



THE EEMSTUNNEL AS PART OF THE NORTH-SOUTH PROJECT



The Project

The North-South Project is a large scale increase of the Dutch gas transport capacities. From Rysum and Oude Statenzijl in the north to Zelzate and 's-Gravenvoeren in the South, a total of more than 500 km new gas transport pipeline and two new compressor stations will be installed. The total investment for the project superceeds 1,6 Milliard Euro.



The Section Rysum-Midwolda

The section from Rysum to Midwolda is not only the most northern, but also one of the most challenging sections of the North-South Project. Imported Norwegian Gas from North Sea pipelines Europipe and Norpipe will enter the new system at the existing Gassco compressor station from where it is transported to Midwolda in the Netherlands while underway crossing the Ems.



The Tunnel

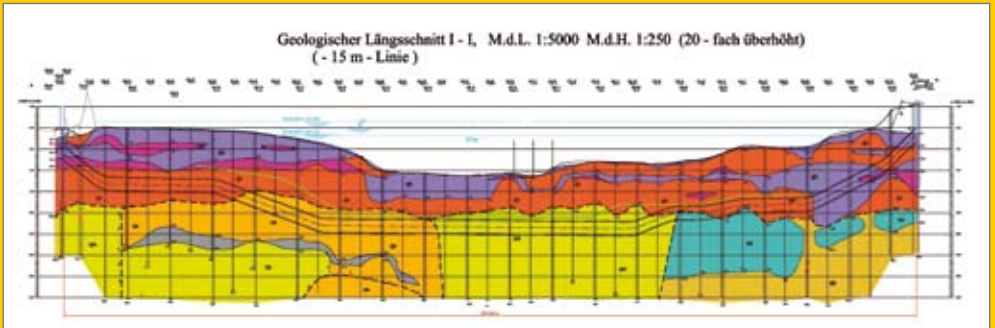
A tunnel of 4.015 m length and an internal diameter of 3 m will be constructed between Knock on the German bank of the Ems and Borgsweer in the Netherlands. The tunnel shell,



its lining, will be made of steel fibre reinforced concrete segments, six of each forming a ring of about 1,2 m length.

The Geology

The geology along the tunnel axis has been thoroughly investigated. The majority of the alignment is dominated by Holocene and Pleistocene sands. Especially challenging is a region of 'potklei' or Lauenburger Ton near the German Bank as well as the vital morphology of the Ems bottom in this region, both dealt with by a careful choice of the tunnel alignment.



The Machine

A hydro shield tunnel boring machine equipped for segmental lining will be used to excavate the tunnel. The outside diameter of the machine measures approximately 3.8 m at a length of 16 m. Together with its 7 trailers that contain the machine's auxiliary units the total length is an impressive 80 m. The cutter head that is used to loosen the soil and crush obstacles has been specially adapted to the geology of this project.



The Pipeline

To later transport the gas at a pressure of just below 80 bar a steel pipeline of 1,2 m diameter (DN1200) will be used. Even though a pipe wall thickness of 22,7 mm

is used inside the tunnel, it needs to be protected against accidental damages and corrosion. For this purpose, an additional 7 mm of polypropylene coating



is applied to the pipeline. Four pipe strings each approximately 1 km in length will be assembled and tested in the northern extension of the tunnel axis to be installed after its completion. Once this is accomplished, the remaining space inside the tunnel will be filled up to make it a permanent and water tight structure.

The Construction Site

The northern portal of the tunnel will be located on the German bank of the Ems in the immediate vicinity of the Emden Vessel Traffic Service – Knock Radar. All site installations serve the sole purpose to house and supply the tunnel boring machine with energy, air and segments during execution of the works. The excavated soil is hydraulically pumped from the tunnel processed on site by the

so-called separation plant. The TBM itself will start its drive from a shaft in the center of the site and arrive at Borgsweer in a similar construction.

The Completion

All works are scheduled to be finished on October 1st, 2010, when Norwegian gas is starting to flow through the new pipeline.



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