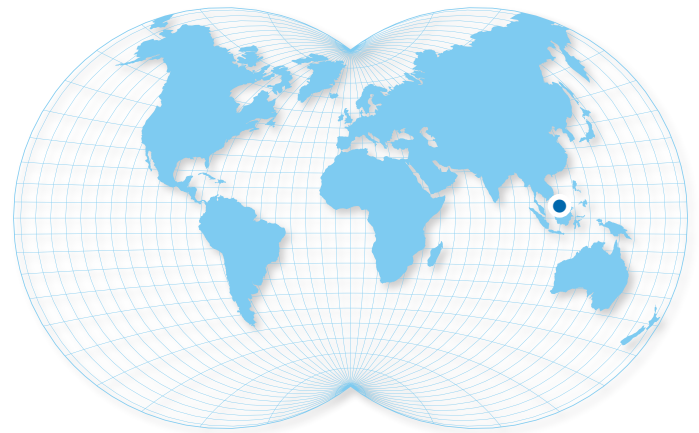
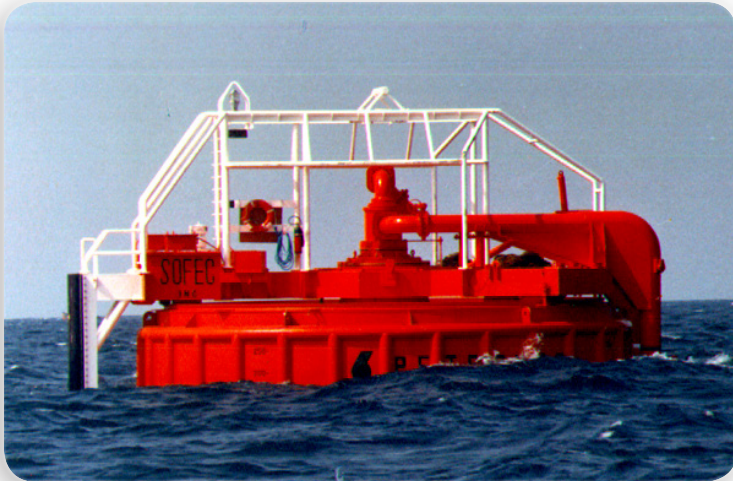


KERTEH, WEST MALAYSIA:

# Terrengganu #1 CALM



## Scope of Work

SOFEC designed and constructed a multi-product CALM terminal and two PLEMs and also designed the four 18-in. pipelines, which link the terminal to a refinery two miles away.

SOFEC determined wind, wave and current forces using analytical techniques and wave tank testing and performed all foundation design for the six-leg CALM and the PLEMs. SOFEC designed and fabricated all structural and mechanical components, which include a fully sealed field repairable main bearing.

## General Description

Client Name:	Petronas Carigali
Contract Award:	October 1981
Installation Date:	October 1982
Application:	Multi Product (Fuel oil, diesel, naphtha and ballast) 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)

# Terrengganu #1 CALM

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## (Continued) Comments

The Terrengganu mooring terminal was an improved dual product import/export CALM system. The terminal used a relatively small main bearing and three heavy duty outboard turntable rollers running on a replaceable crane rail track. The CALM buoy itself features six self-aligning chain stoppers, vertical pull hawse pipes, six watertight compartments, and closed centerwell. One compartment contains a manually operated hydraulic system for operation of underwater PLEM ball valves. The Terrengganu CALM was a low maintenance design with fully sealed rotating components that required minimal lubrication. All components are designed to allow full field servicing. The fully sealed main bearing can be replaced without removing the turntable.