FPSO Sector Overview

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Floating production developed rapidly over the past decades...

**History**
- Offshore oil production started in the 1950s in shallow waters with fixed platforms.
- Soon thereafter floating production solutions were introduced as:
  - Offshore oil fields where discovered in increasingly deeper waters.
  - More marginal reserves lead to shorter expected production periods, which paved the way for redeployable and mobile units.
- Several types of floating production systems have been developed:
  - FPSOs have become the most widely used production solution. Only in US GoM other systems are more dominant.
- Main areas for floating production: US GoM, Brazil, West Africa, South East Asia, North Sea basin.

**Offshore oil and gas is becoming increasingly important**
- Global offshore oil & gas expenditure is expected to show strong growth the coming years:
  - Capex and opex to grow from ~USD 250bn now to ~USD 350bn in 2013.
  - Deepwater CAPEX estimated at USD 167bn for the coming 4 years.
- Current break-even costs for new field development lies around USD 40 - 60 per barrel, which makes most offshore projects currently highly attractive.
- Offshore oil production now accounts for approximately 32% of global production and is expected to grow to 39% by 2018.
- Deepwater offshore oil production is becoming increasingly important:
  - Accounts for about 9% of total production in 2010 and is expected to grow to 17% going forward.

**Harsh environments require higher exploration and production costs**

**Offshore oil accounts for an increasing part of global production**

...and several different types of floating production systems have been developed...

<table>
<thead>
<tr>
<th>Flexibility</th>
<th>FPSO – Floating Production Storage Offloading unit</th>
<th>SEMI - Sub</th>
<th>Tension Leg Platform (TLP)</th>
<th>SPAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consist of a newly built or converted oil tanker hull</td>
<td>Has a deck supported by columns / pontoons to enable the unit to become transparent for waves</td>
<td>Is positioned and stabilised by at least three separated, vertical tendons moored to the seabed</td>
<td>Is a vertical floating platform which is moored with a semi-taut or taut mooring system</td>
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<tr>
<td>Is a disconnectable or permanently moored floating production system</td>
<td>Stays on location using dynamic positioning and/or is anchored by catenary mooring lines</td>
<td>Could function as a “stand alone full processing&quot; platform or simple &quot;well head&quot;</td>
<td>Could support drilling as well as production activities at the same time</td>
<td></td>
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<tr>
<td>Is well suited for developments in harsh environments</td>
<td>Can accommodate both drilling and dry tree capabilities</td>
<td>Can be equipped with drilling and/or dry tree capabilities</td>
<td>Has the ability to accommodate dry trees, which in turn minimises subsea maintenance</td>
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<td>Has the ability to process, store and transport hydrocarbons</td>
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<table>
<thead>
<tr>
<th></th>
<th>Disconnectable</th>
<th>Storage</th>
<th>Leased by independent operators&lt;sup&gt;1)&lt;/sup&gt;</th>
<th>Harsh environments</th>
<th>Ultra deepwater&lt;sup&gt;2)&lt;/sup&gt;</th>
<th>Drilling&lt;sup&gt;3)&lt;/sup&gt;</th>
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</thead>
<tbody>
<tr>
<td>FPSO – Floating Production Storage Offloading unit</td>
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<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✗</td>
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<tr>
<td>SEMI - Sub</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Tension Leg Platform (TLP)</td>
<td>✗</td>
<td>✗</td>
<td>✔️</td>
<td>✗</td>
<td>✔️</td>
<td>✔️</td>
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<td>SPAR</td>
<td>✗</td>
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<td>✗</td>
<td>✗</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

<sup>1</sup> A small number of Semis are leased by independent operators
<sup>2</sup> Ultra deepwater considered to be > 2000m water depth
<sup>3</sup> Prosafe Production has one FPSO with drilling capabilities

Source: DnB NOR sector report 2009, Douglas Westwood 2010
…but globally FPSOs are the preferred production solution

239 floating production systems and 93 storage vessels are in service as of July 2010

FPSOs have distinct advantages

- Storage capacity, thereby making it suitable for remote locations
- Operate in all environments; shallow to deep water
- Extensive deck area provides flexibility in process plant layout
- Self propelled and moveable; easy to relocate (disconnectable)
- Time to deployment and first oil is relatively short

- In principle no drilling capabilities (with limited exceptions (e.g. Prosafe))
- Complex turret / swivel technology is relatively expensive and can require high maintenance

1) Not shown in the bar charts are 6 FPSOs, 2 production semis and 2 FSOs that are off-field and available for reuse. Also not included is a FPSO in China that is off-field for repair. Two FPSOs and a FPU in the GOM are employed in emergency use.

Source: International Maritime Associates, July 2010
FPSOs are owned by both (independent) leasing companies and oil majors

Number of FPSOs per leasing company (including newbuilds – total 104)

Number of FPSOs per oil company (including newbuilds – total 80)

Source: Pareto research
FPSO demand drivers are expected to show considerable growth in the near future...

Drilling activity is expected to pick up...

..and new oil fields are becoming smaller..

..on the back of an expected oil price rise..

Deepwater capex is growing in tandem

..thereby increasing production in deep water..

Future FPSO demand expected to be robust

- Deeper drilling and smaller fields drive demand for versatile solutions like FPSOs that can operate in deep waters and are not bound by a fixed location
- Macro drivers like the oil price and E&P expenditure drive demand for oil processing systems in general and will also boost FPSO demand
- Main threat is a low oil price (below USD 50-60), which effects the break-even/hurdle rate for new offshore oil field development

Source: IEA World Energy Outlook 2009, Douglas Westwood Energy Outlook, Sandrea and Sandrea
...thereby leading to strong FPSO demand...

**Gulf of Mexico**
- Submission of FPSOs to the Gulf of Mexico since January 2002
- One of the most promising basins in the world; large volume of deepwater wells
- Increasing water depth of discoveries (> 2.5km depth)

**South America**
- 70% of oil and gas reserves are located in (ultra) deep waters
- Pre-salt discoveries gained worldwide attention due to the expected size of reserves
- Holds estimated reserves of 5-8 bn/b of crude oil and natural gas

**Europe**
- North Sea FPSOs are tailor made for the area
- Harsh conditions
- Strict compliance (UKCS, NCS)
- Other areas in Europe will see increased drilling activity
- Oil majors are exiting and independent and niche players take over

**Asia**
- The scale of projects in Asia is substantially smaller compared to other regions
- Increasing activity in deeper waters expected (Malaysia, China, Australia)
- Many regions with hurricane risks
- Very large area, some regions still vastly unexplored

**West Africa**
- Benign waters
- Large reserves
- Absence of infrastructure
- Acceleration of shallow water activities
- Challenging political situation in some countries
- Africa is forecasted to continue its regional dominance in terms of investments in deepwater

Source: ABN AMRO research, International Maritime Associates, July 2010
…which is not yet met by current projected supply

Promising FPSO supply / demand balance

- A supply shortage is expected from 2013 onwards in case no new FPSOs enter the market (see graph to the right):
  - Supply side consists of all producing and ordered units
  - Demand side is calculated on the basis of outstanding projects, i.e. firm tenders, planned and possible
- New FPSO demand has to be met by the following supply drivers:
  - ✔ New units constructed
  - ✔ Leased units coming off contract
  - ✗ Scrupping of old vessels
  - ✗ Field specific idle vessels

- The current demand / supply outlook is promising and offers new opportunities for growth in the industry

Fleet utilisation has been robust and is currently above average

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of idle units</th>
<th>Utilization rate</th>
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<tbody>
<tr>
<td>1990</td>
<td>2</td>
<td>88%</td>
</tr>
<tr>
<td>1992</td>
<td>7</td>
<td>85%</td>
</tr>
<tr>
<td>1994</td>
<td>5</td>
<td>90%</td>
</tr>
<tr>
<td>1996</td>
<td>3</td>
<td>94%</td>
</tr>
<tr>
<td>1998</td>
<td>5</td>
<td>95%</td>
</tr>
<tr>
<td>2000</td>
<td>3</td>
<td>100%</td>
</tr>
<tr>
<td>2002</td>
<td>5</td>
<td>95%</td>
</tr>
<tr>
<td>2004</td>
<td>7</td>
<td>90%</td>
</tr>
<tr>
<td>2006</td>
<td>5</td>
<td>85%</td>
</tr>
<tr>
<td>2008</td>
<td>5</td>
<td>88%</td>
</tr>
<tr>
<td>2010</td>
<td>5</td>
<td>90%</td>
</tr>
</tbody>
</table>

Average utilisation – 94%

FPSO supply and demand based on existing projects only¹)

¹) Options are assumed called for existing contracts
²) 24 of these units have secured contracts, 4 are currently speculative
Source: Pareto research, ODS Petrodata
Strategic challenges for the FPSO industry: a highly competitive environment

**Supplier power – Low**
- Most equipment / component suppliers are too small and the supplier base is too large to exert significant supplier power
- Due to limited availability of slots at shipyards, they are important suppliers
- Past years (2006 – 2008) the supply side has experienced significant tightening, which led to price increases and delays
- FPSO companies have taken measures:
  - Intensified pre-bid engineering to be more accurate about time and costs
  - Firm price commitments from subcontractors during tendering phase
  - Cost adjustment clauses in contracts
- Supply side costs are down ~15-20% from peak in 2008 and have flattened out at this level

**Threat of substitutes – Medium**
- FPSOs remain preferred floating production system
- FPSOs account for 61% of current floating production systems and 80% of current production floater orderbook
- As offshore oil fields become smaller, oil is more complex to extract and water depth is increasing, FPSOs are gaining competitive advantage

**Internal rivalry – High**
- Industry still too fragmented
- High fixed cost base through engineering capacity
- Tender / project basis of industry creates a win/lose all environment
- High exit barriers
- Returns on projects trending towards WACC

**Barriers to entry – High**
- The past 6-8 years several new players have tried to enter the market by building speculative units
- Many speculative players have gone bankrupt or have been liquidated due to cost overruns, delays and lack of contract awards
- Engineering capability is key

**Buyer power – High**
- Customers are often considerably larger than FPSO companies
- Multiple FPSO companies bid for the same tenders
- Leasing structure allows buyers to shift all but operating risk to the industry
- Contract awards account for a significant proportion of total FPSO company capex and revenue

Source: ABN AMRO research, Pareto research, International Maritime Associates
New FPSO industry dynamics...

Most important trends impacting the industry...

- **Increasing size and complexity of projects**
  - Era of ‘easy oil’ is over and offshore E&P is increasingly taking place in remote areas and deeper waters
  - Engineering expertise and in-depth know-how is key
  - Required capex for these projects is rising rapidly

- **Customer demands for solid players with track record**
  - As projects are becoming bigger and more complex, oil companies want to be ensure flawless project execution
  - Following the Macondo oil spill, oil companies are becoming more prudent and require solid track records of suppliers

- **Capital constraints**
  - As projects are becoming increasingly large and complex, required capex is rising (since 2003 FPSO prices have doubled)
  - Most companies in the sector currently not have the financial strength to take on new large-scale projects

- **Tighter regulatory control**
  - The offshore industry is expected to face increased regulatory control, following the Macondo oil spill
  - Compliance with new measures will inevitably lead to higher costs and standards, which small players are unlikely to meet

- **Higher local content requirements**
  - Governments are expected to favour FPSO companies with financial strength and track record when teaming up with local counterparts

…and which are expected to lead to new industry dynamics

1. **Consolidation**
2. **Company structure: engineering vs. FPSO fleet ownership**
3. **Financing solutions**