Underwater Systems

Diving, Habitats, ROV, AUV, Submarines, Subsea Manifolds

OCEN 201
DIVING & HABITATS
SCUBA BREATHING APPARATUS

- SCUBA tank
- Regulator
  - 1<sup>st</sup> stage
  - 2<sup>nd</sup> stage
CLOSED CIRCUIT SYSTEM
VENTILATION REQUIREMENTS
HYDOLAB UNDERWATER HABITAT
Hydrolab’s Replacement Aquarius Today
NEEMO PROJECT IN AQUARIUS
SUBMARINES
Grouper
Torpedo Room
Diesel Engine
Captain Stateroom
Fast Attacks & Boomers
Submarines in the Cold War
MAROON-TYPHOON
HULLabaloo
OL’SARGE & TEAM AT RACES
Hullabaloo
REMOTELY OPERATED VEHICLES (ROV)
ROV Classification Examples

Phantom XTL Observation ROV

Cherokee Light Work Class ROV

Hydra Magnum Work Class ROV

Giano CMROV
## ROV Classification by Percentage of Market (2000)

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number of Vehicles</th>
<th>Percentage of Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomous Underwater Vehicles (AUV)</td>
<td>45</td>
<td>2%</td>
</tr>
<tr>
<td>Cable Burial and Maintenance (CMROV)</td>
<td>87</td>
<td>3%</td>
</tr>
<tr>
<td>Cable Burial Ploughs</td>
<td>59</td>
<td>2%</td>
</tr>
<tr>
<td>Light Work</td>
<td>315</td>
<td>11%</td>
</tr>
<tr>
<td>Mine Counter Measures Vehicles (MCMV)</td>
<td>481</td>
<td>17%</td>
</tr>
<tr>
<td>Observation</td>
<td>1363</td>
<td>47%</td>
</tr>
<tr>
<td>Remotely Operated Towed Vehicles (ROTV)</td>
<td>71</td>
<td>2%</td>
</tr>
<tr>
<td>Work Class</td>
<td>476</td>
<td>16%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2897</strong></td>
<td></td>
</tr>
</tbody>
</table>
Work Class ROVs

AMATEK Straza’s Scorpio

Stolt Core Vehicle
ROV
Oil and Gas Exploration and Production Industry

Stolt Offshore Toolpusher and Subsea Wellhead
AUTONOMOUS UNDERWATER VEHICLES (AUV)
AUV or UUV

- Unmanned Underwater Vehicle - receives command and control from the mother vessel-physically or acoustically

*Hugin 3000*  
*ROVs Argo & Jason*
Capabilities

- Launch and Retrieval Systems
  - basic to complex

Retrieval of a Remus AUV

Retrieval of a Hugin 3000
AUV Manta, 34 ft long, 32,000 lb displacement, 5000 lb payload.
Solar Powered AUV
Benefits

- No Tether – minimal impact due to sea conditions
- accurate positioning,
- quick turn around time,
- desired flying height,
- desired surveying sensors,
- decreased time on site & decreased support
Future

- **Commercial**
  - Submarine Cable
  - EEZ surveying
  - Mineral surveying
  - Inspection, Repair, Maintenance via
    - Hybrid AUV/ROV
    - Intervention AUV
ATMOSPHERIC DIVING SUITS (ADS)
Modern ADS

- Newtsuit 1980’s
- Spider 1970’s
ATMOSPHERIC DIVING SUIT
Future

- Hardsuit 2000
- Exosuit
SUBSEA PRODUCTION
TWO-WELL SUBSEA TIEBACK
FLOATING PRODUCTION STORAGE & OFFLOADING (FPSO)
ABB Subsea Systems Supply Companies

**Topside Control Systems**
- ABB Industry

**Pipeline & Risers**
- ABB Offshore Systems

**Production & Workover Control Systems**
- ABB Offshore Systems

**Chokes**
- ABB Control Valves

**Umbilicals**
- ABB

**Total Systems, Structures/Manifolds, Intervention Tools, Subsea Processing**
- ABB Offshore Systems

**Well Systems, Xmas trees Workover Systems**
- ABB Vetco Gray
ABB Offshore Systems has three systems of template & manifolds which are defined as follows:

- **MSS 350**: Guideline assisted installation, moonpool installable components, light weight, water depth < 500 m
- **MSS 3000**: Guideline less installation, installable by light vessel, water depth 500 - 3000 m,
- **MSS Single Lift**: Guideline assisted installation, whole system installed in one lift

Snorre B Template, MSS 350
Marlim Manifold, MSS 3000
Kuito Manifold, MSS 3000
Horizontal Trees

- Allows complete access to the well bore without removing the tree
- Well is produced from the side of the tubing hanger and flows horizontally through the master valve
- Economical when used on natural flow wells, as a conventional riser / workover system is not required
- Internal tree cap and tubing hanger have the same seal design, setting technique, and running tool.
- All ROV access points are grouped on one side of the tree.
- Conventional workover/completion riser system not required for subsea HT horizontal tree, resulting in substantial savings.
BEAUTY OF BEING AN OCEAN ENGINEER