SKANDI ACERGY – LAUNCH & RECOVERY SYSTEM (LARS)
JANUARY 2010 FFU Seminar
seabed-to-surface
ROV Launch & Recovery Systems (LARS) – A short history

- The vessel contract was signed in late summer 2006
- Dual moonpool solution
- Green LARS (all electric)
- Purpose build ROV Hangar
- None of our subcontractors were able to commit to LARS delivery
- Autumn ’06: Decision made that we should design the system in-house for delivery spring ’08
- ACERGY was responsible for the delivery of the LARS
ROV Launch & Recovery Systems (LARS) – A short history

- Vessel handed over to DOF July ’08
- Both ROV systems released for operational use December ’08
- Operational limitations: Hs4 (test phase)

Feedback

- Both systems are functioning according to design parameters
- Have been Launching in Hs 7.5 !
- Still it’s new systems (Prototype)
- Used on various projects world-wide
Skandi Acergy

- ACV WROVs; ACV-06 and ACV-07
- 2 x Moonpool launch, Cursor based, PLC Controlled, AHC Launch & Recovery Systems (Environmentally friendly [Electric Systems])
- Increased operational capability – up to Hs 6
- 400 Te AHC Knuckle Boom Crane – rated for 3000 msw
- 50-100 Te Knuckle Boom Crane – rated for 2000 msw
- 2100 sq/m Cargo Deck
- Moonpool for VLS
- Maximum POB of 140
- Length – 158m
LARS - Description

LARS has been designed to work together as a number of integrated systems under the control of a single operator station for each ROV system i.e Port and starboard.

A single operator is able to launch and recover the system in a fully automated mode. However, manual intervention is possible at any time. There is a local hangar based operator station and a remote control station in the ROV control room.

The LARS control system manages –
- Winch synchronisation
- Gripper arm operation
- Moonpool door operation
- Air bubble system stop and start
- Software interlocks are present to protect against accidental use
Skandi Acergy - ROV LARS introduction

- To give an overview of
  - individual components
  - their operational role in the Launch and Recovery System

Design criteria:
- Fully automated
- Easy to operate
- All electric
- Bubble system
- Redundancy
- High weight
- High speed
- Designed for arctic operations
- No windows
Skandi Acergy - ROV LARS

- 2 x Moonpool launch
- Cursor based system
- PLC Controlled
- AHC Launch & Recovery Systems
Skandi Acergy - ROV LARS

- Cursor Winch
- Cursor Frame
- Cursor Rail
- Latch Beam
- ROV
Skandi Acergy - ROV LARS

Guide Rails

Cursor Frame

Latch Beam
Skandi Acergy - ROV LARS

- Cursor Frame
- Cursor Guide Rails
- Cursor Winch
- Latch Beam
- Latch Beam Umbilical Winch
- Moonpool Doors
- Latch Beam Gripper Arms
- ROV Umbilical Sheave
- ROV Umbilical Winch / Lower Tween
  Deck Sheave. (#1)
- D-Deck Damping Sheaves. (#2 & #3)
- Bubble System
- Skidding System
ROV LARS – Cursor Frame

- Supplier: External
- Passive Device – Mechanical trolley for Latch Beam.
- Runs on the Guide Rails, between ROV Hang and keel line.
- Primary function is to control the Latch Beam and restrict ROV movement during launch / recovery.
- Cursor Frame is raised / lowered on the guide rails by the Latch Beam and Cursor Winch.
- Soft-landing system fitted to Cursor Frame.
- Two hydraulic Parking Cylinders, located on the top of the Frame (plus secondary mechanical locking pins) to allow secure storage of the Cursor Frame - allowing access to Latch Beam for maintenance, etc.
ROV LARS – Cursor Frame and Guide Rails
ROV LARS – Cursor Winch

- Supplier: external
- Cursor Winch consists of two drums running on a single common shaft
- Primary function is to raise / lower the Latch Beam
- Mounted on underside of Hatch on D-Deck
- The two wires pass through the Cursor Frame and are attached to Latch Beam
- Turnbuckle adjustment on Latch Beam to ensure horizontal lift of Cursor Frame
- Winch Drive via five electric motors
- 37.5 Te lift capacity
- Electrical cabinets located in ROV Umbilical Winch Room, Upper Tween Deck
ROV LARS – Latch Beam

- Supplier: external

- Latch Beam is the interface between the TMS and Cursor Frame

- Two termination points for Lift Wires – running from Cursor Winch

- Latch Beam raised / lowered by Cursor Winch

- Gross Weight: 7.5 T

- Interface Cone fitted to TMS – allow mating with Latch Beam
ROV LARS – Latch Beam

- Latch Beam has several functions, controlled via umbilical from surface;
- TMS Lock / Unlock (1 x electric actuator)
- Rotate ROV / TMS – CW / CCW (2 x electric actuators) Orientation critical for Moonpool entry
- 1 x Camera – TMS entry / exit – Latch Beam
- 1 x Camera – Latch beam entry / exit – Cursor Frame
- Sensor – Latch Beam IN / OUT of Cursor Frame
- Sensor – TMS IN / OUT of Latch Beam
ROV LARS – Latch Beam
ROV LARS – Short Animation

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ROV LARS – Latch Beam Umbilical Winch
ROV LARS – Gripper Arms

- Supplier: Acergy
- Installed on D-Deck / ROV Hanger roof
- Each gripper Arm has two **hydraulic** cylinders
  - Arm Engage / Park
  - Claw Extend / retract

- Gripper Arms ... why ?
  - Primary function is to eliminate any working under a suspended load (Cursor Frame, Latch Beam)
  - Secondary function is to eliminate the overloading of ROV Frame / Moonpool Doors
  - Moonpool Doors / Vehicle Frame unable to support package. (ROV, TMS, Tooling, Latch Beam and Cursor Frame)

- Support package by hooking under Latch Beam
- SWL of each Gripper Arm is 20 T
ROV LARS – Gripper Arms

- Gripper Arms - shown supporting Cursor Frame and Latch Beam (above Moonpool Door)
ROV LARS – Lower Tween Deck Sheave

- Supplier: external

- Function is to route umbilical from ROV Umbilical Winch to the Damping Sheave on D-Deck

- Fitted with a Shock Absorber to control pivoting during spooling operations

- Sheave Data below

<table>
<thead>
<tr>
<th>Particular</th>
<th>Value</th>
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<tbody>
<tr>
<td>Sheave Diameter</td>
<td>2000mm</td>
</tr>
<tr>
<td>Load Capacity (Maximum ROV Umbilical Tension)</td>
<td>560kN (57.0 Te)</td>
</tr>
<tr>
<td>Weight</td>
<td>3750kg</td>
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</table>
ROV LARS – Lower Tween Deck Sheave
ROV LARS – D-Deck Damping Sheave

- Supplier: external
- Sheave Assembly has two functions
  - To route ROV Umbilical from Lower Tween Deck Sheave to a position over centre of the Moonpool
  - When Cursor and Umbilical Winch in synchronous operation and TMS is locked in Latch Beam, there is possibility of umbilical seeing unwanted loads
  - To eliminate unwanted loads, the Damping Sheave is incorporated into the LARS Control System with three modes of operation
ROV LARS – D-Deck Damping Sheave

- ROV winch to react relative to Cursor Winch
- Damping Cylinder to react if a snatch occurs.
ROV LARS – D-Deck Damping Sheave

- Damping Sheave with removable Doghouse Cover as installed on ROV hanger roof, D-deck
- Installed on ROV Hanger roof on D-Deck
ROV LARS – ROV AHC Umbilical Winch

■ Supplier: external

■ 3 x Electric Drives working in parallel on single toothed rim

■ Each Electric Drive consists of
  ■ Electric Asynchronous Motor c/w gearbox
  ■ Drive via Frequency Converter
  ■ Feedback from Incremental Encoder

■ 1 x Frequency Converter must always operate as Master
■ 2 x Frequency Converters operate as Slaves
■ Load shared between all three units

■ Brake resistor Bank – for dissipating energy

■ AHC designed to run for 15 minutes per 30 minutes of operation
ROV LARS – ROV AHC Umbilical Winch

- Winch has two modes of operation;
  - Speed Mode
  - Tension Mode

- Winches are located on the Lower Tween Deck area, PS and SB

- Winch Control Cabinets situated aft of the Winch frames
ROV LARS – Moonpool Doors

- Supplier: external

- Two Hinged Doors, which folding downwards, inside the Moonpool when opened

- Can be closed when ROV deployed – recess for all wires & umbilicals

- Operation of Moonpool Doors controlled by LARS Control Program

- Option for local control at Control Station in ROV Hanger
ROV LARS – Recovery with Air Bubble System

- Supplier: Acergy

- The purpose of the system is to aerate the water in the ROV Moonpool, reducing the loading during launch and recovery operations.

- Comprises of an Air Compressor feeding a buffer air tank, which supplies pipework routed around the lower part of the ROV Moonpool.

- Operation of the Bubble System is controlled by LARS Control Program, via a failsafe pneumatic isolation valve.

Typical Hs 4.3 situation
ROV LARS – Skidding System

- Supplier: Acergy
- The purpose of the system is to assist with the movement of large / heavy equipment in and out of the ROV Hanger area
- The Skidding System runs from the Landing Area to both the Port and Starboard Moonpool areas
ROV LARS- HPU

- Supplier: Acergy
- HPU (one per system) for the operation of:
  - Gripper Arms
  - Sheave Damping
  - Cursor Parking Cylinders
  - Moonpool Doors

- The HPUs will be installed on the Workshop roof, inside the ROV Hanger
- HPUs - linked into the Cursor Control System, with the following (minimum) functions available via the control system:
  - Start / Stop
  - Emergency Stop

- 2 x HPU will be linked to allow interchange in event of problem / failure
Lessons Learned - positive

- **The Skandi Acergy** ROV LARS has proven
  - The multi-discipline capabilities within Acergy
  - Engineering disciplines teamwork
  - Acergy’s engineering department’s ability to deliver industry leading technology

- The delivery of **Skandi Acergy** ROV LARS
  - Contributes in making the **Skandi Acergy** a superior vessel in the industry
  - Sets new industry standards for ROV operation limitations
  - Have a good track record on projects world-wide
  - Have received very good customer feedback upon completion of projects
Questions?