FPSOs

1. Introduction
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8. Future of FPSOs
Good Morning!

Please raise your right hand if you think San Diego is a suitable choice of venue for an IUMI conference?
Keep your hand up if:

You have heard of FPSOs before?
Keep your hand up if:

You know what FPSO stands for?
Keep your hand up if:

You have ever been involved with FPSO claims before?
1. INTRODUCTION
What is an FPSO...?
What Does an FPSO Do?
Why use an FPSO?
Marginal Field Exploration
FPSO Advantages

Marginal field exploitation
Ability to disconnect
Operate in remote locations
Flexibility to move to a new field
Oil storage capability
Good safety record to date
Can be leased = lower up front costs
Cost amortised over several fields
Types of Processing Units

They look the same but – the risks are different
2. Types of FPSO
Early FPSOs

The first oil FPSO was the Shell Castellon, built in Spain in 1977.
FPSO “Armada Perkasa”
FPSO "Crystal Ocean"
FPSO “Girassol”
FPSO “Alisa Craig”
FPSO “Kizomba”
FSO “Khalij-E-Fars”
FPSO “Skarv”
“Shell Prelude” FLNG
3. Mooring FPSOs
Spread Mooring
 FPSO Mooring Systems
FPSO Mooring Systems

Single Point Mooring (SPM) Systems
FPSO Mooring Systems

- Tugs
- Dynamic Positioning
- Main engine propulsion
- Bow / Stern Thrusters
- Hold back moorings
FPSO Mooring Systems

Dynamic Positioning (DP)
Risers

Emergency Disconnect Damage Risks

Maximum Bend Radius

Uncontrolled Disconnections

Pollution Risk
Deep Water Riser Technology
Deep Water Riser Technology
Deep Water Riser Technology
4. Risks Associated With FPSOs
Risks

Impossible to remove risk

Important to identify risks and manage / mitigate

Humans involved

No blame culture should be adopted

Near misses should be reported and recorded
Risks

Hull structural damages, hull envelope
COT & WBT, plating and stiffness
Corrosion, fatigue, contract incidents
Power generation and compressor systems
Paint coating systems (external & internal)
Risers
Turret system including swivels and chain table
Mooring system damages
Subsea equipment
Offloading Equipment
Operational Errors
Operational Errors

Captain and station keeping
Offloading hose entanglement
Shuttle tanker contact damage
Crew language barriers
5. Environmental Factors
Environmental Factors

http://blog.skytruth.org/
6. Repair Challenges
Offshore Repairs

Offshore intervention $, $$$, $$ !!!!

Heavy Lifting Equipment Offshore is costly

In service repairs vs production outage

Offshore Repairs increases headcount on FPSO

Accommodation problems - Beds!

Temporary Flotels
7. Technical & Engineering Observations
Demand for deeper water depths to access oil and gas reserves

'Easy' oil has gone

Development of deepwater riser systems

With increasing depth comes increasing Engineering challenges
Technical and Engineering Observations

Conversions

New Buildings

Routine Inspection & ROV access

Classification Societies
How FPSO's are Built / Converted

FPSO's are usually ‘ship-shaped’ and resemble a modified oil tanker

Purpose built or converted from an existing hull

Modifications to increase the strength or fatigue resistance in particular areas

Hull bending - hogging and sagging
Buoyancy = Hogging of Hull
FPSO Newbuildings
FPSO Newbuildings
FPSO Oil Tanker Conversions
FPSO Oil Tanker Conversions
Decommissioned oil tanker

Availability of suitable second hand ‘donor’ tanker hulls

Avoid in-service fatigue damage

Poor weld quality
FPSO Conversions

Structural loadings encountered by FPSO's

Conversions should improve the local detail design to enhance fatigue performance

Require structural fatigue enhancements
FPSO Conversions
Cargo Oil Tank (COT) Damage

Damages in way of primary structural members

Cracks at the intersection of the bottom longitudinal stiffeners with transverse web frames in way of the connecting brackets

Damage in way of brackets, e.g. transverse bulkhead lower brackets

Local weld defects - crack initiators

Defects monitored, evaluated and repaired

Repairs require a high level of NDT and strict welding control
**Water Ballast Tank (WBT) Damage**

Fatigue cracks detected after 2-3 years of operation as an FPSO

No evidence of failure noted in 13 years as a trading tanker

WBT cracks arrested by drilling & grinding

Damages assessed and repaired on location whilst maintaining production

Hot work required adjacent tank emptying and cleaning

Oil and water levels in adjacent tanks relevant

Tanks then monitored monthly
Power Generation / Compressor Systems
Paint Coating Systems
Turret System Including Swivels and Chain Table
Mooring System Challenges

Anchor chain failure
Clump weight detachment
Thrash zone areas
Chain table problems
Catenary mooring spring effect
No Go Zones (“NGZ”) on sea bed
Disconnect / Reconnect (emergency and routine)
8. Future of FPSOs
Future of FPSOs
10 Reasons Why FPSOs are the Future of Oil & Gas

1. Shorter time to field = Faster revenue generation
2. Reduced investment = less overheads
3. FPSOs do not have to be custom built
4. FPSOs can evade harsh weather
5. FPSOs can move from field to field
6. Abandonment costs are less than for fixed platforms
7. FPSOs can be used in shallow and deep waters
8. Asset integrity costs reduced with FPSOs
9. FPSOs reduce costly and expansive underwater infrastructure
10. FPSOs are more environmentally friendly than platforms
And Finally……

It is easy to forget that the devil is in the detail

If Class didn’t see it why should I?
Spencer Clark

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