



Oil & Gas
Authority



Norwegian Ministry
of Petroleum and Energy



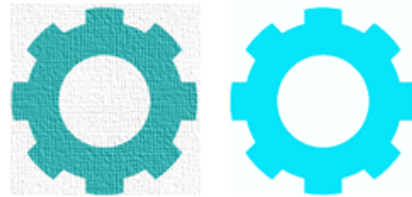
UK and Norway Technology Hackathon

Output Report Gallery

22nd November 2017: Aker Solutions, Aberdeen
30th November 2017: Stavanger Forum, Stavanger

Digital Twin in Action

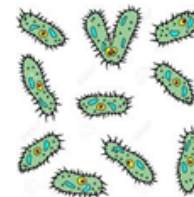
- Utilise data from historical store
- Produce a digital twin of whole process:
 - Can lead to more land based operational control
 - Remote monitoring
 - Can open up new ways to use and analyse digital data
 - Introduce predictive maintenance
- Output from Digital Twin needs to feed into 'action' system
- Be lean in gathering data 80% solution might be good enough to start with
- Can this data be shared for common good of industry?



25
Votes

Scale Removal / Prevention

- Scale detection
 - First understanding of the source of the scale problem
 - Analyse inhibitor and behaviour of system
 - Monitor and respond to scale formation
 - Increased flow assurance knowledge
- Scale Prevention
 - Composite piping/low friction coating for critical areas – prevent
 - Remove the water before creates a problem
 - Physical re-scaler that can operate while production online
 - New chemical solutions to mitigate Scale formation
 - Introduce sensors that are linked to chemical injection valves into well
- Scale Removal
 - Bacterial removal possible
 - Electromagnetic removal
 - Ultrasonic removal
 - Scouring chemicals



19
Votes

Online directory for re-use Equipment

- Platform for obsolete parts
- Could be recovered from decommissioned platforms for re-selling
- Audit equipment for re-sale prior to COP
- Minimise waste at point of decommissioning
- Re-use opportunities post revenue or cost reductions elsewhere
- Common sharing networks or platforms not currently widely used
- Supplies the grey market for late-life production equipment

18
Votes

oilbay

Modular Access

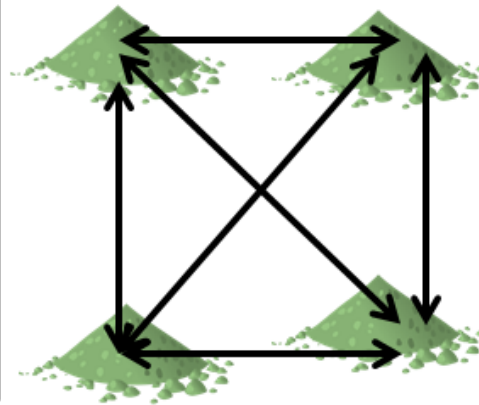
- Challenge weight of current and manual handling aspect.
- Alternative scaffold materials and system
 - Aluminium
 - Bamboo
- Lower weight.
- Reduced manual handling.
- Reduce rig up time.
- Reduce POB.
- Was semi-implemented within ConocoPhillips.

12
Votes



Dealing with Cutting Pile

- How do we sample drilling cutting piles better than we currently do?
- Can industry share cutting pile data for better understanding?
- Alternative methods
 - Probe
 - Intelligent fluids
 - Suction pile principle
 - Non-intrusive methods
 - Bioscience for fast degradation
 - Existing subsea excavator with hydraulic cutting attachment
 - Sucking' pipe from pipeline
 - ROV propelled 'hammer action' coring tool



Drill-Seis

- Use drill bit as a seismic source
- Will allow well stability monitoring as drilling progress
- Is this available already?

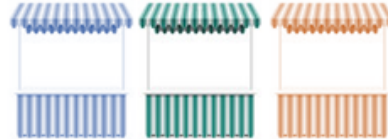


Let the market decide

- Oil companies to share challenges on portal
- Vendor led technology solutions
 - Functional specs
 - Concepts
 - Architect design
- Cultural change for operators to let go of control
- Let supply chain try integrated approach to avoid multiple conflicts of risk, cost, time, scope

9

Votes



Crack finder

- How to detect cracks
 - Camera –ecotone – look for small detail in large area
 - Robots walking and inspecting, painting white to detect better
 - Use digital twin to predict crack areas, to narrow search
 - Drones, with various detectors inc. ultrasound

9

Votes



'Internal' Google Maps

- Automatic visual map collection – then additional 'tags'
- Visual
- Thermal
- Hyper spectral camera material
- Material classification
- Inventory Mapping
- Laser used to digitize
- Q: Identification of materials (like asbestos etc) what's already available?



9

Votes

How Clean is Clean

- Accelerated Degradation of oil containing pipelines
- Regulations are open to challenge is alternative solution found
- Doing the job of flushing but in a different way
- Use of bugs for wax removal?



8

Votes

Fit for Purpose Vessel

- Purpose built decommissioning vessel with all facilities on board.
- Features could include:
 - Power supply
 - Water cutting
 - Enhanced ability to work in poor weather
 - DP3
 - Cranes
 - Accommodation
 - Workshops
 - Ability to further adapt for additional requirements
- Vessel for providing remote power has been developed by Saudi Aramco.



8

Votes

Remote Control

- De-man installations and convert to remotely controlled
- Already exists in production operations.
- Use existing sensors to minimise intervention.
- Incorporate intelligence to existing sensor to reduce risk / cost
- Look at other industries
 - Traffic Systems
 - Healthcare systems
 - Robotic workers

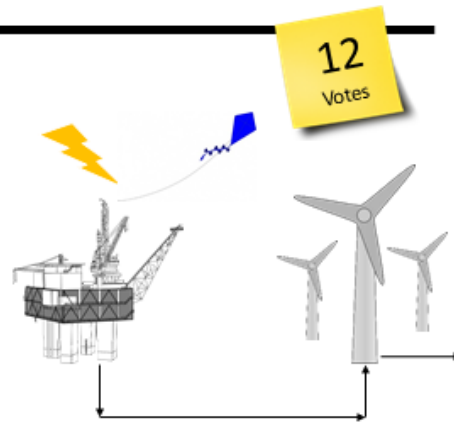


14

Votes

Topside Wind Turbine

- Generate Electricity on platform.
 - Export to windfarm network.
- Removal and installation synergies with windfarms
- Additional kite moving in figure of 8 to generate electricity.
- Floating windmill power generation.
 - Float to platform, then move out when needed.
- Remove the topside and replace with a wind turbine.
- Integrate wind with other natural power sources.



Produce Thicker Crudes at Lower Temperatures

- Refer to Heriot Watt University for studies on chemical in/separation.
- Outsource separation optimisation- risk reward sharing.
- Use big data- share the benefits.



Simple Surveying

- Better forward planning of all required surveys
- How to eliminate need for survey personnel offshore
- Are decom tolerances the same as operations?
 - If lower tolerance can one all encompassing survey be used for all purposes ?
- For less Critical Surveys – catch all, survey for low risks – Photo/Video to save costs
- Bundling survey requirement using optimum, fit-for-purpose technology.
 - Other analysis – thermal/spectro photometer/IR/laser scan
 - Integrate 'street view'

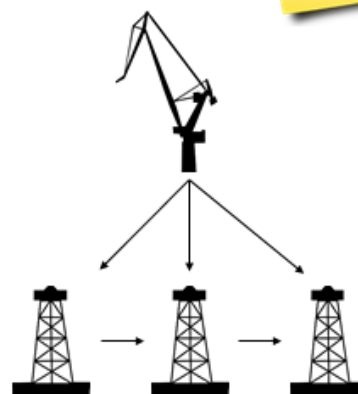


8

Votes

Lifts Lifts Lifts

- Reuse or transfer cranes between platforms, as they are decommissioned.
- Alternative lift methods
 - Smaller loads lifted by drone.
 - Big balloons.
 - Airship, could be inflated as needed
 - HLV UGLEN (the owl).
 - Remote operated Cranes.
 - Onshore crane op's.



8

Votes

Lift Off

- Platform cranes are aged and used more in decom than ever before
- How to ensure safe and reliable lifting capacity?
 - Self erecting crane
 - Adapt tower cranes
 - Rental fleet
 - Self installing floating tower
 - Ballasting crane
- Pay per lift commercial model?
 - Offers a flexible service



7

Votes

Step it Down

- Moving from newest, most expensive technology to more basic technology techniques
 - Simplify
 - Think small



7

Votes

Lego-Rig

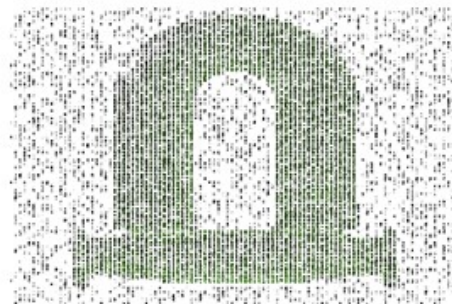
- True modular equipment design for decommissioning, conforming to ISO standards.
- Rig Upgrades for decom
- Simple Plug and lubricate
- Allow access to wells
- Modular parts can include
 - Modular crane
 - Modular mud pit & pump



7
Votes

Metering

- Embed transducers into composite materials. Water in oil and flow.
- Automation of chemical injection/dosing.
- Virtual flow metering/virtual flow modelling.

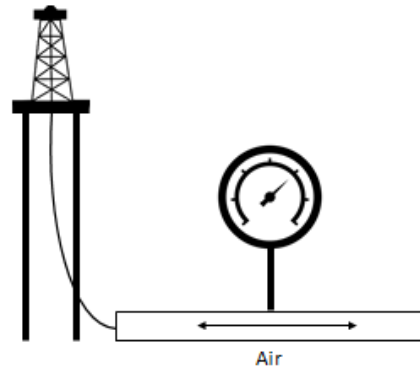


6
Votes

“Windstore” Blowpipe

6
Votes

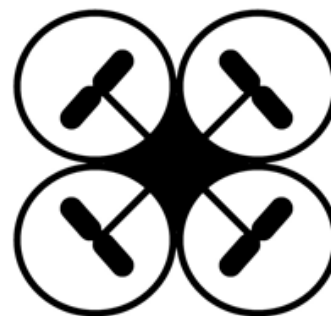
- Pipe pressure used to store energy.



P2P inspect

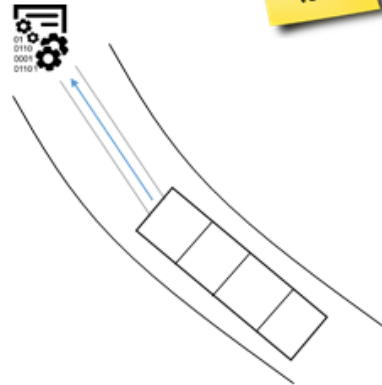
5
Votes

- Drones to inspect from stream to shore
- Can include automated ROV
 - Battery powered
 - Onshore operated
 - Means less offshore personnel
 - Reduced facilities needed from platform
- Built in logic to determine where needs inspection
- Can some fabric maintenance be carried out?



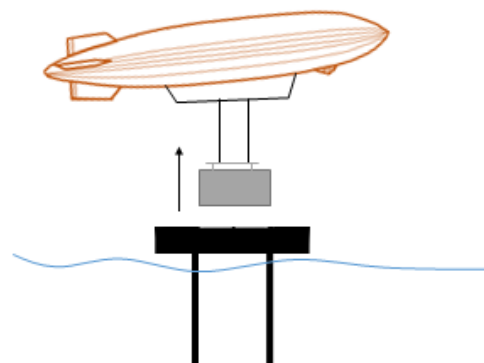
ESP's and alternatives

- How to adapt ESP to improve functionality
 - Installation of vibration on pump
 - Downhole separator cyclone to remove water
 - Move VSD downhole – soft start downhole then switch to main power.
 - Additional sensors on ESP to condition monitor can optimise workover timings
 - Real time telemetry of key production. Well characteristic for further optimise operation
- Slim line fit and tubular to surface.
- Bring suppliers into ops.
- Operate/monitor onshore.
- Standardise on pump type NS5820 (std). Apply rigidly.
- Monitor/optimise/predict failure.



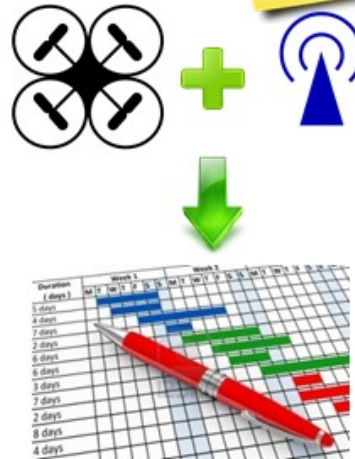
Decom Zeppelin

- Airship lifts.
- Can stay on station for when needed and inflated / deflated as required.
- Use drones to lift up to 4 tonnes.



Intelligent Inspection Fabric Maintenance

- Drone technology for all forms of platform inspection.
- Model degradation and combine with sensors to optimise efficient maintenance.
- Have multi skilled team onshore with interactive tools for maintenance planning based on inspection results.
- Would allow proactive rather than reactive maintenance.
- What do other industries do?



Crane Ship

- Lift boats vs cranes.
- Using powered lift boats could solve crane + power issues.
- Crane Ship available in Norway currently.
 - HLV UGLEN (the owl).



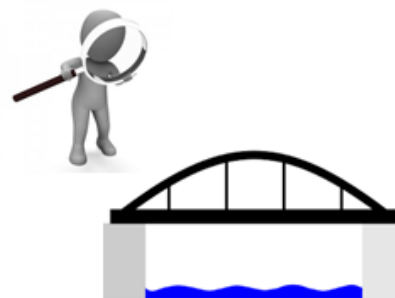
Lifetime Development Plan

- Set baseline today
- Incorporate old data
- Switch out strategy
- CAPEX/OPEX for new equipment > team integration
- Move to prediction
 - Recognise changes
 - Recognise anomalies
 - Machine learning



I-Smart Monitoring

- Wireless systems – easily deployed avoid running new equipment.
- Use to integrate a number of systems together
- Big Data ‘back office’ processing
- Logistics – huge opportunity for ‘real-time’ monitoring
- Tech may exist for monitoring bridges in civil engineering world



Skid-on Skid-Off

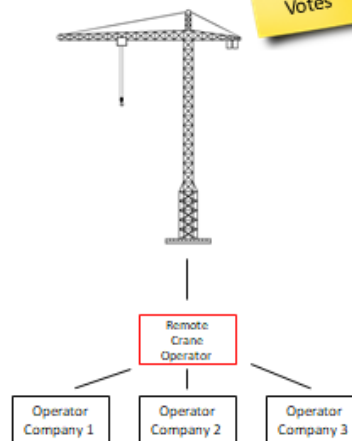
- Vessel to skid heavy loads and transport to dockside.



3
Votes

Remote Control Operations - Robotics

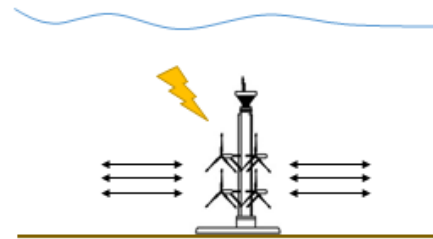
- Remote Control crane – also mobile
- Partial preparation done by personnel – rest completed by 'robotics'
- Remote operated onshore serving multiple operators



3
Votes

Energy from the Sea

- How can we better store energy for use in decommissioning activities and late life?
 - Sea water battery.
 - Underwater turbine.
 - Pumped hydro storage.
 - Energy storage and generation in legs.
 - Pressurised vessel for storage potential



3
Votes

Mooring Systems: Wear, Tear and Chain Failure

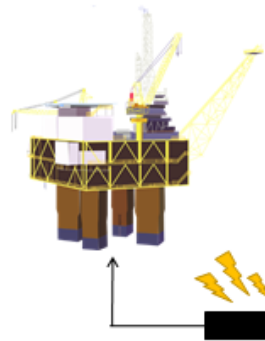
- Chain crawlers to inspect chains along length.
- Localise wear and regularly change the weak link.
- Combination of neutral buoyancy + ROV + chain crawler technology to replace links/chains.
- "Bike chain" type linkage for new builds.
- Seabed storage of spare moorings.
- Conductivity/corrosion/baselining.
- Acoustic inspection "hit it" and listen.
- Magnetic force buffer between links.
- Link design- contact point, surface area etc.
- Distributed wear mechanism on links.



3
Votes

Subsea Hub Generation

- How else can we generate “clean” energy for decommissioning?
- Subsea power generation for platform:
 - Current
 - Wave
 - Thermal
 - Heat sink – like a fridge in reverse
 - Kites



2
Votes

Light Bulb

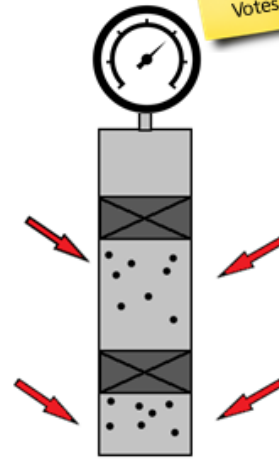
- Is there opportunity to use jackets for renewable energy
- Use current assets for testing temporary systems
- Test centre offshore
 - Mobile power - tidal turbine
 - Floating wind turbines
 - Hydrogen production
 - Fire pumps to feed turbines
- Learning from Nuclear, portal for new ideas



2
Votes

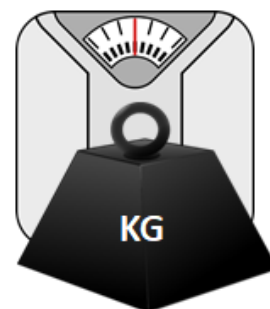
What's the barrier?

- Better verify the quality of P&A cement plugs
- Can we add a comms link to gather and transmit real quality of cement
 - Install remote monitoring during well P&A
 - Required for 3 months after P&A and in perpetuity afterwards
 - Powered to last 25 years – then bio-degrade.
- Can we pre set a gas below plug like helium, then use as a tracer in case it passes.



Weight Estimating for Decom

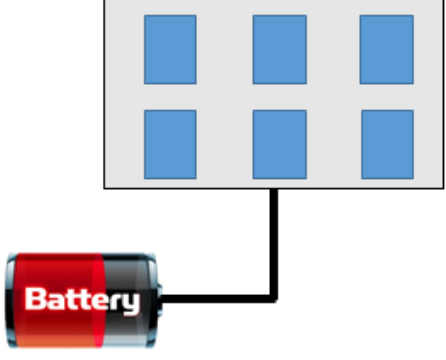
- Techniques and technology to assist in better estimating the weight of topsides for removal.
- New mathematical techniques.
- Gravitational models.
- Weight based on displacement.
- Can strain gauge provide accuracy?
- Considering multiple materials properties steel/concrete.
- Full 3D scan -NASA of internals then externals.
- Make digital twin of asset.



Transition of Power

- Knowledge sharing
- Offshore hotel (logistical timing)
- Offshore platform as a power hub – can it be optimised
- Predictive analysis to power failure
- Generator supply vessel
- Battery power

4
Votes




The diagram illustrates a power transition concept. A red and black battery labeled 'Battery' is connected via a black line to a grey rectangular box containing six blue squares arranged in a 2x3 grid, representing a power hub or offshore platform.

UK/Norway - Common Regulation –Common Approval

- UK/Nor Common regulations to minimize cost/complexity
- Common approaches/processes - efficiency

4
Votes



The diagram features a line drawing of two hands shaking in a firm grip, symbolizing agreement or partnership. Below the handshake are two maps: the United Kingdom on the left and Norway on the right, representing the geographical context of the common regulation and approval process.

Circular Economy

- Change in decom mind-set, look at what can be reused
- Introduce walk to work
 - Accommodation
 - Crane
 - Modular drilling rig
- Let all vendors see what equipment is on platform to be decommissioned
- Target making offshore decom cost neutral



3
Votes

Robotic Pipeline Inspection

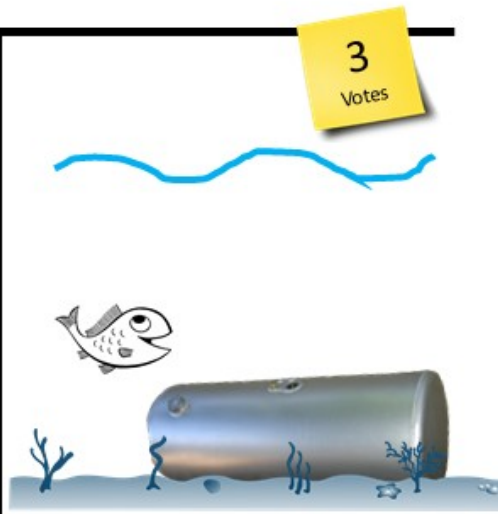
- Autonomous robotic solution for pipelines
- Live analysis for HC from pipeline robot – ultrasonic measurement
- Robotic 'PIG' to travel up/down pipes with analysis



3
Votes

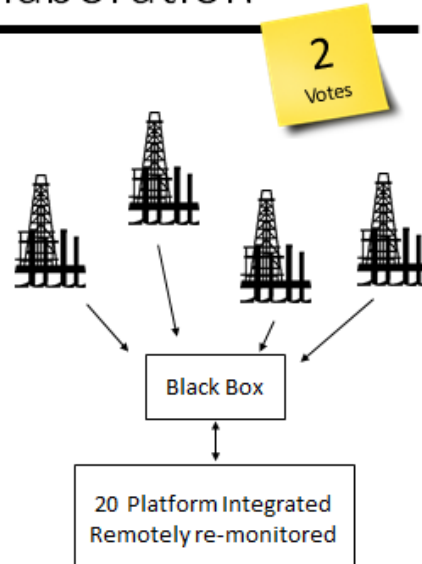
Wet Storage

- Look at storing diesel on seabed
- Reduced weight on rig
- Could change order decom takes place
- Could feed more than one platform



Unmanned – Industry Best Practice + Collaboration

- Approaches from current operations to be shared
- Common comms + architecture systems -> transmit to shore
- Central (common) hub onshore for warm/cold assets (multi-operator)
- New entrant/new opportunity – ‘Security Offshore Ltd’



'Fast Boat'

- Daily commute
- Intra or cross company arrangement for 'persons on board' availability
- Needs flexibility in operations for involved assets
- Walk-to-work as part of solution
- Collaboration



2
Votes

The Exit


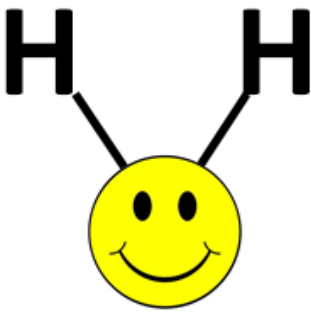
- Reduce POB requirement after COP
- Organisation transition for ops to P&A to Decom
- Develop specialists in late life operation – multi-skilled
- Potential to handover duty holder ship
- To ensure safety case compliance platform knowledge required



2
Votes



Dry Up

- Late life production optimisation including flow assurance
- Late life water handling
- Change in mind set
- Subsea water separation
- Water shutters

Accommodation Hub

- Shared cost of running facility to service multiple projects
- Flotel with shared agreement
- Defined schedule i.e. seafox bus movements

Light on light off

- Platforms use large amounts of diesel to keep lights on.
- Reaction Engines as alternative (Used in space industry)
 - Circular system
 - Easy to install
 - Ring Main (induction)
 - Reverse osmosis
 - Geothermal energy
- Flexible power from various sources
 - Battery back up
 - Air into H2



2

Votes

Fabric Maintenance - Repair and Condition Monitoring

- Use of welding for piping/ structural repairs.
- Baseline integrity data to look for future changes.
- Australia hull coating technology for anti fouling.
- Coating with Nano technology.
- Hydrophobic paints.



2

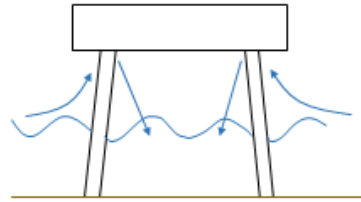
Votes

Suck and Blow Power Operation

2

Votes

- Using platform legs and the rise and fall of the sea to generate power.



P&A

1

Vote

- New P&A Technology
 - Solids free resin instead of cement
 - Use cuttings and formations to abandon the well
- Value for new technology incorporated in new commercial model / requirements



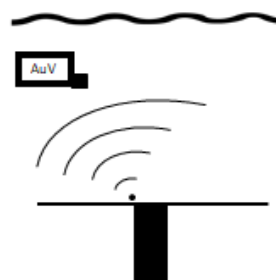
Platform Purpose

- Convert idle platforms to accommodation hubs
- Use same basic idea for accommodation, and utilise ullage in platform deck space for storing kit offshore for platforms that are space constrained
- Alternative power for accom only platform



Suspended Well Monitoring

- Part time monitoring of subsea wells
- AUV not ROV – avoid vessels
- Wireless signals
- Overcome bandwidth limitations



Critical Equipment Assessment

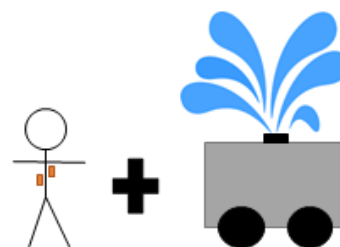
- Spares Pooling / Inventory mgt
- OEM going out of business
- Risk based assessment tools exist BUT expensive to initially set up
- OGUK have inventory rationalization as a key priority
- ERP/SAP systems compatibility is impossible



1
Vote

Tailored Detection

- Personal F&G detector and RFID tracking.
- Movable Wi-Fi F&G, as used on US Marines.
- Moving deluge skid.
- Remove current equipment.
- Potential for equipment decommissioning timing.



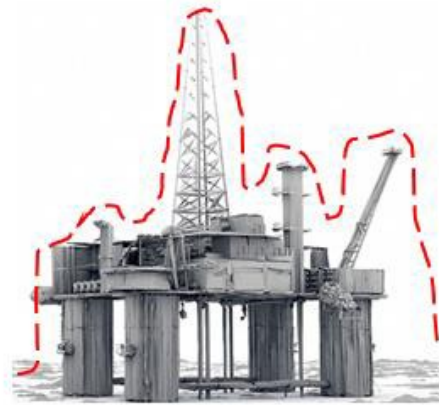
1
Vote

PowerGen

1

Vote

- Alternative power sources for platforms at various stages of decommissioning
 - A UV film that generates power from sun
 - H2 Hydrogen generation
- Convert helideck to solar panel to generate power
 - Still needs to function as helideck
 - Non-slip coating
 - No reflection for pilots



Quick + Consistent Condition Assessment

1

Vote

- Expertise needed to assess full system (equipment) -define current condition - audit
- Definite change-out strategy/audit



Maintenance Versus Servicing -> Overhaul

- Be clear about difference between maintenance V's servicing – different team?
- Carry out analytics on machinery – emitted energy – feeds info 'intervention' activities (maintenance)
- Seek to maximise service intervals through system/materials modifications (better oil, bigger oil storage), online oil quality measurement.
- Use to predict and extend overhaul intervals



1

Vote

Managing Obsolescent Control Systems to C.O.P

- "Self healing" self modifying systems.
- Use adaptive technology.



1

Vote

Improving Water in Oil Quality

- Look at low shear valves & pumps.
- Stop water: Use membrane technology.
- Consider use of chemicals for oil/ water separation.



Manage the window

- Alternative way to manage the drilling window if narrow
- Look at ECD gradient
- 2 channel drill string, flow out and back
- Heave lock model to stabilise pressure around drill bit



Subsea Non-invasive Cutting Measurement 'Space Gun'

- Utilize existing non-invasive techniques
- Marinize
- Need to search for this
- Calculate from analogues – Merge with drilling data
- Requires sharing between operators
- Ground penetrating radar - Potential Solution for compositional analysis



$X+Y=Z$



0
Votes

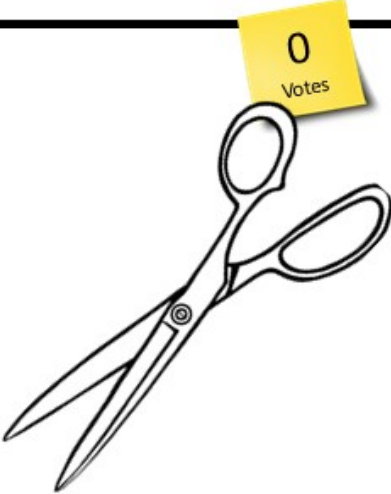
Cuttings – Risk Based Modelling

- Use historical data from drill operations
- Model behaviour over time
- Model outcome of disturbance




0
Votes

R2D2

| | |
|---|---|
| <ul style="list-style-type: none">• Robotic cutting with remote control• Different cutting tools equipped on one machine• Fully battery powered |  <p>0 Votes</p> |
|---|---|

Technology Standards

| | |
|---|---|
| <ul style="list-style-type: none">• New technology standards / Assurance• Different countries have different technology standards• Create knowledge portals• Shared info on legacy equipment<ul style="list-style-type: none">• Non-bespoke• Plug and play e.g. Subsea Controls• Value of reuse to operators |  <p>0 Votes</p> |
|---|---|

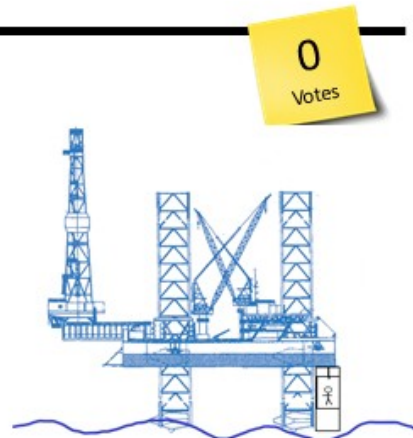
Hippo-bag

- Alternative low weight containers
- Ship dehydrated materials offshore in bag
- Hydrate on fly
- Similar to get orange juice producers do in South America



Leg-elevator

- Look at ways to reduce dependence on cranes and logistics costs
- Elevator from sea level, to main deck
- Can move away from helicopter and undertake personnel transfers



What Stays? What Goes?

- Do conductors / tubes need removal or flushing
- Modelling of cells to inform – remove or keep – risk model



Preservation - Lite

- Mothball + Modularise OR Preserve and Revise
- Use historic data to inform level of preservation needed to be safety quality
- Outsell + buy back
- Inventory management



Use Cumulative Non Linear Risk Models

- Insufficient models exist currently for complex problems that industry leaders want answers to
- Risk algorithms can be created for bound asset sets
- MOD + Universities considering



0

Votes

Easy to Gather Well Integrity Data

- One time only deployment – 'but junk in hole'
- Apply fibre optics
- Avoid Production outages
- Challenge intervention frequency
- Monitoring unit sits above DHSV



0

Votes

Hybrid power

- Look at how we can use hybrid energy tools to generate power
- Keep platforms at high voltage for as long as possible
- Tie in with new battery technology (IARC)



0

Votes

Well Control Advancement

- Lower cost MPD
- Alternative contract models – big service companies sell whole package, use bespoke services
- Re-evaluate safety/ risk/ balance
- Advancements in fluid design and QC



0

Votes

Fabric Maintenance – Who is my Specifier?

- Engineers to specify paint and application method.
- Long term performance solutions – prep/coating type/application method.
- Coating standards to fit expected lifetime.
- CO2 pellets instead of grit for blasting operations.
 - Minimizes equipment/clean-up/waste

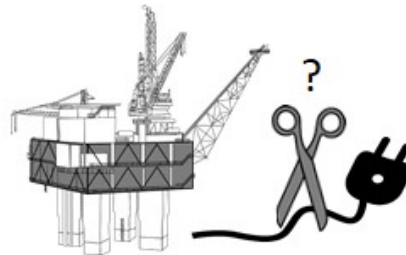


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Votes

Start from Scratch

- Install temporary power cables.
- Cut existing cables.
- Detail new spec and procedures.
- Scrap old cables.



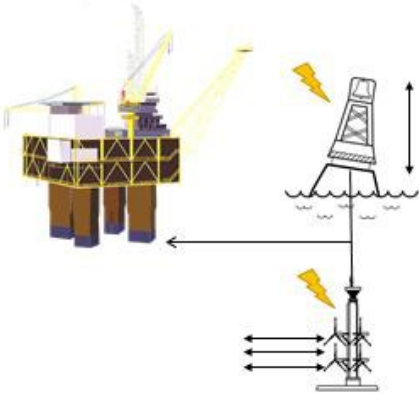
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Votes

Up and Down- Back and Forth

0
Votes

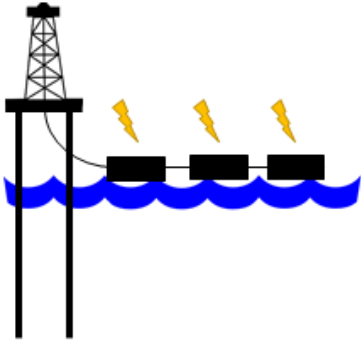
- A combination of wave and tidal used for power generation.



Wave Goodbye to Energy Problems


0
Votes

- Storage of wave and tidal energy.
- Link up series of wave generators



Last Man Standing


- Independent helideck system- one of last things to remove.
- F&G and deluge and lighting.



0
Votes

Gen Set

- 750 KVA zone 2 gen set.
- Ready.



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Votes

NASA Tools

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Votes

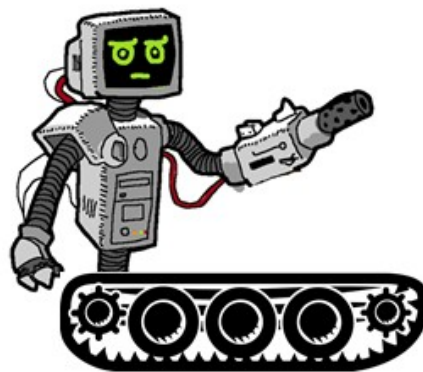
- Tool kits used by NASA.
- Lightweight vs multi function.



iROBOT

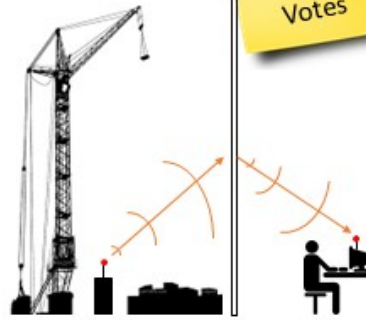
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Votes

- Robots acting remotely based on photos or 3D models.
- Robots to be equipped with multiple tools.
 - Cutting
 - Welding
 - Inspection
 - Work subsea also



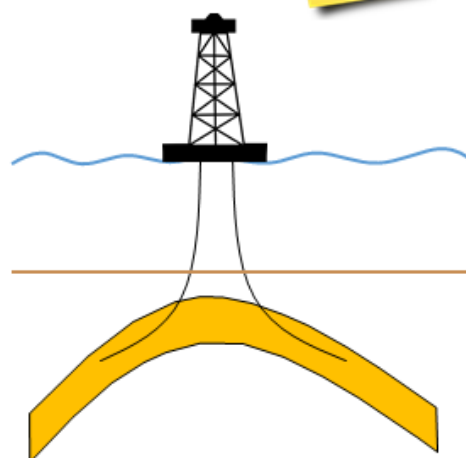
Remote Cranes

- Remote operated cranes – operating multiple cranes simultaneously
- Efficiency increase, but still need crane
- No Crane – winch only
- Crane eBay – short life only needed



Well Planning and Reservoir Issues

- New logging while drilling technology.
- Refer to UK consortium.
- Look into JIPs.



The cut is Good

Well P&A

- Verification that tubular downhole cut is good
- Early engagement (operator and service company as some technology already exists)
- Every well is different so variety of application possibilities

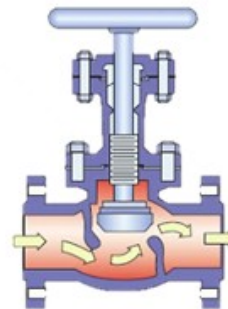


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Votes

Problem Values

- Remove any stuck valves in pipelines
- Fit magnets in pipeline
- Add on gate valve through clamp and guillotine


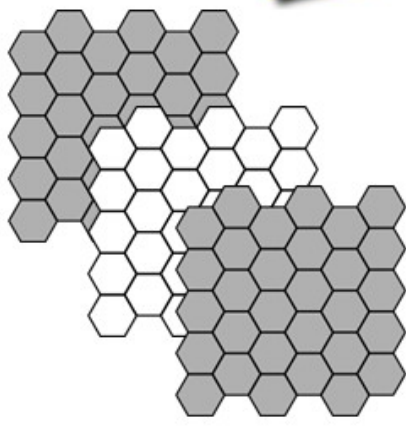


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Votes



Sloppy!

- How can we reduce the cost of dealing with slops
- Not just container solutions
- Is new membrane technology available that can efficiently separate constituents

Bundle Platform Data

- Standardise data solutions.
- Joint operator multi systems driven by Decom safety case / Risk
- Standardise Protocols
 - Beyond having same plugs
 - Look at integration in marine industry

Collaborative Decision Making in Run up to COP

- Common open std/methods on cost/benefit decisions
- Contractor/operator mix on same page
- Impacts maintenance investment decision
- MER strategies driver for OGA
- Emissions component

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Votes



Contract for Availability

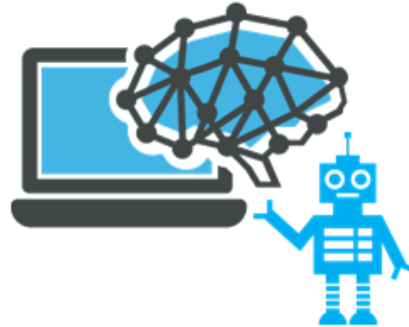
- Change contract model to give contractor responsibility for plant availability.
- Allows contractors to build up a body of continuous work.
- Operators hand over some control of schedule.

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Votes

| AUGUST | | | | | | |
|--------|--------|---------|-----------|----------|--------|----------|
| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
| ✓ | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| ✗ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 27 | 28 | 29 | 30 | 31 | | |
| ✗ | ✓ | ✓ | ✓ | ✓ | | |

Data Clean + Mining – Prediction

- Data quantity and quality is a problem – A data clean capability is needed
- Data mining
- Machine Learning
- Maintenance prediction
- Improved planning



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Votes

Waste Water 'Tech'

- Scale remediation
- Tech -> Transfer
- From onshore/ other industries
 - Tech transfer mechanism needed



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Votes

New Set of Eyes

- Non vendor audits
- TA whistle blower –TA spec 'wall' – how to climb past TA
- Innovation blockage in assets (inc IT)



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Votes

Fabric – What's my History

- Lack of history from multi-owner assets
- Keep good records
- SMART systems to define when to carry out fabric maintenance – campaign or ongoing



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Votes



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