

TECHNOLOGY

# Turbojet®

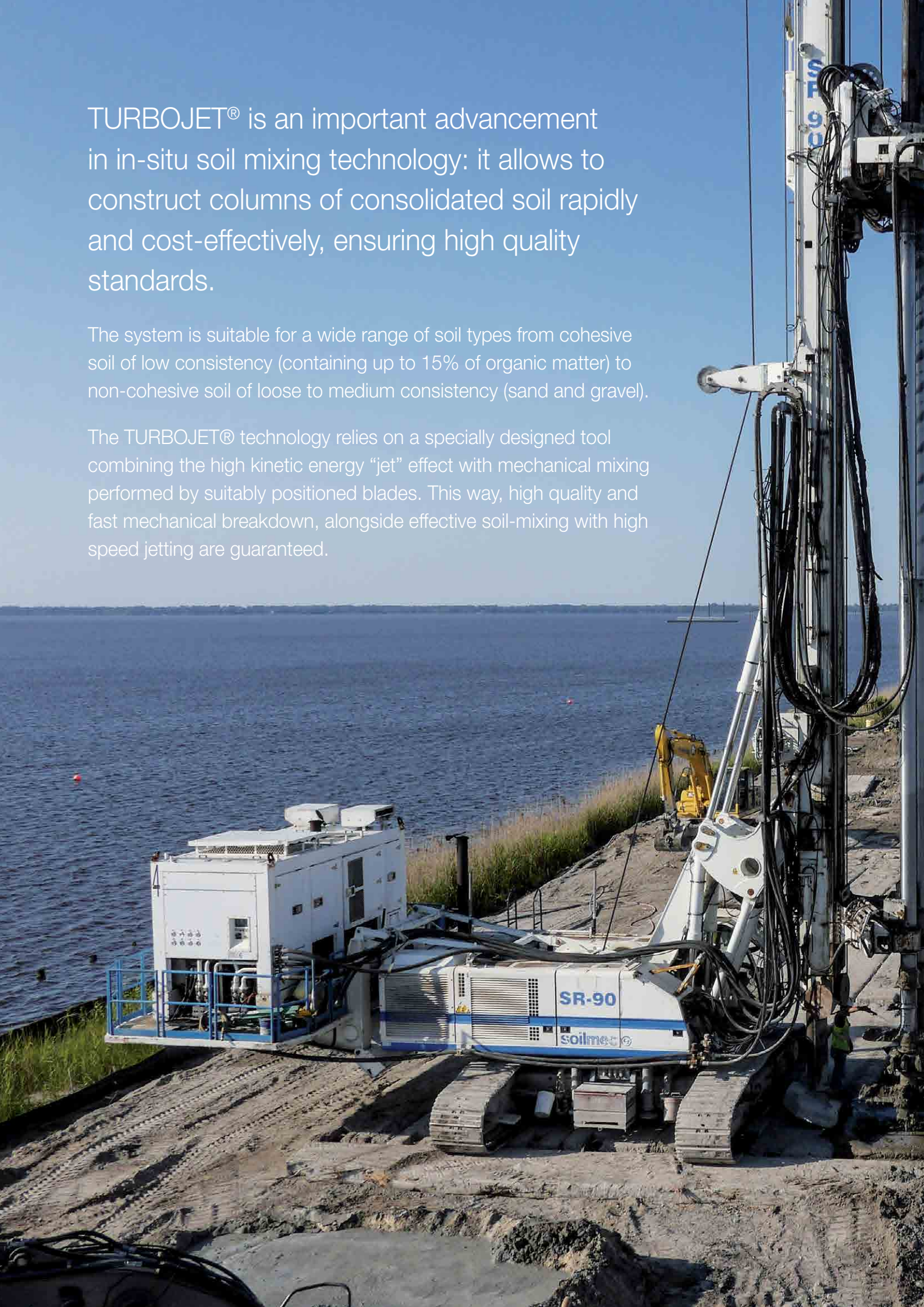
**soilmeco**  
Drilling and Foundation Equipment



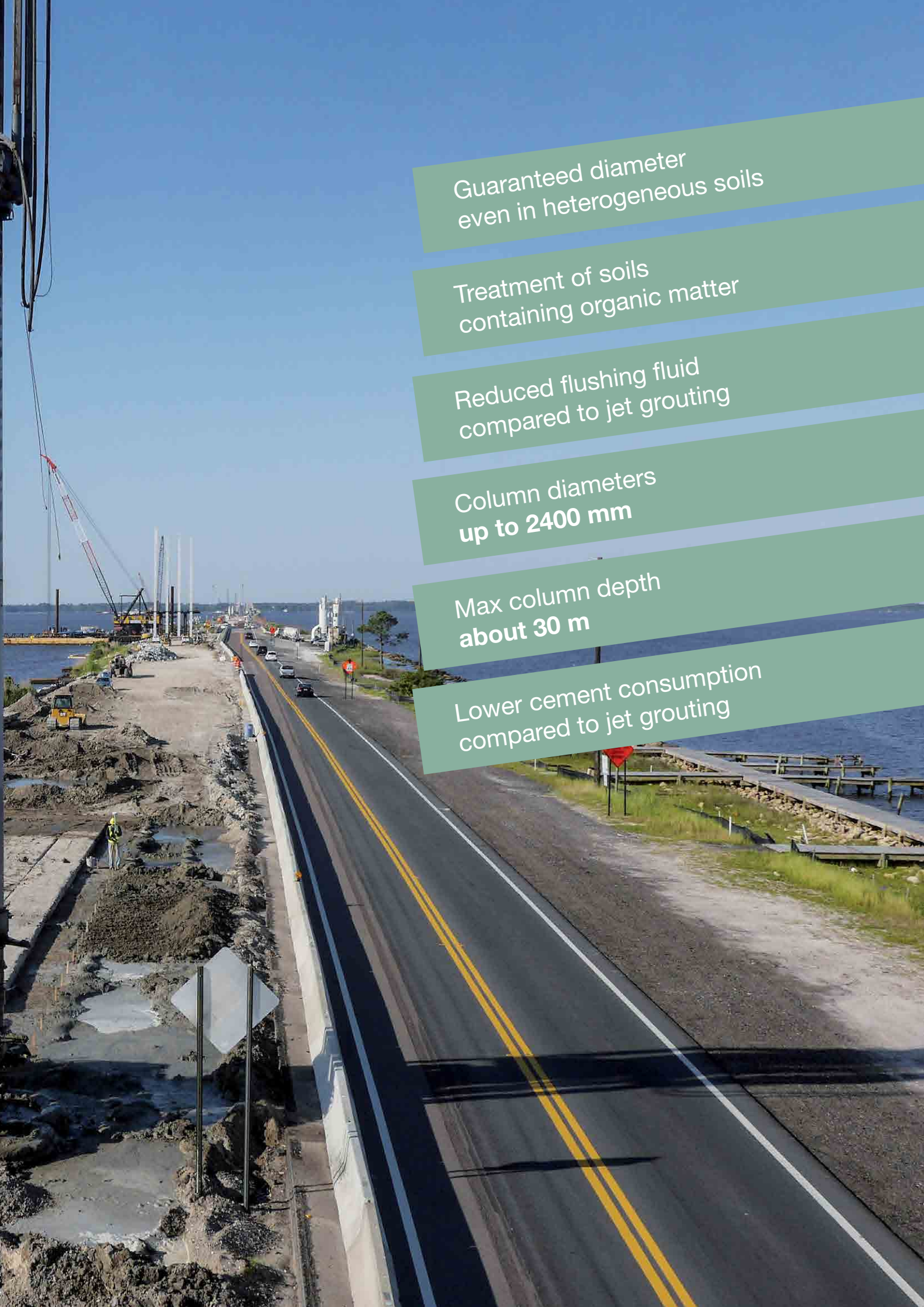
TURBOJET® is an important advancement in in-situ soil mixing technology: it allows to construct columns of consolidated soil rapidly and cost-effectively, ensuring high quality standards.

The system is suitable for a wide range of soil types from cohesive soil of low consistency (containing up to 15% of organic matter) to non-cohesive soil of loose to medium consistency (sand and gravel).

The TURBOJET® technology relies on a specially designed tool combining the high kinetic energy “jet” effect with mechanical mixing performed by suitably positioned blades. This way, high quality and fast mechanical breakdown, alongside effective soil-mixing with high speed jetting are guaranteed.





A wide-angle photograph of a coastal road under construction. On the left, a large crane stands near several vertical piles driven into the ground. A yellow excavator is visible in the foreground. The road, marked with double yellow lines, stretches into the distance. To the right of the road is a body of water with a wooden pier. The sky is clear and blue.

Guaranteed diameter  
even in heterogeneous soils

Treatment of soils  
containing organic matter

Reduced flushing fluid  
compared to jet grouting

Column diameters  
**up to 2400 mm**

Max column depth  
**about 30 m**

Lower cement consumption  
compared to jet grouting

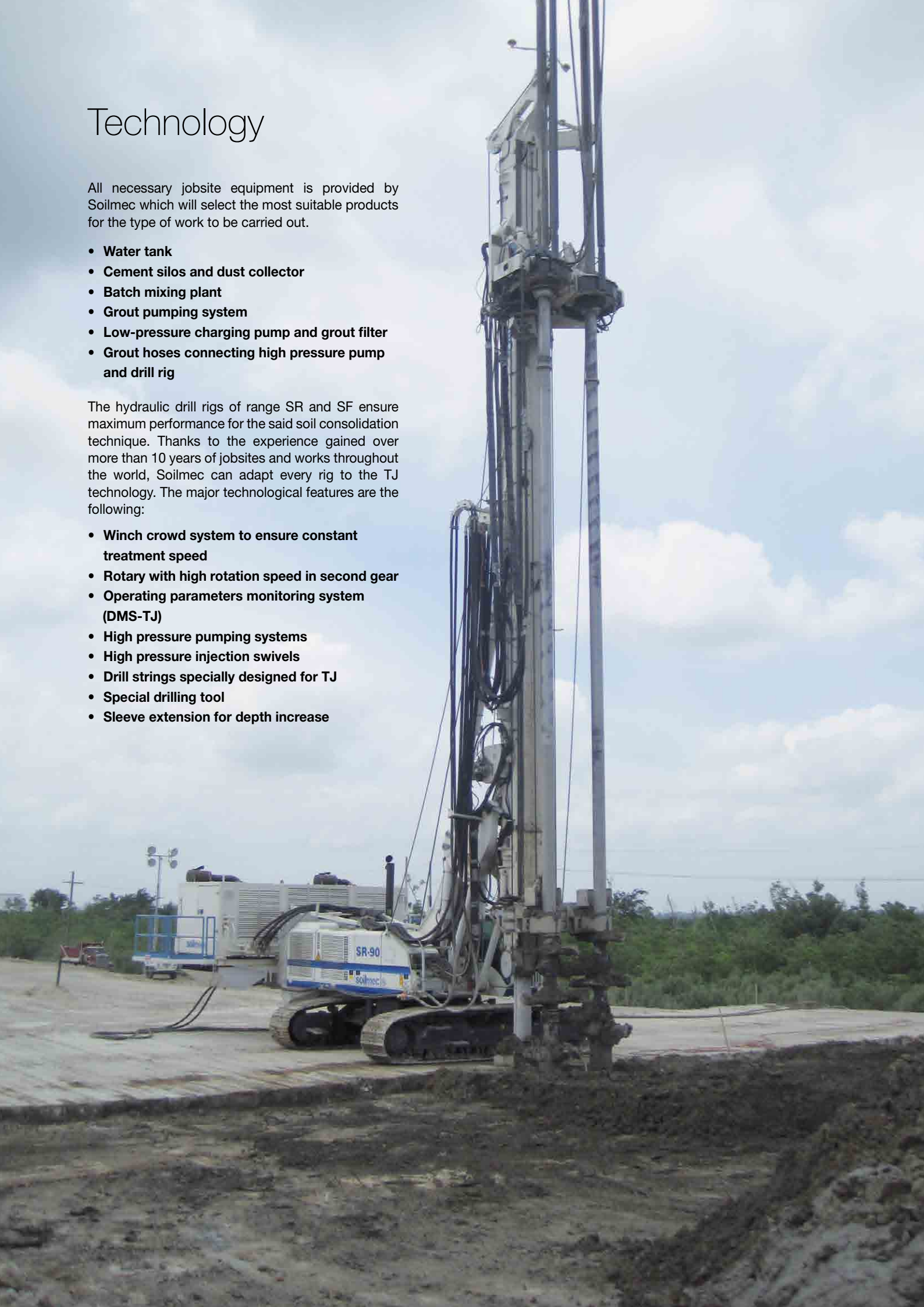
# Technology

All necessary jobsite equipment is provided by Soilmec which will select the most suitable products for the type of work to be carried out.

- **Water tank**
- **Cement silos and dust collector**
- **Batch mixing plant**
- **Grout pumping system**
- **Low-pressure charging pump and grout filter**
- **Grout hoses connecting high pressure pump and drill rig**

The hydraulic drill rigs of range SR and SF ensure maximum performance for the said soil consolidation technique. Thanks to the experience gained over more than 10 years of jobsites and works throughout the world, Soilmec can adapt every rig to the TJ technology. The major technological features are the following:

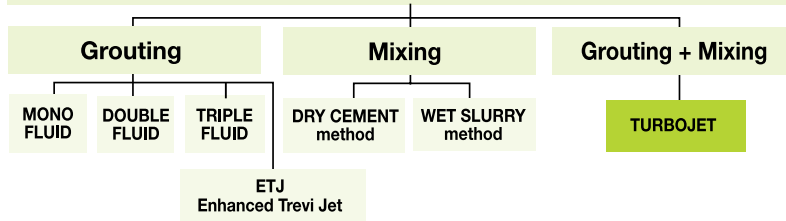
- **Winch crowd system to ensure constant treatment speed**
- **Rotary with high rotation speed in second gear**
- **Operating parameters monitoring system (DMS-TJ)**
- **High pressure pumping systems**
- **High pressure injection swivels**
- **Drill strings specially designed for TJ**
- **Special drilling tool**
- **Sleeve extension for depth increase**





# Construction stages

## Columns of consolidated soil



During drilling, an initial treatment is performed by injecting a cement grout down to the design depth. Then treatment is repeated while uplifting the tool, to ensure the best result is achieved.



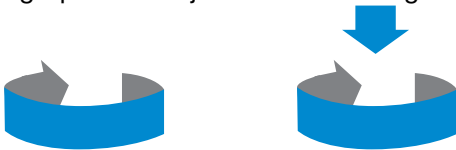
### TURBOJET WORKING PARAMETERS

Drilling speed	m/min.	0.5 - 1.5
Rotation speed at drilling	rpm	25 - 55
Extraction speed	m/min.	0.5 - 2.0
Rotation speed at uplifting	rpm	35 - 55
Cement grout flow rate	l/min.	100 - 200
Cement grout pressure	MPa	5 - 40
Cement per m <sup>3</sup> of soil	kg/m <sup>3</sup>	150 - 450
Average industrial production	m <sup>3</sup> /hour	10 - 50



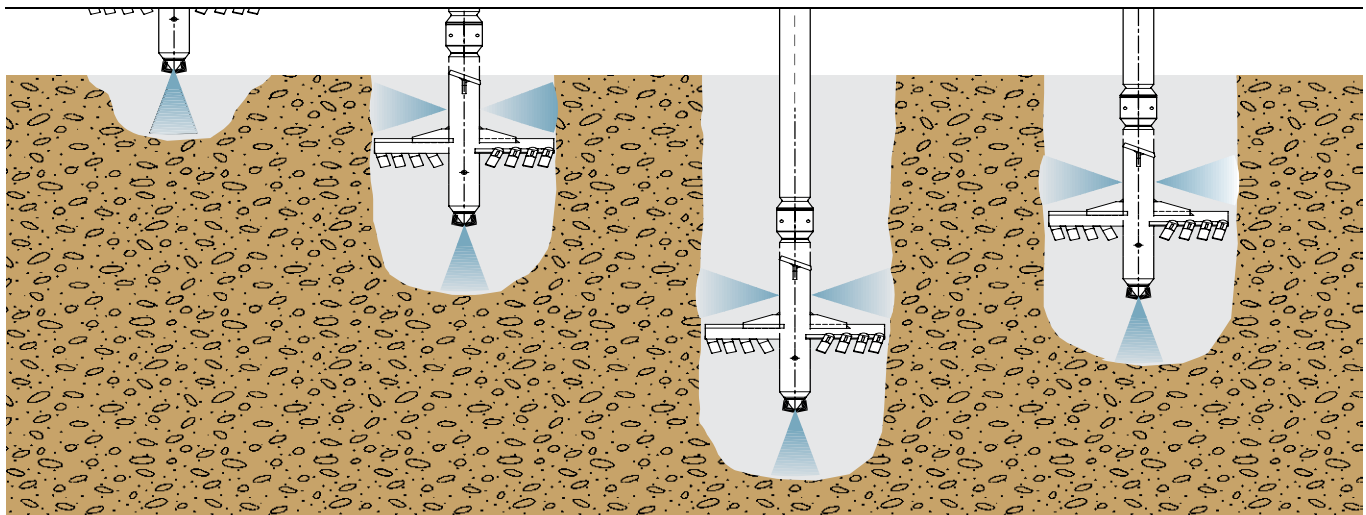
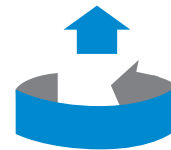
### STAGE 1

Drilling and simultaneous treatment with high-pressure injection of cement grout



### STAGE 2

Extraction and simultaneous treatment with high-pressure injection of cement grout



# Jobsite equipment



**01**  
Agitator



**02**  
Batch plant



**03**  
Tank



**04**  
Autoclave



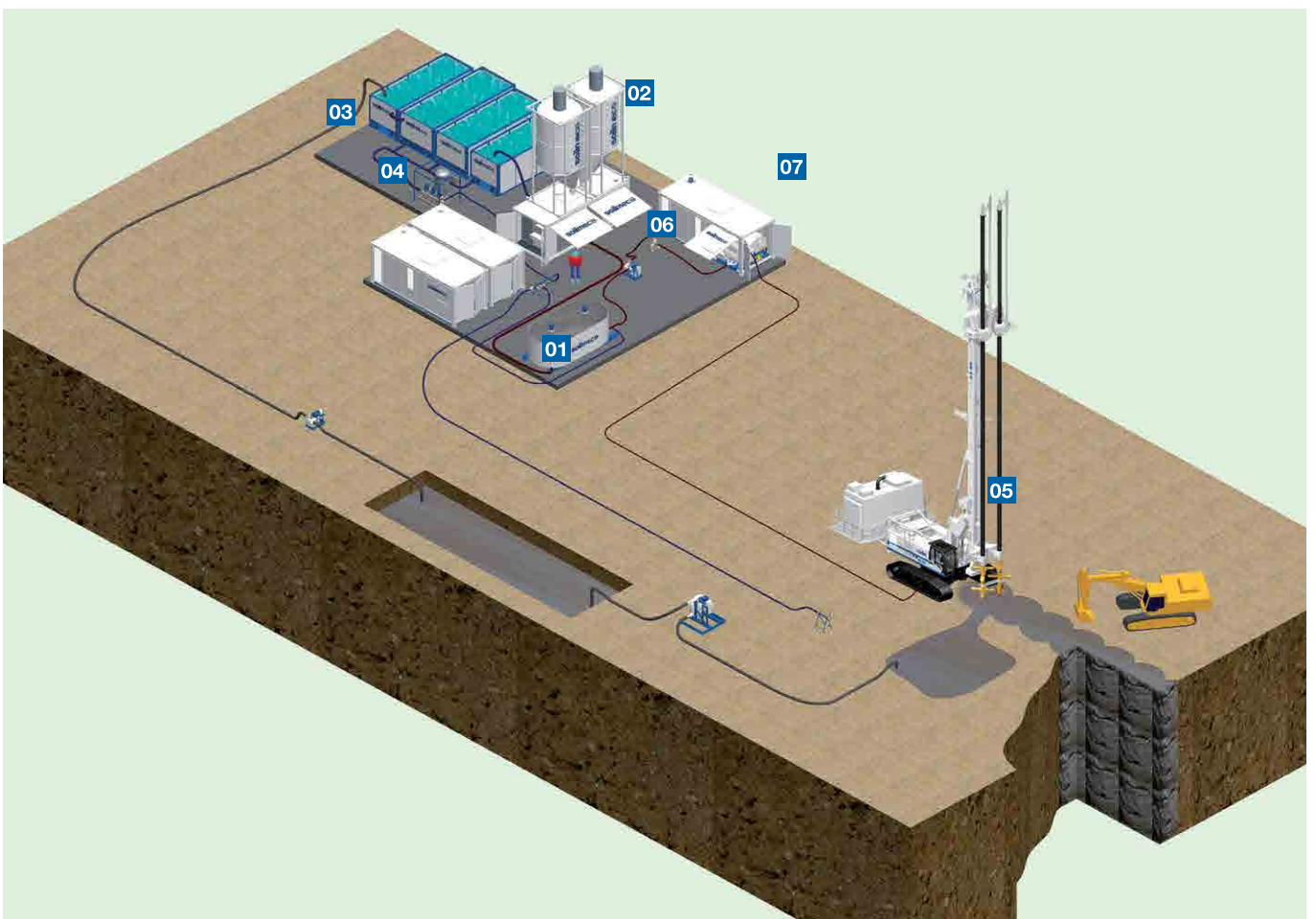
**05**  
Drill Rig



**06**  
Filter



**07**  
High-pressure pump

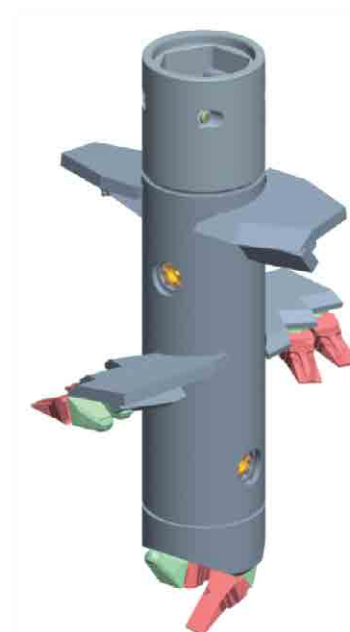
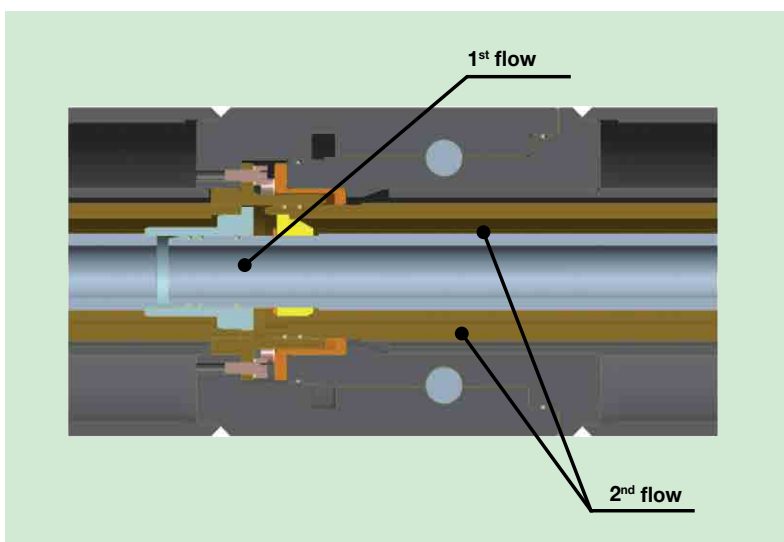


## Drilling rods

As increased flow rates and pressures are requested for higher performances, a new range of smooth rods with hexagonal couplings ensuring better sealing has been specially developed and named YHD.

The new rods feature an outer tube which delivers the torque and crowd force from the rotary to the tool and an interchangeable inner core with a 2"3/4 passage for the consolidating fluid under pressure. The inner core is easily recovered to allow for the use of the outer tube for other technologies, such as Displacement Pile, thanks to the large 5" inner passage.

As it is the case for all new-generation TURBOJET® accessories, the rods are guaranteed up to a 400 bar pressure. The inner passage can host two coaxial tubes to allow two fluids to run through in two separate chambers, such as cement grout/cement grout or cement grout/air. By injecting the cement grout through two separate tubes, it is possible to reach maximum flexibility when consolidated soil columns of higher diameters are needed.





# Tools

## Drilling tools

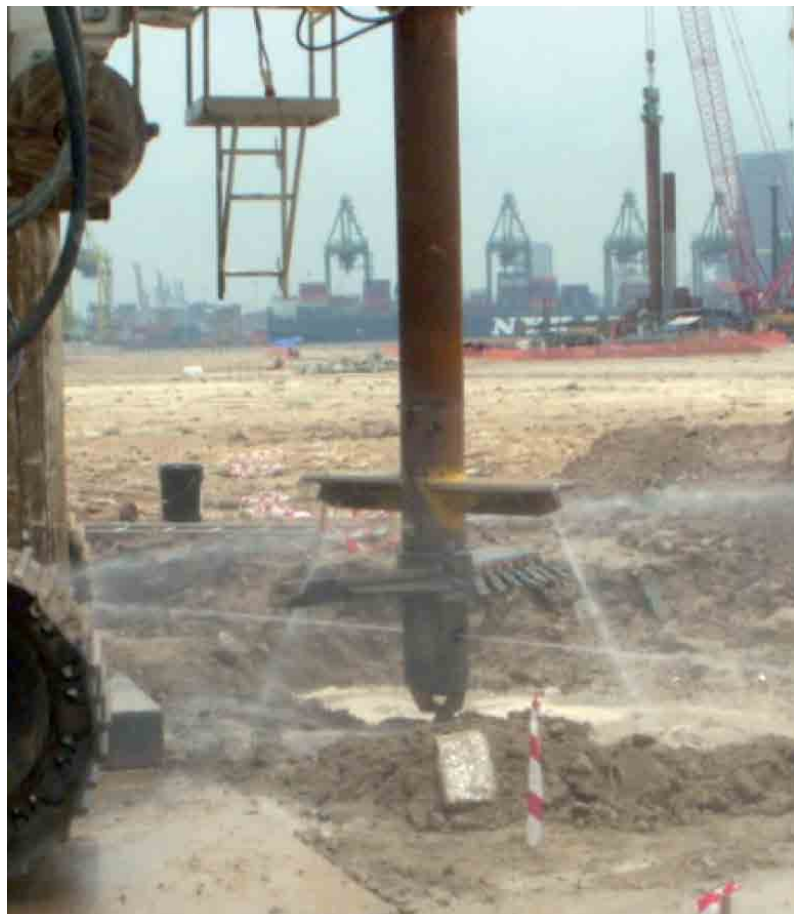
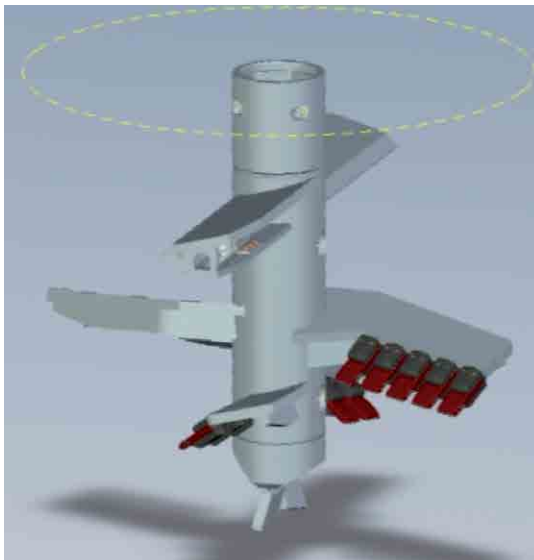
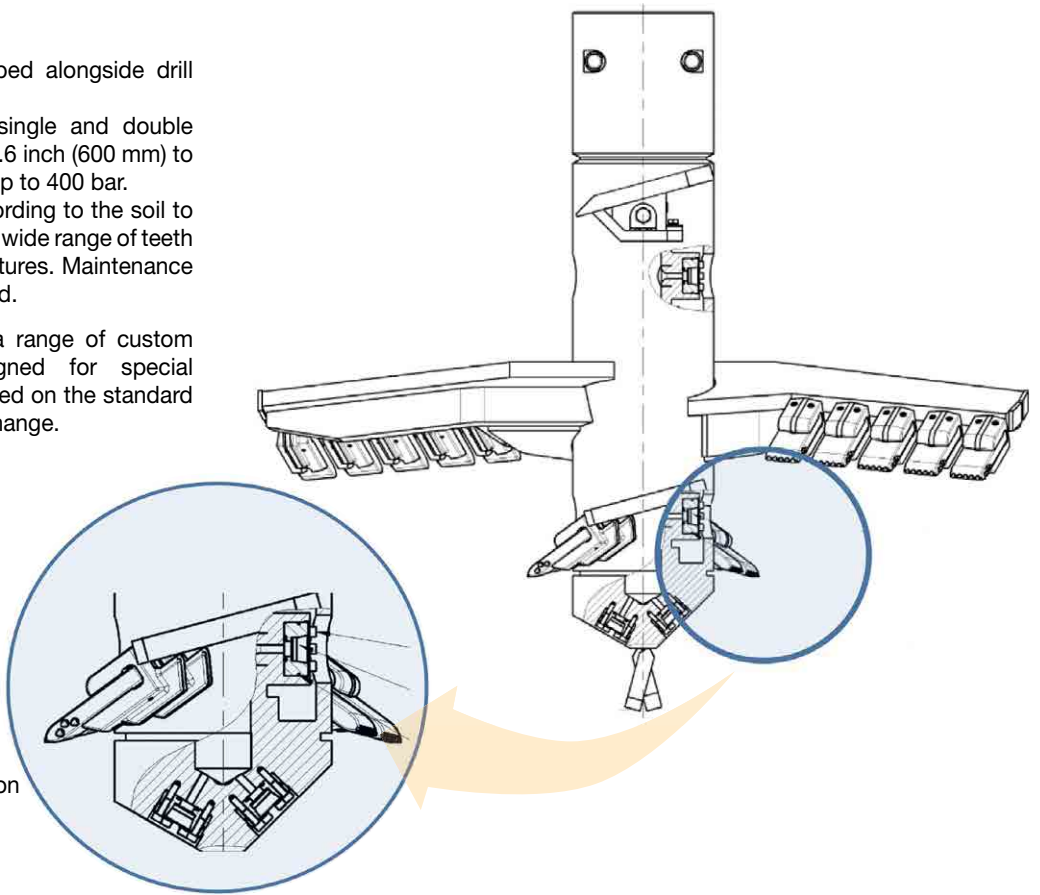
Drilling tools have been developed alongside drill rods.

The new range includes both single and double passage tools of a diameter of 23.6 inch (600 mm) to 63 inch (1500 mm), for pressure up to 400 bar.

Tools are specially designed according to the soil to be treated and can be fitted with a wide range of teeth to increase specific operating features. Maintenance time at jobsite has been minimized.

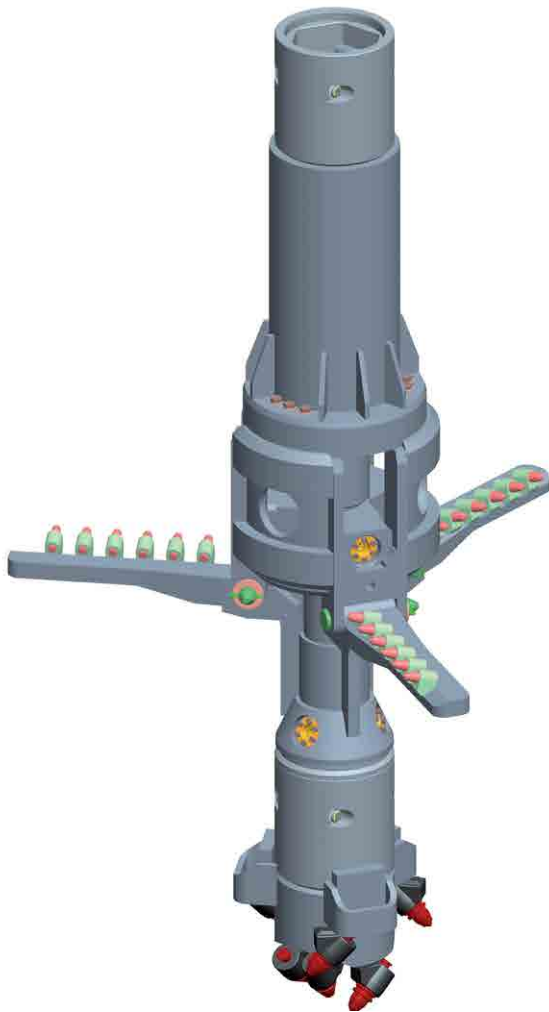
Besides standard accessories, a range of custom accessories have been designed for special applications to be easily assembled on the standard drill string with no need for any change.

- Jetting nozzles with optimized direction
- Removable nozzle sleeve
- Wing orientation for enhanced mixing
- Not protrusive fixing pins
- Special study for teeth orientation
- YHD-5 high pressure coupling





# Tools



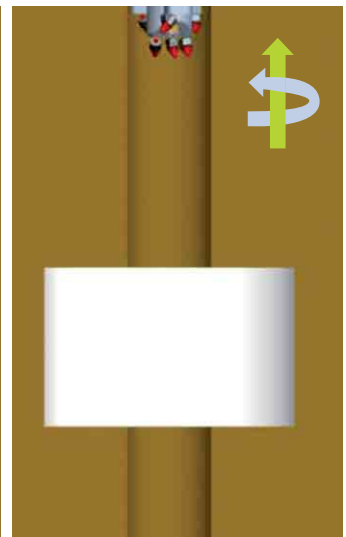
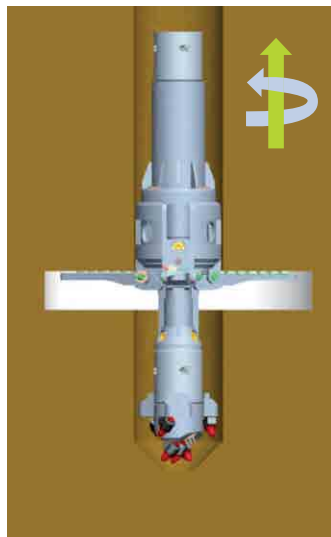
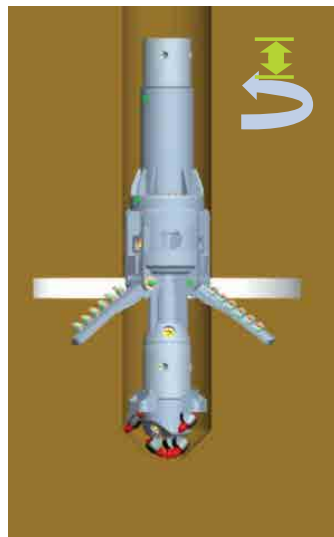
The tool drills the hole with low pressure flushing water (20-50 bar) and closed wings. Once the final depth is reached, the injection grout pressure (300-400 bar) let the wings open and a control valve closes the nozzles on the bit. The treatment can start. When the treatment is stopped, the injection grout pressure is reduced thus closing the wings.

The TJ-idle has been developed to the perform treatment in holes where section are left untreated..

The TJ-idle tool is fitted with opening wings with minimum diameter of 20 inch (508 mm) when closed (during drilling or through ground that does not require treatment). Once the target depth has been reached, the injection grout pressure lets the wings open and the treatment is performed whilst lifting up the rods.

The drilling/mixing treatment is performed using the rig's hoist capacity which is highly performing with respect to the thrust force, thus ensuring the perfect verticality of the column. When the treatment is stopped, the jetting grout pressure is reduced thus closing the wings to the minimum diameter and interrupting the column where needed, for time and jetting material savings.

One single tool is suitable for all diameters ranging from 31.5 to 59.1 in.



# Tools

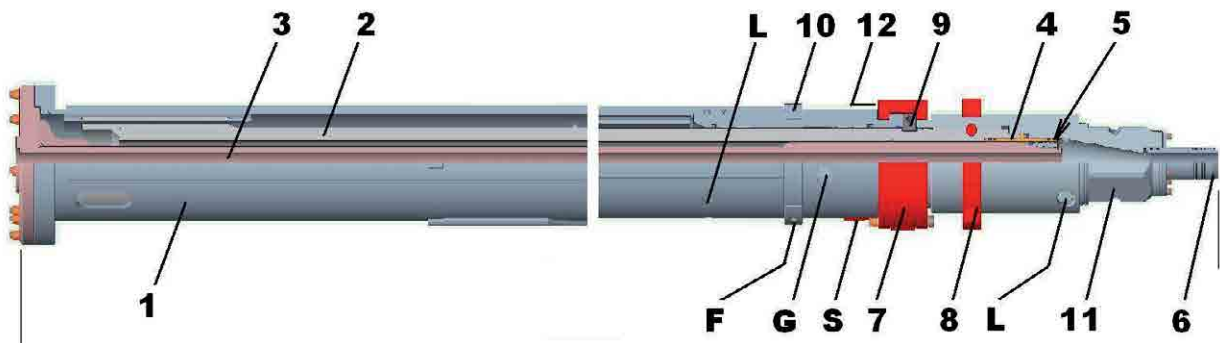
The TKTJ (Telescopic Kelly TURBOJET®) allows a greater depth of column with no need to increase the mast height or to use longer sleeves going beyond the head above the machine.

The TKTJ allows for an 26 ft (8 m) increase in the treatment depth compared to standard, while ensuring at the same time the same pressure and flow rate of the TURBOJET® technique.

A special drilling sleeve for Turbojet technology has been designed, to ensure:

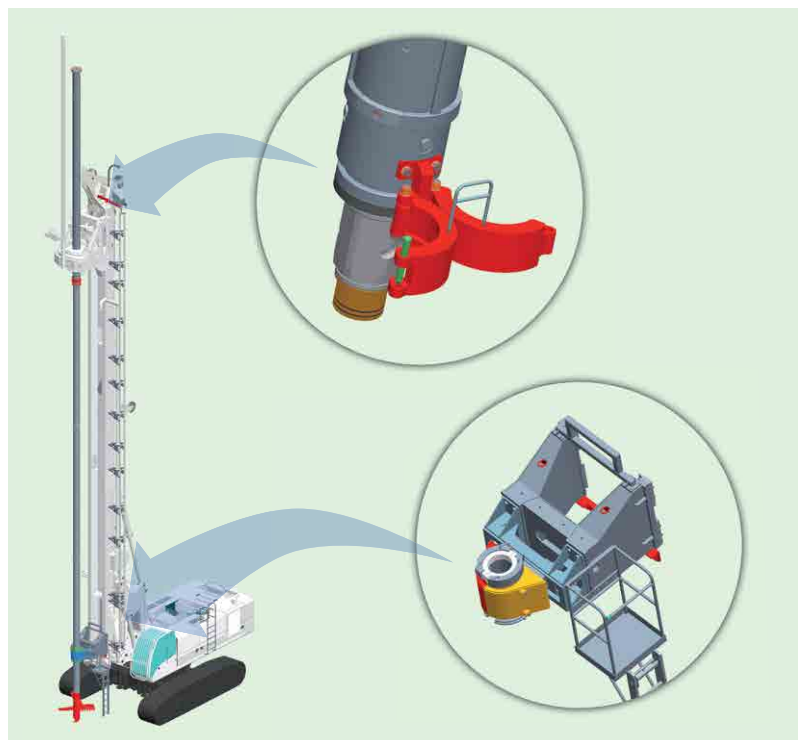
- higher drilling depth
- lighter rig
- continuous jetting with high pressure pump
- greater depth on low headroom works

1. Outer tube
2. Middle tube
3. Inner tube
4. Chromed wear sleeve
5. Seals kit
6. Bottom sealing nose cone
7. Victaulic-type opening safety collar
8. Drill bar support collar
9. Stop collar for middle element
10. Bolt-on stops
11. Adaptor between middle tube and drill bar
12. Victaulic collar jaws safety handle



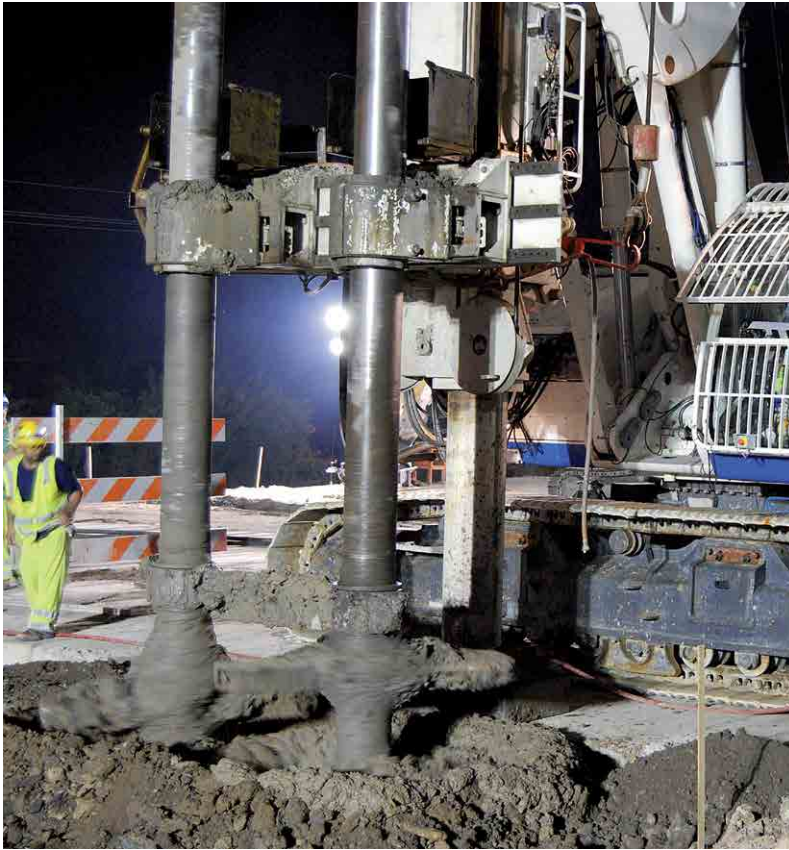
**The fitting kit is composed by:**

- Special TJ swivel and guiding system on sleeve rudder
- TKTJ sleeve
- YHD rods
- Hydraulic bottom guide c/w automatic cleaning
- TJ tools

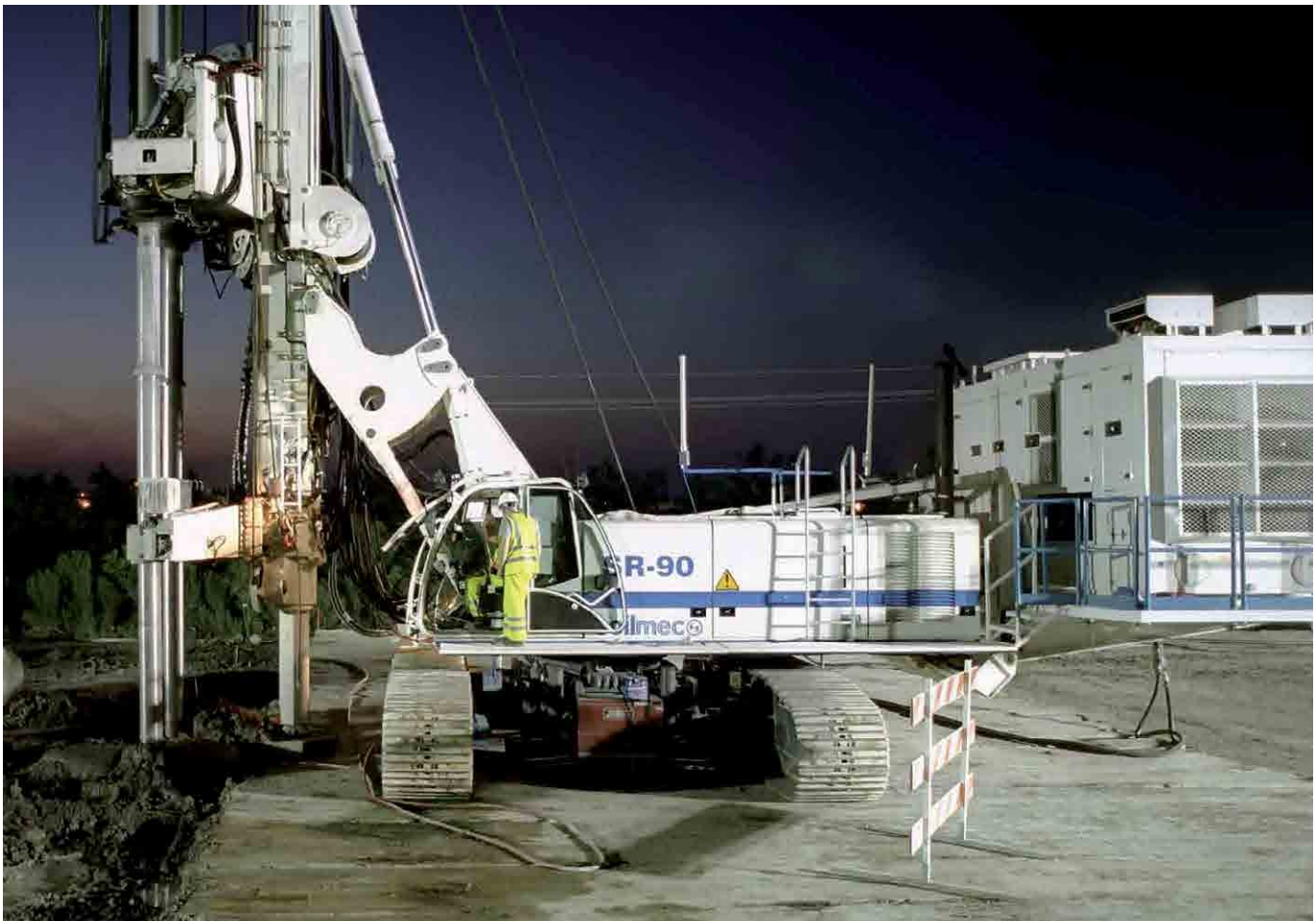




## Special application



TTJ is a twin shaft Turbojet powered by two high pressure pumps and fitted with double rotary assembled on the same mast. The best performing version features an additional hydraulic power pack on the turret counterweight to ensure the higher power needed by the extra rotary. This application guarantees the following operating benefits: maximum verticality, very high mixing quality even in case of plastic clays or if pre-cutting techniques cannot be used, excellent productivity, good quality of finely mixed drainage fluid. The most performing version allows to bore primary and secondary double columns of 1500 mm diameter and variable spacing distance from 1000 to 1200 mm, down to a maximum depth of 39 m.











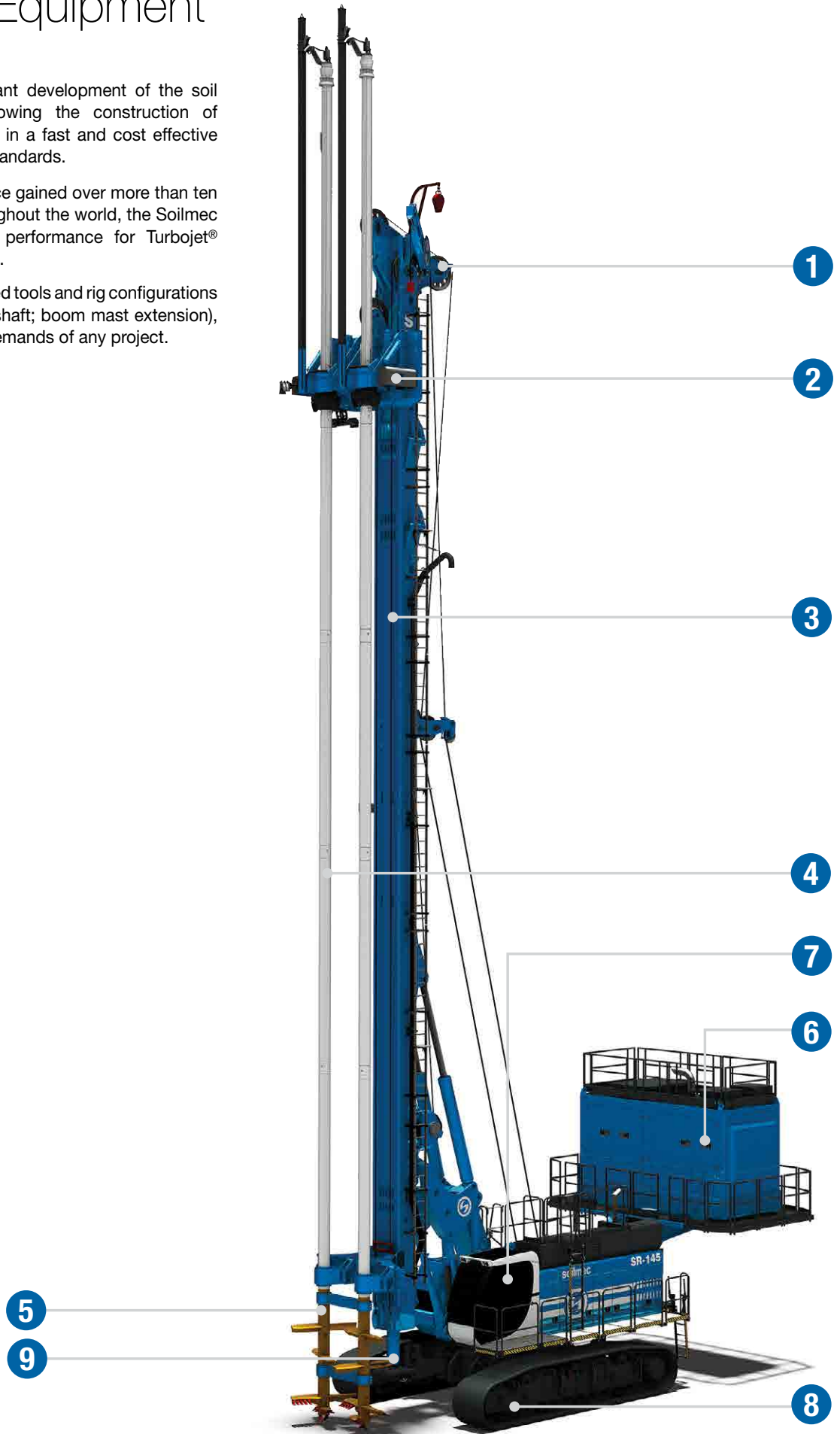
# Soilmec Equipment

Turbojet® is an important development of the soil mixing technology allowing the construction of consolidated structures in a fast and cost effective way, with high quality standards.

Thanks to the experience gained over more than ten years on job sites throughout the world, the Soilmec rigs ensure maximum performance for Turbojet® consolidation technique.

A wide range of dedicated tools and rig configurations are available (up to 4x shaft; boom mast extension), in order to satisfy the demands of any project.

- 1 CATHEAD
- 2 ROTARY HEAD
- 3 MAST
- 4 DRILL ROD
- 5 TJ TOOLS
- 6 POWER PACK
- 7 CAB
- 8 UNDERCARRIAGE
- 9 FOOT ELEMENT





# Soilmec Equipment



Model	SR-45	SR-75
Max treatment diameter	1000 mm	1500 mm
Max pile depth with 8,5 m string extension	20 m	22.7 m
Mast lattice boom extension length	10 m	16 m
Max depth c/w lattice boom mast extension	23 m	30.7 m



Model	SR-95	SR-125	SR-145
Max treatment diameter	1500 mm	1500 mm	1500 mm
Max pile depth with 8,5 m string extension	25.5 m	28.5 m	31.5 m
Mast lattice boom extension length	15.8 m	15.8 m	15.8 m
Max depth c/w lattice boom mast extension	33 m	36 m	39 m



All technical data are purely indicative and subject to change without notice

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Drilling and Foundation Equipment