Use of simulation for efficient ROV operations

Fugro Subsea Services Ltd

Subsea Expo 2016
Content

- Application of simulation on engineering projects
- Overview of Fugro DeepWorks subsea simulator
- Graphical workflow to create simulation models
- Case Study 1: Guidepost relocation and buoyancy transfer
- Case Study 2: ROV data monitoring clamp deployment
- Case Study 3: Virtual SIT
- Case Study 4: Alternative uses of simulation
- Summary
Could the project benefit from the use of simulation?

Simulation being used to optimise design for efficient use offshore

Simulation can provide a virtual Site Integration Test (SIT)

The creation of videos to outline each step of a repair or inspection procedure

A complex working environment can be visualised using simulation
Simulation overview

Dynamic real-time simulation

Fugro DeepWorks subsea simulator
Simulation of mechanisms
Reaction forces between objects

Realistic environmental conditions

Front Camera View. Visibility 10m
Front Camera View. Visibility 5m
Current profile simulation
Simulation overview

Modelling of hydraulic and electrical ROV components

Camera positions and overlays  Control manipulator arms real-time  Range of ROV vehicles

Simulation metric data.

ROV and tooling  ROV and TMS  Time history

Use of simulation for efficient ROV operations
Model generation process

STEP 1
Receive 3D model

STEP 2
Review scope for optimisation

STEP 3
Optimise model

STEP 4
Link graphical model to a collision object
Use of simulation for efficient ROV operations

Model generation process

STEP 5
Create simulation configuration

Tool being used for mission rehearsal
Case Study 1: Guidepost relocation and buoyancy transfer

- Feasibility study of relocating guidepost between guidebases using ROV.
- Buoyancy design review and identify potential snag points between ROV tether and guidepost rigging to **identify and reduce operational risk**.
- Simulation video created for **task familiarisation** and mission rehearsal.
- Validation that attached buoyancy allows movement of guidepost using ROV.

Use of simulation for efficient ROV operations
Case Study 1: Guidepost relocation and buoyancy transfer
Case Study 1: Guidepost relocation and buoyancy transfer

- Check stability of ROV when moving the buoyancy spheres.
- Calculate time to complete the full transfer to **improve efficiency**.
- **Verify suitability** of ROV hook arrangement on rigging.
- Ability to **replicate the process** using the onshore simulator within the engineering department.

**STEP 2**

![Diagram showing the relocation and buoyancy transfer process]
Case Study 1: Guidepost relocation and buoyancy transfer

Process to transfer individual sphere.

Full operation piloted in simulation. Recording of the simulation replayed with x100 real-time speed.
Case Study 2: DeepData ROV clamp deployment

- ROV deployment verification of a 170kg motion sensor pod and clamp assembly.
- Clamp design review.
- Access check of clamp locking mechanism.
- **Controllability of the vehicle** when a current profile is added to the simulation.
- Consider the change in ROV pitch attitude if additional buoyancy is added to the clamp.

https://www.youtube.com/watch?v=U19O_-pfB6w
Case Study 2: DeepData ROV clamp deployment

- ROV Rotation (Roll, Pitch, Yaw): -0.9, -0.9, 176.5 degrees
- ROV Position (X, Y, Z): 70.2, -191.4, 0.5 m
- ROV Linear Velocity: 0.1, 0.0, 0.3 m/s
Case Study 3: Virtual SIT

Virtual SITs provide a service for external clients to **raise awareness** of any issues to addressed before the SIT is performed and **optimising the design** of the tooling interface.

Requirements for equipment design:
- Access
- Stabilisation
- Manipulation
- Tooling interface
- Tooling visibility
- Marking and monitoring visibility
- Tether snag points
Case Study 4: Alternative uses for simulation

Simulation raising a failed bumper bar from the seabed to mitigate risk of a potentially hazardous situation.

Simulation to review the blind spots on the sonar display as a result of the introduction of a protective frame on the ROV.
The use of subsea simulation for efficient ROV operations and a cost-effective engineering solution
THANK YOU

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