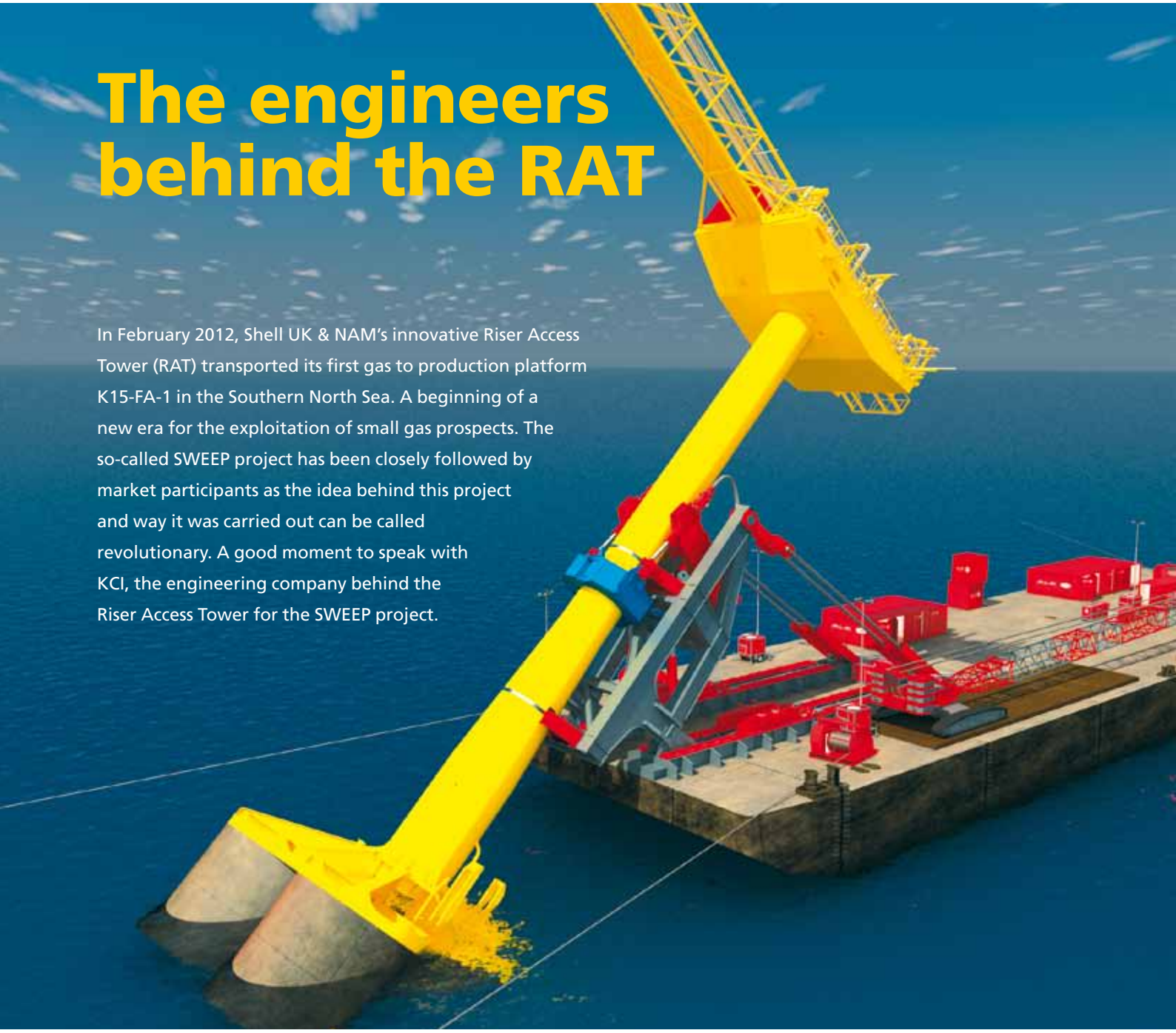
PLATFORM K15-FA-1 IN THE SOUTHERN NORTH SEA

The engineers behind the RAT



In February 2012, Shell UK & NAM's innovative Riser Access Tower (RAT) transported its first gas to production platform K15-FA-1 in the Southern North Sea. A beginning of a new era for the exploitation of small gas prospects. The so-called SWEEP project has been closely followed by market participants as the idea behind this project and way it was carried out can be called revolutionary. A good moment to speak with KCI, the engineering company behind the Riser Access Tower for the SWEEP project.

KCI won the engineering of the generic RAT design on the basis of a competitive bid. After finishing the basic engineering, Shell & NAM asked KCI to complete the detailed design for the first opportunity which is K15-FA. And to take care of the procurement of the long lead items including primary steel. KCI also took care of the fabrication engineering support and assisted in the offshore (pre) commissioning.

Edwin van Drunen, Manager Projects at KCI explains why he thinks KCI won this challenging job: "In 2007, KCI took on the complete development of the MO7 monotower for Cirrus (today known an Oranje Nassau Energy - ONE). Part of this project was the tie-in to NAM's L9-FF-1 platform complex. The co-operation with NAM for the tie-in solutions went very smooth. They saw, I think, our expertise in designing and engineering solutions for marginal gas fields."

The SWEEP assignment

The idea behind SWEEP is to develop a cluster of marginal fields with a generic solution. A one size fits all approach. Cost need to be restricted as otherwise it would be impossible to develop these smaller gas prospects in an economically viable way.

Artist impression of the innovative Riser Access Tower (RAT).

Edwin van Drunen, Manager Projects at KCI.

"They saw our expertise in designing and engineering solutions for marginal gas fields."

- Edwin van Drunen.

RAT platform render 1.

A Riser Access Tower connects subsea wells with an existing production platform. The assignment KCI received from Shell UK and NAM for the SWEEP project, was to limit Brownfield modifications as much as possible.

A further challenge was that the RAT needed to be transported and installed from a barge in order to avoid an expensive installation vessel.

Generic design

In 2009, KCI started with the investigation of seven specific SWEEP locations for the generic design. Mwata Belgrave, KCI project leader for SWEEP, managed the project from the beginning.

''We looked both from a structural and process perspective when starting the investigations. The range of soil conditions, water depths and environmental conditions influences the structural design. We also used a range in gas compositions to design a process system which is able to treat the gas of all SWEEP locations.

Multiple innovations in one design

While Shell and NAM set the boundaries for the generic design, it was up to KCI to come up with creative and cost effective solutions.

RAT platform render 2.

Mwata Belgrave, KCI project leader for SWEEP.

Installation of the RAT platform in September 2011.

Edwin van Drunen feels that 'through the open atmosphere and combined forces of the integrated KCI and Shell/NAM project team the RAT design was brought to a higher level'. It all resulted in a highly innovative detailed design of the first RAT for the SWEEP project.

In fact, there are multiple innovations incorporated in the design: first of all, the RAT is a lightweight structure but at the same time strong enough to carry all equipment in both horizontal as vertical position. Secondly, the installation method was an exciting novelty. Never before a completely precommissioned platform was transported horizontally on a barge and upended to vertical position. The structure was transported on a barge and upended to vertical position by a special frame. In this way it could be lowered to the sea bottom where pumps were used to create an underpressure to suck the structure into the sea floor. A third point and special feature is the fact that the RAT is a completely free standing structure. There are no forces at all that interfere or put pressure on the existing production platform with which the RAT is connected through a bridge. Next to all these structural innovations, smart storing solutions have been incorporated in the fully optimised design. In the outer caissons of the monotower, hydrate inhibitor (KHI or glycol) is stored. In the topside, methanol and corrosion inhibitor (CI) is stored. These smart chemical storing solutions, make the RAT a very compact design.

Knowledge & tools

The design of the first RAT was a truly multidisciplinary project. KCI's structural department & hydrodynamics department teamed up to get the best of insights in the forces and accelerations that would affect the structure. Forces and accelerations during the transport in horizontal position would differ from the in-place conditions after the structure was vertically installed. Software tool like SACS and AQWA were used. Also KCI's departments E&I , process and piping took seat in the multidisciplinary project team.

Chemistry

Looking back on the project, both Edwin van Drunen en Mwata Belgrave feel that the chemistry between all parties involved led to the successful installation of the first RAT. KCI was also closely involved with the fabrication & installation engineering. The RAT was built at Mercon's yard in Gorinchem and installed by ALE. Both companies worked together for the installation and came up with the idea of the upending frame which was a last part of the puzzle to finish this project successfully.