



'Big Boy' squares in at Sasolburg



by Sam Efrat, Trenchless Technologies

Installation of 630 mm HDPE pipes under railway lines near Sasolburg.

A NEW 630 MM OD HDPE-pumped water pipeline, to augment the supply of water to a nearby coal mine, needed to be installed beneath two railway lines near South Africa's fuel-from-coal capital, Sasolburg.

The water pipeline was originally to be installed by means of pipe jacking; however, the main contractor Chaldean Trading elected to employ Trenchless Technologies to undertake the works by means of horizontal directional drilling (HDD).

It decided to use the new TERRA-JET 7520 D nicknamed 'big boy' to do these crossings. This machine can drill directional bores of up to 400 m in length and in 800 mm in diameter depending on ground conditions. It is driven by a 97 kW (132 HP) powered diesel engine, which is 'clean' and meets the emission standards and regulations



TOP The railway line near Sasolburg
ABOVE The TERRA-JET 7520 D during the 40 m-long pilot bore underneath the railway tracks

required by the European Union. Due to the low engine speed of only 1 850 rpm, this HDD machine operates super silently, a plus for the operator who may work without ear protection and who can talk normally during operation.

Torque and pullback force are produced by separate hydraulic circuits. Therefore the maximum torque of 7 750 Nm and the maximum pullback force of 195 kN (20 t) can be used simultaneously under full load – a rarity nowadays for HDD machines!

A multifunctional joystick allows efficient one-handed control of the functions of rotation, thrust, quick-gear, drilling fluid, back-reaming and pipe pull-in.

The TERRA-JET 7520 D is equipped with a new second generation automatic drilling and back-reaming system (ADBS), which

TABLE 1: PROJECT DETAILS

City:	Sasolburg, South Africa
Utility:	Water Pumped Main For Coal Mine
Contractor:	Trenchless Technologies, Johannesburg
Drilling machine:	TERRA-JET 7520 D
Length:	25 m and 40 m
New pipe to be pulled in:	HDPE pipe OD 630 mm (25")
Back-ream diameter:	800 mm (32")
Ground conditions:	Clay with sandstone

automatically, and within milliseconds, adjusts the machine working speed to the ground conditions. In soft ground, the drill operates at maximum speed while slowly in hard ground but always at the optimum speed. This allows the operator to relax and concentrate on the job on hand and prevents the drill rods from being overloaded.

During the pilot bore, the ADBS additionally controls the thrust force. If the drill head hits an unexpected obstacle, the ADBS stops the drilling speed immediately and drills very slowly through the obstacle. All automatically!

The pullback force is produced by a robust hydraulic cylinder. In comparison to hydromotors and rack-and-pinion drives of conventional HDD machines, the hydraulic cylinder shows its superiority in hard ground, which requires slow back-reaming speeds. Then the hydraulic cylinder has its highest efficiency rate while hydromotors lose up to 25% of their power at low rotation speeds.

The drilling fluid volume is normally set at 185 ℓ/min at a maximum fluid pressure of 85 bars and may be optionally increased to



370 ℓ/min. The pilot bore on both railway crossing was done using the aggressive three-fingered head and took only 45 minutes to complete the first 25 m installation.

Back-reaming was then undertaken using 420, 650 and 800 mm back-reamers with each back-ream taking approximately two hours to complete, while the final back-ream and pipe pull-in took only 60 minutes. The entire first 25 m installation was completed within two days.

Similarly, the 40 m installation took about one hour for the pilot hole and about 2.5 hours for each of the 420, 650 and 800 back-reaming operations and one hour for the pipe pull-in with two days taken to do this 40 m installation.

Considering that both clay and sandstone material were encountered, 'big boy' performed exceptionally well and both the client and contractor were extremely pleased with the outcome. **35**



LEFT At the other side of the bore, the 630 mm (25") HDPE pipe was laid out and butt welded. The back-reamer \varnothing 800 mm (32") and the 48 m-long HDPE pipe OD 630 mm (25") are assembled. The back-reaming process may begin

ABOVE The back-reamer 800 mm (32") and the HDPE pipe OD 630 mm (24") have reached the starting hit (machine side). The HDPE pipe is successfully laid under the railway in a length of 40 m

Trenchless Technologies

were awarded the SASTT Excellence Award for 2007 for the Klipspruit Basin Sewer Upgrades contract along with Johannesburg Water and Vela VKE Consulting Engineers, which utilised CIPP, pipe bursting and HDD.