

UNDERGROUND INNOVATIONS

NEWS FROM ROBBINS



ISSUE 26
WINTER 2012 / 2013

EPB BRINGS MEGA PROJECT ONE STEP CLOSER

SEPTEMBER'S EPIC EPB BREAKTHROUGH

brought a Mexican mega project one step closer to reality. The first of three 8.93 m (29.3 ft) Robbins EPBs broke through a shaft at Lot 1, finishing the urgent phase of Mexico City's wastewater program. The ceremony was well attended by federal officials and the country's outgoing President, Felipe Calderón.

The 62 km (39 mi) long Emisor Oriente Wastewater Tunnel for the National Water Commission (CONAGUA) will avert catastrophic flooding in the downtown area while boosting the capacity of the

city's aging wastewater pipelines.

Although six TBMs were slated to bore at each of six lots, problems in shaft 0 at the critically-designated Lot 1 site prompted a swift machine change in 2011. "The first piece of this project is the critical 10 km (6 mi) section at Lot 1. The Herrenknecht TBM started in shaft 0 in 2009, but was stalled for six months due to a flood. In order to finish in time, we brought in a Robbins TBM originally slated to work on Lot 5. The TBM bored at Lot 1, in the opposite direction towards the TBM in shaft 0," said David Juarez,

Site Manager for contractor ICA.

The Lot 1 site is prone to flooding during rains, due to a loss of slope in the canals in this area. The site has the potential to overload current pumping stations and send untreated water back into the city.

"We are building a treatment plant and a pumping station at Lot 1, to pump the water diverted into Emisor Oriente back into the canal where the slope has not been affected," said José Miguel Guevara, General Supply Coordinator at CONAGUA. The pumping station will go into service soon and the Lot 1 tunnel will be sealed off. The Robbins EPB is being disassembled for launch at its original Lot 5 section.

Tunneling at the rest of Emisor Oriente's lots is expected to take years to complete, but Juarez is confident in the Robbins EPBs: "The performance is very high compared with the other machines that are working here. And the field service people of Robbins have been very helpful—they monitor advance every single day."

LEFT: Mexican President Felipe Calderón (left) and Governor Eruviel Ávila (right) commemorate the breakthrough in September 2012. RIGHT: The first of three 8.93 m (29.3 ft) diameter Robbins EPBs breaks through at Emisor Oriente's Lot 1 site.





The 6.25 m (20.5 ft) Robbins TBM excavated 2,500 m (1.6 mi) in its first six months at the Mumbai Water Tunnel, and bored a record-setting 57.4 m (188 ft) in one day.

MAIN BEAM ON THE MOVE SETS AN INDIAN ADVANCE RATE RECORD

AFTER BORING 2,500 M IN SIX MONTHS, the performance of a 6.25 m (20.5 ft) Robbins Main Beam TBM was already impressive. But in December 2012 the machine topped that with an Indian advance record, boring 57.4 m (188 ft) in one day.

The TBM was launched in June 2012 to excavate the 8.3 km (5.2 mi) Mumbai Water Tunnel for the Unity-IVRCL JV. The deep tunnel, more than 109 m (357 ft)

“Robbins has made an outstanding effort, which speaks to their knowledge and team spirit.”

-- Pravin Titare, Unity Infrastructure

below the city, will alleviate Mumbai's current leakage problems from its aging lines and provide inhabitants with a consistent flow of clean drinking water.

Onsite First Time Assembly (OFTA) was used to assemble the main bearing,

lube system and back-up decks, as well as the Robbins-supplied horizontal, vertical and stacker conveyors. OFTA saved the contractor both time and money by assembling the parts at the jobsite and eliminating pre-assembly at the manufacturing facility.

Following the good results, Pravin Titare, General Project Manager at Unity Infrastructure said: “Robbins has made an outstanding effort during the excavation, without many difficulties, which speaks to their knowledge and team spirit.”

Difficult ground conditions are expected during excavation, including hard basalt rock, fractured ground and possible water inflows. In preparation, the TBM has been equipped with 482 mm (19 in) cutters and a probe drill.

Once completed, the Mumbai Water Supply Tunnel will run between the Kapurbawdi and Bhandup areas. The tunnel will provide the city's approximately 20.5 million residents with a reliable water supply, even during the seasonal monsoons that regularly contaminate Mumbai's water resources.

PROMPT FINISH FOR SWISS TBM

SWITZERLAND'S NEWEST SAFETY TUNNEL

runs parallel to the Milchbuck Road Tunnel, a Zurich thoroughfare built in 1978 that forms part of the A1L motorway. The safety tunnel includes multiple cross passages in order to meet new standards.

Boring of the tunnel was completed on time on December 4, 2012, when a 4.15 m (13.6 ft) diameter Robbins Main Beam TBM made its final breakthrough.

The Milchbuck Safety Tunnel required two methods of excavation due to split geology—1,000 m (3,280 ft) of TBM tunnel were bored through molasse rock of 80 MPa UCS, while a 400 m (1,300 ft), conventionally excavated section was dug in unconsolidated rock. The machine, for contractor Marti Tunnelbau AG, finished in March and was stopped in order to allow the completion of a conventionally excavated tunnel.

The TBM successfully bored through 400 m (1,300 ft) of compact rock and 600 m (2,000 ft) of fractured zones with over-break. “The performance went very well. It was hard work, but we had a special back-up to apply 360 degree shotcrete in these sections,” said Thomas Guggi of Marti Tunnelbau Ltd. The design allowed for a 20 cm (8 in) thick wet application using two shotcrete robots.



EPIC TBM ASSEMBLY COMPLETE

DEEP IN THE JUNGLE

DIRT ROADS, FOOT BRIDGES AND FOREST were what greeted survey crews looking to determine the feasibility of a TBM assembly nearly 150 km (93 mi) into the remote Vietnamese highlands.

The finished Thuong Kon Tum Hydroelectric Project, will have a generating capacity of 220 MW per year using Vietnam's longest tunnel (17.4 km/10.8 mi), but getting the TBM components to the site required extensive planning.

Onsite First Time Assembly (OFTA) was identified early on as the most acceptable method of TBM assembly, given the tight project schedule. The Robbins-developed method allows TBMs to be initially assembled on location, rather than in a manufacturing facility--a method that can save months on the project schedule and millions in USD on shipping costs.

The contractor, a Chinese joint venture of HydroChina Huadong Engineering Corporation and China Railway Construction 18th Bureau Group Co., Ltd, had to rebuild much of the roadway. Nearly 95 km (59 mi) consisted of rudimentary dirt roads accessible only with 4-wheel drive vehicles. Multiple bridges had been designed only for foot or bicycle traffic, and had to be reinforced or rebuilt.

Smaller, more lightweight shipments

aided in the successful transport of TBM components. OFTA at the jobsite was very successful, with some challenges due to the remoteness of the location: "There is necessarily a long delivery time for spares, and other materials such as oil, grease, and bolts. Power, internet, and phone can also be intermittent at times," said Gheorghe Moldovan, Robbins site manager.

The 4.5 m (14.8 ft) diameter Robbins

142 km (88 mi) from Ho Chi Minh, a TBM was assembled onsite in the difficult-to-access Vietnamese highlands.

Main Beam TBM and back-up were assembled in a concrete cradle, then moved forward into a 400 m (1,300 ft) long launch chamber. Robbins continuous conveyors were installed after the TBM began boring.

Since its launch in October, the TBM has bored more than 180 m (590 ft) in gneiss with high quartz content, at a strength of 150 MPa (22,000 psi) UCS.

FREE ACCESS TO WEBINAR ARCHIVES

Enjoy complimentary access to two years' worth of webinar recordings. These hour-long informational sessions feature Robbins experts exploring topics ranging from ground support to hybrid TBMs to mechanized mining methods.

Find out more on *Tunnelling Journal's* webinar archive:

<http://tunnellingjournal.com/webinars-on-youtube/>

CHINA'S UNIQUE TBMs FOR VARIABLE GROUND

A record number of six Robbins Main Beam TBMs are gearing up for variable ground conditions in northeast China. The TBMs, each 8.5 m in diameter, will excavate hard rock using unique ground support systems.

The setup allows for customizable ground support ranging from ring beams to rock bolts, wire mesh, or shotcrete. If severe conditions are encountered, the TBMs are equipped with the McNally Support System to allow placement of continuous steel slats in the tunnel crown. The McNally System has been shown to reliably hold fractured ground in place, even during rock bursting conditions. Materials handling will take place in the tunnel invert in order to allow for more room to work in the top half of the tunnel.

Behind each of the eight TBMs supplied for the Chinese project will be Robbins continuous conveyor systems consisting of extensible tunnel conveyors and adit conveyors spanning many kilometers. The project construction is expected to begin in 2013.



LEFT: Crews celebrate the December breakthrough at Milchbuck.
TOP RIGHT: Onsite First Time Assembly (OFTA) in Vietnam.
BOTTOM RIGHT: The Robbins Main Beam TBM was launched in a remote region of Vietnam in October 2012.



WINTER 2012 / 2013



LEFT: Small diameter SBU-Ms feature hard rock or mixed ground cutterhead designs that have been proven on hundreds of projects. RIGHT: Small diameter SBU-Ms, similar to the machine pictured, are remotely controlled and feature vacuum spoil removal.

NOVEL SBU DESIGN **STEERS FOR SUCCESS**

A SMALL MACHINE WITH BIG IMPACT.

That was the goal of Robbins engineers who successfully developed a new variation on the Motorized Small Boring Unit (SBU-M). The cost-effective design gives contractors an alternative to microtunneling in rock and mixed ground at diameters below 48 inches (1.2 m).

Like its larger counterparts, the small diameter SBU-M allows for line and grade control to within 1 inch (3 cm) on bores up to 500 ft (150 m) in length, and can be used with steel casing or Reinforced Concrete Pipe (RCP). Both machine types use proven cutterhead designs mounted with customized cutting tools, ranging from disc cutters to carbide bits. The SBU-Ms are equally capable of excavation in mixed ground or hard rock up to 25,000 psi (175 MPa) UCS.

The small diameter SBU-M is unique, however, in a number of ways. Its smaller size, from 30 to 44 inches / 760 to 1,100 mm (compared with the original size range of 48 to 78 inches / 1.2 to 2.0 m), its proven success in a variety of ground

types, and its versatility make it a budget-conscious alternative to microtunneling at these diameters. Continuous steering of the machine is remotely controlled from the launch pit, and guided by a laser. During excavation, spoils are removed using a vacuum line rather than an invert auger. The machine can be used with either an Auger Boring Machine (ABM) or Pipe Jacking Unit.

The new design is poised for success in a relatively untapped market: "Right now, contractors use microtunneling machines for these small diameter, line and grade sensitive bores, even in hard rock. This makes the work very expensive unless the contractor owns the machine," said Kenny Clever, Robbins SBU Product Manager.

The new SBU-M models are being readied for launch on a series of trenchless bores in North America and the Middle East, among other projects slated for 2013. Clever is confident in the new designs, and is looking forward to their worldwide use.

2013 EVENTS CALENDAR

Robbins will participate in the following trade shows:

UCT

January 29-31
Houston, Texas, USA

bC India

February 5-8
Mumbai, India

NASTT No Dig

March 3-7
Sacramento, California, USA
*Technical Presentation:
Pinpoint Steering with SBU-Ms
Presented by Kenny Clever*

TU-Seoul

March 18-20
Seoul, Korea

Bauma

April 15-21
Munich, Germany



© 2013 The Robbins Company

**TO SUBSCRIBE TO THIS NEWSLETTER,
PLEASE CONTACT:**

Desiree Willis, Technical Writer
e willisd@robbinstbm.com
p +1 253 872 0500

The Robbins Company
29100 Hall Street
Solon, Ohio 44139 USA

p +1 440 248 3303
f +1 440 248 1702

www.TheRobbinsCompany.com