Robbins

NEWS FROM ROBBINS

UNDERGROUND INNOVATIONS

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SWIFT BREAKTHROUGH AT CENERI

November 6, 2008 marked a Robbins machine's successful achievement after negotiating high cover (600 m/2,000 ft) and potential squeezing ground.

The 9.7 m (31.8 ft) diameter Main Beam machine achieved notably higher advance rates compared to Herrenknecht machines boring similar tunnels. The TBM completed the 2.4 km (1.5 mi) long Ceneri adit tunnel on schedule after ten months of boring.

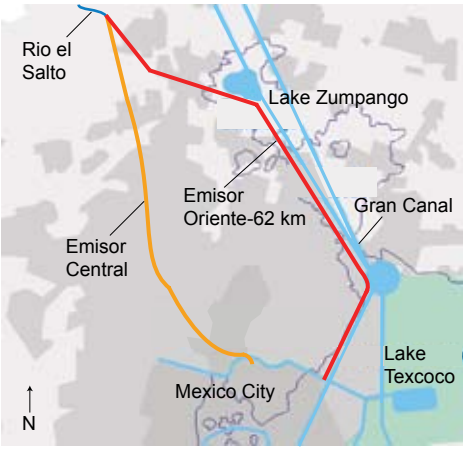
Daily advance rates averaged 18.5 m (60.7 ft), compared to lower averages for the machines boring the Gotthard Base Tunnel. Several Herrenknecht TBMs utilizing 17-inch cutters through similar ground conditions recorded 13.5 m (44.3 ft) per day and 11.5 m (37.7 ft) per day in the Bodio and Amsteg sections, respectively.

The High Performance (HP) TBM achieved the swift advance rates using 19-inch disc cutters on a back-loading cutterhead—the first time this cutter diameter has been used to excavate through the Alps. "Cutter performance has been the single most impressive result of this project," said Ferruccio Borroni, General Manager for Robbins Europa. Only about 30 cutter rings were changed in the last kilometer of boring, with the cutters excavating a combined 167,000 m^3 (5.9 million ft^3) of hard rock. Geology consisted of competent schist, Swiss molasse, and Ceneri orthogneiss ranging from 30 to 130 MPa (4,300 to 18,800 psi) UCS.

Located in Sigirino, Switzerland, the Ceneri adit tunnel was constructed by the Consorzio Monte Ceneri (CMC) JV—a consortium of CSC, Lugano, Frutiger SA, Thun, Rothpletz, Lienhard + Cie, and Aarau. The tunnel will serve as a passage to internal concrete batching plants and supply caverns during construction, as well as provide access to the main Ceneri Base Tunnels.

AlpTransit's parallel 15.4 km (9.5 mi) long Ceneri Base Tunnels will cut through Monte Ceneri, shaving off over half the time required to travel by rail between Lugano and Bellinzona, Switzerland. Construction of the twin tubes will begin in early 2010, and will include two 4.0 km (2.5 mi) sections of either TBM or D & B tunnels (with selection left up to the contractor).

The 9.7 m (31.8 ft) diameter Robbins machine broke through on November 6, 2008. Photo: ©AlpTransit Gotthard Ltd.



Three Robbins EPBMs will bore sections of the 62 km (39 mi) long Emisor Oriente sewer tunnel.

THREE EPBMs WILL IMPROVE MEXICO CITY DRAINAGE

Three 8.93 m (29.3 ft) Robbins Earth Pressure Balance Machines (EPBMs) will bore Mexico's longest tunnel project. Scheduled for shipment to the jobsite by the end of 2009, the machines will excavate sections of the 62 km (39 mi) long Emisor Oriente sewer tunnel.

Mexico City, founded on what was once an island in the middle of a lake, is sinking at the rate of 10 cm (4 in) per year. Over the last 30 years, the city's critical drainage lines have lost their slope, resulting in a 40% reduction in overall capacity. To remedy the problem the city is moving forward on the Emisor Oriente tunnel to drain additional water from the Valley of Mexico. The tunnel will be constructed using a total of six TBMs.

Carso Infraestructura y Construcción, S.A.B de C.V. signed a contract with The Robbins Company for the supply of three machines on October 26, 2008. Additional supply will include the back-up systems, cutting tools, and spares.

The Robbins EPBMs will bore Lots 3, 4, and 5 of the Emisor Oriente project in geology ranging from sandy clay and gravel to tuff and pumice. The tunnel lengths will be 9.6 km (6.0 mi), 9.7 km (6.0 mi), and 9.5 km (5.9 mi), respectively.

Mixed face cutterheads will be utilized on the machines, with interchangeable cutting tools depending on the ground conditions. In soil the machines will utilize knife-edge bits, which can be changed out with 17-inch (432 mm) disc cutters in rock.

For muck removal, the Robbins EPBMs will feature 900 mm (35 in) diameter ribbon-type screw conveyors to safely excavate ground with boulders, which are predicted to be up to 600 mm (24 in) in diameter.

Tunneling of the USD $1.2 billion project for the National Water Commission (Conagua) is expected to be complete by 2012. The finished tunnel will provide drainage at 150 cubic meters of water per second (5,300 ft^3/sec), easing problems due to both surface subsidence and the city's booming population, which has doubled over the last 30 years to 19 million.

ROBBINS OPENS NEW HONG KONG OFFICE

Robbins announces its new office, Robbins Asia Pacific Ltd., which will provide service in the fast-developing Asia Pacific Region. Located in Hong Kong, the office will focus on sales, technical support, and procurement.

Geographical areas covered by the new subsidiary include East Asia, the Middle East, and Australia, excluding India and China where our three other offices are located. "This new office will allow us to meet the needs of our East Asian customers in real time, and in face-to-face conversations, " said David Salisbury, Business Development Manager for Robbins Asia Pacific Pty Ltd. Goals of the new branch include expanding the regional EPB market, as well as providing support for hard rock TBMs and small-diameter tunneling.

In the future, the subsidiary will include engineering, field service, and other support services, and will assist in the development of a Robbins manufacturing facility in Guangzhou.

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SMOOTH STARTUP IN SHANXI PROVINCE

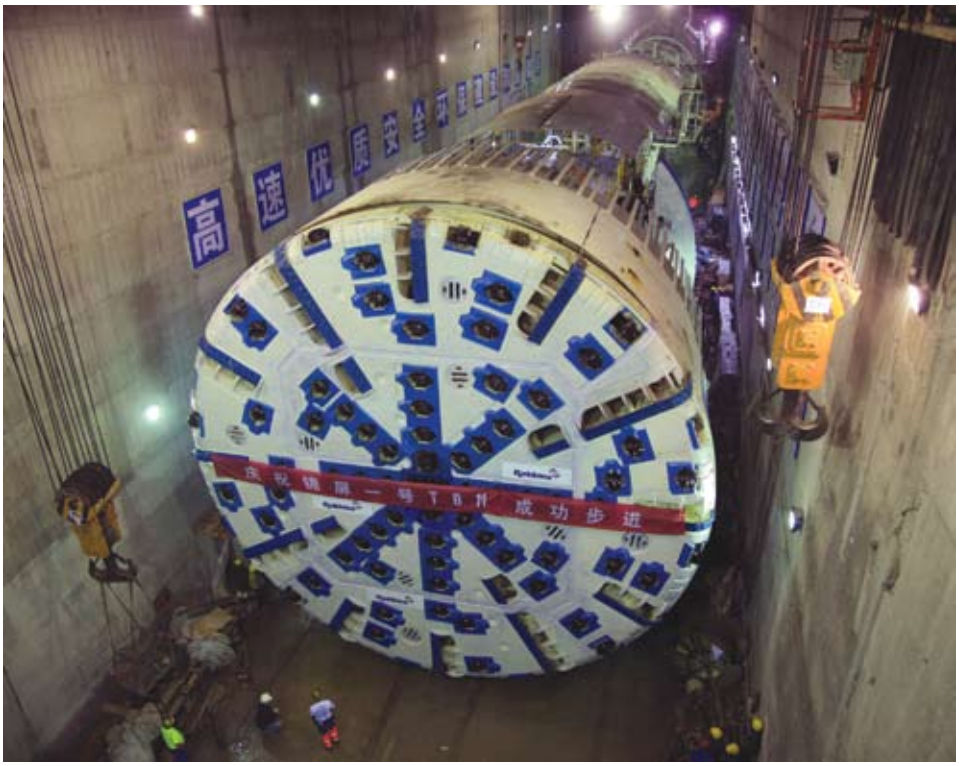
The 3.65 m (12 ft) Double Shield TBM was launched in November 2008 in China's Shanxi Province. Photo: Dave Fisher

A 3.65 m (12 ft) diameter Robbins Double Shield TBM is working to ease chronic droughts in Northern China. The machine was launched from a 450 m (1,500 ft) long starter tunnel in November 2008.

The Robbins TBM is the first machine to be built solely by Robbins China in Shanghai. Much of the TBM itself is new, while components such as the back-up, conveyor, and motors were salvaged from the Kunming Water Supply Project, which utilized a Robbins Double Shield TBM of the same diameter.

An 11.0 km (6.8 mi) long tunnel is being bored in ground consisting of limestone and granite up to 200 MPa (29,000 psi) UCS with a deep overburden of loess.

The Yin Hong Ji Shi Water Transfer Project will divert water from the Hang Yan River to the Shi Tou River for a hydroelectric project benefiting areas around the nearby city of Xian.



Left: *The 12.4 m (40.8 ft) diameter machine at Jinping-II was launched in September after an initial onsite assembly.*
Above: *The Robbins Conveyor Division has provided over 100 km (125 mi) of belt conveyor in 2008.*

GIANT JINPING MACHINE LAUNCHED

All TBMs at one of China's largest tunneling projects, Jinping-II, are now up and running.

The 12.4 m (40.8 ft) diameter Robbins TBM at headrace tunnel No. 1 began operation in Fall 2008, joining another 7.2 m (23.6 ft) diameter Robbins machine boring the 15.3 km (9.5 mi) long dewatering tunnel.

The Jinping-II Hydroelectric Project has involved infrastructure development on a massive scale, requiring four 16.7 km (10.4 mi) long headrace tunnels, auxiliary tunnels, and powerhouse structures, all supported by a town of 20,000 workers from around the globe.

Two of the four headrace tunnels are being excavated by drill and blast, with the remaining two by TBM. The tunnelling and D&B work are split into two contracts—China Railway 18th Bureau (Group) Co Ltd. is responsible for headrace tunnel nos. 1 and 2, while China Railway 13th Bureau (Group) Co Ltd are constructing headrace tunnel Nos. 3 and 4.

The 12.4 m (40.8 ft) machine for headrace tunnel No. 1 was assembled in just three months using Onsite First Time Assembly (OFTA)--a process developed by Robbins to allow initial assembly of TBMs at the jobsite. The overall process results in savings due to decreased shipping costs and man hours.

Since the launch of the giant machine, advance has been ramping up. The machine is currently undergoing a 2,000 m (6,500 ft) long test bore to ensure all systems are working properly. Current ground support includes ring beam installation every 900 mm (35 in) and a 17-bolt pattern of rock bolts every 1.5 m (5 ft).

Excavation at the dewatering tunnel has advanced a total of approximately 2,890 m (9,480 ft), at rates up to 50 m (160 ft) per 24-hour shift. Operations at the drill and blast tunnels have advanced approximately 2 km (1.2 mi) in headrace tunnel nos. 2 and 4.

Once complete, Jinping-II will be the largest power station in a 21-station project for owner Ertan Hydropower Development Co. Ltd. The scheme will harness up to 25 million MW per year from the Yalong River for China's West to East Electricity Transmission Project. The entire project is expected to go online in 2030.

ROBBINS CONVEYORS GO LONG

For the first time ever, more than 100 km (60 mi) of Robbins conveyor are traveling behind TBMs worldwide. The amount represents a significant increase from years past.

"We've had very few problems considering the number of systems we started up in 2008. Our quality has improved substantially thanks to our project managers and field service personnel," said Dean Workman, Vice President-Conveyor Systems.

One of the highlights from 2008 was the Robbins conveyor system provided for the East Side Access Project in New York City, USA. The system transports muck using every commonly recognized version of belt conveyor and passes over a major roadway. "We're very happy with the system--it has achieved over 95% availability for the duration of the project," said Workman.

Other unique conveyor systems include those provided for the AMR and Veligonda Projects in Andhra Pradesh, India. At the AMR Project conveyor systems are optimized for the long tunnel, at 22.5 km (14 mi) in length in two flights of 11.25 km (7 mi) each. The Pula Subbaiah Veligonda Project, which starts up in 2009, will include an even longer system. The conveyor will stretch to 19.2 km (12 mi) in a single flight, making it the longest single conveyor Robbins has ever provided.

SMALL BORING UNITS A FIRST IN INDIA

Kota City in Rajasthan, India is currently undergoing a massive infrastructure overhaul. Vichitra Constructions Pvt Ltd of New Delhi was contracted to excavate rail crossings for a water pipeline in quartzite. Previous contractors had made three unsuccessful attempts at the crossings since 2000, using various types of technology.

"We were looking for a completely different method, and found that disc cutter technology would likely work best in the very hard, abrasive rock we had," said Mr. Sudhir Agrawal, Vichitra Executive Director.

The contractor has now successfully utilized a Robbins Small Boring Unit (SBU-A) and Auger Boring Machine to excavate three crossings in India's first ever use of disc cutter boring attachments.

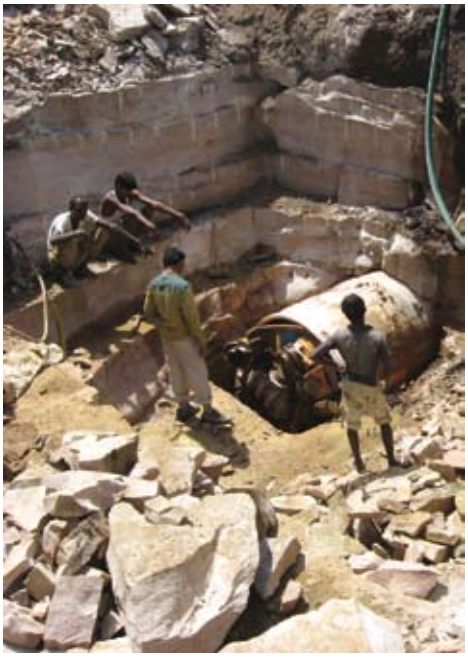
The SBU-A, in diameters from 600 mm to 1.8 m (24 to 72 in), is a hard rock cutting head used with a standard ABM on utility crossings up to 150 m (500 ft) in length.

Work on Kota Water Supply Project 16 started in 2000, with crews first hand-mining an 11 m (36 ft) long by 4.5 m (15 ft) wide launch pit. The dig took four months at rates of 200 to 300 mm (8 to 12 in) per day in hard quartzite up to 200 MPa (29,000 psi) UCS. The first attempt at the crossings utilized a small pipe jacking system and hand mining, which was abandoned after several months of low production rates. Subsequent attempts utilized HDDs with rock heads, but both times the drills failed in the hard rock.

In 2007 after researching various methods, current contractor Vichitra purchased a 1.5 m (60 in) diameter Robbins SBU-A and a Robbins 60-1270 Auger Boring Machine (ABM).

Both rail bores were completed by Autumn 2008 in abrasive rock, as well as an additional 14 m (45 ft) long bore underneath a roadway. The 100 m (330ft) rail crossing was excavated in two 50 m (165 ft) long passes from either side of the tracks. During the first bore, the machine holed through into a center pit between the two tracks. Typical advance rates were up to 1.5 m (5 ft) per hour.

"Given the success of the SBUs after an eight year wait, combined with the number of infrastructure opportunities in India, we believe there will be many future uses of this technology," said Mr. Sudhir.



Left: *India's first ever Robbins SBU-A/ABM setup was utilized in Kota City, Rajasthan.*
Middle: *The 1.5 m (60 in) diameter SBU-A bored through hard quartzite rock.*
Bottom: *The Robbins SBU-A was successful at boring the crossings after multiple failed attempts with other methods since 2000.*
Photos: Scott Fisher

EVENTS CALENDAR

Robbins will exhibit at the following trade shows:

2009

UCT
January 20 - 23
San Antonio, Texas

NUCA
March 4 - 6
Phoenix, Arizona

ISTT
March 29 - April 3
Toronto, Canada

Intermat
April 20 - 25
Paris, France

World Tunnel Congress
May 23 - 28
Budapest, Hungary

RETC
June 14 - 17
Las Vegas, Nevada

Trenchless Australasia
September 20 - 22
Melbourne, Australia

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