CARSP - AN OPERATIONAL PERSPECTIVE

Introduction

The Chirag Azeri Reservoir Seismic Project (CARSP) is the latest phase of seismic acquisition for reservoir management on the Azeri-Chirag-Gunashli (ACG) oil field complex in the South Caspian Sea, Azerbaijan.

WGP's involvement with CARSP

WGP has been involved with CARSP since 2006, initially solely concerned with the installation of the seismic source system for the project.

During early 2006, WGP's involvement increased, looking at the design and installation of equipment onto a single vessel. The design criteria from the Client being that the equipment had to be modular and transferable between vessels (non-vessel specific). Thus the system components became based where possible on modular ISO containers. Additionally, the vessel needed to be capable of:

- Deployment of the High Pressure Seismic Source System
- Deployment and recovery of 120km (initially) armoured OBC spread, including Backbone cable, Hubs/ Taps, and Sensor Arrays (receiver cable)
- Remote Operated Vehicle (ROV) Operations, including:
  - i. Wet mate connections, Sensor Array cable to Backbone Hubs
  - ii. Touch Down Monitoring (visual)
  - iii. Positioning of Receivers (Taking 'fixes')
  - iv. Manipulation of Cable as necessary, to ensure coupling / sandbagging adjacent to pipeline crossing

WGP's participation in the project expanded further in Q3 2006 so that the company was tasked with providing personnel for both 'shooting' and cable operations and ultimately for the overall operational management of the project.

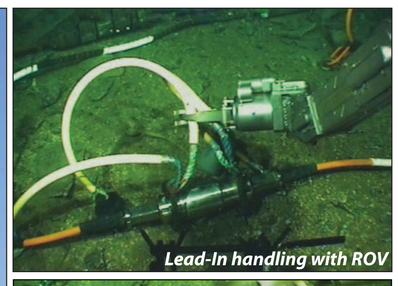
Following the completion of Phase I of CARSP, the initial vessel used, AHTS Pacific Raider, was fully demobilised and returned to owners.

Post demobilisation, an internal Lessons Learned session was held which led WGP to implement an extensive remedial action plan prior to Phase II which included:

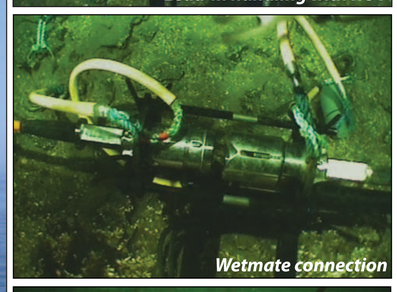
Item	Action	Requirement / Driver
1	LMF Compressor and associated prime mover CAT engine overhaul.	Improve operational integrity of the compressor. Necessity to reduce the risk of disruption as only single compressor assigned to the vessel.
2	Replace all Bend Restrictors on the Gun Array	Bend Restrictors on the source, connecting Bolt APG airguns, had proved to be a prime source of gun downtime.
3	Increase level of Bolt APG airgun spares	To ensure vessel could remain in production and increase overall operational efficiency during 'shooting' phases.
4	Increase level of Ion DigiShot airgun spares	To ensure vessel could remain in production and increase overall operational efficiency during 'shooting' phases.
5	New Dedicated Laying Reels (DLR's) designed and built.	Increased capacity (and hence operational efficiency), increased durability and redundancy.
6	New cable deployment method – over stern	To improve vessel efficiency (deployment whilst moving ahead, as opposed to deploying amidships and utilising vessel thrusters for propulsion as used during Phase I operations).
7	New Cable Stern Wheel, replacement of overboard static chute as used during Phase I operations	To enable deployment / recovery astern – Cable wheel to eliminate friction observed whilst using overboard chute. Cable wheel circumference to match minimum bend radius of Cable. Integrated lifting arm to enable Hubs to be moved from vertical to horizontal (and vice-versa) to reduce strain on Hub connectors.
8	Installation of HiPap positioning system plus Seapath vessel motion sensor system	Improve positional accuracy of ROV and thus corresponding positioning accuracy of 'as laid' cable. At 500m water depth, this would provide a positioning accuracy of +/- 2m (based on DGPS accuracy of +/- 0.5m).
9	Provision of 'Work Spec' ROV	ROV to be provided with increased performance capability (increased power/ speed to improve operational efficiencies) plus increased range. ROV provided together with a 'Tether Management System' plus A-Frame deployment system to both reduce potential safety risks during deployment and recovery plus, increased operational margins in which ROV could be deployed/recovered.
10	Additional welfare facilities	2 x Accommodation Units, gymnasium, laundry: to improve welfare conditions for survey crew.

Phase I to Phase II improvements

Shooting phase post OBC deployment



Lead-In handling with ROV



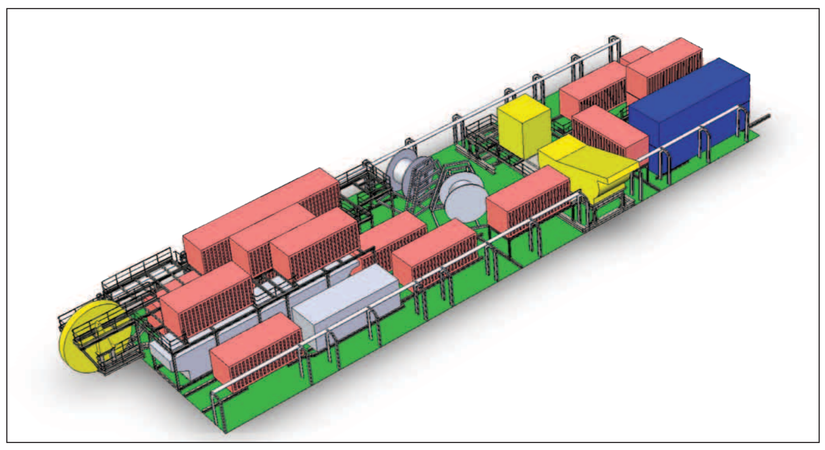
Wetmate connection

Backbone retrieval

A major advancement for the Phase II of the project was the provision of a larger vessel, the PSV Citadel with increased back-deck space (675m^2, against the Pacific Raider's 408m^2). As an indicator for the increase in magnitude of installation from Phase I to Phase II, the weight of steelwork and equipment increased from 120 tonnes to 470 tonnes.

Conversion and outfitting of the Citadel took 10 weeks to complete.

Phase II survey operations commenced in March 2010, and will have completed 4 surveys by the end of January 2011, comprising 1 repeat (4D) and 3 baseline surveys, upon completion of which the Citadel will be demobilized. During this time, equipment will be stored onshore to undergo maintenance and care until Phase III start-up scheduled for 2011/12.



Citadel Phase II installation 3D rendered AutoCAD image

Conclusions & Observations

1. WGP has been able to flourish and excel during the life of the project. Because of the company's size and structure WGP worked with the Client being reactive and nimble as changes and developments during the project has dictated. SIMOPS (**Sim**ultaneous **Op**erations) being incurred throughout, driven by the Field Production which would require plans to be changed to accommodate their needs; examples being, the vessels being engaged to perform field utility functions such as pipeline surveys, well inspections, etc.

2. The Oyo Geospace OBC system worked well, particularly following enhancements to the backbone connectors, however the necessity for the Recording System to be located on a Platform introduced a new set of complexities and challenges.

3. WGP's experience and capability went through a steep learning curve in terms of cable deployment on the seabed. This was achieved through the engagement of a highly skilled and experienced offshore team whose backgrounds were primarily from the offshore telecommunication cable installation sector.

4. Utilising an ROV for cable operations was both a great advantage and also a cause for operational downtime, particularly during Phase I. The use of an ROV was an absolute necessity as it was required to:

- Assist with 'Riser Pull-ins' – riser cable from recording station on each platform to the seabed backbone cable.
- Perform 'wetmate' connections of Sensor Array cables into the Backbone.
- Connect recovery A&R (Abandonment & Recovery) wire onto the ends of SA / Backbone cable during cable recovery; conversely disconnect A&R wire during deployment.
- Accurate positioning of laid cables for both initial base line and repeat surveys.

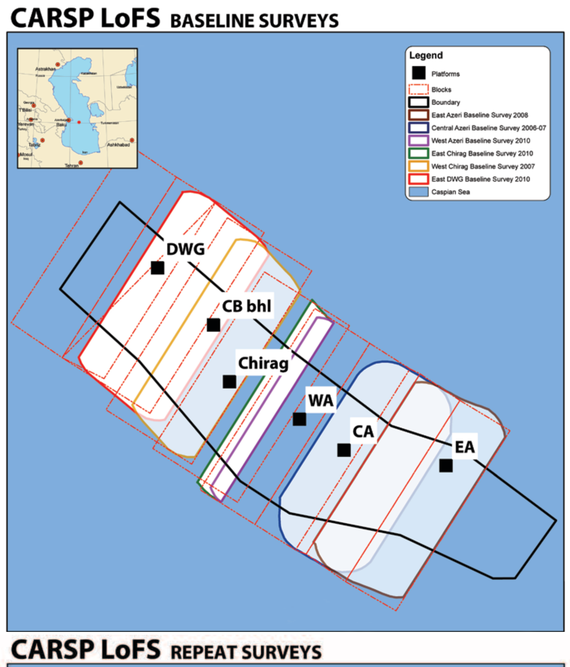
Additionally, the ROV was used to:

- Take positional 'fixes' for all modules, start and end coordinates of laid cable.
- Provide video feed of as laid cable.
- Manipulate seabed cable to ensure good grounding or coupling with the seabed. For example, move around obstacles if necessary.
- 'Sandbag' cable over pipeline crossings

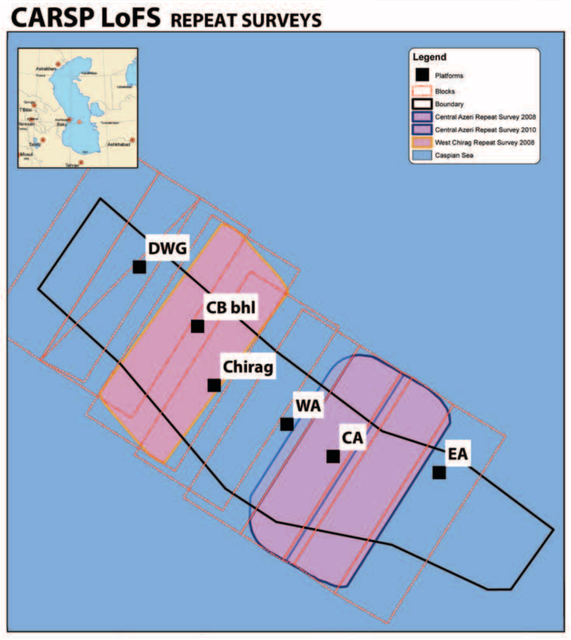
However, operational efficiencies were constrained as a result of:

- Free swimming ROV allowing ROV umbilical to become entangled with seabed cable during deployment.
- Sea state limitations upon ROV deployment & recovery.
- Malfunction of ROV support equipment (specifically generators).
- Underpowered ROV not able to meet demand.

CARSP LoFS BASELINE SURVEYS



CARSP LoFS REPEAT SURVEYS



Acknowledgements

The authors thank BP, specifically Seaborne, R.T., Watson, P.A., Robinson, N.D., Slopey, W., & Talibov, A. for input, and continued support and permission to publish this paper.

References

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