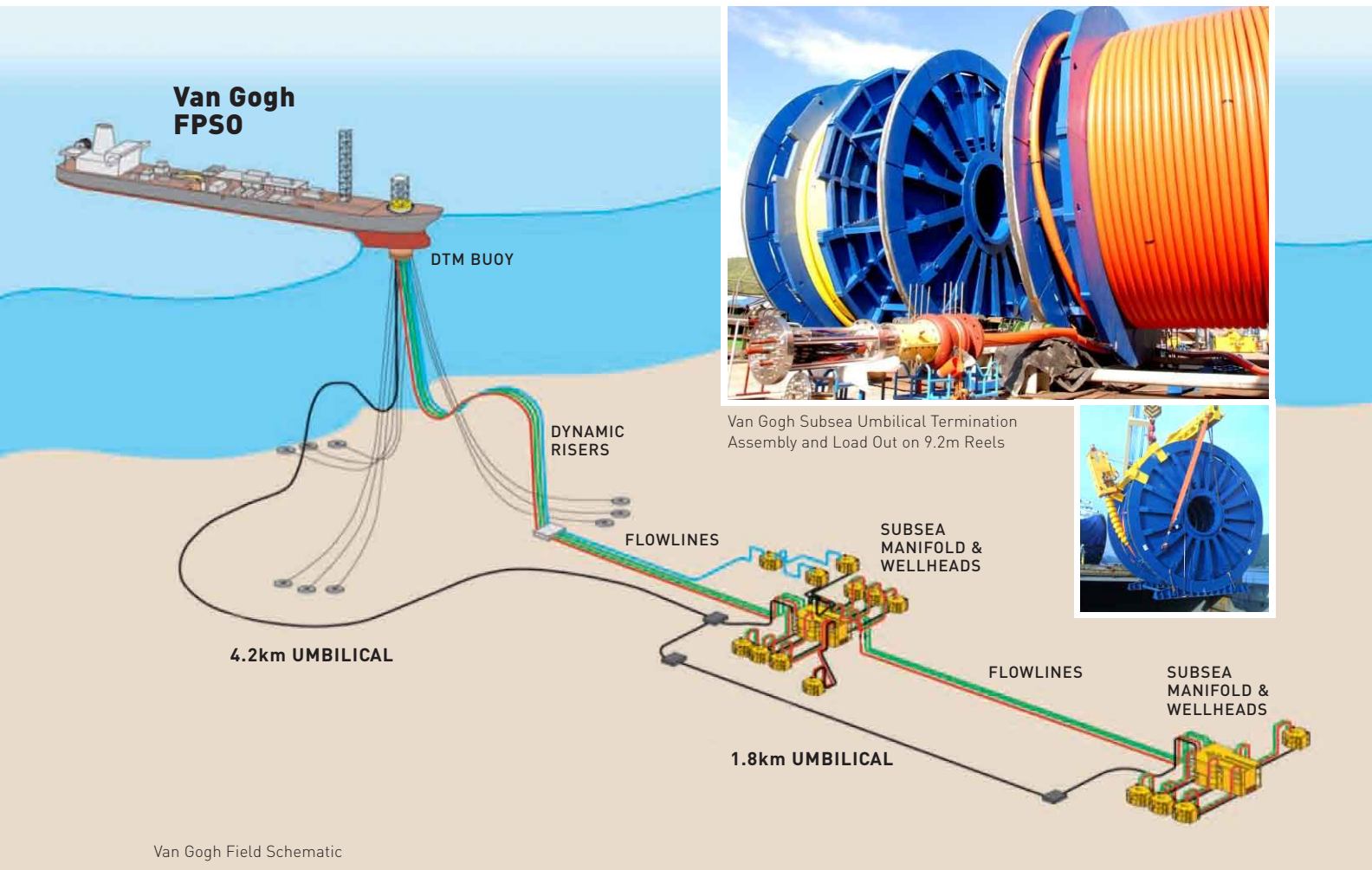




## PROVIDING THE VITAL CONNECTION



### Dynamic and Static Subsea Production Umbilicals

for the Apache Van Gogh Project - Exmouth Basin, Offshore Western Australia

**The Van Gogh development is part of the greater Vincent Field located 53 km north-northwest of Exmouth off the coast of Western Australia.**

The development of the Van Gogh oil field involves the installation of subsea well production equipment and connection to a Floating Production Storage and Offloading (FPSO) vessel. The FPSO incorporates a Disconnectable Turret Mooring Buoy (DTMB), which allows

the vessel to disconnect from the field hardware in adverse weather conditions and relocate to safer waters, returning to reconnect when the storm has passed.

JDR's scope of works included the supply of subsea production umbilicals for use in 350m water depth for a 20 year design life. First production from Van Gogh is expected late 2009.

# Subsea Production Umbilicals for Apache Van Gogh

The main umbilical from the FPSO to the Drill Center 1 manifold is 4,174m long and the infield umbilical to Drill Center 2 is 1,850m long. The main umbilical riser was installed in a 'lazy-S' configuration using distributed buoyancy modules. To ensure proper dynamic response of the riser, internal ballast was incorporated into the dynamic section. All electrical cable quads included special low permeation outer jackets to mitigate the effects of hydrogen gas.

## SPECIALISED HARDWARE

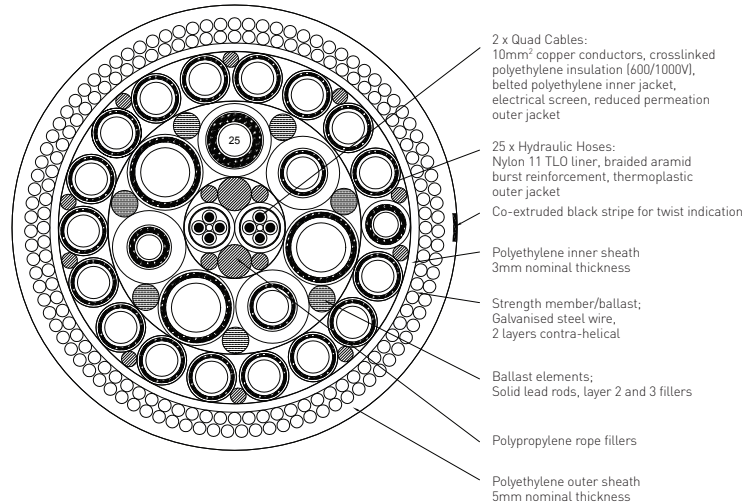
The umbilical riser was installed in the DTMB using a bull nose umbilical termination unit (BUTU) and bend stiffener latch mechanism (BSLM). The BSLM provided automatic connection of the dynamic bend stiffener and allows disconnection by ROV if necessary. A subsea distribution unit (SDU) was fitted to the main umbilical and UTAs were fitted to both ends of the infield umbilical. The two umbilicals were delivered by JDR on standard 9.2 m x 5.0 m installation drums with the SDU & UTAs attached for offshore installation.



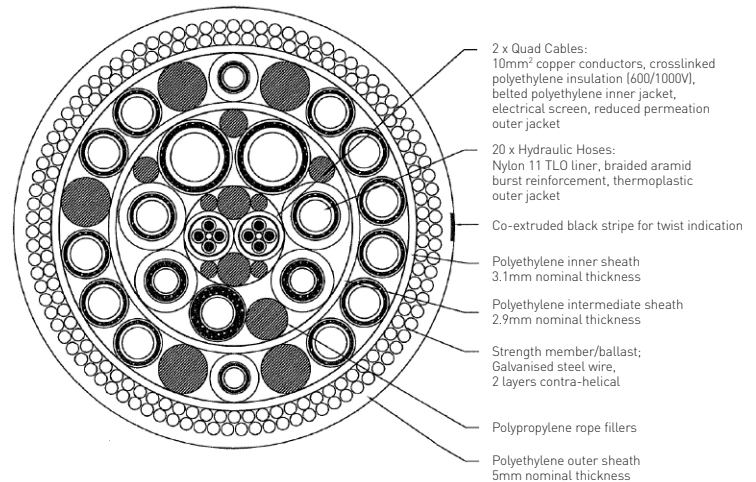
Van Gogh Subsea Umbilical Termination Load Out on 9.2m Reel

## MECHANICAL DATA

### 4.2km Dynamic Subsea Production Umbilical (Van Gogh FPSO to Subsea Manifold)



### 1.8km Static Subsea Production Umbilical (Infield)



## UMBILICAL SYSTEM ANALYSIS

JDR carried out extensive fatigue analysis on the dynamic riser cross section. Calculated fatigue life predictions were 4,786 years for the structural armor wire and 11,970 years for polymeric components. The fatigue data was used to determine the requirements of a fatigue test program. An umbilical sample successfully completed the fatigue cycle test. Chemical compatibility and permeation testing were carried out on individual thermoplastic hose components. On-bottom stability analysis considered 100 year return periods as well as the presence of solitons and the along-slope pulse.



JDR has demonstrated flexible and innovative design and engineering approaches for umbilicals, cables and termination systems, establishing a reputation as a responsive and collaborative engineering and offshore service resource.

JDR is a leading worldwide provider of custom designed and manufactured subsea power cables and umbilical systems for a broad range of applications in the oil and gas sector and the growing offshore renewables industry.

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