

# Monobuoy Reference Project for



Vinashin

Vietnam Shipbuilding Industry Corporation



PTSC

Petroleum Technical Services Company



...FSO5 - Bach Ho

# FSO5 - Bach Ho - Vietnam



## FSO5 Bach Ho

### Clients:

VINASHIN  
PTSC

### Locations

Haiphong, Vietnam - Shipyard  
Bach Ho Field - Offshore

### Project Characteristics:

Design of floating storage & offloading unit  
Project Management  
Construction Supervision  
Supply of main components  
ABS Design Review

### Project Size

Undisclosed

### Dates:

Design and Construction  
February 2007- April 2010  
Commissioning:  
April 2010 - ongoing

### Monobuoy Scope:

#### Project Management

#### Design:

- Hull
- Rigid Arm & Chaintable/Turret head
- Mooring systems
- Process Equipment

#### Procurement:

- Process Equipment
- Mooring equipment
- PAGA & Fire and Gas detection system
- DCS Process Control System

#### Installation & Commissioning

- Piles and mooring chain installation
- FSO Hookup
- Riser Hookup
- Vessel Commissioning

# Project Highlights

## Contract Signing

- Contract was signed between Vinashin and Monobuoy on 7<sup>th</sup> February 2007.

## Basic and detailed Design

- Basic Design for 150,000 DWT FSO
- Detailed Design, Workshop drawing, Nesting Sketches

## Hull Construction

Hull construction started in early 2008 and was completed in January 2009.

Ship outfitting was then completed throughout 2009.

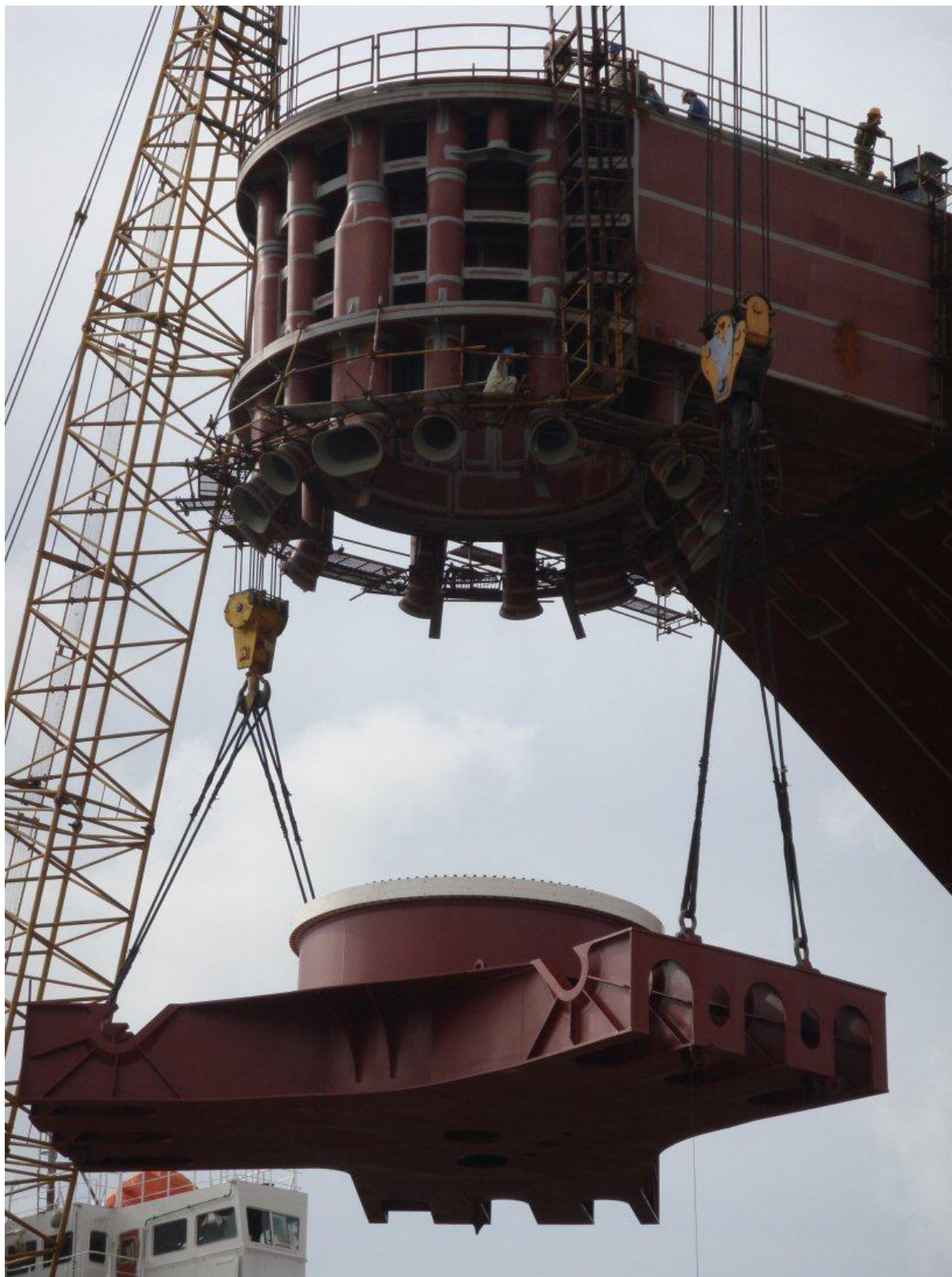
Hull construction was performed in the Nasico shipyard in Haiphong Vietnam with fabrication supervisors from the Monobuoy Company.



## Rigid Arm Construction

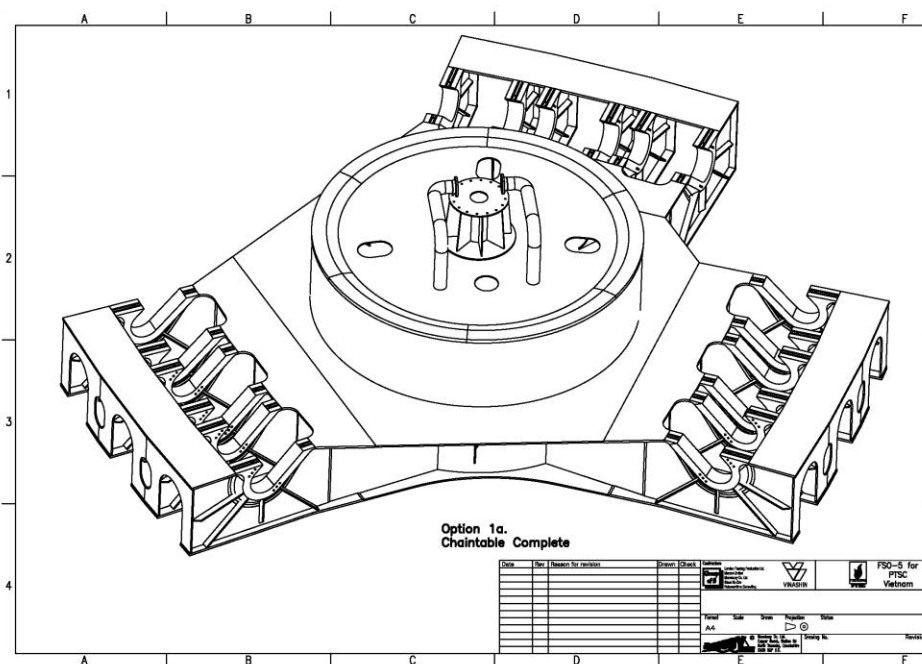
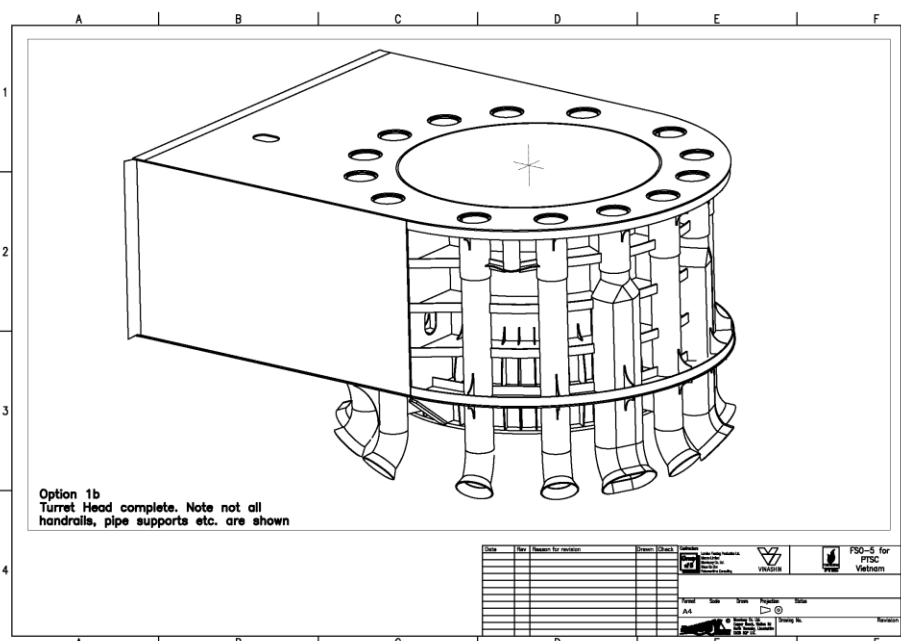


# Chaintable Construction



Chaintable being connected to turret head in Nasico Haiphong yard

Chaintable general arrangement



Turret Head general arrangement

## Main Mooring Components:

- Mooring Pile Construction



9 anchor piles were designed and manufactured by Monobuoy in 3 months in a Malaysian fabrication yard.

- Mooring Chain Construction

Monobuoy performed all the mooring analysis for the project. Chains were then manufactured in China, with the shackles being fabricated in Holland.

These were all transported to Vung Tau and assembled there prior to offshore installation at the Bach Ho Field under Monobuoy Supervision.





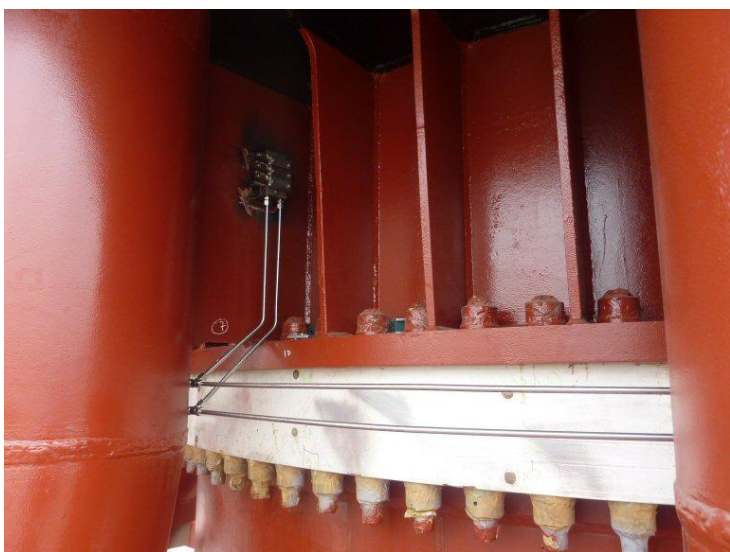
9 lengths of RQ4/RQ3 mooring chain lying on the Truong Sa Crane barge prior to offshore installation.

- Clump weight construction



The clump weights were designed and manufactured by Monobuoy using a Vietnamese casting and forging company. Over 800 tonnes of clump weights were needed for the mooring system.

- Main Bearing



A 6 meter diameter bearing was ordered from Rother Erde in Germany.

Installation and bearing foundation machining was performed by

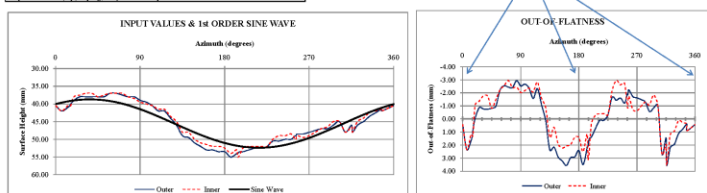
Monobuoy in the Nasico yard.

PROJECT	230723		
Equipment	L-33	Inner or Outer Surface	Turret Head
Date	02/03/2009	Surface ID	4300
Version	A0	Surface ID	5530

1st ORDER SINE WAVE		
	1st Estimate	Final
len mm	45.57	45.57
amp mm	7.00	6.83684128
freq deg	141	124.5495936

DERIVED RESULTS		
max. out-of-flatness mm		6.58746183
Global Slope mm/m		1.17459789
Slope Direction (deg)		26.34959253

DATUM POINTS		
Angle deg	Height (mm)	
0	40.07	
90	41.52	
180	51.07	
270	49.62	



Bearing Foundations on turret head and chaintable were machine to 0.3 millimeter out of flatness over a 6 meter diameter bearing.



Picture of bearing foundation machining

- Risers

Risers analysis was performed by Monobuoy, and risers were supplied by Goodyear, Brasil.

Riser configuration consisted of 2 strings of 10 × 35ft 8inch submarine hoses layed out in a lazy S configuration in 40m water depth.



## Chainstopper Construction

Monobuoy carried out most of its precision engineering manufacturing work in the UK using a fabricator in Leeds.

Chainstopper with a flapper configuration installed on chaintable.



First length of chain pulled through chainstopper.



## Product Swivel Construction

A single product swivel was designed and manufactured by Monobuoy

Swivel characteristics:

- Single Product
- 15 bar pressure
- 4 electrical paths
- 4 pneumatic paths
- ABS Certification
- ATEX Certification



Product Swivel General Arrangement drawing (includes single product, electric and pneumatic Swivel)



Swivel installed with 2 × 8" expansion pieces inside Turret Head

## Process Equipment

- Metering Unit



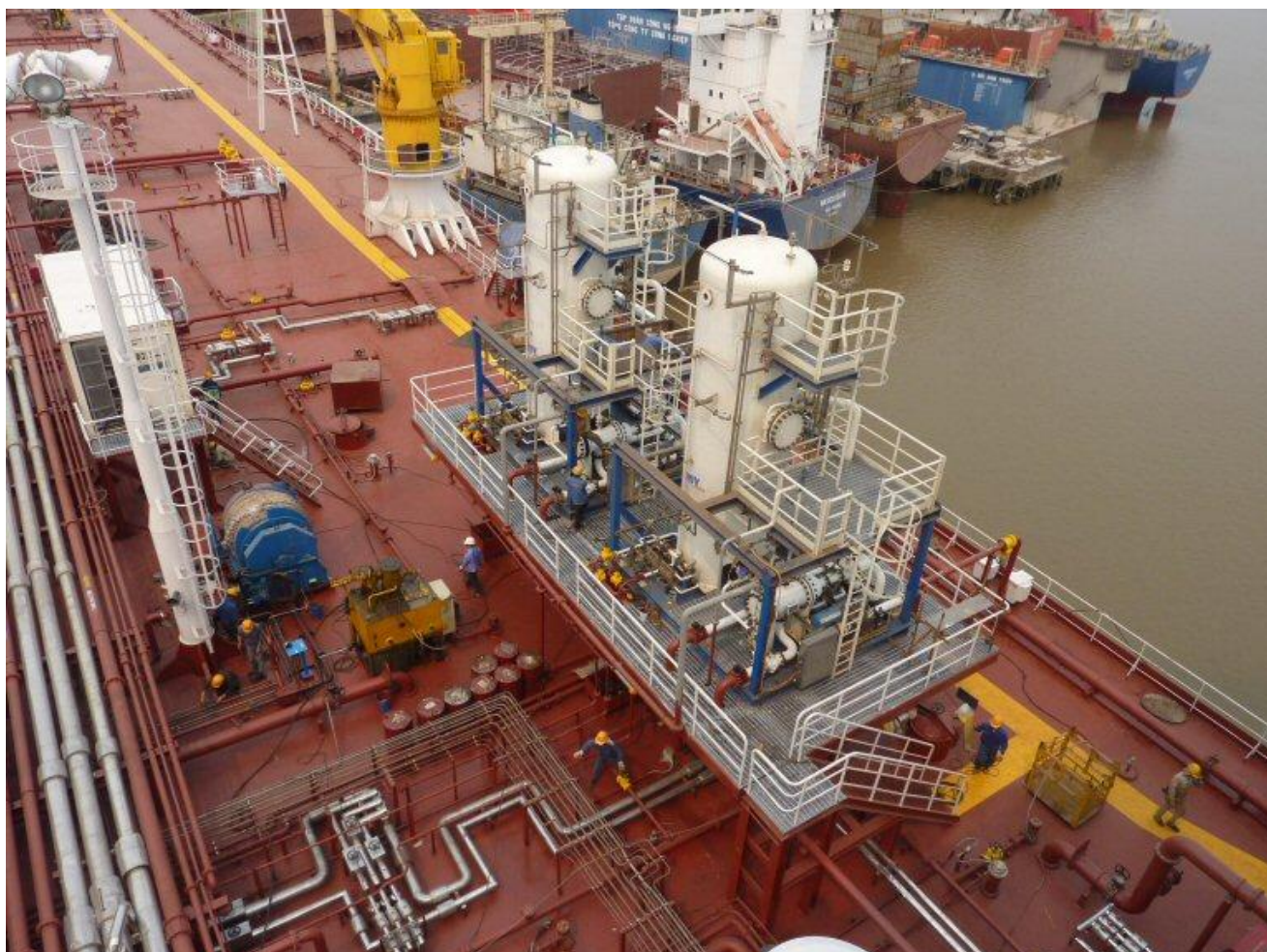
Metering unit installed on deck

- ESD Skid
- Heat Exchanger Skid



Heat exchanger Module

- PWT Skid



Process Water Treatment Module installed on deck

- **Distributed Control System**



A distributed control system was supplied by Monobuoy using Emerson Process Management to control the whole process flow line on board the ship, as well the entire ships ESD, OSD,LSD emergency shutdown systems.



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