Super tunnel: Strukton digs deep in South Korea

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Travelling at high-speed, the Strukton boat navigates it way through the many densely grown rock islands between Gaduk and Geoje. And although the trip takes longer than an hour, that’s still 2.5 hours shorter than the alternative: a detour by car via the mainland. In 2010, when the new connection is ready, the travel time will be reduced to 40 minutes.

Strukton, the company that originated from the railway construction company of Dutch Rail, NS, has a lot riding on this undertaking. This prestigious project off the South Korean coast is destined to become the calling card of the Dutch concern abroad. “We want to become the world’s leading immersed tunnel constructors,” says director Martijn Smitt, while a school of dolphins surfaces alongside the boat. “But then we have to prove ourselves here. In this country, everything revolves around trust. We simply may not betray their confidence.”
That is the reason why Smitt has personally visited the project at least once every six weeks to see how it is progressing. And to ensure that the company staff permanently stationed in South Korea is well cared for. A luxury residential complex consisting of 25 rooms, each fitted with Dutch TV and an Internet connection is being built for them. The communal kitchen will be led by a chef who will probably be taught the finer points of Western cuisine by top chef Herman den Blijker, as part of his TV programme ‘Herrie in de Keuken’. But that is not the only interest shown by television in the South Korean megaproject. It is also the subject of a documentary by the American channel Discovery.

The tunnel for the Busan Geoje Fixed Link project, the official name for the bridge and tunnel connection between the islands of Geoje and Jungjuk, will consist of 18 concrete tunnel sections, each of a length of 180 metres and a breadth of 35 metres, resulting in a total length of 3,200 metres. The sections will be immersed to 60 metres under sea level, without causing any hinder to the busy shipping traffic. That will make it the longest and deepest immersed tunnel in the world.

Strukton was commissioned by Daewoo, one of the most powerful ‘chaebols’ – family conglomerates – in South Korea. For the South Korean concern, active in practically all sectors of the national economy, the knife cuts on more than two sides. Because once the $32 million project has been completed, Daewoo will have an ideal access route for the suppliers of its own shipyards in Geoje, who currently still have to make the time-consuming detour via the mainland. And the new road will no doubt make Geoje even more popular among South Korean tourists who flock to the idyllic peninsula every summer. What’s more, Daewoo may for a period of 40 years levy toll on the new connection, which is expected to be used by over 30,000 cars a day.

Director Bo-Hyun Yang confirms that this is an exceptionally large operation, even for Daewoo. “This is one of the largest infrastructure projects in the history of South Korea,” he says. “Preparations started as early as in 1995. But many investors initially didn’t dare take the plunge. It took until 2002 until the final decision was taken.”

Daewoo briefly considered carrying out the whole project itself, Yang admits: “But we soon came to the conclusion that we have neither the know-how nor the technology to build such a tunnel.”

Ultimately, two large companies were short listed for the order. The Japanese Obayashi and Strukton. “But the Japanese mentality differs somewhat from the European,” says Yang with a degree of understatement. The Koreans still have a problematic relationship with the Japanese, who occupied Korea for several decades in the first half of the previous century. The Dutch, on the other hand, are greatly admired. Practically everybody in the country knows the name of Hendrick Hamel van Gorcum, whose ship ‘De Sperwer’ shipwrecked off the South Korean coast in 1653. “The Dutch have been trading in this area since the 16th century,” says Yang; “They are uniquely familiar with the Asian mentality.”

There was, however, a brief moment when Daewoo feared that the cooperation with Strukton would fall through. That was after a new missile test by the Stalinist regime in North Korea, with which South Korea is still formally in a state of war. “We feared that Strukton would consider the situation too dangerous,” says Yang.

In reality, that was never an issue, says Strukton director Martijn Smitt during the boat trip to the construction docks in Anjon, where the first tunnel elements will be floated. “That thought never crossed our minds. For precautionary reasons, we did, however, include a clause in the contract that Strukton would get all its investments compensated, plus an additional fee, if the situation with North Korea were to get out of hand.”

Strukton’s staff are full of praise for the cooperation with Daewoo up to now. “It is remarkable how much respect Daewoo commands in this country,” says project director Gert Nederend, who welcomes the Dutch visitors at the construction dock. “Waiting months for certain components, as sometimes happens in the Netherlands, is unimaginable here. If the big boss says that something has to be ready at a certain time, then you can be sure it will be.”

Martijn Smitt nods in confirmation: “People here are very hierarchical. And the working days are long, from seven to nine – or later if that’s what it takes to get the job done. Six days a week. While this is certainly not a low-cost country. In fact, the salaries here are higher than in the Netherlands.”
Up to now, the cultural differences between the Koreans and Dutch have been manageable, says Nederend. “Of course, you should never reprimand somebody in front of his colleagues. That would cause serious loss of face. In such a case, you must take somebody aside. But, who knows, perhaps that’s something that we should do more often in the Netherlands.”

In a shipyard immediately alongside the construction dock, the finishing touches are being made to a freighter, the product of a shipbuilding industry in which the Dutch also excelled until quite recently. Isn’t Strukton concerned that Daewoo is simply out to learn the tricks of the trade? Remco van de Wijngaard, 2nd immersion officer, does not rule that out: “Anyone can build a tunnel. But tunnel immersion is a completely different discipline. The Koreans will let us complete this one project, then they might decide to do the next one themselves.”

Project director Nederend is less pessimistic. “We don’t tell them everything,” he says. “They will need us again next time. What’s more, we will have built up a good working relationship with them in the meantime. And that is highly appreciated in a country like Korea.”

The weather is a critical factor in the planning of the project. Tunnel sections can only be immersed under calm sea conditions, which only occur over a couple of months a year. A day later than scheduled, the first of the 18 tunnel elements leaves the dock. A second should follow immediately afterwards, but the exit is blocked by hundreds of Korean fishermen who feel they are receiving insufficient compensation for income they fear they will lose as a result of the construction of the bridges and tunnels.

Director Smitt thinks that the protest actions are highly premature. In his opinion, it is questionable whether the new link will have any negative impact on fishing. “It may even have a favourable effect,” he says. “In a similar project in Canada, the fish were in fact drawn to the bridge piers.”

Same technique as in North-South Line

In constructing the South Korean tunnel, Strukton is using exactly the same technique as applied in the North-South Line and other immersed tunnels in the Netherlands, says director Martijn Smitt: “The principle is the same. Only the local conditions call for specific modifications. Here we drop down to 60 metres, and surface conditions can be pretty rough sometimes. The River IJ, in comparison, is like a big bathtub, without waves, and only 14 metres deep.”

The project in South Korea involves 18 tunnel elements with a total length of 3,200 metres, that consists of just four sections in Amsterdam; one under Central Station and three under the River IJ. Work on the North-South Line is proceeding according to schedule, says Smitt. “In fact, the immersion part is proceeding slightly faster than planned. The last two sections were shipped from the dock in June and are now parked in the Suezhaven port.”

The start of this year saw the completion of the western wall of the new metro station under Central Station, part of the North-South Line in Amsterdam. “Work is now proceeding on completing the eastern wall,” says Smitt.

The walls consist of piles that are drilled to a depth of 30 and 60 metres under the railway yard. They are earth and water-retaining, effectively forming a solid construction pit in which a long tunnel elements can later be immersed. The other three will be immersed in the River IJ.

Tunnel immersion has over the years become something of a Dutch speciality.

The first tunnel realised using this technique was commissioned in 1942. That was the Maas Tunnel, currently used by over 100,000 vehicles on a busy day. “Actual construction was carried out by Christiani Nielsen, a company that would form part of Strukton in the 1960s,” explains Smitt.

Over the years, the Maas Tunnel was followed by the Willems Tunnel, also in Rotterdam, the Wijker Tunnel, the Calland Tunnel, the HSL tunnel and the A73 at Roermond. Also the Second Coen Tunnel, an order that Strukton failed to win at the last moment, will be constructed using immersion technology.

The tunnel link between Busan and Geoje is not the first large foreign project for Strukton. The company has already
been active for some time in Limerick, in Ireland, where a tunnel consisting of five sections is being immersed. The project in Limerick should be completed in 2008.

Smitt was also involved as adviser from 1999 to 2002 in the construction of a section of the metro under the River Vitatava in Prague.

He hopes that the assignment in South Korea, with a turnover volume exceeding € 70 million, will pave the way for more large international projects. In his opinion, Strukton has most to fear from a domestic competitor, namely the BAM/Volker Stevin combination – “With which we cooperated in laying the HSL Tunnel” – and the Japanese Obayashi, that also tendered for the order in South Korea. Obayashi is currently involved in a large-scale project under the River Bosporus. “That tunnel is also very large,” Smitt grins: “But it is only 50 metres deep. Meaning we have the longest and the deepest!”

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Photo by Henk Schutten