ROV control system philosophy
in coiled tubing drilling

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Island Offshore

- Island Offshore:
  - 29 vessels, 6 on order
  - Of these 4 RLWI vessels

Island Offshore Subsea AS: Light well intervention operator
- Performing LWI activities using RLWI vessels
Coiled Tubing Drilling

- Drilling using Open Water Coiled Tubing

- Island Offshore has done this on two occasions until now:
  - Rogfast – core drilling
  - Centrica Energy – pilot hole drilling on the Butch field
Pilot hole drilling for Centrica Energy

• A pilot hole is the topmost part of a well, typically drilled to look for shallow gas. The aim is to know if the location is suitable for a production well or not.

• Centrica Energy was the first company in the world to use Open Water Coiled Tubing Drilling for offshore purposes – and with great success!

• Conventionally these operations are performed using a drilling rig. Advantages by using a vessel and in open water (riserless), are:
  • Cheaper operation
  • Safer operation
  • Emissions to the environment are reduced
Pilot hole drilling for Centrica Energy - video

http://iosubsea.no/media/news-c95791405
Open Water = Riserless

- Well operations are performed from a vessel
- Saves space and time due to no riser needed
Open Water = Riserless

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Open Water Coiled Tubing (OWCT)
On vessel:
- ROV services

On deck:
- Coiled tubing equipment
- Passive compensator
- Topside injector

- Directional Drilling and Coring

Subsea injector
OWCT System Overview

- Reel
- Passive tension
- Topside injector
- Subsea injector
OWCT System Overview
Subsea injector control

Hydraulic motors to control the coil tension and coil traction.
ROV connection to the subsea injector
ROV connecting to subsea injector - video
The ROV industry is one of the most innovative industries within the oil and gas sector. Communication and power shall be supplied through the ROV-system. We use a closed loop hydraulic supply from the skid of the ROV. A valve pack and control module is installed on to the injector.
Subsea injector control, topside injector guidance and passive heave control

- Advanced controlling of operations subsea
- User of high level programming in C#
- Gives operator on vessel full overview and control regarding pressure and flow to injector functions, weight on bit, distance in hole, visual from cameras etc
Topside system

- Computer rack
  - Two servers
  - Video recording
  - Connection to land for data and video transfer and diagnosis
Operator control room

Coiled tubing control cabin

Subsea injector operator

Video

SSI user interface

TSI user interface

Topside injector operator

Job Master

Joystick box
Operation
Alarms and log

- Alarm list and warnings visible and logged.
- All states and changes are logged and available for historical trending.
- Risk reducing means: Redundancy, control of startup / default state of all parameters.
Managing risks

- Managing risk is equally important in control systems
- Redundancy is important, but also wrongly programmed devices can be devastating
- Important to know what to do if the software fails and have control over the default state and startup state
- Increasing risk that industry equipment, such as SCADA systems, being struck by viruses.
  - Germany in 2014: Cyber attack on steel industry company. Massive destructions to the factory.
  - Ukraine in 2015: Hackers hacked into the SCADA systems and turned off the electricity supply for a whole region in Ukraine.
ROV based Control system for Subsea Equipment
Subjects for this presentation

- Envirex Group – Short about us
- Internet Of Things (IoT)
- Using Ethernet as main communication
- ROV Technology to control subsea equipment
Short about us

• **Who?**
  iCsys, Envirex and Envirent

• **Where?**
  Rogaland -> Klepp

• **What?**
  Design, Engineering, Production, Maintenance and Rental within Hydraulics, Electronics and Software.

• **Why?**
  Strong focus on quality, cost-reduction, innovation and customer satisfaction within all our fields of expertise.
Internet of Things (IoT)

- What is Internet of Things?
- Big Data?
- Cost benefits?
- How to use this concept Subsea?
Using Ethernet as main communication

- No need of expensive MUX
- Serial, Video and control signals over the same link
- Easy to implement in existing infrastructure
- Cost and availability benefits
- Easy to provide remote (onshore) support
• ROV Technology is adapted to subsea environments

• Advanced and flexible options for control applications

• Space efficient design

• Field tested components

• Standard components allow easy spare management and ensures availability
Island Offshore’s new LWI vessel: Island Navigator
Island Navigator - size

MAIN DECK SECTION – 169 meter
“ISLAND NAVIGATOR”
UT 777 (2017)

MAIN DECK SECTION – 116 meter
“ISLAND WELLSERVER”
UT 767 CD (Built 2008)

MAIN DECK SECTION – 106 meter
“ISLAND FRONTIER”
UT 737 L (Built 2004)
Sister company: Agat Technology

PDT - Perforating Drilling Tool

www.agat.no
Sister company: Agat Technology

PDT - Perforating Drilling Tool

**Conventional Perforation**

- Hole diameter and penetration depth may vary (API tests shows more than 66% variance in hole diameter)
- Makes it difficult to calculate pressure & pumping rate for well Stimulation, Fracking, Cement jobs or Leak-off tests
- Creates restrictions in casing and may have sharp edges that may damage packer elements

**Perforation Drilling Tool**

- Each hole has same diameter and penetration depth
- Makes it easy to calculate pressure & pumping rate for well Stimulation, Fracking, Cement jobs or Leak-off tests
- Burr-free holes in casing and clean passage for packer

www.agat.no
Sister company: Agat Technology

PDT - Perforating Drilling Tool

**Control system and Graphical user interface**
- Electronic card on the downhole tool
- Real time communication
- Operation sequences will be communicated and monitored
- Verification and documentation of anchor set and retract
- Verification and documentation of drilling operation
- Depth control of PDT is synchronized with wireline depth

Animation:
https://www.youtube.com/watch?v=upevQ566HbU

www.agat.no
Thank you for your attention!

Questions?