Aker BP – Field of the future

Automation

Terje Hammer Meling
FIELD OF THE FUTURE
A focused portfolio on the NCS

**Skarv / Ærfugl**
Solid base performance and area upside potential

**Alvheim area**
High production efficiency and low operating cost

**Ivar Aasen**
Production ramp-up and IOR opportunities

**Johan Sverdrup**
World class development with break even price below 20 USD/bbl*

**Ula/Tambar**
Late life production with significant upside potential

**Valhall/Hod**
1 billion barrels produced, ambition to produce additional 1 billion barrels

* Full field
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Common governing model

Remote Operations
- Autonomous operation
- Robotics for inspection
- Predictive analytics, digital processes and workflows

Unmanned Installations
- Simpler, cost effective and inherently reliable designs
- No maintenance requirements
- Modular design – Plug&Play
- Competitive material selection

Expanded Subsea Facilities
- Boosting and processing
- Subsea power
- Long distance tie-backs

Zero Discharge/Emission
- All electric
- Alternative energy sources
- No discharge to sea or air
- Energy management
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Underwater Intervention Drones

- **Today**: Remotely operated vehicle (ROV)

- **Future**: Autonomous drones and ROVs
  - General visual inspection/Close visual inspection
  - Light intervention – cleaning, operate valves, CP-probe
  - 3D-scanning – laser (point cloud), pictures and photogrammetry
Autonomous Inspection Drone

- 800 x 800 x 1200 mm
- 4 hour excursions
- Autonomous Behavior
  - Pipeline tracking
  - Subsea Target Detection
  - Docking and undocking
  - Pathfinding by QR code highway
- Equipment skids
  - Class 4 Torque tool
  - Grabber
  - CP probe / Brush
- Operation modes
  - Vessel
  - Subsea Residency
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Common standards and guidelines

Subsea Wireless Group (SWiG)

Standardised communication protocols for:

- Acoustics,
- radio,
- free space optics,
- Wireless power transfer
A digital / virtual replica of physical assets, systems, facilities that can operate in a digital / virtual equivalent of the real environment: process / field / business etc., using a collection of information mirroring models, where data and information tie the real and virtual world together. The digital representation reflects an “up to date” condition of physical elements, instances and dynamics of how the real system operates and lives throughout its life cycle.

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Digital twin cont.d.

- Ref. «A Systems of Systems Digital Twin to Support Life Time Management and Life Extension for Subsea Production Systems»

MTS/IEEE Oceans Conference Marseille 17-20 June, 2019
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Eureka

AkerBP digitalisation

- Smart subsea crew, use case 1: Smart riser health
- Smart subsea crew, use case 2: Smart subsea health
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Smart riser health

Eureka

Objectives:
- Remove weekly status reports
- Automate identification of alarm events
- Simplify sensor status evaluation directly in application
- Reduce review time by Integrity Engineer
- Enable performance comparison between weeks
Smart subsea health

Today

The Future

- Threats and Risk Assess
- Equipment
- Relationship
- Data
- Integrity Management Activity
- Agile Working

Subsea Health

- Repair Remediation activity
- Data
- Assess result
- Inspection Activity
- Relationship

Eureka
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Smart subsea health cont.d.

Powered by Graph database technology

- Impact Analysis
- Risk Assessment
- Asset Management
- Knowledge Graph
- Compliance Monitoring
- Augmented Intelligence
Smart subsea health cont.d.

Architecture

MVP: Smart Subsea Health APP
MVP: Riser health

CDF

Contextualized data

PI
Sensor data

Synergi
Incident HSE Data

Workmate/SAP
WO Notifications

CCS/Event
Waive height
Position
Movements
Accelerations

COABIS
Anomaly Inspection
History
Progress
Completion status

Subsea Integrity Graph

Model Hosting

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Autonomous crane

Remote operations

- Partners: Optilift, Palfinger & IKM Tech Team Solutions.
- All-electric crane.
- Remote / autonomous operation.
- Planned functionality:
  - Auto landing and lift-off.
  - Relative heave-compensation.
  - Anti pendulum compensation.
  - Anti collision for cargo.
  - Anti collision for people.
  - Anti collision for crane boom.
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Cargo tank inspection on Skarv

Confined space inspection

*Today*
- Entering of people to hazardous (gaseous and confined) areas
- Rope climbing
- Entering watch and watch of entering watch
- 14 days of preparing
- Mechanical blinding – approx. 50 hours

*Plans*
- Perform first test autumn 2019
- Proof of concept

*Obstacles*
- NDT (non-destructive testing)
- EX/ATEX-certification
- Combined sensory apparatus
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Alvheim – Coating robot w/BRI Norhull

Surface treatment
- Complete surface maintenance on flat surfaces
  - High pressure washing
  - Sanding
  - Soap wash
  - Coating
- Operated from deck
- Sensor that checks if surface is ready
- Zero-emissions – “vacuum cleaner”-technology
- Up to 20x faster than traditional surface maintenance
- Alvheim surface area 5500 m²

- Testing
  - Onshore last May
  - Offshore in Q1 2020
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Robot technology

Offshore testing
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Autonomy – Need, opportunity and challenges

Need & opportunities
- Routine inspection
  - Topside
  - Subsea
- Condition monitoring
- System surveillance and reporting

Challenges
- Conservative business
- Low TRL
- Money
References

- https://seekingalpha.com/article/4232371-oceaneering-oii-investor-presentation-slideshow (Oceaneering presentation snip)
- https://deepoceangroup.com/assets/rovs/ (AID)
- https://www.youtube.com/watch?v=RdSE6p-98rE (Cyber Hawk – tank inspection)
- https://www.youtube.com/watch?time_continue=103&v=qCKKKIVowM (Sky-Futures)
- https://www.youtube.com/watch?v=cmtVupIkDml (Sky-Futures, confined space video)