Proof of concept

This year, Allseas' Pioneering Spirit mega-vessel is finally due to set out into the seas to perform its first heavy lift. Elaine Maslin provides an update.

***Pioneering Spirit*'s twin-hull mounted lifting beams.**
Photos from Allseas

For as long as it's been a concept, Allseas' *Pioneering Spirit* super heavy lift vessel has been described as a mega-vessel.

But, it should also be called a megaproject, a term usually associated with massive field developments with multi-billion dollar investments, with all the connotations – complexities, delays, awe – that come with the moniker. For example, the latest plan for the vessel includes the addition of a 5000-tonne long reach crane.

The massive, twin-hull €2.4 billion (US$2.7 billion) single lift platform installation, removal and pipelay vessel measures some 382m-long and 124m-wide. It is designed to lift up to 48,000-tonne topsides and up to 25,000-tonne jackets, as well as doing deepwater pipelay work. The vessel, a concept few thought could be realized since its creation in 1987, was finally delivered to Allseas and transported to its berth at the Maasvlakte, near the mouth of Rotterdam harbor, for the installation of its 16-beam topsides lifting system, just over a year ago, after three years' construction in South Korea.

Edward Heerema

The *Pioneering Spirit* was due to start its working life in summer 2015, lifting the beleaguered 13,000-tonne, Talisman/Repsol Yme topsides offshore Norway. And then, start the first topside lift in Shell's four-platform Brent decommissioning program, the 23,000-tonne Brent Delta, in the UK sector of the North Sea this year. A platform installation was also on the cards as well as pipelay work on the shelved South Stream project, through the Black Sea. In addition, the firm is also scheduled to install the Johan Sverdrup topsides for Statoil offshore Norway in 2018-19.

But, by mid-year it was clear both the Yme and Brent Delta removals would be set back, as work installing the complex lifting gear was taking longer than expected. The platform installation job, on Husky Energy's White Rose offshore Newfoundland, Canada, was also taken off the near-term job list, after Husky is likely to set the project back to beyond 2020, as the operator adjusts to the current US$30/bbl oil price.

Edward Heerema, Allseas' founder and president is sanguine and eager to put this beast – possibly the most keenly awaited vessel in the industry – to the test.

In retrospect, gradually it was clear the mega-vessel would not make its planned operational timetable, he says. They simply underestimated the amount of work that would be involved in installing, commissioning and testing the 16 lifting beams that sit on the vessel's bows, not least because of some 2500 km of electric cabling, terminations, hydraulics, etc., that power this hugely, interconnected complex system. The design means each of the beams can move in three directions independent of the others, in combination with the ship's ballasting systems, to compensate for motions as a structure is lifted or lowered. It's far from simple and comes complete with redundancy.

In-Depth

See Infield at OTC Booth #4676

Quick stats

OE's at-a-glance guide to offshore hydrocarbon reserves and key offshore infrastructure globally is updated monthly using data from leading energy analysts Infield Systems (www.infield.com).

New discoveries announced

Depth range	2013	2014	2015	2016
Shallow (<500m)	72	72	53	3
Deep (500-1500m)	19	29	15	2
Ultradeep (>1500m)	34	12	13	2
Total	**125**	**113**	**81**	**7**
Start of 2016 date comparison	127	114	72	-
	- 2	-1	9	7

Note: Operators do not announce discovery dates at the time of discovery, so totals for previous years continue to change.

Reserves in the Golden Triangle

by water depth 2015-19

Water depth	Field numbers	Liquid reserves (mmbbl)	Gas reserves (bcf)
Brazil			
Shallow	9	30.75	333.28
Deep	11	1204.00	1595.00
Ultradeep	41	11,598.00	12,833.00
United States			
Shallow	11	66.15	144.00
Deep	20	982.27	1058.48
Ultradeep	23	3157.50	3020.00
West Africa			
Shallow	124	4063.45	16,851.22
Deep	37	5407.50	6350.00
Ultradeep	17	2150.00	2610.00
Total	284	28,628.87	44,461.70
(last month)	(286)	(28,870.87)	(44,541.70)

Greenfield reserves

2015-19

Water depth	Field numbers	Liquid reserves (mmbbl)	Gas reserves (bcf)
Shallow	942	35,201.08	482,880.62
(last month)	(982)	37,816.14)	(502,542.59)
Deep	143	9471.93	118,532.62
(last month)	(144)	(9676.93)	(118,522.62)
Ultradeep	88	17,210.90	44,560.00
(last month)	(90)	(17,367.90)	(44,700.00)
Total	1,173	61,883.91	645,973.24

Pipelines

(operational and 2015 onwards)

	(km)	(last month)
<8in.		
Operational/ installed	42,095	(42,302)
Planned/ possible	24,250	(24,495)
	66,345	(66,797)
8-16in.		
Operational/ installed	83,458	(83,639)
Planned/ possible	48,839	(49,549)
	132,297	(133,188)
>16in.		
Operational/ installed	95,106	(94,172)
Planned/ possible	44,996	(45,081)
	140,102	(139,253)

Production systems worldwide

(operational and 2015 onwards)

Floaters		(last month)
Operational	272	(273)
Construction/ Conversion	52	(51)
Planned/possible	309	(313)
	633	(637)
Fixed platforms		
Operational	9260	(9291)
Construction/ Conversion	97	(85)
Planned/possible	1377	(1411)
	10,734	(10,787)
Subsea wells		
Operational	4872	(4880)
Develop	421	(424)
Planned/possible	6396	(6451)
	11,689	(11,755)

Global offshore reserves (mmboe) onstream by water depth

	2014	2015	2016	2017	2018	2019	2020
Shallow	14,528.97	20,949.72	39,811.33	16,372.41	15,986.26	22,801.80	25,454.94
(last month)	(14,528.22)	(20,973.15)	(39,799.62)	(16,690.08)	(16,521.25)	(23,774.11)	(29,719.19)
Deep	4469.26	1085.18	5491.04	2221.55	4423.30	6210.09	12,063.71
(last month)	(4469.26)	(1085.18)	(5491.04)	(2221.55)	(4592.11)	(6139.51)	(12,168.71)
Ultradeep	2342.81	1928.92	3173.17	3231.63	4893.14	5880.73	7888.56
(last month)	(2342.81)	(2037.21)	(3067.88)	(3228.63)	(4893.14)	(6195.41)	(7953.85)
Total	**21,341.04**	**23,963.82**	**48,475.54**	**21,825.59**	**25,302.70**	**34,892.62**	**45,407.21**

***Pioneering Spirit* with *the Lorelay*, one of Allseas' first vessels.**

Allseas has also worked through a number of component level design flaws, such as a gear sprocket, used to move the beams forwards and back, which had to be removed and a new stronger sprocket designed.

"We did not plan the commissioning of the beams sufficiently accurately," Heerema says. "If you take all the cables you have to pull, the terminations, cylinders, valves, control systems, etc., multiplied by 16 beams... it gradually became clear that 2015 couldn't be achieved."

But, he says: "We have had no fundamental problems. We are totally confident in the system, we are just going through the work and it is just slow. There were a few design flaws but none were insurmountable. There are so many control systems, everything has a backup, redundancy." The delay has also given the yards preparing to receive this facilities more time to get ready, Heerema says.

To date, 12 of the 16 beams have been installed and Allseas is focused on completing these, ready for the Yme job, for which only 12 are needed.

The system that allows for the cooperation of all the beams together was tested a long time ago, Heerema says. Each beam's ability to move up and down, sideways and in and out has also been tested. The next step is testing them working in a real operation, which will be via a test lift in Dutch waters using a 5500-tonne dummy topsides, built for Allseas, sitting on the now decommissioned North West Hutton modular support frame, installed on suction piles.

Scheduled for some time in May, this will be a key – and for Edward Heerema exciting – test of the system, as it will verify the cooperation of the beams working together. "The point isn't how much the system lifts," he says. "It is how it lifts." Just as cranes have to be tested to 10% above their capacity, each beam will also be tested to 10% over its 3000-tonne capacity, by hanging a cargo barge from it.

The huge unit's massive ballasting capabilities are already being tested as work is carried out. *Pioneering Spirit* is currently ballasted low enough to allow work on the lifting beams from the purpose-built *Iron Lady* barge, positioned between the twin hull slot. The ballast capacity ranges from a draft of 10m to 27m. This involves pumping 37,000cu m of water per hour.

Once testing is complete, the vessel will sail out to Yme, often called "why me," after the facility had to be scrapped

09 March 2016

The test platform under construction.

before going into production due to issues with its substructure. Its topsides will be lifted and then taken to the Lutelandet yard in Norway, transferred by the *Iron Lady*, to be decommissioned by Veolia. Allseas' work will then focus on adding the final four beams, including two that have been extended 5m, ready for a targeted May 2017 Brent Delta topsides removal, with disposal, again via the *Iron Lady*, to Able's yard in northeast England.

The vessel's 170m long stinger, completing the 2000-tonne tension capacity S-Lay pipelay package, is ready to be installed when it's required, and sitting in storage in Vlissingen, Netherlands. Meanwhile, the jacket lift system, a tilting system, which has been fully designed with some equipment and steel purchased, is still on hold – it's not currently required until 2019, for the one Brent steel jacket (the rest are concrete gravity based structures).

However, while *Pioneering Spirit* remains without its jacket lift system, Allseas is planning to add a 5000-tonne long reach crane to the rear of the vessel, where the jacket lift system is due to also go later on. Allseas hasn't been afraid of making changes to the *Pioneering Spirit*, including, mid-build in 2013, deciding to increase the slot size for wider platforms. The latest addition, as well as numerous other optimizations and tweaks since construction started back in 2010, is the result of numerous feasibility studies for clients, Heerema says.

"We have been going around telling the industry for 25 years about this and initially clients said it's nice, but didn't take it seriously," he says. "Since construction started in 2010, and it's for real, we are getting orders from clients who let us do paid studies of exactly how we lift their platforms. Then, we had to go into every detail of how to do it. Some things had to be more optimized or done in a smarter way. That's given us a lot of additional knowledge.

"As an example, we are going to add a 5000-tonne crane on

Rig stats

Worldwide

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	104	77	27	74%
Jackup	399	267	132	66%
Semisub	144	97	47	67%
Tenders	31	22	9	70%
Total	678	463	215	68%

North America

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	35	30	5	85%
Jackup	23	6	17	26%
Semisub	16	11	5	68%
Tenders	N/A	N/A	N/A	N/A
Total	74	47	27	63%

Asia Pacific

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	12	4	8	33%
Jackup	118	69	49	58%
Semisub	33	16	17	48%
Tenders	21	15	6	71%
Total	184	104	80	56%

Latin America

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	29	22	7	75%
Jackup	54	38	16	70%
Semisub	31	27	4	87%
Tenders	2	2	0	100%
Total	116	89	27	76%

Northwest European Continental Shelf

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	N/A	N/A	N/A	N/A
Jackup	48	42	6	87%
Semisub	43	31	12	72%
Tenders	N/A	N/A	N/A	N/A
Total	91	73	18	80%

Middle East & Caspian Sea

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	1	0	1	0%
Jackup	111	88	23	79%
Semisub	4	3	1	75%
Tenders	N/A	N/A	N/A	N/A
Total	116	91	25	78%

Sub-Saharan Africa

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	22	18	4	81%
Jackup	22	14	8	63%
Semisub	9	7	2	77%
Tenders	8	5	3	62%
Total	61	44	17	72%

Eastern Europe

Rig Type	Total Rigs	Contracted	Available	Utilization
Drillship	N/A	N/A	N/A	N/A
Jackup	2	1	1	50%
Semisub	1	0	1	0%
Tenders	N/A	N/A	N/A	N/A
Total	3	1	2	33%

Source: InfieldRigs 11 March 2016

This data focuses on the marketed rig fleet and excludes assets that are under construction, retired, destroyed, deemed non-competitive or cold stacked.

the ship as well as the jacket lift system. The jacket lift system is wonderful for jacket lifting, but it is not quick or versatile. If we want to do quick small lifts, there is pressure to have a fast traditional crane with a long boom." More details are to be decided.

The *Pioneering Spirit*, developed over three decades, enters a market in one of its toughest down cycles, with few expecting a return to a boom any time soon. Allseas, which also operates pipe layers including the *Solitaire* and *Audacia,* and other vessels, is holding its own, Heerema says, even if that means waiting on investing in the *Pioneering Spirit's* jacket lifting system.

The current market conditions also means work on *Amazing Grace*, a new heavy lifter which would dwarf *Pioneering Spirit* with a 72,000-tonne topside lifting capacity (*OE: August 2014*), has slowed. "We are still equally enthusiastic, but the speed has been reduced and delivery date shifted forward two plus years from what we had been saying before," which was 2021, Heerema says.

"My feeling is that the business will stay depressed this year and next, and 2018 will start to pick up for a few reasons," Heerema says. "New wells will have to be drilled because insufficient work is being done at the moment, and fields will deplete. Also, the oil producing nations will have to come together to talk to Saudi Arabia to limit production of oil, so the price goes up. I guess one day or another this will take place. "This time it is very politically driven," he adds, "with antagonism between several countries, so it is difficult to predict. The situation makes our cash flow low, but there is work which covers all our dues. But it is not enough to make large new investments."

As a decommissioning vessel, the hastening of field cessations caused by the low crude prices, should, in theory, result in more work for the *Pioneering Spirit*. Yet, operators are holding back, wanting to save their cash, Heerema says.

"They are doing preparations for decommissioning but not spending money on it because they need the cash," he says. "There is no urge for them to do it," despite the costs of keeping a platform idle and indeed the current lower rates of drilling rigs and subsea construction vessels, which could be used for plugging and abandonment campaigns or removing subsea infrastructure.

The time will come when they have to bite the bullet and one of the tools that could help them looks finally set to prove itself this year. OE

OE has been following the progress of the *Pioneering Spirit*, for many years named the *Pieter Schelte*, after Edward Heerema's father. Last year, we also got a tour of the gargantuan vessel.
Gallery: http://ow.ly/ZJyOT