

BlueSea technologies Advanced Simulator

Tiberio Grasso

Co-Authors: Paolo Ferrara, Alberto Maliardi, Eliana De Marchi, Campaci Renato

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- Innovative technologies developed by Eni/EniProgetti, and made available to Safety Competence Center for management and operations
 - **Combined ROV Control**: control system acting to move a fleet of ROV using a single joystick, in a coordinated way
 - *Killing System*: well kill string re-entry system assisted by two Work Class ROVs using CRC for its positioning over a deepwater well in blowout conditions
 - **CleanSea** : AUV/ROV system with a complete set of interchangeable payload for environmental monitoring, gephysical surveys and asset integrity
 - **Rapid Cube**: Containment&Capture system for wellheads in blowout conditions, used to collect outcoming oil to surface vessel while discharging gas





Need for a Simulator

- Integration of the standard training for the specific BS technologies
- Creation and use of the subsea scenarios models, in conjunction with the BS technologies, to prepare operator to the real specific operation
- Inclusion of non nominal/not expected situations
- Simulation of multiple approaches to the task to be carried out, pros/cons analysis and operation optimization









Simulation Environment

Based on a commercial ROV simulator (VROV by GRI Simulations)

Basic features

- Dynamic simulator
- Mission preparation for training
- Modeling and building of subsea field scenarios
- Up to 3 ROVs with TMS, with standard HMI
- Cameras, sonar and manipulators simulation





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Simulator Setup







Each workplace

- Computer for ROV management and HMI –touchscreen-
- Computer for Dynamics Simulation & Cameras management

Chosen Simulator, screenshots













BlueSea Technologies simulation



Combined ROV Control concept

eni

Basic features

- Use of more than 1 ROV, and any fleet geometry, to move heavy and/or large objects
- Use only ONE station/ONE operator to control the ROV fleet
- Coordination is achieved through the Combined ROV Controller
- ROV fleet acts as a unique ROV, with analogous capabilities (auto modes, thrust along cartesian axes...)



Simulated Combined ROV Control

eni

Simulator environment







eniprogetti

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Killing System Scenario









Application of CRC Concept

2 Innovator Work class ROVs

Well Kill string and support structure

Blowout presence sensors



Basic features

- AUV with positioning and hovering capabilities
- Vehicle acting as a ROV, using FO tether and surface HMI
- Specialized interchangeable payload
- Vehicle control station
- Payload control station
- Reactive control on payload, for realtime modification of the vehicle trajectory





Cleansea Scenario Architecture





Simulated Cleansea system

Simulation focus

Vehicle missions and guidance

Close inspection on structures and pipelines

Reactive control – payload driven

Pipeline tracking







Real Rapid Cube System

Basic features

- Emergency system used in case of oil/gas blowout
- Module is moved over the blowout with suitable vessel
- 3 subsea winches are deployed around the blowout
- Module is then attached to winches ropes and tensioned using a WC ROV
- Oil enters inside the module for recovery to vessel
- Gas is separated inside the module and discharged on sea



Simulated Rapid CUBE system

Simulation focus

Module positioning from vessel

Module latching to the 3 subsea winches ropes, using WC ROVs

Winches activation for module positioning and tensioning











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