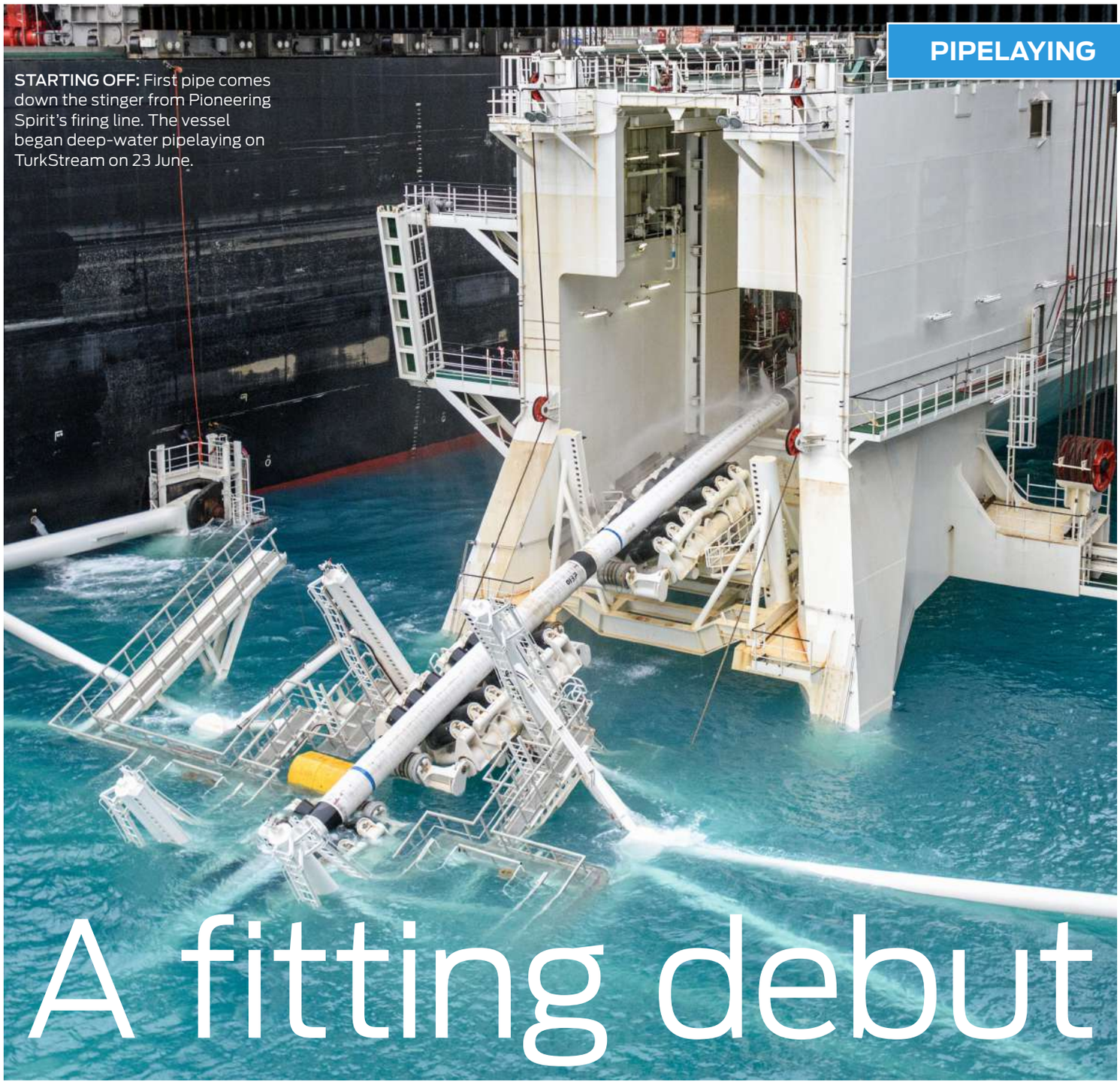


STARTING OFF: First pipe comes down the stinger from Pioneering Spirit's firing line. The vessel began deep-water pipelaying on TurkStream on 23 June.

Photos: Allseas

A fitting debut

The first contract to call for Allseas' mighty new vessel to work in pipelaying mode is now into its fourth month. Adrian Cottrill checks out how the ship has been shaping up in the ultra-deep waters of the Black Sea.

The world's most impressive offshore construction vessel is now about a sixth of the way through its first pipelaying job. And that job is the most technically challenging project yet seen in the pipeline world.

The TurkStream scheme across the Black Sea from Russia to western Turkey provides a truly appropriate maiden pipelay contract for Allseas flagship Pioneering Spirit. This huge vessel has already taken heavy lifting — the prime driver for building it — into a new league by performing single-piece removal of two full platform topsides in the North Sea.

Now TurkStream is giving the unit the chance to prove the other string to its bow — top-of-the-line pipelaying. The project calls for pipe of 32 inch external diameter to be placed in waters that plunge as deep as 2200 metres (2198 metres is the most precise figure currently available). Pioneering Spirit has already reached just about that far down.

Never before has such large pipe been laid at such great depth. The two parallel trunklines will each run 930 kilometres from a Russian dispatch point at Anapa on the Black Sea's eastern shores to a Turkish receiving point at Kiyikoy, 100 kilometres west of Istanbul.

Apart from the diameter/depth combination, the project »

ACROSS THE DEEPS: Most of TurkStream's 930 kilometre route from Anapa to Kiyikoy falls in the Black Sea's abyssal plain, in waters up to 2200 metres deep.

Map: SST

» presents a wide variety of other challenges. The seabed drops steeply from 80 metres to more than 1500 metres at the continental shelf break. Potential geohazards along the route include submarine channels, landslides and mud volcanoes.

Soft sediments in the stagnant deeper waters of the Black Sea's abyssal plain are also unique in containing dissolved hydrogen sulphide. The increased corrosion threat to the outside of the 39 millimetre thick steel pipe wall is countered with a polypropylene coating and specially designed linepipe material.

Off and running

Pipelaying on TurkStream has started at the Russian end. Pioneering Spirit began its stint in a fanfare of publicity on 23 June. Russia's President Vladimir Putin, Gazprom chief

From SouthStream to TurkStream

Russia's initiative to send gas across the Black Sea to western Europe took firm shape in 2011 when Gazprom set up its subsidiary South Stream Transport (SST), now based in Amsterdam, together with European partners ENI, Wintershall and EDF.

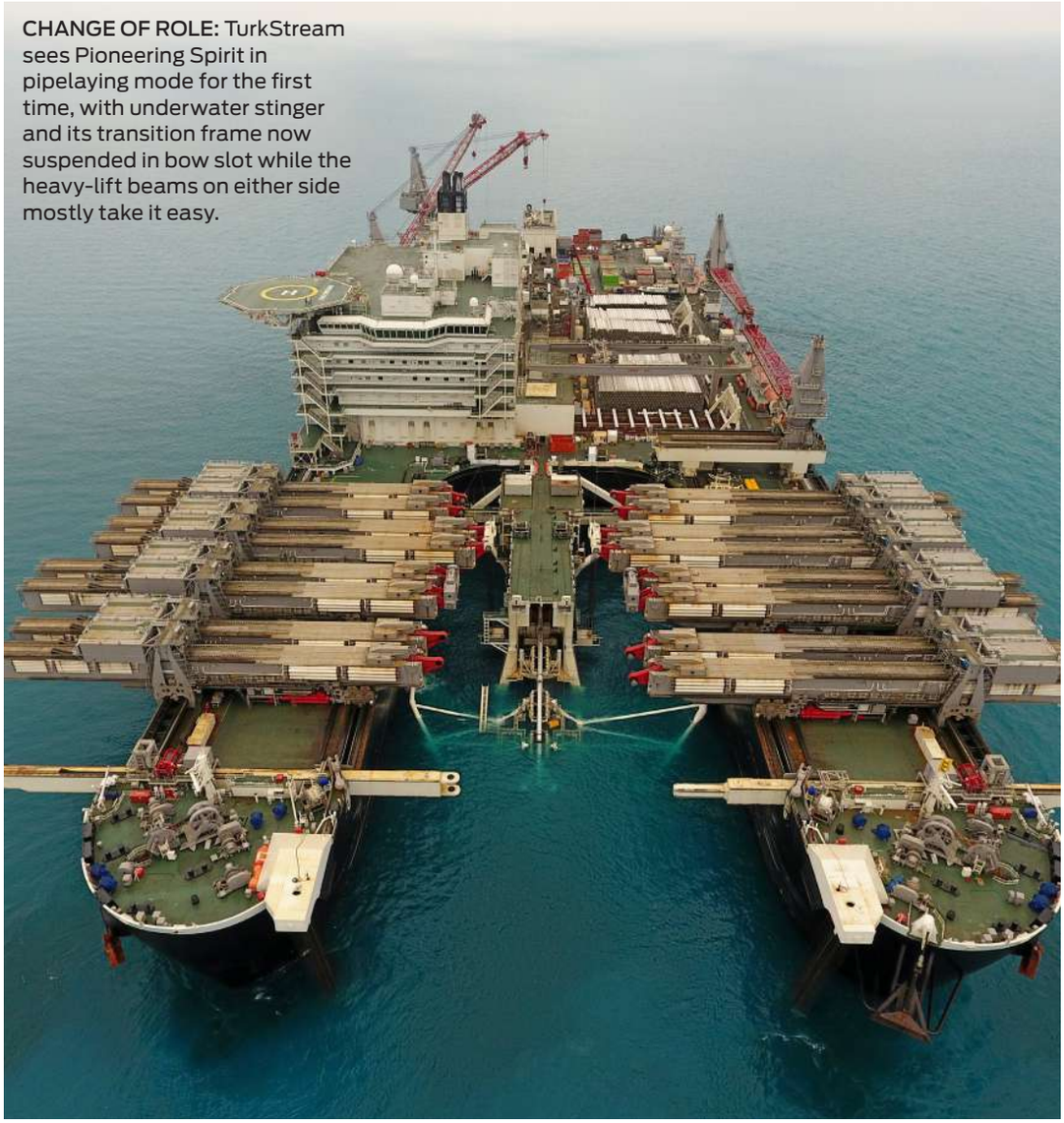
At that time, the plan was to lay four 32-inch trunklines for SouthStream, making landfall in Bulgaria.

Three years into its life, the project entered a period of particular geo-political turbulence as events in Crimea unfolded. In late 2014, with pipe manufacture well under way and the Russian landfall in preparation, Russia's President Vladimir Putin cancelled SouthStream.

On 1 December 2014 the project became TurkStream, now making its landfall in Turkey rather than Bulgaria, and with Gazprom taking over all its partners' shares. The first two-thirds of the 930 kilometre route remained much the same, but with some extra survey work needed on the final third.

A reduction from four trunklines to two — eliminating lines 2 and 3 — then came in October 2015. The name of the client for TurkStream remains SST.

The Russian fighter jet incident over Syria in November 2015 led to offshore works being put on hold for nearly a year until October 2016 when Russia and Turkey signed an agreement that allowed TurkStream to restart. Allseas was awarded the contract to lay Line 1 in December 2016, followed by the award for Line 4 two months later. Co-operation between the two governments continues to be good says SST, and the target for first flow of gas is stated as the end of 2019.



CHANGE OF ROLE: TurkStream sees Pioneering Spirit in pipelaying mode for the first time, with underwater stinger and its transition frame now suspended in bow slot while the heavy-lift beams on either side mostly take it easy.

executive Alexei Miller and Allseas president Edward Heerema were all on board the vessel for the symbolic launch of Line 1.

Floating 30 kilometres out from the coast in 350 metres of water, the ship picked up and connected to the end of the shore approach section (laid in early summer by Allseas vessel Audacia), and started its deep-water mission straight off down the continental slope.

Over the following 11 weeks the vessel went on to install 200 kilometres of Line 1 before laying the end down in a depth of 2170 metres at the edge of Russian waters.

By mid-September, Pioneering Spirit was back inshore, picking up the second line and heading off south-west again, parallel to Line 1 and generally about 300 metres from it. This journey will continue for 870 kilometres until a laydown near the Turkish coast in May next year.

Edward Heerema appears delighted with the way Pioneering Spirit has been shaping up as a pipelayer. "The vessel has laid roughly 245 kilometres of TurkStream so far," he said at the start of October. "Yesterday we reached a peak of 4.6 kilometres, our best daily rate yet.

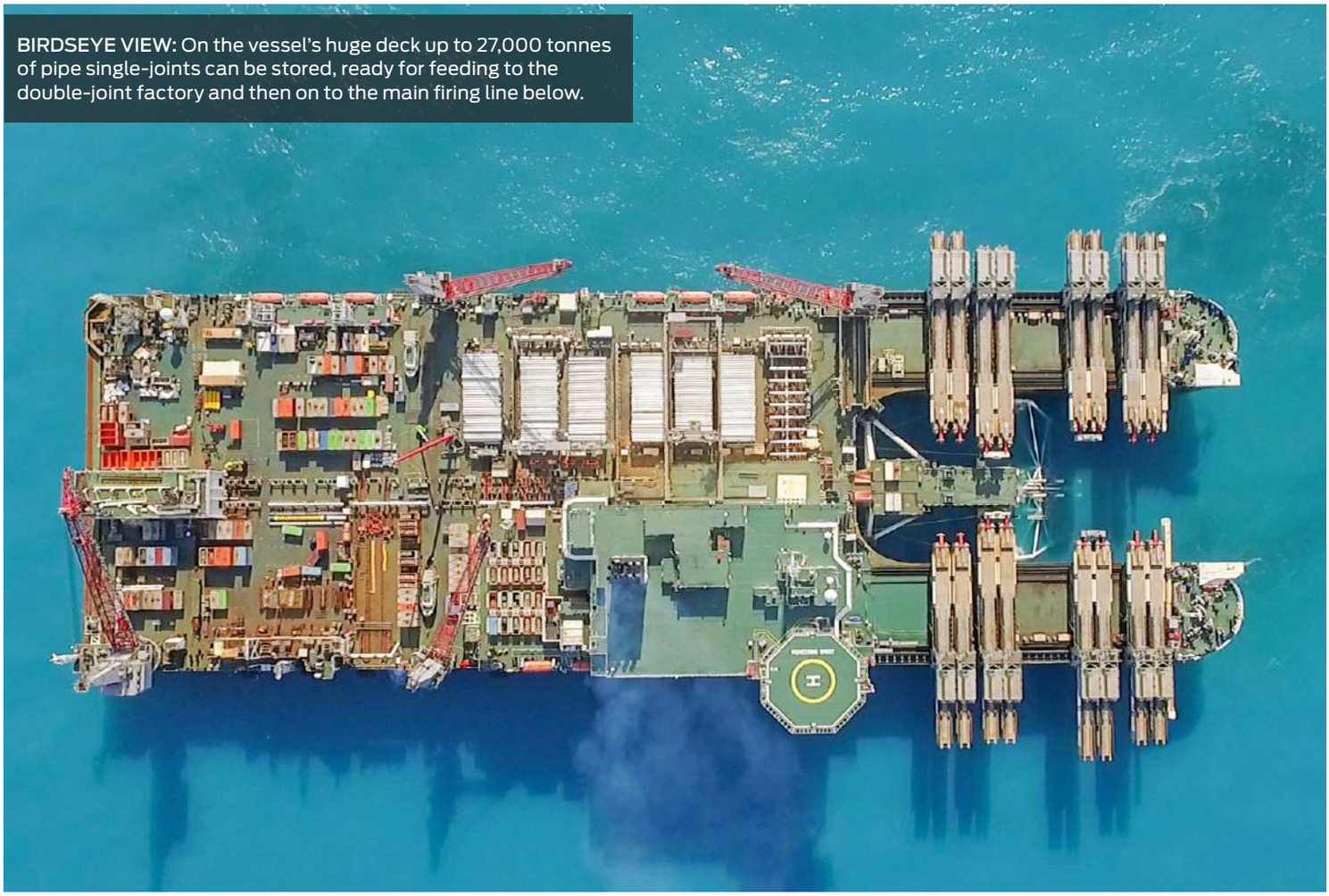
"Every week is getting a little better," he added. "We will surpass our current best daily rate, I just don't know how often. Of course the average is a lot less because you have days with bad luck." So far the average has been about 2.6 kilometres a day.

All in all, "the ship and its equipment have been behaving completely up to expectations", said Heerema. "Frankly, it is fantastic to get such performance so quickly with a ship that is completely new. Teething problems can never be avoided, but there have been no major surprises on this front."

The vessel's DP station-keeping is reported as excellent, not least when laying down the Russian slope. At some points the line had to be placed in a corridor just two metres wide.

Behaviour in bad weather is earning plaudits as well. "We've had days that were so stormy that no support vessel could come near the ship, and still we continued laying pipe," said Heerema.

Allseas' client also appears satisfied. "We are pleased to see that Pioneering Spirit is progressing in line with our schedule," says Jay Chaudhuri, project manager for Gazprom company South Stream Transport (SST) in Amsterdam, "although it is too early for us to evaluate the performance in detail". »



BIRDSEYE VIEW: On the vessel's huge deck up to 27,000 tonnes of pipe single-joints can be stored, ready for feeding to the double-joint factory and then on to the main firing line below.

SMOOTH TRANSITION: Pipe reaches a near vertical departure angle by the time it gets to the end of the huge stinger that hangs in the vessel's bow slot.

World-class kit

On its huge deck area, Pioneering Spirit first receives and stores up to 27,000 tonnes of 12-metre long pipe single-joints. The double-joint factory builds these into 24 metre lengths to be passed on to the 300-metre long firing line below.

This has an impressive six welding stations, along with ultrasonic testing and field-coating facilities. With more than 500 people on board, the workforce naturally includes some of the world's finest welders.

As the line pays out steadily over the stinger it is controlled by four mighty tensioners that offer a combined pipe-holding grip of 2000 tonnes. "However, on this project, only in case of a calamity will the maximum tension capacity be needed," said Heerema.'

Up at the surface, Pioneering Spirit's huge stinger provides for the pipe to slope gently from its near-horizontal angle along the firing line to a steep departure angle as it heads for the seabed.

The stinger is effectively 210 metres long when its transition frame is included. This 6200 tonne combination was first placed in Pioneering Spirit's bow slot in March for initial trials in Rotterdam. Two pairs of the vessel's big lifting beams are used to help support it.

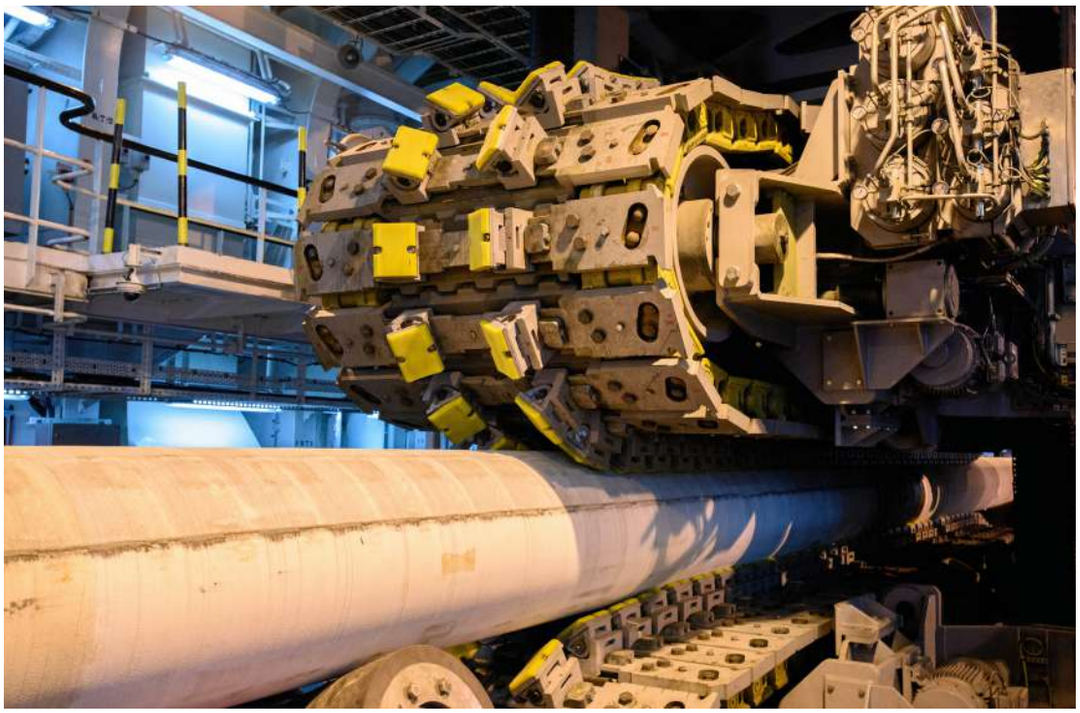
Those trials were to fine-tune pipelay systems and train the welding crew. Then, on arrival in the Black Sea, a period of highly-instructive offshore trials included actual pipelay, and use of the abandonment and recovery system.

Leading-edge design

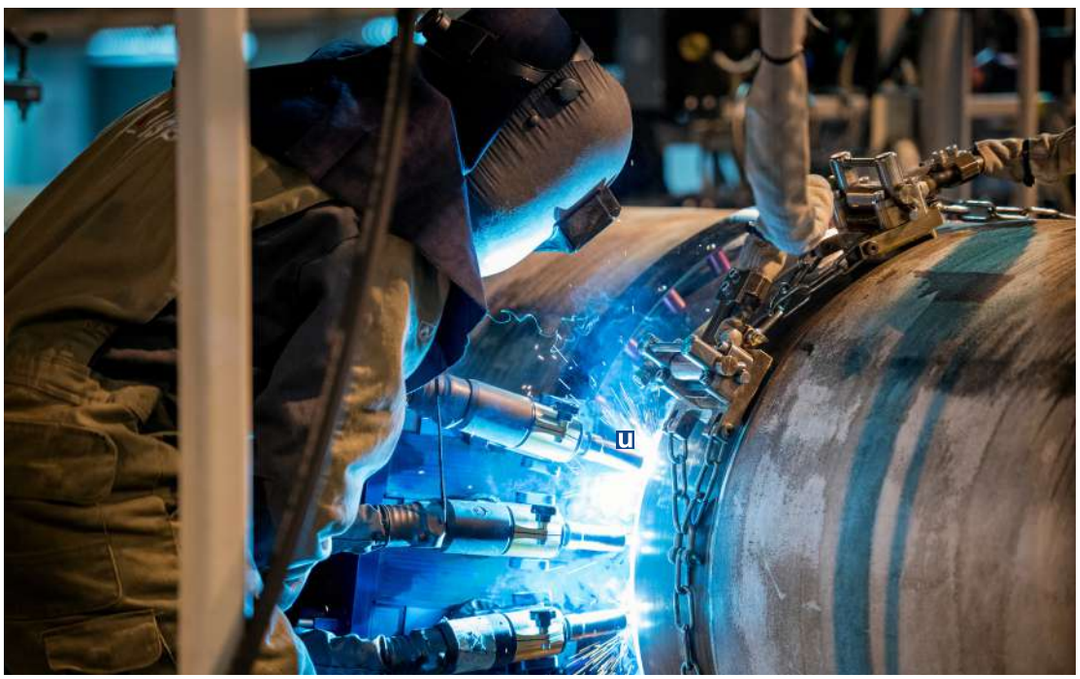
The project's combination of water depth, pipe diameter and length presented SST and its offshore engineering consultant IntecSea with major new technical challenges at the design stage.

"The resulting co-operative effort with industry has yielded impressive advances in areas like pipe manufacture, quality control, installation and pre-commissioning of the overall system," says Chaudhuri.

The most testing stage in



TIGHT GRIP: The line of four mighty tensioners offer a combined maximum pipe-holding power of 2000 tonnes.



ON THE FIRING-LINE: At the molten heart of the matter is Allseas' Phoenix welding system.

the pipe's life is at the seabed sagbend during installation across the Black Sea's deep-water plain. Here the combination of bending and external pressure is at its highest, and the need to resist buckling at this point is the governing factor in the whole pipe design.

In a bid to wring every last drop of throughput potential, the pipe has a mirror-smooth internal epoxy coat, little more than a tenth of a millimetre thick, to reduce its skin friction. TurkStream's ratings for operating, design and collapse pressures are respectively 284 bar, 300 bar and over 350 bar.

TurkStream is also the first such project to receive a hydrotest waiver. Before going into service, lines like this have traditionally been filled with water and pressurised as a final check on integrity. However, that major operation calls for huge volumes of water to be handled and disposed.

For TurkStream, SST has determined — and DNV-GL confirmed — that modern standards of pipe manufacture and testing, and of ultrasonic checking of welds during laying, are now so accurate and reliable that hydrotesting is unnecessary.

With all its challenges, its technical advances, and the unique lay vessel at work on it, TurkStream is definitely living up to its status as just about the most innovative and instructive pipeline project yet seen.