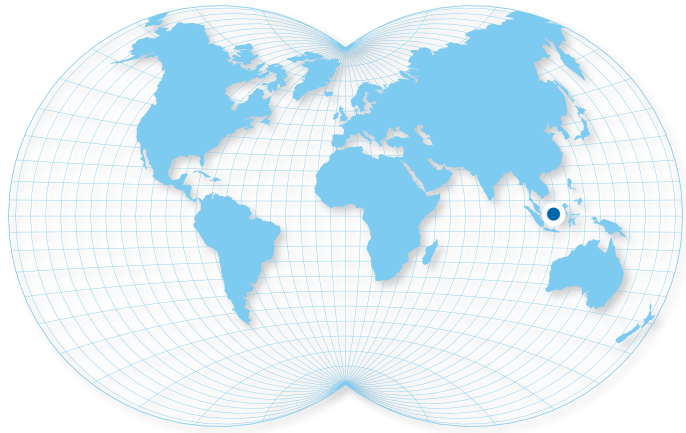


KERTEH, WEST MALAYSIA: Terrenganu #2 CALM



Scope of Work

Designed, constructed and installed a replacement CALM system to accommodate 35,000 to 85,000 dwt tankers in 20m water depth. The system is linked via four 18-in. pipelines to a refinery located two miles away.

General Description

Client Name:	Petronas Carigali
Contract Award:	April 1998
Installation Date:	April 1999
Application:	Multi Product (Crude oil, fuel oil, diesel and naphtha) Import and Export

Project Specifications

Water Depth:	20m (65ft)
Tanker Size:	85,000 dwt
Dimension:	11.5mØ x 3.3m
Floating Hose:	2 x 20-in.

Underbuoy Hose:	2 x 16-in. Chinese Lantern
Hawser System:	12-in. Dual hawser
Anchor Leg System:	6 x 2.75-in. ORQ
Anchor System:	7mt Stevfix anchors

Design Environmental Criteria

Operational	
Significant Wave Height:	4.5m (14.8ft)
Wind Velocity:	18m/s (35 knots)
Surface Current:	1.5m/s (2.9 knots)
Survival	
Significant Wave Height:	5.3m (17.4ft)
Wind Velocity:	31.4m/s (61 knots)
Surface Current:	1.9m/s (3.7 knots)

Comments

In 1982, SOFEC designed, constructed, and installed a multi product import/export CALM system for Petronas. SOFEC removed the existing system and installed a replacement CALM plus 55m of chain per leg. This system uses a relatively small main bearing and three heavy outboard turntable rollers running on a replaceable crane rail track.

Terrenganu #2 CALM

(Continued) Comments

The CALM buoy itself features six self-aligning chain stoppers, vertical pull hawse pipes, six watertight compartments, and closed centerwell. The buoy deck is equipped with a quick disconnect manifold for manual operation of the hydraulic system for control of underwater PLEM ball valves.

The Terrenganu CALM is a low maintenance design with fully sealed rotating components that require minimal lubrication and can be replaced without removing the turntable. All components are designed to allow full field servicing.