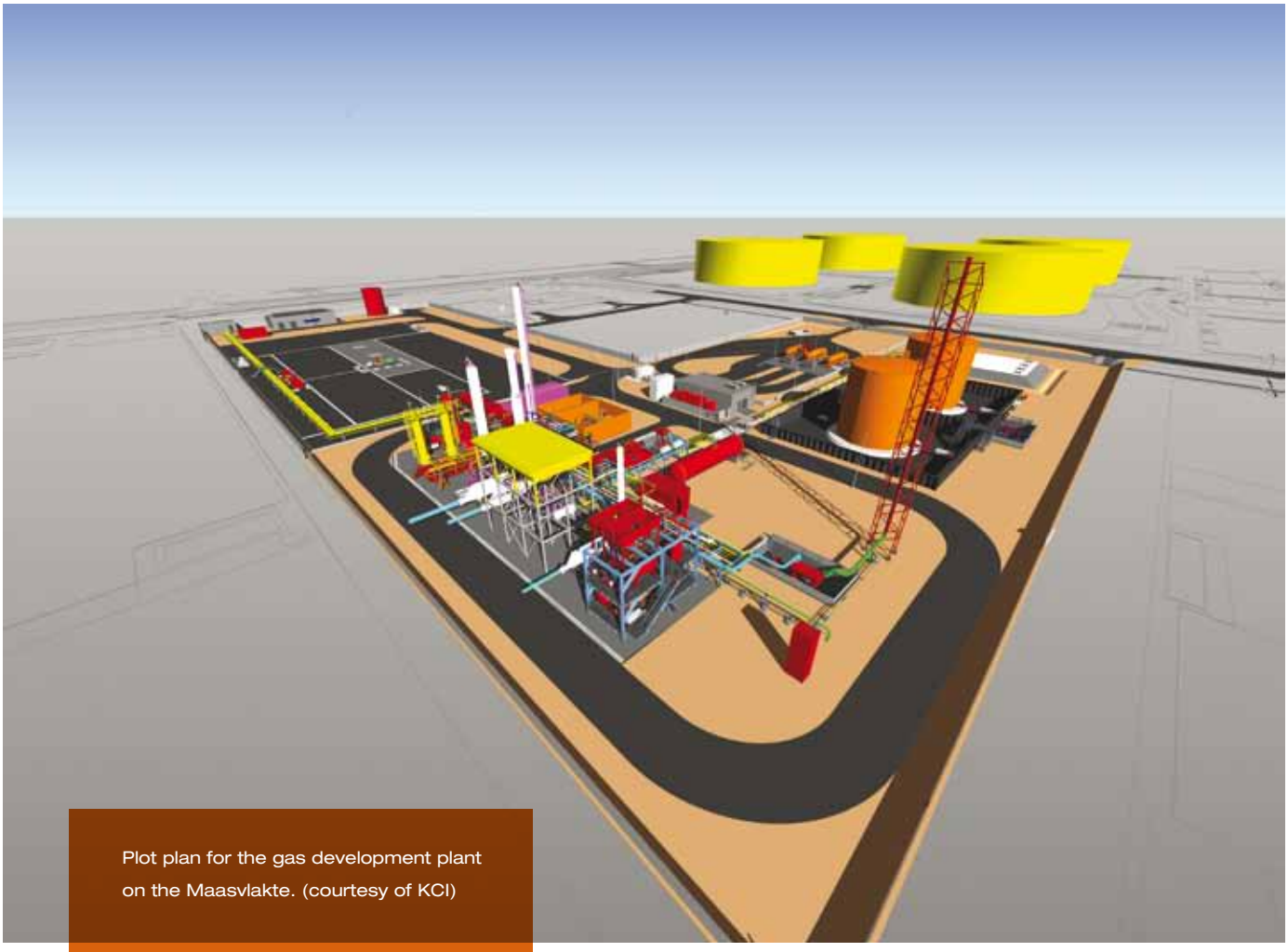
A complex project with a great many challenges

KCI designs unique onshore gas development plant

Commissioned by and in association with Oranje Nassau Energie (ONE) and working to a very short deadline, the consulting engineering firm KCI in Schiedam has designed a unique gas development plant. After completion, this plant will process gas extracted from the Maas field just off the coast in the Q16a block. What is different about this plant is that besides condensate, useful LPG products such as butane and propane, will be separated from the gas flow. Offshore Holland visited Schiedam to take a look and interview some of the people directly involved in the project.



Plot plan for the gas development plant on the Maasvlakte. (courtesy of KCI)

Engineers company KCI became involved in the development of the marginal Maasveld gas field in 2011. Drilling towards this gas field, which lies roughly three kilometres in a north-westerly direction out on the North Sea, began from the Maasvlakte in June of that year. The gas reservoir was reached at a depth of about 2.5 kilometres in the third week of August. This was followed shortly thereafter by extensive production testing. Further to an evaluation of the data that this provided, it was concluded that the gas field has sufficient potential for development and could be economically developed. The volume of gas that can be extracted has been estimated at 820 million cubic metres of high calorific gas, with a lot of condensate.

The partners in the project are Oranje-Nassau Energie(ONE), who will be the operator, TAQA, Energy 06 and Energie Beheer Nederland (EBN), which represents the Dutch state. ONE issued the tender for the design, procurement of the necessary materials and equipment, and the construction of a gas development plant on the Maasvlakte. Based on knowledge, skill and competitive pricing, the assignment for the design and construction of the gas development plant was awarded to KCI. ONE contracted the firm Oranjewoud for the civil engineering aspects of the project. KCI's role in the entire project ranged from the FEED/detailed design, process engineering assistance, integrated control system engineering and procurement, to project management and commercial assistance.

Transformed restrictions

"To start with," says Shahruz Asgari, head of the Process Department at KCI, "we were asked to undertake a conceptual study for the production of gas with a relatively simple installation. But once we could examine the composition of the gas from the Maasveld in more detail, we realized that there were some restrictions. This has do to with the strict delivery specifications which apply to natural gas and gas condensate. We solved this problem and transformed the restrictions by making it possible to separate a number of useful LPG products, such as butane and propane, from the gas flow. Our goal was, of course, to supply the gas in accordance with the required specifications, but at the same time enable LPG products to be separated in a way which is both economic and involves a minimum of risk. In the end, it turned out that our solution could do this, but before reaching that point we had already looked at almost 20 different processes. This took place in close consultation with ONE's experts. In the meantime we were also able to make a good estimate of what it would cost to build such a gas plant. And as it turns out we remained within the set margins, which we are really proud of."

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Major challenge

The concept phase was followed by the FEED (Front End Engineering and Design) phase. A few more partners joined the KCI/ONE team thereby creating a multidisciplinary team. KCI project manager Jack van Vliet explains that the key to the success of the project was the integrated way of working with the client, which led to a shared sense of responsibility among the team for the project management, as well as the procurement of the equipment for the gas plant, such as the automated systems. During peak periods there were 50 people on the team. This was necessary because throughout the entire project we had to stick to a strict schedule. The team occupied an entire floor of our offices in Schiedam. In this way the available expertise should be quickly shared. And because the lines of communication were short, decisions could be made quickly. Certain equipment already had to be ordered during the detailed design phase because of the long delivery time. This was necessary in order to start at the time agreed with the client on the assembly of the plant, which comprises some 75 large pieces of equipment in total. The detailed design was ready by the time the construction work began. This was not always easy because the work on the detailed design, to some extent, had to run concurrently with the construction engineering. But this was the only way in which we could meet ONE's request for the gas plant to be operational by the final quarter of this year.

Unique installation

LPGs are separated from natural gas in several place in Europe. "As such, this is a known technique," Shahruz Asgari continues. "What is unique to

the Netherlands, however, is that this is the first gas plant in which butane and propane can be separated economically while the gas can also be delivered in accordance with the required specifications. The additional investment in the separation equipment will therefore yield extra income for ONE, and this is what makes this plant unique."

Project Manager Jack van Vliet agrees with that and further comments that the project has attracted considerable interest shown by other operators in the Netherlands. "The entire gas development plant has been built alongside the MOT tank terminal and the ECT container terminal on a site of 300 x 300 metres. The gas produced after processing is supplied to Gasunie, the condensate is transported by pipeline to the adjoining tank terminal, but can also be transported by tank truck, if required. This will also be done with the separated butane and propane. The plant will have a special transhipment installation for this. For the time being the plant will be connected to one well. The plant has been set up for connection to three production wells in total. The processing capacity of the installation is one million cubic metres of gas a day. We have carried out another study to see if gas from other fields could be processed in the plant. Facilities are also being installed to apply compression when the pressure in the Maasveld gas field starts to fall in a few years' time."

Mission accomplished

Looking back on the recent period Jack van Vliet sums up his experience. "What makes this project interesting in my view, is that it covers every facet of gas processing. From compression, dehydration and separation to storage and transhipment. We were able to put forward the right solutions for all these areas by making use of the latest technologies available for this. Making sure that everything met the current legislation and provisions was not always easy. This is because the onshore regulations are quite different than those for offshore and many other restrictions also apply in the Rotterdam Port area. For both ONE and ourselves, this was quite a challenge. And the fact that we had to start on the detailed design during the conceptual phase added to the pressure. The challenge here too was keeping the flow of information and all the changes which the various parties wanted to make to the design under control. By working together closely, the project team succeeded."

"We completed the entire project successfully, and we learned a great deal in the process," concludes Shahruz Asgari. "I therefore think that operators will want to take another hard look at their own strategy now that a way has been found to extract more value out of their gas production."