Subsea goes off the boil

DEMAND LULL IN MARKET

Preparatory work already carried out

PLANS to take the Twister gas separation system subsea appear to be on hold because of reduced pull from the market, *writes Adrian Cottrill*.

However, substantial preparatory work has been done in recent years.

Twister chief executive Mick Longton says: "The subsea Twister is a step that will come after we get subsea compression installed and proven."

A subsea feasibility study was completed in 2002 with Norske Shell and FMC, sponsored by Norway's Demo 2000 programme and including work at Statoil's K-Lab. That was the first move in a four-year development programme, later with support from the European Union.

Next came a co-operation agreement with Petrobras in 2006, envisaging an onshore test followed by a subsea pilot test offshore, and hope of a commercial subsea system by 2014.

The onshore test did indeed go ahead successfully in Bahia, northeast Brazil, and Petrobras considers the technology qualified.

The oil company even went so far as to name a preferred location for the subsea test — the Canapu field in 1200 metres of water. However, there is as yet no firm timetable for further progress.

The next step would be a contract to marinise the Twister unit, but with Petrobras pre-occupied with major developments, the focus looks to be off the subsea Twister at present.

GAS SEPARATION

Tunu deal is the next leap ahead for Twister

Dutch innovator wins **contract from Shell** to supply **system** in **Nigeria**

ADRIAN COTTRILL
London

ELEVEN-year old hi-tech company Twister has this month reached another milestone in the drive to promote its unique gas separation technology.

The compact Twister technique exploits a swirling vortex flowing at supersonic velocities to remove water and heavier gas liquids from a raw gas mix.

The Dutch company — spun off by Shell Technology Ventures in May 2001 — has just announced a contract from Shell in Nigeria to supply a system for the Tunu processing facility in the Niger Delta's southern swamp area.

This plant forms part of the Nigerian government's initiative to reduce gas flaring.

"Not only is Tunu our fifth commercial contract, but it will allow us to work with the most variable gas specification that we have yet handled," says Twister chief executive Mick Longton.

"Meanwhile, we have also been settling into a promising relationship with Honeywell subsidiary UOP," says Longton.

Four months ago the two companies formed an exclusive marketing alliance that UOP says "allows us to expand our current suite of natural gas processing technologies and equipment".

UOP also took a 20% shareholding in Twister, in what Longton describes as "an important endorsement of our technology".

He has high hopes that this link to a large mainstream partner will be a great help in overcoming the challenges always faced by those who attempt to push innovative technologies in a traditionally conservative and risk averse industry.

"Through UOP, Twister will get wider exposure, and gain from becoming part of a larger package offering," he says.

Local content When Tunu goes on stream in mid-2014 it will be the second Twister system operating for Shell in Nigeria.

The first is at the Okoloma gas plant which feeds the Afam power station, and has now been running for three years. Like Afam, the new Tunu order calls for six Twister tubes at a contract value likely to be similar to Afam's rumoured $12 million.

Tunu will have a much greater local content than Afam, organised via Nigerian partner Fairshores. "For Afam we built the complete module outside Nigeria" says Vincent Groote, Twister's sales director for Europe, Mid-East and Africa.

"Now, for Tunu, we will build specialist elements like the tubes and vessel outside Nigeria, then bring these into the country for modularisation there."

With a throughput capacity of 4.5 million cubic metres per day (30,000 barrels of oil equivalent per day), the Twister system for Tunu is slightly larger than Afam's, and incorporates various refinements compared with that predecessor.

"We now have a smoother inner surface to the tube, which reduces internal resistance," says Groote. "Also, at the exit point where we separate into wet and dry gas we have optimised to a snail-shell

Start of the commercial path: the 12-tube array on Malaysia's B11 platform remains Twister's largest serving system to date

Photos: TWISTER

shape rather than the more abrupt bend of the Afam system."

Throughout the dozen years of its life, Twister technology has been steadily refined.

The technology made its commercial breakthrough on Shell's B11 platform off Sarawak where a 12-tube array has performed well in this sour gas environment and notched up more than eight years of service.

With a design capacity of 17 million cubic metres per day it remains the largest Twister system to date.

Refinement The next contract — Afam, four years later, in 2006 — was the first to adopt a second-generation "low pressure drop" tube design.

This reduces the loss in pressure as the gas passes through the system from around 35% to 25%, boosting the force experienced by the swirling vortex in the tube to 500,000g.

Then came an order from Brazil's Petrobras for an onshore test in Brazil to pave the way for possible use subsea.

In September 2008 Colombia's Ecopetrol ordered a two-tube system for its Gibraltar onshore field. Commissioning issues have slowed progress, but Twister is now expected to start up there in June this year.

Progress on sour gas

LOOKING to the future, Dutch company Twister is examining how to exploit its gas separation technology for pre-treatment of sour gas.

Reduction of high levels of hydrogen sulphide and/or carbon dioxide contaminants is clearly a future direction, says regional sales director Vincent Groote, to provide a gas that is within the capabilities of existing treatment technologies.

"Although we are still in the conceptual phase, real progress is being made," Groote says.

He explains that Twister's supersonic velocity of the gas induces a 50 degrees Celsius drop in gas temperature by the time it reaches the separation point in the tube. This means that a normal inlet temperature of 20C goes down to -30C in the tube.

"In typical natural gas regimes you can knock out hydrogen sulphide at -50C, and the bulk of carbon dioxide at -70C," Groote says. "So you can achieve this by lowering the gas inlet temperature accordingly."

Groote also mentions carbon dioxide removal on an FPSO, where use of Twister in the treatment train could save valuable space compared with existing approaches.

At the heart of all this is expertise in computational fluid dynamics, says Groote.

"We have a model which we can use to predict multiphase gas behaviour in Twister tubes, but we can also use it for a lot of other things," he adds.

System is a model of supersonic simplicity

Fast mover: gas is rotated at supersonic speed in a Twister tube

INSTEAD of the traditional approach to dehydration of natural gas and separation of gas liquids, with its large and complex machinery and extensive use of chemicals such as glycol, the Twister system has at its heart a two-metre long steel tube that is no more than 200mm in diameter.

Here the stream of cooled wet gas is forced to swirl at supersonic speeds so that centrifugal force pushes the liquid droplets outwards to the pipe's inner wall where they can be channelled off. It is simple, compact, and has no moving parts.