Overall this forms 65% of all claims costs
- **Special Machinery (Third Party)** - Only 1% of the closed claims was formed by special machinery
- **Site Works** - Actually resolving the problem, in terms of labour and specialist contractors amounted to 16.5%
- **Materials** - Only 5% of claims was taken up by materials
- **Costs (Engineering)**
  Direct costs to support works amounted to 4.5%
  including surveys and consultancy
- **Costs (Admin)**
  These included principals costs, contractors admin/overhead and legal costs and formed 8%

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What we (should) know from experience and statistics
Cost of quality – “Rule of Ten”

» “Detecting and fixing a problem during production is 10 times faster and cheaper than doing so in the next phase”
» Additional: offshore is 2 times (3?4?) more expensive!
» Additional: the “new” type of turbine
Examples
Offshore projects still suffer from Onshore relicts

- „white“ blades vs inspection „grids“
- electrical signals vs live-cams / live mics
- work-floor vs workstation
- torque check vs tension check
- drive train CMS vs holistic/integral CM
- change nacelle vs change item
- supplier „Black Box“ vs owners knowledge
- snag list vs do it right first time
- buy a car vs built a power plant
- CAPEX vs OPEX
- OEM‘s „dictate“ vs full operational authority
- fix programme vs necessary actions
- proven technology vs track record
Design examples

» Design optimised for workshop assembly
  ▪ Some areas can hardly be inspected after final assembly

» Bolting instead of welding
  ▪ Esp. foundation and exterior structure
  ▪ Needs high effort during maintenance
  ▪ Exchange in many cases impossible due to tolerances
Supervision example

- Hardening depth of a bearing not sufficient
- Attribute (hardness) not directly measurable
- Owners expert was kept out due to „black-box“ mentality
- „Repair“ needs nacelle exchange by jack up vessel

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Contract example

- Not secured inspection rights in contract
  - no proper inspection possible
- Documents to be delivered
  - long discussions afterwards
  - certain documents can’t be created at a later stage (test reports)
Storage example

» Spec: max 5 over each other
» Damage will occur after 1 or 2 years of operation
Production example

» Missing earthing due to corrosion protection
» Fixed offshore by mechanical grinding of surface
» Defect class „c“: „no impact on safety, durability and production“
Production example

Misaligned fixture of a water cooler
Cooler positioned outside the nacelle;
Repair needs extensive rope access offshore
Production example

- Wrong Loctite used for bolt connections of tower platforms
- Design optimized for workshop assembly
- Repair needs extensive rope access offshore
Quality example

15-25 €/m² in paint shop
50-200 €/m² sheltered onshore site
> 3000 €/m² offshore, common tender after installation

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Conclusion
Conclusions

» “Asset integrity lies at the heart of achieving long term reliability, predictable costs, and reduction of the cost of electricity“

» Use experience, learn from the field, take what you have learned and go upstream in the next project

» Focus on the machine that earns your living
  ▪ Make sure it gets installed and commissioned right
  ▪ Characterize and monitor
  ▪ Intelligently plan interventions
  ▪ Plan for swapping out equipment and rotating spares

» Have your project monitored 100%.
8.2 can assist!

Thank you for your attention!

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