

LOVSUNS Press Release 02-2018

LOVSUNS TBMs successful in the World

Projects in Northern America and Turkey on the way

Dubai (UAE)/Toronto (CDN)/Liaoyang (CN), April 2018. **The last weeks were amazing for LOVSUNS projects in Northern America and in Turkey. The Alarko job site team celebrated with Lovsuns the breakthrough of the TBM at the Kabatas to Mahmutbey Metro Line Project in Istanbul, Turkey. And a team from Super Excavators visited the LNSS factory in China for final acceptance and tests with „GO“ to send the TBM direction Northern America for the Blacksnake Creek Stormwater Separation Improvement project in St. Joseph, Missouri, USA.**

Breakthrough at Metro Line Kabataş to Mahmutbey in Istanbul

The construction of the Kabataş-Mecidiyeköy-Mahmutbey Metro Line in Istanbul, Turkey, is for the Turkish contractor Alarko as well as for LOVSUNS a turn-key project in this amazing European as well Asian Metropol City. The contract for Alarko consists of the engineering, procurement, construction, assembly and system integration, testing and commissioning works of the 22.5 km long mass transit rail system between Kabataş-Mecidiyeköy-Mahmutbey with 5.5 km TBM and NATM tunnel construction works and viaducts, the whole construction works of three stations, finishing and electromechanical works of 15 stations, 1.5 km depot yard connection line and superstructure of the depot area and maintenance buildings. In the beginning of April 2018 the breakthrough was celebrated.

Underground Transportation in Istanbul

Only for job sites in Istanbul more than 20 Tunnel Boring Machines were ordered in 2017 for the extension of the Metro Tunnel System. For the Metro M7 extension Lovsuns delivered a CAT 6.12 m EPB-Shield-TBM which was used in the Toronto Metro Project in 2010, refurbished in Toronto and skinned up to 6.5 m. The TBM started the 4 km drive end of 2016 in the high populated Kabatas area on the European side of Istanbul to bore two sections.

Existing and planned Metro lines in Istanbul

The Istanbul Metro system consists nearly 90 stations (more than 65 underground), is actually more than 150 km long and also complemented by a line of Premetro (Hafif Metro), a suburban train, a tram system, an urban network of buses and a funicular. Actually four Metro Lines on the European and since 2016 two on the Asian side of Istanbul are used by more than 1 million commuters with rising numbers. The Metro started in 1989 its service to redeploy the commuter traffic from the streets to urban underground transportation.

Five more lines operated by Metro Istanbul are planned to build or construction is underway:

- M3: Kirazli - Bakirköy-IDO (planned to open in 2019)
- M4: from Tavsantepe (formerly known as Kaynarca) to Istanbul-Sabiha Gökçen International Airport (7.4 km; construction finish is planned for 2018)
- M7: Mecidiyeköy - Mahmutbey; construction began in Feb 2014 and was later extended from Mecidiyeköy via Fulya, Yıldız (old: Darphane on map) and Besiktas to Kabatas, totalling around 24.5 km with 19 stations (due to open in 2018)

- M8: Cross-city Line on the Asian side from Bostanci to Dudullu (14.3 km, start of operation is planned for 2019)
- M9: Tangential Line through western suburbs from Ikitelli Sanayi to Ataköy (13 km, planned to be finished in 2019)

Section for Metro M7 from Fulya to Kabatas

The Istanbul Metro currently is undergoing a massive extension with more than 70 stations and over 330 km of route under construction. The most will be constructed on completely new lines and some will be added to the existing routes. The Metro M7 is the largest project, started in 2014 to be executed in two stages and is planned to start service in 2018. The new route includes 19 stations from Mahmutbey in the Northwest to Kabatas in the Southeast, an important ferry hub for commuters between Asia and Europe.

Logistical challenges

Preparations for the 81 m wide and 105 m long job site in Fulya started in January 2016 by securing the surrounding mountaineous residential zone with earth piling. Originally the Metro line should end in Mecidiyeköy, but plans changed and the Metro was extended to Kabatas with finally four more stations. The original plan was to build only a launch shaft and a parking house in Fulya, but then changed to a Metro station due to the high population in this district. The Civil works were given to two different contractors and Alarko won the contract for the extension line, the construction of the station and all electromechanical works.

Two shafts are situated at the Fulya job site. From one shaft the tunnel heads in NATM in direction to Mecidiyeköy. The second one is the launch shaft for the TBM to drive in direction to Kabatas with return in a second tube back to Fulya. The shaft is 33 m deep with 12 m diameter. The 4.5 km tunnel will go

from Fulya via Yildiz and the very popular Besiktas area to the final station Kabatas directly at the ferry port. Underground the two shafts at the Fulya job site will be connected to the Metro station platform, which will be underground 240 m long and on surface 80 m.

Using the launch shafts for the TBM and the NATM, first of all the underground station was built. Then, from the wall of the station in direction to Kabatas, a 15 m long Pilot Tunnel was drilled and a thrust frame was built for the TBM. After that, the 110 m long TBM with back-up was assembled in the station to start drilling in the Pilot Tunnel for using as soon as possible the EPB mode. At Yildiz and Besiktas station, first of all, the stations were built and then the TBM drives through the stations. After the breakthrough with reaching the final station Kabatas, the Lovsuns TBM will be disassembled and used for further projects of Alarko.

Rebuilt EPB-TBM of LOVSUNS

The TBM is a rebuilt mixed face EPB (Earth Pressure Balance) machine with a cut diameter of 6.57 m. LOVSUNS built new cuttinghead, forward, stationary and trailing shields, as well as the main drive system. The rest of the machine has been refurbished. The maximum pressure is 4 bar. The machine is designed for an advance rate of 6 m/h. The TBM including back-up is 91 m long with 11 m of TBM and 80 m of back-up. In addition the TBM with back-up has a weight of 563 t. The cuttinghead face and rim is made of high resistant chromium carbide to prevent higher abrasion. The hydraulic main drive contents motors which delivers a total power of 1,200 kW to the cutting head. Maximum torque of the cutting head is 6,199 kNm at a speed of 1.8 rpm. The operator station is specially equipped with programmable logic controller (PLC) with an integrated logging system which records information

about the performance of Cutting Head, Screw Conveyor, Main Drive, Grout Injection and much more.

The TBM has an automatic Tunnel Guidance System and the LNSS Ground Conditioning System with a foam injection rate of 193 m³/h. The grout injection system delivers two different components (component A with 24 m³/h and component B with 2.4 m³/h) with 16 bar maximum pressure. The ventilation system shows a capacity of 450 m³/min.

Eight more TBMs waiting for start

LOVSUNS won the order of altogether eight more Earth Pressure Balance (EPB) TBMs for the Alarko-Cengiz and the Makyol/Ictas/Kalyon/Astor joint ventures building two more Metro lines in Istanbul.

Kaynarca-Pendik-Tuzla Metro Line Project

On the Asian side of Istanbul, 19.78 km double line tunnels are planned for the extension of the Metro Line M4 with the Kaynarca and Pendik stations and the connection of the M4 Kaynarca station with the Tuzla station of the B2 Line. The Alarko-Cengiz joint venture will drive two TBMs from the C cross section to Kaynarca station (2 x 3.2 km) and two TBMs from the C cross section to Tuzla station (2 x 3.3 km). For two further TBM drives from the Pendik to the Hastane station (2 x 3.39 km) there is one LOVSUNS TBM with pending order and an existing TBM is planned to use. The launch date for the TBMs is planned for 2018.

For the ground conditions mixed geology with soft to hard and abrasive to very abrasive rock formations (quartzite, limestone, sand stone, mud stone, some abrasive quartzite, dayks and more), also some short sections with alivium are expected.

Kirazli-Halkali Metro Line Project

On the European side of Istanbul, 13.20 km double line tunnels are planned for the connection of the Metro Line M3(M1A) with Halkali station and M1B with Kirazli Bagcilar station, crossing the M9 Metro Line at Mimar Sinan station. The Makyol/Ictas/Kalyon/Astor joint venture will drive two TBMs from the Mimar Sinan to Kirazli Bagcilar station (2 x 2.7 km) and two TBMs from the planned Fatih to the Yarimburgaz station (2 x 3.9 km). The launch date for the TBMs is also planned for 2018.

For the ground conditions mixed geology with generally soft rock, mud stone, sand stone, marn, alivium and filled material are expected.

TBM specifications

Both joint ventures ordered four TBMs each with mixed face cutterhead, 1,200 KW main drive power, high power, torque and advance rates, unique wear protection on cuttinghead and screw conveyor as well as high screw conveyor output.

First Chinese-Built LOVSUNS TBM for USA accepted in Chinese LNSS Factory

A team from Super Excavators visited the LNSS factory in China for final acceptance and tests in the beginning of April 2018. They gave the „GO“ to send the TBM to Northern America for the Blacksnake Creek Stormwater Separation Improvement project in St. Joseph, Missouri, USA.

The 3.3 m double shield rock TBM was sold to Super Excavators Inc. for the \$27 million Blacksnake Creek Stormwater Separation Improvement project in St. Joseph, Missouri, USA. The machine was designed and engineered from

the LOVSUNS Canadian team and built by its parent company Liaoning Censcience Industry Co. Ltd. (LNSS) at its Liaoyang facilities, China. “This is a big step - or breakthrough - for LNSS and LOVSUNS in achieving our goal of delivering high-quality tunnel boring machines to the North American market,” said Hongyu Xue, general manager of Lovsuns.

The Blacksnake Creek project will intercept and convey flows from the creek away from the combined sewer systems via a new tunnel system. The project comprises more than 2 km (6,650 ft) of 2.3 m (7.5-ft) inner diameter tunnel lined with precast, gasketed concrete segmental lining, and one 38 m (125 ft), 2.3 m (7.5 ft) inner diameter crossing of the BNSF Railroad via auger boring. Five total shafts are included in the project. The tunnel will transition from soft ground to hard rock along each end of the tunnel alignment along with some mixed face conditions. The project is expected to last into the fall of 2019.

LOVSUNS Tunneling Canada Ltd.

LOVSUNS, former Lovat which was sold to Caterpillar, carried on the Tunnel Boring Business as the wholly owned subsidiary of Liaoning Censcience Industry Co. Ltd. – LNSS only one month after the Caterpillar Tunneling assets were sold to the Chinese LNSS in November 2014 with the order of the 3.9 m diameter EPB TBM to bore two wastewater tunnels in Istanbul, Turkey. Further TBM orders for several drives of the new Metro Line extensions followed. "We designed and engineered tailormade TBMs for Istanbul and now for the US-market in Toronto and completely produced the TBMs in the facility in Liaoyang China. That means that we very successfully united the best practice, knowledge and technology of both companies for the highest advantage of our customers", explains Hongyu Xue, General Manager of LOVSUNS Tunneling Canada Ltd.

Further information you may find on
www.lovsuns.com

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Figures:

Figure 1: Alarko job site and LOVSUNS teams celebrated the breakthrough of the TBM at the Kabatas to Mahmutbey Metro Line Project in Istanbul, Turkey

Figure 2: The 6.5 m diameter EPB TBM after final acceptance at LOVSUNS in Toronto, Canada

Figure 3: The launch shaft for the TBM with crane for muck transport at the Fulya job site which is situated in a highly populated area

Figure 4: A team from Super Excavators visited the LNSS factory in China for final acceptance and tests with „GO“ to send the TBM to the project, the Blacksnake Creek Stormwater Separation Improvement in St. Joseph, Missouri, USA

(Quelle/credit: Lovsuns)

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Figure 1



Figure 2



Figure 3



Figure 4