ANALYSIS OF THE P-36 ACCIDENT IN CAMPOS BASIN, BRAZIL

Oswaldo A. Pedrosa Jr.
ANP Development and Production Manager
The rig was originally built for drilling and production operations.

The rig was converted into a Producing Unit capable for processing 180,000 bbl of oil per day, which required large structural and naval modifications.

The accident took place in Roncador Field, Campos Basin, when the rig was producing around 84,000 bpd of oil and 1.3 million m³/d of gas.
P-36 Semi-Submersible Platform

- Flare Tower
- Process Area
- Main Deck
- Helideck
- Starboard Aft Column
- Stability Box
- Extra Buoyancy
- Pontoons
OBJECTIVE

Examine the causes of the accident and, as a result, acquire supporting information to implement corrective measures and regulations aimed at improving operational practices and procedures for offshore activities.
Investigation Methodology

- Chronology of events having causal relationship with the accident
- Analysis of the causes of the explosions
  - Analysis of key events
  - Identification of noncompliance
- Analysis of the causes of the sinking
  - Analysis of key events
  - Identification of noncompliance
- Recommendations
CRITICAL EVENT

Drainage operation of the Drains Storage Tank in the aft port side column
Process Flow Diagram of the Drains Storage Tanks

Closed drains vessel

Port side DST

Starboard DST

Production header

Production caisson

Atmosphere vent line
• **First explosion** - mechanical explosion caused by the rupture of the tank (12:22 a.m. on March 15, 2001)

• **Second explosion** – very large chemical explosion killing eleven members of the fire brigade (12:39 a.m. on March 15, 2001)
Decks and Upper Part of the Column

- Main deck
- 2nd deck
- Tank top
- Exhaust ducts
- Ventilation system duct
- 3rd level
Analysis of the Explosions

Key events

- Frequent movements of water in the drains storage tank
- Storage of large quantity of oily water in the drains storage tanks
  (operating procedures malfunction)
- Operating failure in the level indicators of the drains storage tank
  (maintenance procedures malfunction)
- Blockage of the open drain vessel
  (maintenance procedures malfunction)
- Maintenance of the aft starboard drains storage tank
- Isolation of the tank vent line without isolating the intake line
  (operating procedures malfunction)
Analysis of the Explosions

Key events

Operation to empty the aft port side drains storage tank

Removal of water from the tank via the production header
(operating procedures malfunction)

Operation carried out without management supervision
(operating procedures malfunction)

Mechanical failure or incomplete closure of the starboard tank valve
(maintenance / operating malfunction)
Analysis of the Explosions

Key events

First explosion
- Inadequate classification of the area around the drains storage tank (project design malfunction)

Second explosion
- Ineffective communication system and coordination between the emergency response team and the platform command (operating procedures malfunction)
Analysis of the Sinking

Progressive loss of stability and sinking of the platform

Key Events

- Flooding of column and pontoon
- Admission of ballast water at forward port side
- Continuous submersion of the platform
- Evacuation and abandonment of the platform
- Attempt to salvage the platform
Column and Part of Aft Starboard Pontoon

- Thruster room
- Ballast tank (26 S)
- Stability Box (61 S)
- Pump room
- Water injection equipment room
Analysis of the Sinking

Key events

Flooding of the column and pontoon

Failure of the dampers of the column ventilation system
(maintenance procedures malfunction)

Man holes to aft starboard ballast tank and adjacent stability box left open
(operating procedures malfunction)
Analysis of the Sinking

Key events

Admission of ballast water at the forward port side

Ineffectiveness of the actions to control flooding
(operating procedures malfunction)

Insufficient personnel capability in emergency stability control
(management system malfunction)

Two seawater pumps out of operation
(maintenance procedures malfunction)

Continuous submersion of the platform

Aft starboard ballast tank and adjacent stability box left open
(operating procedures malfunction)
Evacuation and abandonment of the platform

From the total of 175 people on board, 138 considered non essential for the emergence operations were evacuated, beginning at 1:44 a.m. and finishing up at 4:20 a.m., on March 15 of 2001.

Final abandonment carried out by helicopters at 6:03 a.m., with the rig listing at 6°, in the same morning.
Attempt to salvage the platform

- Progressive flooding of the platform started at 8:15 a.m. on March 15 of 2001
- Nitrogen injection through the stability box vent line next to the damaged column
- Slow increase in draft and list
- Platform completely submerged around 11:40 a.m. on March 20 of 2001
P-36 Accident
Environmental Impact

- Around 350 m³ of oil emerged during the first 24 hr after the sinking at about 150 km from the coast
- Oil spill treated by mechanical recovery and chemical dispersion
CONCLUSIONS AND RECOMMENDATIONS

- Improvement to the Operational Safety Management System
- Review of Project Design Criteria
- Review the Classification of Risk Areas, specially in majors modifications of the Installations
- Simultaneous commissioning, maintenance and operation actions
- Staff dimensioning, capabilities and training program
- Management of unit conversion projects
P-36 Accident Investigation

Observed failures and noncompliances

Human and Organizational Factors

Need for effective Safety Management System
Development of a Regulatory Model for Offshore Operational Safety

Performance Based Approach

Operator Responsibility => Implementation of the Life Cycle Safety Management System

Regulator Actions => Inspection and Auditing