Scope of Work
SOFEC designed, constructed, and installed an internal permanent turret mooring system for the MODEC converted 140,000 dwt Nan Hai Sheng Li FPSO.

The permanent turret mooring system installed in the FPSO enables the tanker to remain on station during 100-year typhoon conditions characterized by wave heights up to 13.2m, currents more than 3 knots, and 87 knot winds. The Liuhua 11-1 field is located in Typhoon Alley offshore, southeast Hong Kong, PRC. The Nan Hai Sheng Li FPSO survived a direct hit by Super Typhoon Sally in 1996. The FPSO has a design life of 15 years.

The dual toroidal swivel system on this FPSO, as well as the piping and riser systems, was designed for H2S service.

General Description
Client Name: Amoco Orient Petroleum Co.
Contract Award: July 1993
Installation Date: March 1996
First Oil: April 1996
Vessel Size: 140,000 dwt
Storage Capacity: 650,000 bbls
Water Depth: 305m (1,000ft)

Fabrication: Turret – Japan
Vessel – Singapore

Design Environmental Criteria (100-year storm)
Significant Wave Height: 13.2m (43.2ft)
Wind Velocity: 45m/s (87 knots)
Current: 2.26m/s (4.39 knots)

Mooring System
10x1 chain–wire–chain with subsea buoys (inverted catenary mooring):
4.5-in. ORQ +20% chain
4.5-in. Spiral strand wire rope
Syntactic foam support buoys
40mt High holding power anchors

Turret
Internal Permanent Bow
Turret (Contd.)
The 6.5m internal turret houses a four-pass swivel, with toroidal passages for two production lines, one test line and one spare line. A hydraulic swivel for control lines is also included. Hydraulically activated emergency shut down valves were placed below the swivel as part of the FPSO safety.

Fluid Swivel Assembly
2 x 12-in. 300# ANSI flange connection (740 psi design)

Riser System
2 x 13.5-in. Flexible riser
1 x 6-in. Flexible riser

Comments
In September 1996, the eye of Typhoon Sally passed within one kilometer of the FPSO. Typhoon Sally was classed as a “Super Typhoon” in the South China Sea. Although the environmental conditions reached the 200-year design environment criteria, the MODEC converted FPSO, and its turret and mooring system received no reportable damage.

This SOFEC permanent internal turret mooring system is ABS classed.