



Flood protection in the desert state: Herrenknecht tunnel boring machine at work on modern drainage system in Qatar

Two Herrenknecht tunnel boring machines are being deployed for a major drainage system in the Qatari capital of Doha. Construction of the almost 10-kilometer tunnel is part of some major infrastructure projects for which Qatar has ordered more than 20 Herrenknecht machines.

Doha, Qatar / Schwanau, Germany, 24.07.2014 With annual rainfall of less than 100 mm, Qatar is one of the driest landscapes on earth. But individual driving rain showers lead to extensive flooding in the densely populated capital of Doha. A comprehensive drainage system covering an area of 170 km² aims to ensure improvement in the southern section of the city populated by half a million people.

Two Herrenknecht tunnel boring machines (TBM) are driving a tunnel 20 to 30 meters underground for the so-called Abu Hamour Southern Outfall Project. The EPB Shields with a diameter of 4,470 mm are designed for Doha's soft limestone soil. Muck comprising excavated material serves as the support medium for the so-called Earth Pressure Balance Shield (EPB), providing the requisite pressure balance at the tunnel face. Protected by the shield skin, the tunnel is excavated using ring-shaped reinforced concrete segments. The individual segments are transported through the tunnel as it is completed and connected to form closed rings (segmental lining process) directly behind the TBM with an erector.

Via the main tunnel extending 9.5 kilometers, up to 16.5 cubic meters of water per second will later be conveyed to a central pump station near the New Doha International Airport.

Herrenknecht tunnelling technology was also used in designing some of the inlets during an initial construction phase. Using a slurry AVN machine from Herrenknecht, a total of four kilometers of tunnel with an outer diameter of 3.60 meters were excavated with the pipe jacking method in 2008. This is a remarkably large diameter for pipe jacking.

With its "Vision 2030", Qatar aims to offer its citizens the highest possible standard of living. Some projects are already being implemented and range from surface water discharge to traffic infrastructure. Herrenknecht is also involved in the new Doha Metro System with a total of 21 EPB Shields, many of which have already been delivered.

Project data:

| Project data | | Machine data | |
|---------------|--|---------------------|-----------------|
| Location | Doha, Qatar | M-1795M and M-1796M | |
| Application | Surface and groundwater drainage | Machine type | 2 x EPB 3700 |
| Tunnel length | 4,500 m and 5,000 m | Shield diameter | 4,470 mm |
| Geology | Limestone | Cutting wheel power | 660 kW |
| Client | Qatar's public works authority Ashghal | Contractor | Impregilo S.p.A |

Photos:



Called after districts in the city, the "Al Thummama" and "Al Rawada" machines with diameters of 4.47 meters and 121 meters in length, prior to delivery from the Herrenknecht plant. In Qatar, they are driving a 9.7 km tunnel under one of the main streets in the center of Doha's lively southwestern section while traffic continues to flow smoothly on the streets above.



Site assembly of the Herrenknecht tunnel boring machine which is the first TBM to drive a tunnel in a segmental lining process in Qatar. Apart from the two machines for the Abu Hamour Southern Outfall waste water project, the Emirate will also be deploying another 21 Herrenknecht EPB Shields during construction of the Doha Metro.



Early June saw H.E. Sheikh Abdul Rahman bin Khalifa Al Thani, Minister of Municipality and Urban Planning (MMUP), visit the site of the major infrastructure project undertaken by Qatar's public works authority Ashghal. He visited the second Herrenknecht tunnel boring machine before it disappears underground in July.

Herrenknecht AG

As the only company worldwide, Herrenknecht AG delivers tunnel boring machines for all ground conditions and in all diameters – ranging from 0.10 to 19 meters. The product range includes tailor-made machines for transport tunnels, supply and disposal tunnels and additional equipment and service packages. Furthermore, Herrenknecht manufactures drilling rigs for vertical and inclined shafts as well as deep drilling rigs. In the year 2013, the Herrenknecht Group achieved a total output of 1,027 million euros. The Herrenknecht Group employs around 4,800 members of staff worldwide, among them 200 trainees. With 82 subsidiaries and associated companies working in related fields in Germany and abroad, Herrenknecht provides a comprehensive range of services close to the respective project and customer.

Utility Tunnelling. *The market for Utility Tunnelling technology is characterized by sustainable megatrends such as population growth, urbanization and resource scarcity. Oil, gas, water, electricity and data must be transported efficiently over long distances without loss, and wastewater must be disposed of in high-performance systems. With over 1,800 plants delivered worldwide, Herrenknecht has the highest reference density, both for standardized micromachines as well as for project-specific customized special machines. Currently, around 850 tunnel projects are being implemented using utility equipment with diameters of up to 4.20 meters made by Herrenknecht. Here, trenchless tunnelling offers a range of advantages compared to conventional construction methods: transport, economy and environment remain largely undisturbed while micromachines, HDD rigs or shaft sinking equipment are being used.*