

Indonesia Subsea controls production optimisation



Client:

Kangean Energy Indonesia

Location:

Terang Sirasun and Batur Development

Requirement:

5 x subsea control modules

Proserv was selected to provide the subsea control system for the Kangean Energy Terang Sirasun Batur (TSB) offshore project near the Pagerungan Island area of Indonesia. Four gas fields were developed in two phases from a total of nine subsea wells to a floating production unit for gas export to an onshore gas terminal on the island of Java. The closest Terang field is 4.5km from the FPU in 95 metres of seawater while the Sirasun East field extends to 27 kilometres at and increases to 210 metres water depth.

The first phase developed five of a six slot well cluster at the Terang manifold. The manifold will comeingle the production gases from each well and measure flowrates using manifold mounted wet gas flowmeters. Control is facilitated from a single umbilical while the second phase for four additional trees at Batur and Sirasun utilises a separate umbilical installed during this first phase.

This subsea control system provided by Proserv has fully multiplexed control and monitoring of the subsea christmas tree and downhole hydraulically operated valves, christmas tree instrumentation and manifold wet gas flowmeters. A surface master control station and hydraulic power unit are installed on the FPU, interface with the production facility process control system, and provide all of the subsea system electrical and hydraulic power and communications for the subsea controls equipment.

The Terang Sirasun Batur project uses Proserv's open communication controller (OCC) in a Dual SEM arrangement within Artemis subsea control modules. The OCC provides Kangean with an open platform for this new subsea development using separate communications and power supplies subsea specific to the project requirements. This open platform is used to provide intelligent communication that is independent of protocol, IWIS compliant, can integrate with all major subsea tree manufacturers and interface with all associated

third party subsea devices including the wet gas meters required for this project. The intelligent nature of the technology actively determines the optimum operating frequencies and thereby maximises performance over subsea cables. This digital adaption to external noise, cable construction, and other environmental factors, enables high communication speeds of up to 390kbps and long distance step-outs of up to 100km in length with the same controller. This flexibility and performance provides the Kangean Terang Sirasun Batur project with high speed data from the digital instrumentation and wet gas meters at the nearby Terang drill centre while enabling stable communications even at the furthest reaches of the Sirasun field with a single solution.

Supported from in-region facility

While subsea control technical expertise was provided and managed from the Proserv's UK offices, specialist control system support personnel based at Singapore provided local testing, commissioning and service.

Non-integrated tree solution

With the christmas tree contract being placed by Kangean well in advance of the controls contract, the subsea control modules (SCM) were removed from the direct christmas tree mounting and interface to allow tree delivery without further complications. Instead the SCM for control of each tree is placed on a separate umbilical termination assembly (UTA) mounted on a self-supporting mudmat close to each Tree. In some cases the umbilicals from the Terang manifold are supplying two wells and the



UTA therefore contains capacity for two ROV installed and accessed SCMs.

Subsea control modules

The subsea control modules (SCMs) are mounted on umbilical terminations assemblies (UDA) close to each subsea well, although within diver operating depths full intervention flexibility is provided using an ROV assisted direct lift line intervention solution. This facilitates diverless installation and later intervention where necessary. The design also does not require a running tool and therefore enables a variety of vessels to be deployed to the area without specialised tooling or personnel requirements.

Each SCM incorporates dual redundant subsea electronics modules (SEM) to maximise system availability. The dual SEM design incorporates separate signal and power lines into independent electronic canisters within the SCM. Each redundant power and signal line is interconnected and monitored by the redundant SEM so that failure of either SEM, either communications line or either power line does not affect the availability of the other system components.

Eleven hydraulic functions are available to each tree from the SCM using dual redundant 690 bar and 345 bar supplies. These and the signal cables for the tree mounted serial transmitters are connected to the associated tree using ROV installed hydraulic and electrical flying leads.

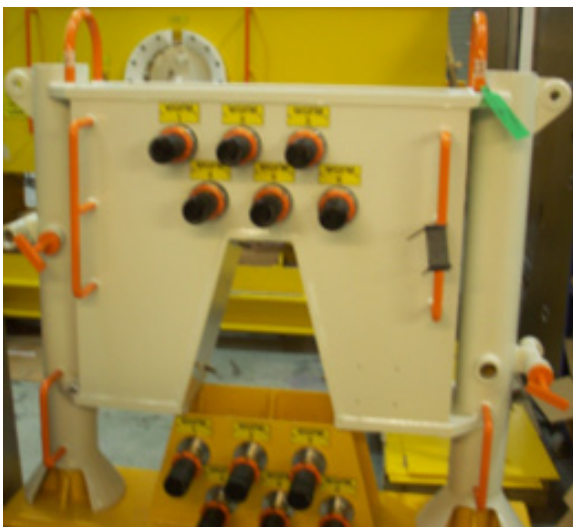
Subsea data module

The Terang manifold includes wet gas flowmeters for each of the connecting wells. These meters are controlled and monitored using a dual SEM subsea data module (SDM). The SDM is designed for integration onto the subsea control system network allowing high speed monitoring using the Proserv OCC infrastructure without further umbilical cabling requirements.

The SDM can be deployed using ROV assisted lift line onto the manifold without the need for divers and is connected to the subsea control system using the umbilical distribution assembly (UDA) connections same as the SCMs.

Subsea umbilical distribution and termination

There are a number of umbilical systems utilised in the Terang, Sirasun and Batur development. Each umbilical terminates using an ROV connected umbilical termination assembly (UTA) which stands alone on the seabed with integral mudmats. At the well sites these UTAs also house the SCMs associated with that well. The increased size of these combined UTA and SCM mounted base structures over a simple UTA requires a design that can be readily connected on to the umbilical on the offshore lay vessel just prior to deployment with minimal expertise or testing.



The varied and often soft seabed conditions require detailed attention to be paid to the mudmat size and deployment.

Subsea hydraulic, chemical and electrical distribution is facilitated at the Terang manifold site using an umbilical distribution assembly. Much like the UTAs this UDA is self-supported on a separate mudmat and requires all of the protection and access requirements for ROV connections and corrosion protection independently of the manifold structure. Hydraulic and chemical supplies are routed from the main umbilical to ROV stabplates for each well location and then on to infield UTAs using ROV installed flying hydraulic and electrical leads.

Master control station

The control system is designed to support a total of 9 wells across the four fields using a twin bay master control station (MCS) located in the control room of the FPU. The MCS and accompanying operator control station provide and engineering and commissioning control interface but day-to-day operation is handed to the production facility control system using a dual redundant RS485 interface. The remote access facilities in the MCS provided Proserv engineers with controlled and secure login from a shore based facility enabling many configuring, maintenance and diagnostic tasks to be completed regardless of worldwide location and often without the need for mobilisation

offshore.

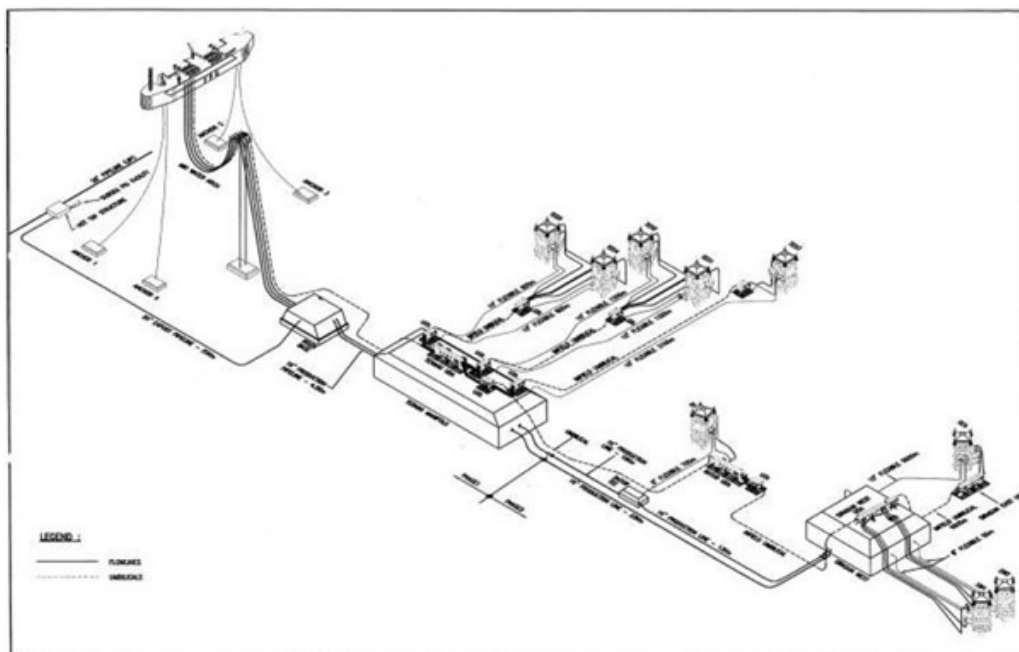
Electrical power units (EPU) mounted within the MCS supply dual redundant cables within separate umbilicals to each phase of the project. Multiplexed communications are provided independently of the power cables within the same umbilicals from Proserv OCC modems within the MCS.

Hydraulic power unit

A platform mounted hydraulic power unit (HPU) supplies high (HP) and low (LP) hydraulic pressure to the subsea control system. The HPU is equipped with a PLC to allow autonomous control and operation. The HPU can be operated manually (hand mode) by the operator at the skid, or automatically (auto mode) by the onboard PLC.

HP pressure provides fluid for the subsea downhole valves at 690 bar, while LP pressure is used at 345 bar for the xmas tree valves. Dual pumps, filters, accumulation and regulators provide redundant pressure systems for both supply pressures.

The HPU reservoirs are sized for full field development, inc. all accumulation, umbilicals, jumpers, actuators, and choke valve. With 50% spare capacity. A dedicated electrically driven pump is provided for initial fill, fluid transfer and cleanup of each reservoir as controlled by the on board PLC system.



Project summary

Project	Kangean Energy Terang Sirasun and Batur Field Development
Client	Kangean Energy Indonesia
Completion Date	December 2010
Water Depth	95m to 210m
Step out Distance	27 km to farthest well
Host Facility	FPU
Location	120km from Pagerungan Island, Indonesia
No. of SCMs	5 + 1 spare
No. of Installed SCMs	-
Hydraulic Functions	11 (1 HP – SCSSV, 10 LP – 8 tree valves, 2 choke)
Operating Pressure	345 bar LP, 690 bar HP
Subsea System Type	Proserv production optimisation Artemis system
Subsea Modems	Proserv open communication controller (OCC)
Intervention Method	ROV installation and intervention using direct lift line deployment
Control Method	Multiplexed electro-hydraulic subsea control system
Scope of Supply	Phase 1 includes 5 wells around the Terang manifold, phase 2 extends a further 4 wells to Batur, Sirasun East and Sirasun West
Additional Information	Dual SEM, serial Instrumentation and wet gas flowmeters included in project