Business opportunities in FPSOs

Untangling the FPSO market

A Tanker Operator report by Ian Cochran

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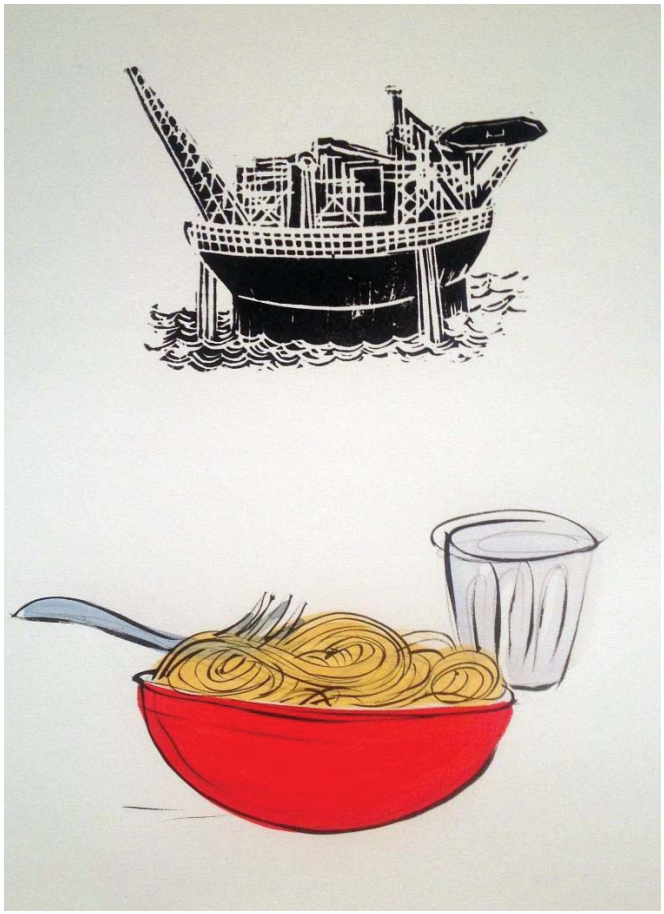

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1 Executive summary

When the first Floating Production Storage and Offloading/Offtake unit first appeared in 1976, this offshore concept was considered as a quick fix for what was in those days a fledgling industry.

At the time, an FPSO was deemed more suitable than offshore drilling rigs for deepwater production projects and there were plenty of large steam turbine tankers surplus to requirement whose hulls would fit the bill.

For example, during the 1970s and 1980s, there were many large tankers idle, some of which had hardly traded and indeed a few had left the new building yard to go directly into layup and actually never traded.

It was quickly realised that once the topsides' engineering work was designed, a hull could be converted in a very short space of time of around 18 months and at relatively little cost, compared with the cost of the oil field development.

Today's FPSOs are more of a culmination of years of experience and research. During the next few years, will move from just being a product to the mainstream solution of choice for deep-water production operations, a leading research company recently said.
Leading engineering concern SBM agreed, saying that over the next few years, FPSOs will move from being a niche product to a mainstream solution of choice in deep water.

Units are continually increasing oil production capacity and becoming more complex with the inclusion of not only sea water sulphate removal equipment as almost standard, but also CO_2 removal and CO_2 re-injection as well.

"This trend will continue as operators try to squeeze as much value as possible from each FPSO that enters service in the major fields," SBM said. "Smaller FPSOs will also be found exploiting smaller reservoirs, such as in the North Sea fields that would have previously used a platform. These are now being developed using an FPSO."

In the future, we will probably see FPSOs fitted with unique production facilities on board, such as gas-to-liquids, liquefied natural gas (LNG) and other gas capture solutions. Also topside production equipment could be relocated to the seabed with the floating unit providing power and storage, plus offtake, through risers.

The market for FPSOs originally developed as a response to the oil companies' need for more flexible production solutions: production facilities that could be mobilized quickly, were stand alone in terms of oil export, could be deployed on deep-water fields, could be moved from one field to another (after upgrade work) and had low abandonment costs, according to a recent report.

Engineering companies were not slow to see a new market emerging and started to tender for offshore production work using redundant VLCCs/ULCCs, while some of the oil majors used their own hulls for conversion work. In those days, the oil majors

owned 2nsiderable tanker fleets, many of which were stream turbine driven VLCCs/ULCCs.

However, as the offshore industry became more mature, other forms of production units started to appear and indeed, still are. Oil was being found in ever deeper and harsher waters, which precluded the use of jack-up and other types of drilling rigs. However, today FPSOs operate in shallow down to ultra-deep waters.

Over time, the FPSO has become more sophisticated and today, we have new buildings with completely different hull shapes. Due to the surge in development and production of natural gas fields, liquefied natural gas (LNG) FPSOs are on the drawing board with at least one under construction.

Unlike tankers, LNG carrier conversions are usually aimed at storing the liquefied gas transferred from another LNGC and regasifying the LNG for shoreside use.

There is no doubt that the FPSO is here to stay, as oil exploration, development and production concerns look for methods of extracting and storing oil from ever deeper locations, such as the pre-salt fields being developed off Brazil, other fields off Australia, West and East Africa and China, plus renewed interest in the North Sea, primarily west of the Shetland Islands, as far as Greenland.

According to leading independent FPSO owner and operator, SBM, in 2000 there were 44 deep-water fields in production. By the end of this year, the figure is expected to exceed 450.Many development plans include the use of FPSOs, as a 30-year plus, life-of-field, production solution.

Industry capex is accelerating in tandem with these developments and will continue to do if the oil price remains at a reasonably high level. Most oil majors contend that the oil price needs to be in the region of $80-$90 per barrel to ensure that E&P is economically viable.

SBM and the other independents operating in the sector are highly dependent on E&P spending to secure new contracts. This spending is driven by the oil companies need to replace reserves and develop proven fields in order to realize value.

The oil price has an impact on the companies' ability and desire to invest. Low oil prices typically lead to a reduction in exploration while a high oil price makes the exploration of additional and smaller fields economical, a recent report explained.

The global financial crisis of 2008, combined with the steep increase in upstream costs in the mid-2000s, led to a decrease in E&P spending and pushed oil companies into delaying investment decisions. Naturally, these events had a major impact on the oil field
services' industry.

However, the stabilization of oil prices, upstream costs and financial markets have helped to reverse this trend over the last couple of years with the offshore service industry now in an era of strong growth, as witnessed by the increase in E&P almost worldwide.

Tempering forecasts is the disruption in oil supplies in Iraq, Libya and Nigeria, plus the ongoing political concerns in Iran, North Korea and Syria, any of which could affect the oil price going forward if the situation in those countries escalates.

The International Energy Agency (IEA) and other expert sources expect oil to remain the fuel of choice up to at least 2035 with a 27% share (down from 33% today). In the overall energy mix, alongside renewables and biofuels, gas is expected to be the only fossil fuel source to increase its share.

Current (end December 2012) global oil and gas production is about 87 mill barrels day. With existing reserves depleting at about 6-8% per annum and a global demand continuing to grow steadily (3-4% per annum) in non-OECD countries, the industry faces the challenge of providing between 66 mill barrels per day and 85 mill barrels per day of additional oil by the end of 2035.

Today, oil majors, national oil companies and independents need an FPSO provider with the accumulated engineering knowledge to solve any challenge and a track record of operating installed vessels successfully for their entire working life. It is a specialist role, which normally cannot be performed in-house, except in a few cases.

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3 Principal market factors

3.1 Market demand

Around 155 projects have been identified that could lead to the installation of an FPSO of which about 60 projects could firm up in the next three years alone.

We make no apology for the number of times Brazil is mentioned in this report, as the huge deep water offshore fields E&P, especially the pre-salt fields in the Campos and Santos Basins, is currently driving the FPSO market.

In Brazil, there could be as many a 56 floaters ordered as some of the projects will require multiple FPSOs. Brazil has current proven reserves of 15.7 bill barrels of oil and gas, which could double in a few years, according to oil major Petrobras in a recent presentation.

Today, the country produces 2.6 mill barrels of oil and gas equivalent per day (boed) and the target is 5.7 mill boed by 2020, a 119% increase. According to Wartsila's local Brazilian office, about 38 production units will be needed between 2012 and 2020 with 19 coming by 2016. This is in addition to 50 drilling rigs, 550 plus OSVs of all types and Transpetro's/Promef's 49 newbuilding tankers project, ranging from MRs to Suezmaxes.

The pre-salt fields in the Campos and Santos basins are already producing some 300,000 barrels of oil per day since oil was discovered in these deep water fields in 2005-2006. Currently eight different platforms are being used including four FPSOs. A fifth was due to go into production in May of this year. The pre-salt fields are located in 2,200 m plus ultra-deep water.

Between 2014 and 2016, another 11 platforms of different types are due to start pre-salt production – 10 in the Santos Basin and one in the Campos Basin. Petrobras said that these will allow the company to produce more than 1 mill barrels of oil per day in the pre-salt layer by 2017, although there might be a certain slippage, as is often the case in Brazil. However, the potential is there.

To help cater for the production side, in 2010, Petrobras ordered a series of eight sister newbuilding FPSO hulls and followed this up with four firm conversion contract awards.

According to figures produced by Pareto and ODS Petrodata last year and published by engineering concern and FPSO operator SBM, the lower case scenario demand for new FPSOs worldwide by 2018 could total around 200 plus. The consultants also estimated a base case demand for 220 and a high case demand for 240 units during the same period.

Other reports have suggested that orders in the region of 90-130 could be expected in the next five years with about 60% placed by leasing contractors, 40% by field

8 FPSO Directory

Name	Owner	Operator	Area	Storage	Construction Year	Constructor
Abo	Prosafe	Prosafe	Nigeria	932	2002	Keppel
Agbami	Chevron	Star Deepwater	Nigeria	1,800	2005	Daewoo Shipping and Marine Engineering (DSME) Corporation
Akpo	Total	Total	Nigeria	2,000	2009	Technip
Albacora Leste (P50)	Petrobras	Petrobras	Brazil	1,035	2002	Jurong Shipyard
Alvheim	Maersk	Maersk	Norway	560	2005	Keppel
Al Zaafarana	Zaafarana	Prosafe	Egypt	800	1994	Prosafe
Anasuria	Shell	Shell	UK	2,000	1994	SBM
Angola PVSM	MODEC	MODEC	Angola	2,000	2010	MODEC
Anoa Natunga	Premier Oil	Premier Oil	Indonesia	550	1990	
Aoka Mizu	Bluewater	Bluewater	UK	600	2006	Bluewater
Aquila	Saipem	Saipem	Italy	110	2009	Saipem
Armada Claire	Bumi Armada	Bumi Armada	Australia	300	2011	
Armada Perdana	Bumi Armada	Bumi Armada	Nigeria	1000	2008	
Armada Perkasa	Bumi Armada	Bumi Armada	Nigeria	400	2007	Singapore shipyard
Armada TGT 1	Bumi Armada	Bumi Armada	Vietnam	620	2009	
Asgard A	Statoil	Statoil	Norway	920	1999	
Azurite (FDPSO)	Prosafe	Murphy	Congo	1,400	2007	Prosafe
Baobab Iviorien MV10	MODEC	MODEC	Ivory Coast	2,000	2003	MODEC
Ba VI	Vietsovpetro	Vietsovpetro	Vietnam	1,100	1994	
Barracuda (P43)	Petrobras	Petrobras	Brazil	880	2001	Jurong Shipyard
Belanak	ConcoPhillips	ConocoPhillips	Indonesia	880	2001	JGC
Berantai	Petrofac	Petrofac	Malaysia	50	2012	
Berge Helene	BW Offshore	ABB	Mauritania	1,650	2004	Keppel
Berge Okoloba Toru LPG	BW Offshore	BW Offshore	Nigeria	472		
Bleo Holm	Bluewater	Talisman	UK	657	2001	Blake
Bo Hai Chang Qing Hao	CNOOC	CNOOC	China	390	1990	
Bohai Ming Zhu	CNOOC	ConocoPhillips	China	1,000		
Bohai Shi Ju	CNOOC	CNOOC	China	390	1999	

Bohai You Yi Hai	CNOOC	CNOOC	China	1,100	1989	HUDONG ZHONGHUA SHIPBUILDING GROUP
Bonga	Shell	Shell	Nigeria	1,400	2001	AMEC
Bourbon Opale	Bourbon	Bourbon	Mexico	306	2004	Aker Langsten A/S
Brasil	SBM	SBM	Brazil	1,700	2002	
Brotojoyo	Berlian Laju	Berlian Laju	Indonesia	400	1980	
Bunga Kertas Lukut	MISC	FVSB	Malaysia	619	2003	
BW Carmen	BW Offshore	BW Offshore	UK	400	1999	
BW Cidade de Sao Vicente	BW Offshore	BW Offshore	Brazil	470	2009	
BW Joko Tole	BW Offshore	BW Offshore	Indonesia	200	2010	BW offshore
BW Pioneer	BW Offshore	BW Offshore	GoM	600	2009	
Capixaba	SBM	SBM	Brazil	470	2006	Keppel Shipyard
Captain	Chevron	Chevron	UK	849		
Challis Venture	PTTEP	PTTEP	(for sale)	2200	1989	
Bo Hai Chang	CNOOC	CNOOC	China	390	1990	Hudong Zhonghua Shipbuilding Group
Chissonga*	Maersk	Maersk	Angola		UC	
Cidade de Anchieta	SBM	SBM	Brazil	1600	2009	
Cidade de Angra dos Reis	MODEC	MODEC	Brazil	1600	2008	Modec
Cidade de Ilhabela*	SBM	SBM	Brazil	1,600	UC	
Cidade de Itaguai*	MODEC	MODEC	Brazil	1,600	UC	
Cidade de Itajai	Teekay	Teekay	Brazil	650	2010	Sembcorp
Cidade de Mangaratiba*	MODEC	MODEC	Brazil	1,600	UC	
Cidade de Niteroi	MODEC	MODEC	Brazil	1,600	2006	MODEC
Cidade de Paraty	SBM	SBM	Brazil	1,600	2011	Keppel
Cidade de Rio de Janeiro	MODEC	MODEC	Brazil	1,600	2005	Modec
Cidade de Santos	MODEC	MODEC	Brazil	700	2008	Modec and Petrobras
Cidade de Sao Mateus	Prosafe	Prosafe	Brazil	700	2008	
Cidade de Sao Paulo*	MODEC	MODEC	Brazil	1,600	UC	
Cidade de Vitoria	Saipem	Saipem	Brazil	1,900	2007	
Cidade Rio Das Ostras	Teekay	Teekay	Brazil	214	2007	
Clov	Total	Total	Angola	1,800	2010	KBR

Conkouati	Perenco	Perenco	Congo	1,420	2012	
Caratinga (P48)	Petrobras	Petrobras	Brazil	500	1997	Petrobras
Cossack Pioneer	Petrofac	Petrofac		1,160	1999	
Rubicon Crystal Ocean	Rubicon	Pemex	Mexico	300	1999	
Cuulong MV9	Cuu Long	MODEC	Vietnam	900	2003	
Dalia	Total	Total	Angola	916	2000	
Dhirubhai-1	Aker	Aker	India	1,300	2008	Aker
Didon	PA Resources	PA Resources	Tunisia	500	1998	
Dynamic Producer	DPI	DPI	Brazil	300	1987	
EnQuest Producer	EnQuest	EnQuest	UK	50	2008	Bluewater
Erha	ExxonMobil	ExxonMobil	Nigeria	2,200	2002	Saipem
Espadarte	SBM	SBM	Brazil	1,900	1999	Keppel
Espiritu Santo	SBM/MISC	SBM/MISC	Brazil	2,067	2006	SBM
Espoir Ivoirien	Prosafe	Prosafe	Ivory Coast	1,100	2001	CNR
Falcon	SBM	ExxonMobil	Nigeria	100	2002	
Farwah Al-Jurf		Mabruk	Libya		2003	Izar S.A.
Fluminese	Shell	MODEC	Brazil	1,300	1974	
Four Vanguard	Premuda	Premuda	Australia	600	2003	
Frade	Chevron	SBM	Brazil	1,800	2006	SBM
Rubicon Front Puffin	Sea Production	Aibel	Australia	770	2007	
Gimboa	Saipem	Saipem	Angola	1,800	2006	Saipem
Girassol	Total	Total	Angola	525	2001	
Glas Dowr	Bluewater	Bluewater	Indonesia	585	2002	SA Five Engineering
Global Producer III	Maersk	Maersk	UK	510	2000	
Goliat	Teekay	Teekay	Norway	137	2008	Aker Solutions
Greater Plutonio	BP	BP	Angola	950	2004	HHI
Griffin Venture	BHP	BHP	Australia	1,800	1993	
Gryphon A	Maersk	Maersk	UK	510	1993	
Guanambi 1*	Petrobras	Petrobras	Brazil	300	UC	
Haewene Brim	Bluewater	Bluewater	UK	626	1999	
Hai Yang Shi You 111	CNOOC	CNOOC	China	1,000	2004	
Hai Yang Shi You 112	Anadarko	Anadarko	China	820	2004	
Hai Yang Shi You 113	CNOOC	Chevron	China	1,800	2004	
Hai Yang Shi You 117	CNOOC	ConocoPhillips	China	2,000	2008	
Ichthys*	INPEX	Total	Australia	1,100	2012	Technip

Ikdam	Ikdam	Ikdam	Tunisia	665		
Jabiru Venture			(for sale)	1,055		
Jasmine Venture MV7	Petrofac	Petrofac	Thailand	800	1998	Modec
Jotun A	Bluewater	Bluewater	Norway	595	1999	
Jubilee	Tullow	Tullow	Ghana	1,600		
Kakap Natuna	MODEC	ConocoPhillips	Indonesia	760	1986	
Kikeh	SBM	SBM	Malaysia	2,000	2007	
Kizomba A	ExxonMobil	ExxonMobi	Angola	2,200	2001	HHI
Kizomba B	ExxonMobil	ExxonMobil	Angola	940	2002	HHI
Kuito	SBM	SBM	Angola	1,400	1999	
Lewek Arunothai	Emas	PTTEP	Thailand		2008	
Lewek EMAS	Emas	Emas	Vietnam		2009	Keppel
Maersk Curlew	Maersk	Maersk	UK	560	2000	Maersk
Maersk Ngujima-Yin	Maersk	Maersk	Australia	1,900	2008	
Marlim Sul	SBM	SBM	Brazil	1,600	2012	
MODEC Venture 1	MODEC	BHP	Australia	30	2007	Modec
MODEC Venture II	MODEC	MODEC	Australia	930	2003	Modec
Mondo	SBM	SBM	Angola	1,600	2008	
Montara Venture	Tanker Pacific	SembCorp	Australia	900	2006	Jurong Shipyard
Munin	Bluewater	Bluewater	China	600	2004	
MV8 Langsa Venture	MODEC	MODEC	Indonesia	272	2005	
Mystras	AGIP	AGIP	Nigeria	1,035	2001	Saipem & Single Buoy Moorings
Nan Hai Endeavour	CNOOC	CNOOC	China	990	1996	
Nan Hai Fa Xian	CNOOC	CNOOC	China	1,600	1992	
Nan Hai Kai Tuo	ConocoPhillips	ConocoPhillips	China	1,000		
Nan Hai Sheng Li	MODEC	MODEC	China	650	1996	
Nan Hai Xi Wang	CNOOC	CNOOC	China	600		
Nganhurra	Woodside	Woodside	Australia	1,400	2003	AMEC and Fluor
Ningaloo Vision	Prosafe	Prosafe	Australia	650	2007	EPCICO
Norne	Statoil	Statoil	Norway	2,000	2007	Aker Kvaerner
Northern Endeavour	Woodside	Woodside	Australia	689	1998	
North Sea Producer	North Sea Prod	North Sea Prod	UK	560	1997	

Ocean Producer	Oceaneering	Oceaneering	Angola	510		
Okha	Woodside	Woodside	Australia	925	2011	
OSX-1	OSX	OSX	Brazil	900	2012	
OSX-2*	OSX	OSX	Brazil	900	UC	
OSX-3*	OSX	OSX	Brazil	900	UC	
P-31	Petrobras	Petrobras	Brazil	1,600	1998	
P-33	Petrobras	Petrobras	Brazil	700	1998	
P-34	Petrobras	Petrobras	Brazil	1,800	1995	
P-35	Petrobras	Petrobras	Brazil	650	1999	
P-37	Petrobras	Petrobras	Brazil	1,000	2000	
P-53	CDC	Petrobras	Brazil	2,000		
P- 54	Petrobras	Petrobras	Brazil	2,000	2004	Jurong Shipyard
P-57	Petrobras	SBM	Brazil	2,000	1988	
P-63	BW Offshore	BW Offshore	Brazil	1,400	2009	
P-66*	Petrobras/BG	Petrobras/BG	Brazil		UC	
P-67*	Petrobras/BG		Brazil		UC	
P-68*	Petrobras/BG	Petrobras/BG	Brazil		UC	
P-69*	Petrobras/BG	Petrobras/BG	Brazil		UC	
P-70*	Petrobras/BG	Petrobras/BG	Brazil		UC	
P-71*	Petrobras/BG	Petrobras/BG	Brazil		UC	
P-72*	Petrobras/BG	Petrobras/BG	Brazil		UC	
P-73*	Petrobras/BG	Petrobras/BG	Brazil		UC	
P-74*	Petrobras	Petrobras/BG	Brazil		UC	
P-75*	Petrobras	Petrobras/BG	Brazil		UC	
P-76*	Petrobras	Petrobras/BG	Brazil		UC	
P-77*	Petrobras	Petrobras	Brazil		UC	
Panyu	CNOOC	Devon Energy	China	70	2003	Bohai Sea Sanlian Co
Pazflor	Total	Total	Angola	2,000	2008	KBR
Peregrino	Maersk	Maersk	Brazil	1,600	2008	BW Offshore
Perintis	M3Energy	M3Energy	Malaysia	640	1998	
Petrojarl	PGS	Arco	UK	60	1998	
Petrojarl Banff	Teekay	Teekay	UK	180	1999	
Petrojarl Foinaven	Teekay	Teekay	UK	280	2001	
Petrojarl Knarr*	Teekay	BG	Norway	800	UC	
Petrojarl 1	Teekay	Teekay	Norway	420	1986	NKK
Petrojarl Varg	Teekay	Teekay	Norway	1,000	1998	
Petroleo Nautipa	Prosafe	Prosafe	Gabon	1,080	2007	
Polvo	Prosafe	Prosafe	Brazil	1,600	2007	Prosafe
Pyrenees Venture	MODEC	MODEC	Australia	850	2007	MODEC
Rang Dong 1	SBM	SBM		1000		

Raroa	Tanker Pacific	Tanker Pacific	New Zealand	120	2006	Jurong Shipyard
Rosebank*	Chevron	Chevron	UK	1,050	UC	
Rubicon Intrepid	Rubicon	Rubicon	Philippines	450	2007	
Rubicon Vantage	Rubicon	Rubicon	Thailand	450	2008	
Ruby II	PTSC	PTSC	Vietnam	745	2008	
Ruby Princess	PTSC	PTSC	Vietnam	1,000	1998	
Sanha LPG	Chevron	Chevron	Angola	362	2002	SBM and Cabgoc
Saxi- Batuque	SBM	SBM	Angola	2,000	2008	
Schiehallion	BP	BP	UK	1,000	2011	Hyundai Heavy
Sea Eagle	Shell	Shell	Nigeria	920	2002	
Sea Rose	H (UK)	H (UK)	Canada	630	2004	
Seillean	Frontier Drilling	Petrobras	Brazil	2,000	1990	Harland and Wolff
Sendje Berge	BW Offshore	BW Offshore	Nigeria	920	2000	
Sendje Ceiba	BW Offshore	BW Offshore	Equatorial Guinea	2,000	2001	
Serpentina	ExxonMobil	ExxonMobil	Equatorial Guinea	1,900	2003	
Sevan Hummingbird	Teekay	Wood Group	UK	300	2005	Venture Production
Sevan Piranema	Teekay	Teekay	Brazil	300	2007	
Sevan Voyageur	Teekay	Wood Group	UK	300	2010	Letter of Intent
Shiraz	AGR/Helix	AGR/Helix	Mexico		2007	AGR Group and Helix Energy Solutions Group Inc.
Skarv-Idun	BP	BP	Norway	554	2006	Bluewater
Song Doc MV19	MODEC	MODEC	Vietnam	360	2007	Modec
Stybarrow MV16	MODEC	MODEC	Australia	53	2006	Modec
Takama*	Prosafe	Prosafe			UC	
Tantawan Explorer	Chevron	Chevron	Thailand	1,000	1996	Sembawang Shipyard
Terra Nova	Petro-Canada	Petro-Canada	Canada	550	1999	Daewoo Shipbuilding and Marine Engineering,
Toisa Pisces	Toisa	Secunda	Mexico	24	2003	Gdansk Shipyard
Trinity Spirit	ConocoPhillips	Alliance	Nigeria	1,700		
Triton	Amerada Hess	Amerada Hess	UK	105	1997	Kvaerne
Umuroa	Prosafe	Prosafe	New Zealand	773	2007	
Usan	Total	Total	Nigeria	2,000	2009	HHI
Wen Chang II	CNOOC	CNOOC	China	700		
Xi Jiang	CNOOC	CNOOC	China	1,000		

Xikomba*	SBM	SBM	Angola	1,700	UC	
Yuum K'Ak' Naab	BW Offshore	BW Offshore	Mexico	2,200	2006	SembCorp Marine
Zafiro Producer	ExxonMobil	ExxonMobil	Equatorial Guinea	1,900	1996	

Notes: - *UC; Under construction, conversion, or projected.

- Source: SBM, Petrobras, FPSO.Com and various websites.