

FIELD DEVELOPMENT CASE STUDY

ROC Oil (WA) Pty Ltd – Cliff Head Oil Field
Offshore Western Australia

AWT DISCIPLINES

Production Technology
Completions Engineering
Flow Assurance
Production Chemistry
Artificial Lift Design

PROJECT BACKGROUND

The offshore Cliff Head Oil Field lies in Production License WA-31-L, 20 kilometres south of Dongara Western Australia. The Field represents the first commercial oil discovery in the offshore Perth Basin. The Field is operated by Roc Oil (WA) Pty Ltd. (37.5% holding) on behalf of joint venture partners:

- AWE Oil (Western Australia) Pty Ltd (27.5%)
- ARC (Offshore PB) Limited (30.0%)
- CIECO Exploration and Production (Australia) Pty Ltd (5.0%)

The Field contains estimated initial recoverable reserves of 15.7 mmstbl. Cliff Head is considered one of the more complex offshore fields in WA, due to its high wax appearance temperature, high pour point, and stacked variable permeability Permian sand layers.

AWT WORKSCOPE



Offshore CTU installation

Following successful appraisal wells confirming commercial hydrocarbon reserves, ROC and its JV partners sanctioned full field development of Cliff Head in 2005 AWT was engaged to provide input in the disciplines adjacently stated. In conjunction with the Operator's Project Team, AWT contributed to in-depth flow assurance studies, production chemistry studies, detailed completion design, equipment specification and procurement by competitive tender. AWT also provided early input into the platform design such that completion and well servicing activities could be effectively conducted throughout the life of the asset.

Due to the characteristics of the Cliff Head crude and the nature of the reservoir, it was concluded all production wells would require some form of artificial lift. In recognition of this requirement, ROC and AWT undertook a comprehensive investigation of available artificial lift technologies in order to determine the most appropriate type, secure the best hardware and develop a deployment strategy. Coiled tubing deployed ESPs were recommended and accepted for this project—the first application of such technology in Australia.

ROC's development drilling campaign resulted in the successful construction of 2 water injection wells and 6 production wells. AWT concurrently

implemented well completions work incorporating the following technical innovations:

- Interventionless reservoir management - zonal selectivity, permanent downhole gauges which will result in improved recoveries, and down hole chemical injection system.
- Maximised flexibility from Electric Submersible Pumps (ESPs) through the use of Variable Speed Drives and ESP specification levels.
- Cost effective well construction through the use of swelling elastomer packers and pre-drilled liners.
- Positive isolation of reservoir during workover/ESP deployment operations minimising potential for formation damage.
- Design, procurement, commissioning and installation of a ROC owned and maintained, permanently installed offshore Coiled Tubing unit (CTU) for deployment and recovery of ESPs.
- Environmental considerations - ability to flush wells to production system prior to workover.
- A further cost-saving resulting from the smaller deck space and loading requirements of the platform and jacket as a result of the CT ESP system.

Conventional offshore completions work requires the use of a rig for CT and ESP down-hole deployment. The design selected in consultation with AWT enabled coiled tubing ESPs to be installed concurrently with drilling activities, which saved substantial time in the overall well construction programme and

enabled commissioning of the production system to commence early.

Following the successful well completions phase, Cliff Head was brought online with some selected involvement from AWT and has produced at rates in excess of 10,000 bopd from 2 deviated and 4 horizontal ESP lifted wells, with the capacity to produce in excess of 15,000 bopd.

The ESP deployment has successfully maintained flow rates through 14 kms of pipeline from down-hole completions to the onshore Arrowsmith Processing Plant.

AWT also assisted ROC in developing an innovative hot water injection / spike water circulation system to prevent wax precipitation and improve flow assurance in the pipeline.



CTU Commissioning



CT-ESP installation concurrent to drilling



CT-ESP deployment

CONTRIBUTED VALUE

AWT is able to assist with long term life-of-asset value and flow assurance for the strategically important Cliff Head field. AWT's ESP management expertise will lead to reduced ESP workover times (~100 platform hours vs conventional ~180 platform hours), reductions in ESP downtimes through decreased equipment mobilisation, improved personnel mobilisation times and rigorous acceptance testing of production-critical equipment.

Post project commissioning AWT has continued to honour its commitment to life-of-asset production optimisation through:

- Monitoring and supporting the ROC Operating Team in all aspects of ESP performance.
- Planning and management of all well servicing activities.
- Rapid response and provision of experienced well servicing personnel for CT ESP replacement.
- Training of operations personnel in elements of ESP and CT maintenance and operations, flow assurance and chemical injection.