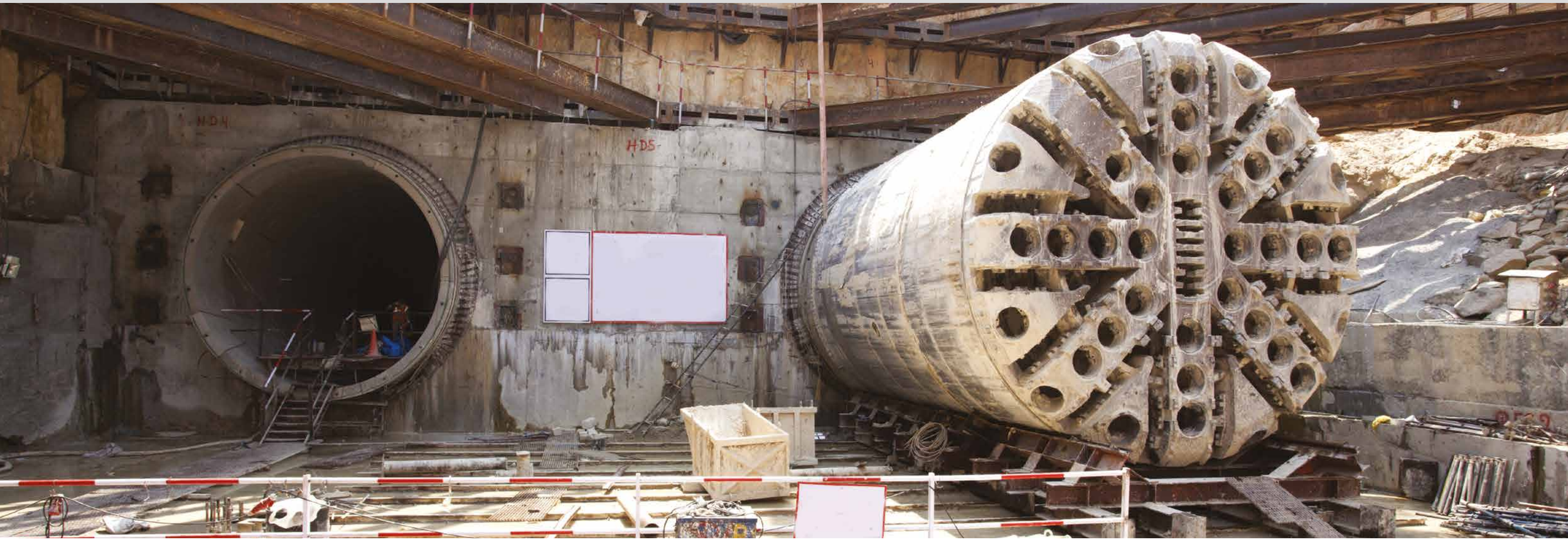
WATSON MARLOW Fluid Technology Solutions

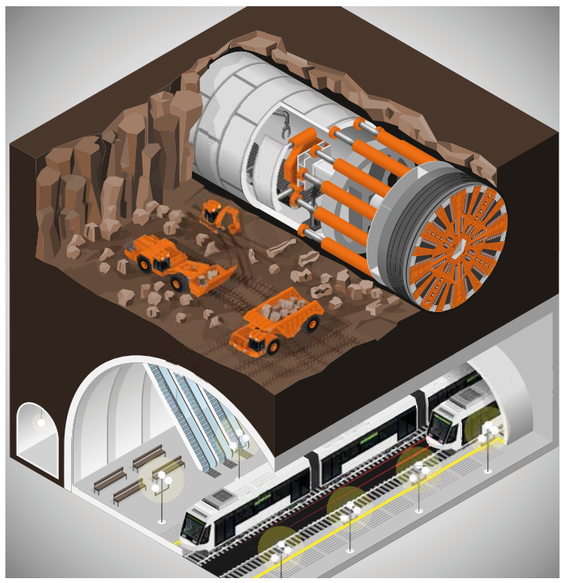
Peristaltic hose pumps for tunnel bore machinery

Heavy duty hose pumps for tunnel bore machines



Tunnel bore machines

Tunnel bore machines (TBMs) have replaced conventional drill and blast techniques for many large underground construction projects. Tunnelling projects, such as underground transport links, often take place below heavily urbanised landscapes where the need to minimise disturbance is essential. However once excavation has started a breakdown can result in costly delays and downtime. In addition, repairs need to take place in-situ which can be difficult. Clearly TBMs require the most reliable components available, proven to operate reliably under the most arduous conditions.



Bredel heavy duty peristaltic hose pumps are virtually maintenance-free as there are no impellers, liners or mechanical seals to replace, no check valves to clog, and no rotors or stators to wear out. The only wear part is the hose, which can be replaced in a matter of minutes without any requirement for special tools. This makes Bredel hose pumps the ideal choice for demanding tunnel bore machine applications.

- Flow rates up to 108 cubic metres/hr at 16bar
- Transfer up to 80% solids in suspension
- Suction lift to 9.5 metres, dry running and reversible
- No ancillary equipment, check valves or sealing water flush systems

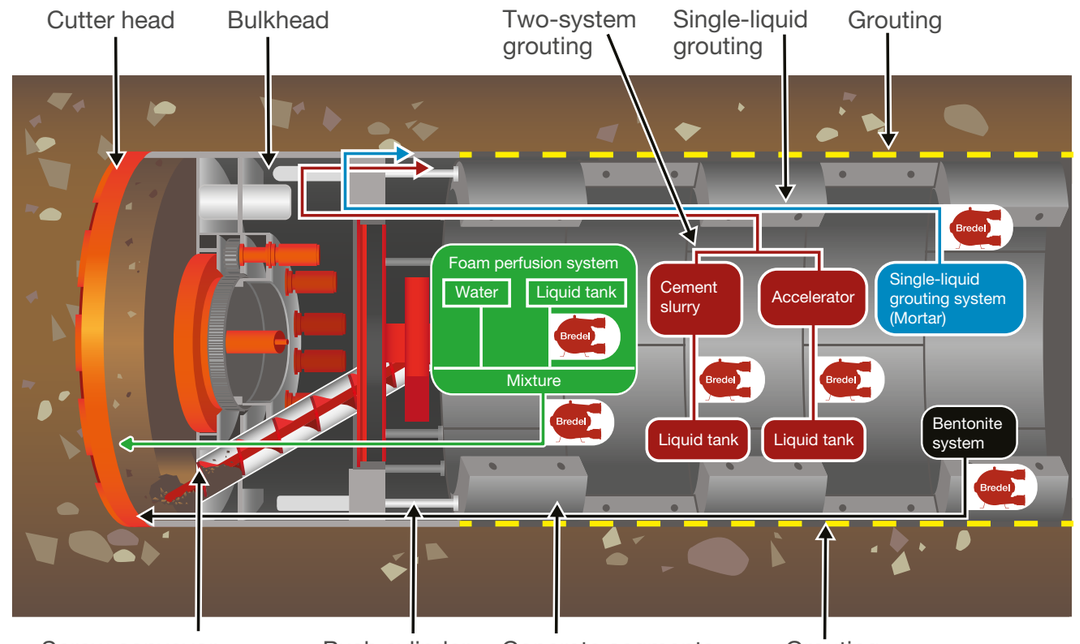
Heavy duty hose pumps for tunnel shield equipment

▲ Concrete segments installed to form the tunnel wall

▲ Bredel pumps used for grout and accelerator pumping for solidification of concrete rings

▲ Bredel pumps used for pumping grout between concrete rings and soil

Shield-type TBMs – internal structure diagram



Soft ground TBMs

Two key applications in tunnel boring projects where the choice of pump can affect performance are ground conditioning and backfilling.

Ground conditioning

Preventing the face of a tunnel from collapsing during excavation and reducing wear on the cutter head is achieved through ground conditioning. Pumping abrasive slurry, foam and bentonite on to the tunnel face helps increase stability of the tunnel during excavation.

Backfilling

As excavation progresses, precast concrete segments are installed to form the tunnel wall.

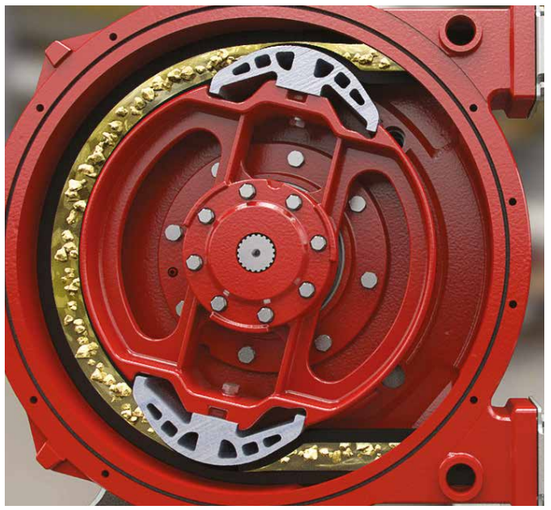
Backfilling involves pumping grout into the void left by the TBM body and the tunnel wall and the concrete segments. There are two types of backfilling grouting; single-liquid and two-liquid grouting:

Single-liquid grouting (mortar) requires high pressure application and the fluid contains a high solids content.

Two-liquid grouting is where an abrasive cement slurry and liquid accelerator are mixed and injected at pressure into the void and start setting immediately after application. This process increases the risk of pump blockages.

Bredel heavy duty are ideal for ground conditioning and backfilling where process reliability and consistent performance are essential:

- The fluid is only in contact with the inner wall of the hose. In the event of a malfunction, only the hose needs replacing
- Pumps abrasive slurry and accelerator with no risk of blockages
- Hose pumps can run dry without damage if the fluid flow is interrupted
- Easy operation, maintenance and minimal downtime



▲ Bredel heavy duty hose pumps handle abrasive slurries without damage to the pump

▲ Bredel pump delivers accelerator in extremely harsh conditions

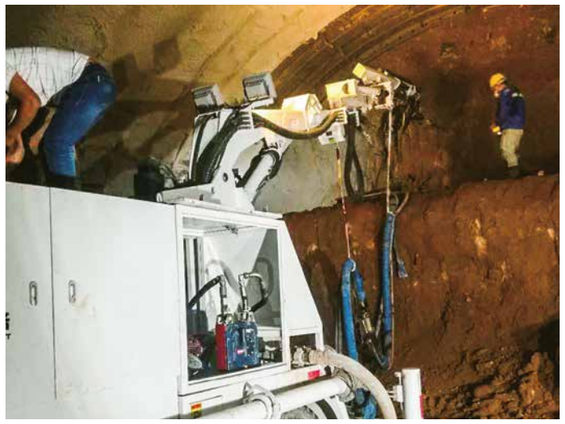
Wet spray fluid pumping

Wet spray pumping is used in tunnelling applications to hydraulically or pneumatically apply liquid cement accelerator to the surface of the excavated tunnel.

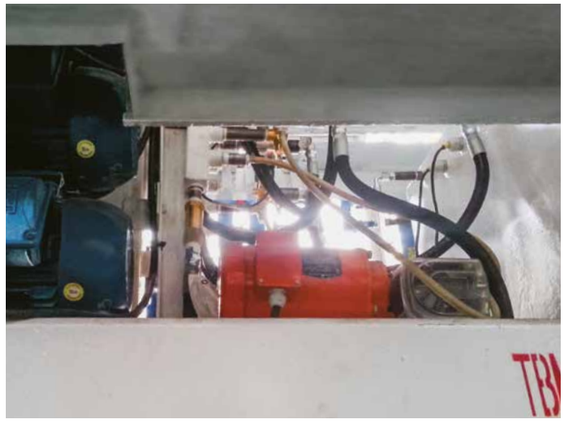
The working condition of the wet spray machine is generally worse than that of the shield machine.

Bredel heavy duty hose pumps reliably handle abrasive liquid cement:

- Pumping quick setting accelerator will not result in pump blockages
- Hoses are easy to clean and easy to maintain with a short changeover time for reduced downtime
- Accurate flow and delivery
- Ideal for use in challenging conditions such as high humidity



▲ APEX pump delivers accelerator in tough high humidity conditions



▲ A Watson-Marlow close-coupled pump used for pumping foam solution for earth softening

Solutions for a range of applications

In addition to Bredel heavy duty hose pumps, Watson-Marlow Fluid Technology Solutions supplies peristaltic pumps for a range of applications from pumping ground conditioning foam for earth softening to pumping accelerator in high humidity conditions. Flow rates from microlitres to thousands of litres per hour with a flow variation within ±1% at pressures up to 16bar are achievable. The common features of low maintenance and high reliability ensures a low total cost of ownership.

Bredel series
- Flow rates from 160 to 108,000 L/hr at pressures up to 16bar
- Suction lift to 9.5 metres
- Hose element is the only component to wear

APEX series
- Flow rates from 2.8 to 6,200 L/hr at up to 8bar
- Hose element is the only component to wear
- Direct-coupled drive maximum flexibility

Close-coupled pumps
- Flow rates from 0.09 to 19 L/min
- Fixed or variable speed
- ATEX option available

Qdos series
- Flow rates from 0.1 to 2,000 ml/min at 7bar
- Flow control 3330:1 with +/- 1% accuracy
- Speed 0.017 to 55rpm

WATSON MARLOW Fluid Technology Solutions

INDUSTRIAL SOLUTIONS

WATSON MARLOW Pumps

WATSON MARLOW Tubing

Bredel Hose Pumps

masosine Process Pumps

AFLEX HOSE

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