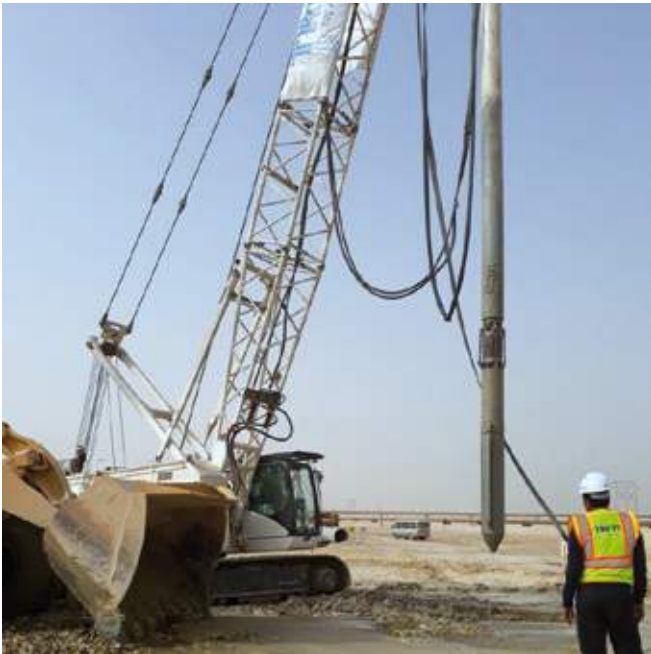




## VIBROFLOT EQUIPMENT

**STA**

VIBRO & GROUTING EQUIPMENT

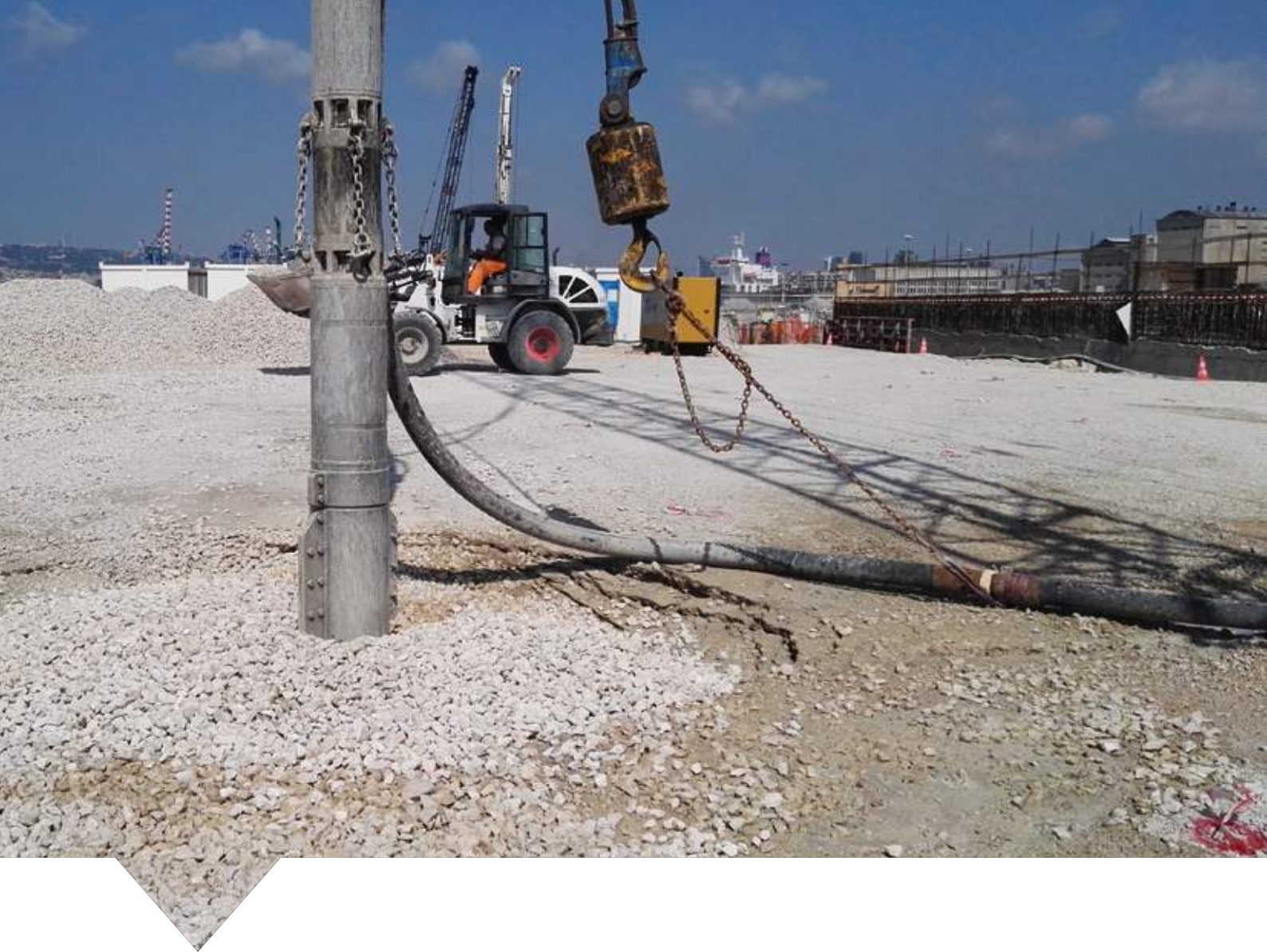


Wet Top Feed Kingdom of Saudi Arabia

Wet Top Feed Sousse Tunisia





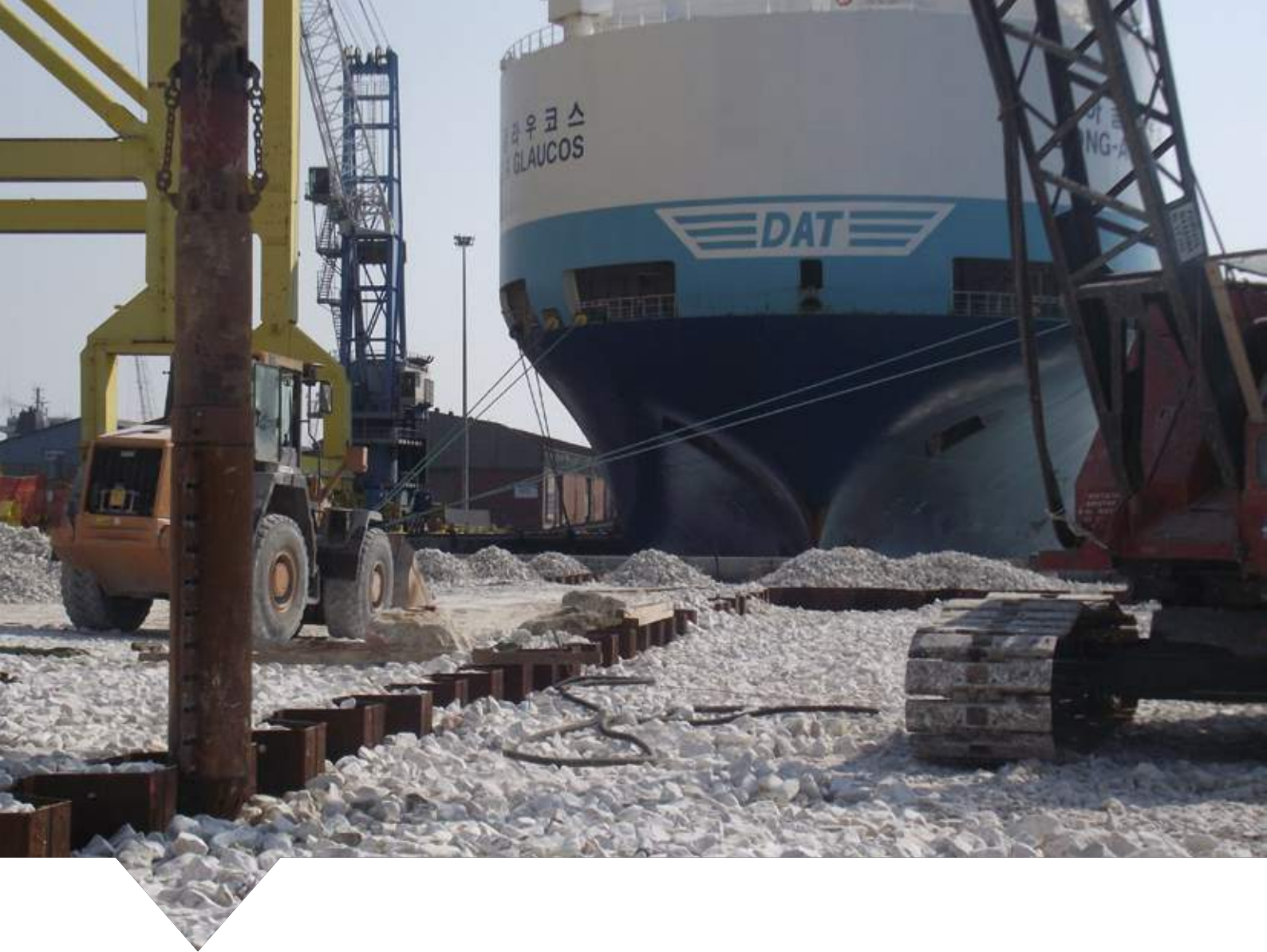


## STA

STA has been designing and manufacturing special hydraulic equipment for more than thirty years. Special foundation and soil improvement equipment.

Vibro flotation and stone columns techniques represent a flexible solution for soil improvement. They are mainly used to improve the bearing capacity, improve soil density, reduce settlements under structural foundations and eliminate potential liquefaction effects

- **Special foundations**
  - Grouting equipment
  - JET grouting equipment
- **Soil improvement**
  - Vibro flotation
  - Vibro replacement-stone columns
- **Naval industry**
- **Special machines**



## Applications

Vibro techniques provide a foundation solution to improve a wide range of weak natural soils or land reclamation projects. The range of application is very wide.

Vibro flotation and stone columns provide an economic foundation support for different applications.

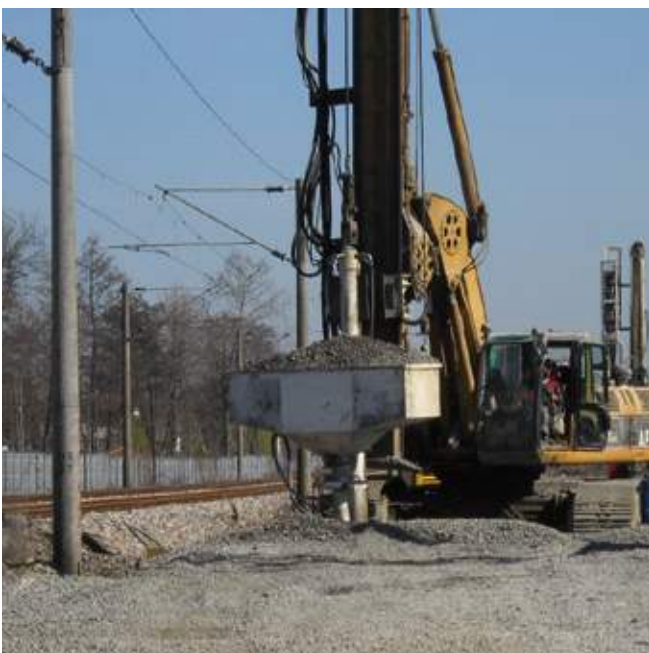
- Industrial buildings
- Oil and gas facilities
- Infrastructures
- Airports
- Railways
- Logistic facilities and platforms
- Foundations for silos
- Foundations for storage tanks
- Commercial and residential buildings



Haiti Port au Prince: 160.000 lm of stone column 20 meters deep.

Turkey: dry bottom feed stone columns for railway project.

Gravel hopper in Trieste Italy for sea bed consolidation.



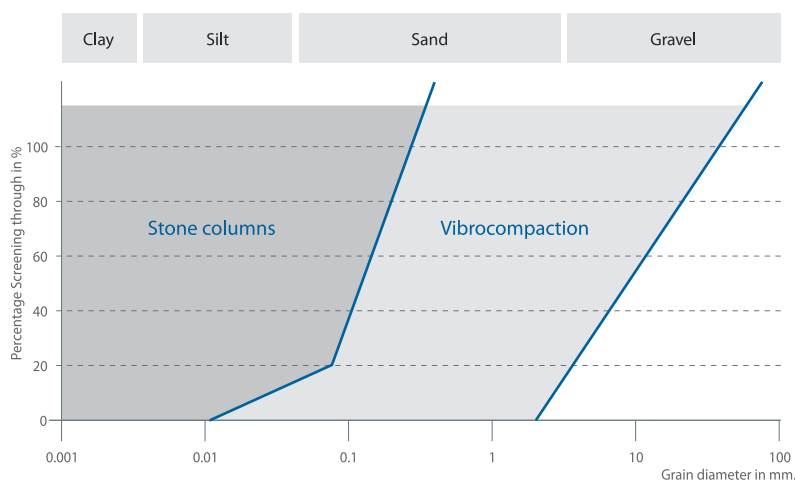


## Vibro flotation vs Stone column

When the soil conditions cannot achieve the required bearing capacity, vibro techniques offer an economic solution for the soil improvement.

The choice of the best-adapted technique will be determined mainly by the type of soil and the soil's water saturation and bearing capacity requirements.

The following graph illustrates the limits of application of the two main Vibro techniques:

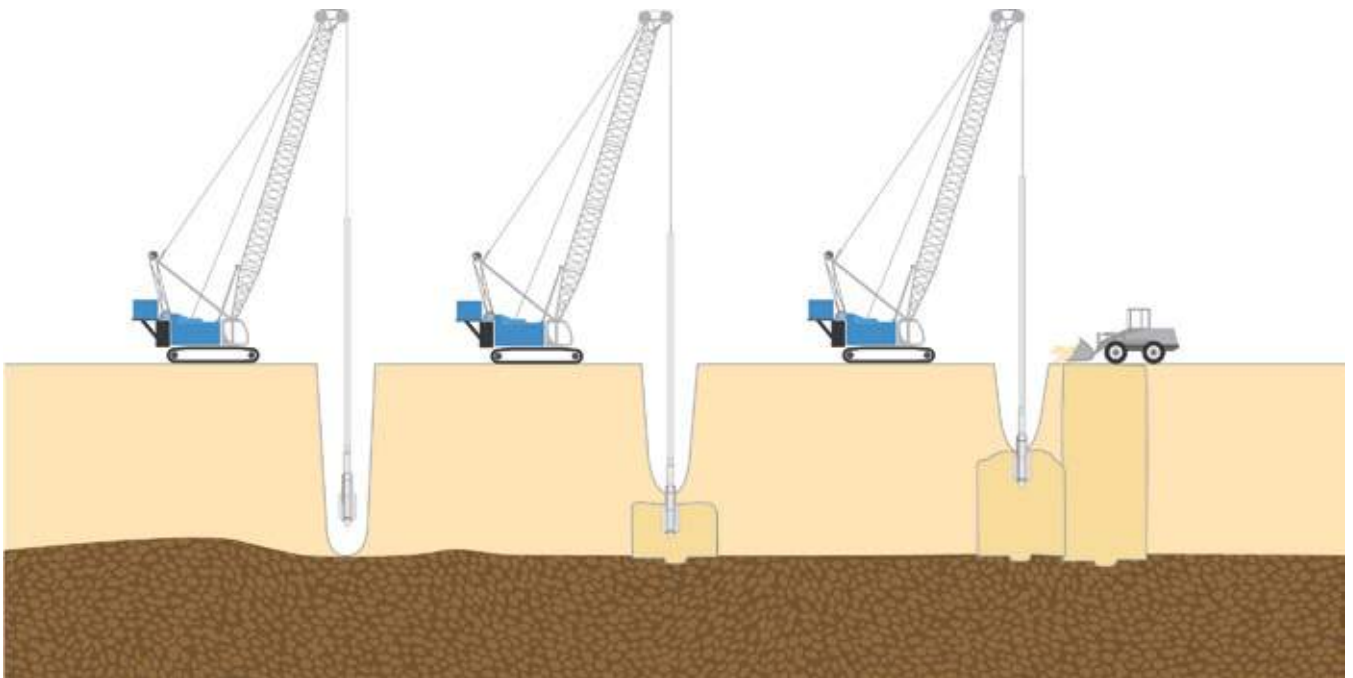


- Vibro compaction
- Stone columns

## Vibro compaction

For land reclamation and sand compaction the VibroSTA is suspended for penetration into the ground thanks to its own weight, vibrations and a perforation fluid as water.

The Vibro compaction technique is used in granular soils with limited fines content. This technique uses the VibroSTA sustained vibrations to rearrange the soil particles of non-cohesive soils into a denser state. The action of the vibrator reduces the inter-granular forces between the soil particles, allowing them to move into a more compact configuration.

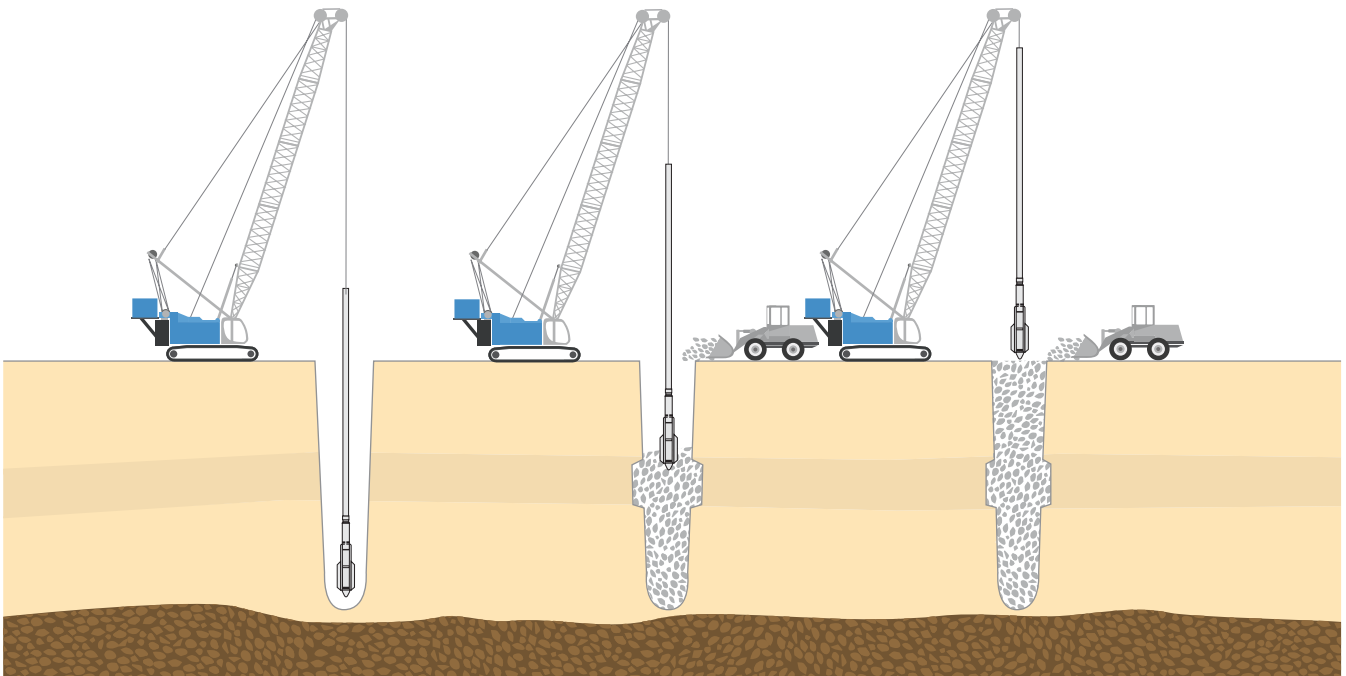




# Stone column

It is a ground improvement technique used to improve the load bearing capacity and reduce the settlement of the soil. It is also called as granular columns or granular piles.

This technique is also known as vibro replacement. In this technique dense aggregate column (stone columns) is constructed by means of a crane-suspended downhole vibrator.











## VibroSTA

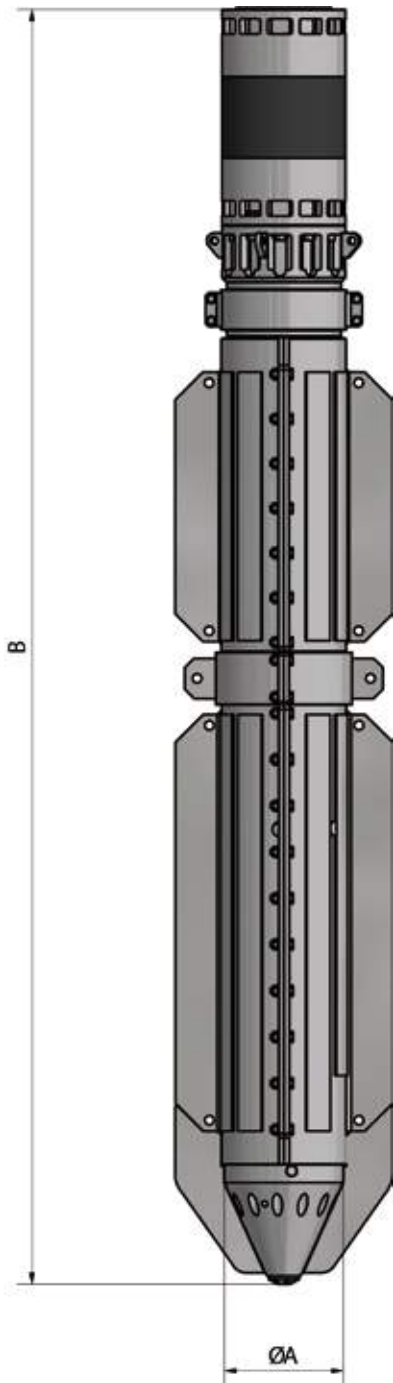
The VibroSTA is a vibrating tool system, composed by a vibrator, an isolator and various extension tubes. The vibrator contains an eccentric mass that continuously rotates, generating radial centrifugal force.

This lateral/radial force is used to penetrate the soil and then to treat the soil itself, according to the chosen ground improvement technique (vibro compaction or stone columns).

Different length extension tubes allow the VibroSTA to reach any required treatment depth. VibroSTA can be equipped with a Bottom Feed System (BFS), for stone column applications.

In this case, a stone tube and a stone tank with a stone gate, will be added to the VibroSTA in order to drive the gravel up to the bottom of the perforation level.





## VibroSTA range

STA offers a wide range of vibroflots for ground improvement jobs.

Different models are available depending on the soil conditions and techniques to be implemented.

The VibroSTA can be mounted on a crane, on a rig or mast, and on excavator.

HYDRAULIC RANGE	VIBRO STA VS130H	VIBRO STA VS150IR	VIBRO STA VS180H	VIBRO STA VS200H
Power (kW)	130	154	180	204
Freq (Hz)	30	50	30	30
Rpm max	2000	3000	2200	1800
KN	200	230	230	413
Weight (kg)	1.900	1.600	2.100	2.600
Length B (mm)	4.000	3.400	4000	4.200
Diameter A (mm)	400	310	400	500



## Stone columns

Installation of stone column improves ground by reducing soil settlement. Due to its higher modulus of elasticity than that of soil, it absorbs more load than soil and reduces overall settlement.

Since applied load distributes in between soil and stone column in the ratio of their stiffness, the load carrying capacity of soil also increases.

Stone aggregates are used to fill stone column. Water can easily pass into the stone column. So, stone column helps in excess pore water pressure mitigation and accelerates the consolidation process.

In this method, boring is done by displacing nearby soil. The soil is displaced laterally, due to which engineering property of soil gets change.

This technique can be performed in two methods.

- Top feed method
- Bottom feed method



## Top feed method

During and after the perforation process an annular space stays open around the VibroSTA and the gravel can be provided into the hole from the top.

The top feed stone columns are a vibro replacement technique recommended for cohesive saturated soils.

This technique consists in building and compacting in the ground columns made from coarse gravel, crushed stone or crushed aggregate, following a grid pattern previously determined by a test trial.

In the top feed method, the column is made with stones that are added from the ground surface into the hole created by the VibroSTA.

This method requires the use of same equipment as the vibro compaction suspended from a crane.

The backfill is compacted and pushed into the sides of the hole. The stone column is formed from bottom of the hole to the top.



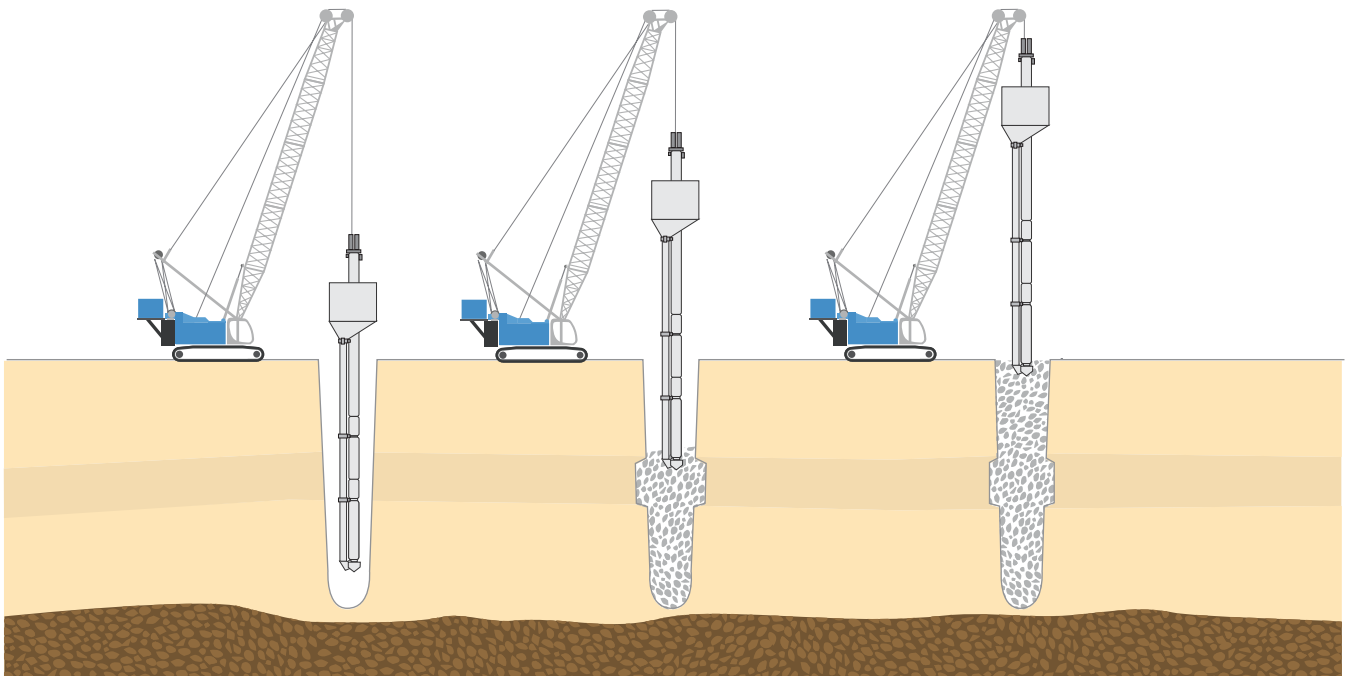
# Bottom feed method

The percentage of fines is higher than 10-15% of the soil volume.

The soil collapse around the VibroSTA and the hole does not stay open during and after the perforation process.

Once the perforation process is terminated, the stones are discharged at the bottom of the VibroSTA tip through a stone tube that drives the gravel into the VibroSTA building the stone column from the bottom to the top of the designed depth. Preferred perforation fluid is compressed air.

- Crane suspended
- Excavator mounted
- Piling rig application











Crane suspended application for dry bottom feed stone columns in Chioggia Italy.

Piling rig application for dry bottom feed stone columns in Sao Paulo Brasil.









## Off shore application

Off shore sea bed consolidation for under water structures can be performed with VibroSTA equipment.

Foundations of quay walls and berths, soil improvement for slopes of dredged areas can be achieved with vibro compaction or stone columns method depending by design requirements.

Execution of top feed and bottom feed stone columns is more challenging when works are to be performed offshore and in marine conditions. In the marine wet top feed method, a 3 m to 3.5 m thick gravel layer is initially placed on the seabed. This layer will feed the stone columns. The maximum stone column lengths that can be constructed using the gravel layer are in the order of 10 m to 15 m. In the bottom feed method gravel is fed to the tip of the vibroflot through a gravel pipe with a large hopper at its head. The hopper has a capacity in excess of the expected stone consumption for one column.





Off shore application: harbour of Trieste Italy. Bottom feed stone columns for sea bed consolidation.





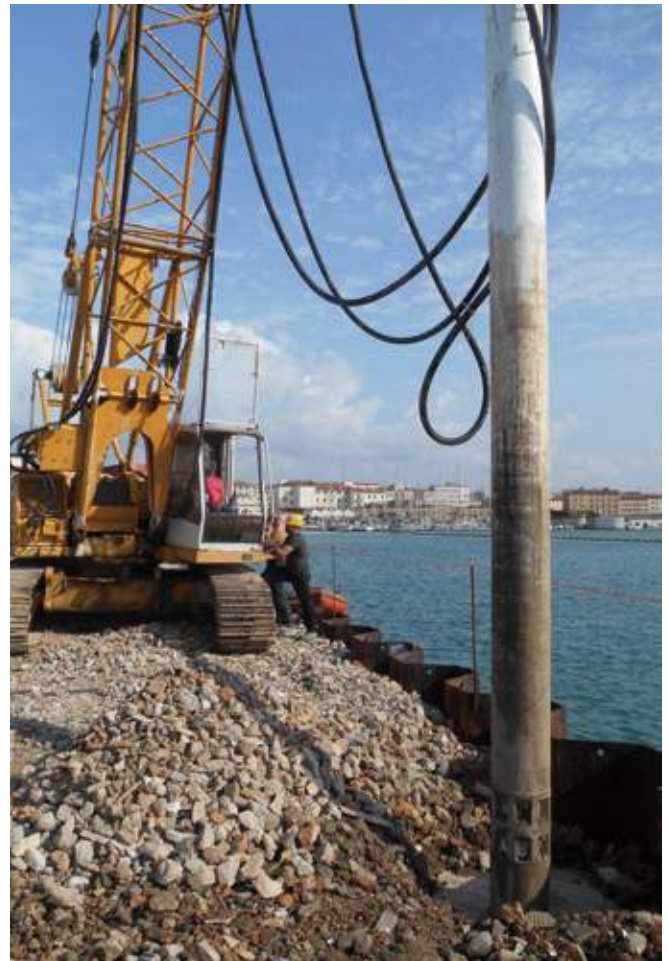


VUGLIELMO G.

CO. E. D. MAR.



Harbour of Livorno Italy Top feed stone columns.



**LEFT PAGE**

Rijeka gateway project: sea bed consolidation bottom feed stone columns 25 meters depth at an underwater depth of 28 meters.







## Data logger system

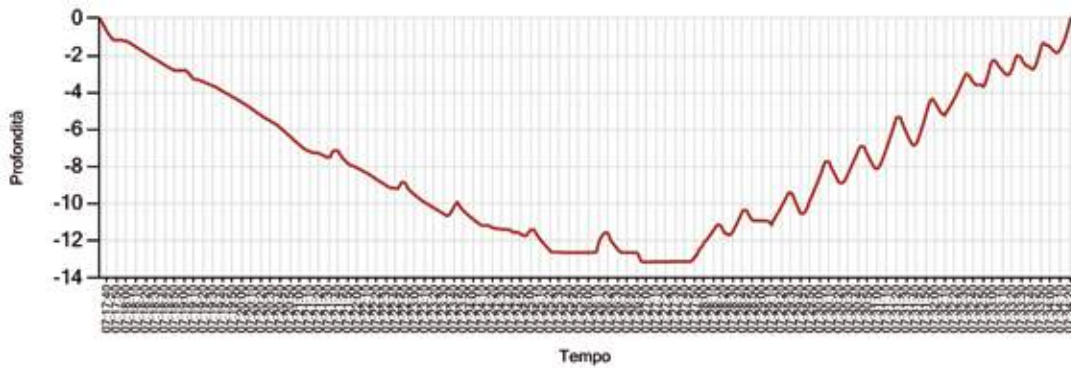
All working data can be visualized in real time and stored with VibroSTALog. The operator can manage and control:



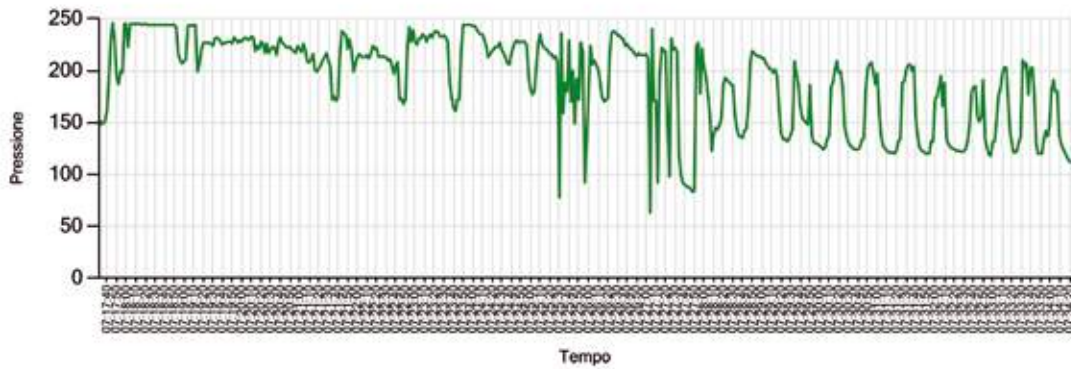
- Depth
- Power of compaction
- Column profile
- Air/Water flow and pressure

Cantiere: napoli  
Operatore: luigi  
Numero Blocco: record  
Numero Foro: ab1001

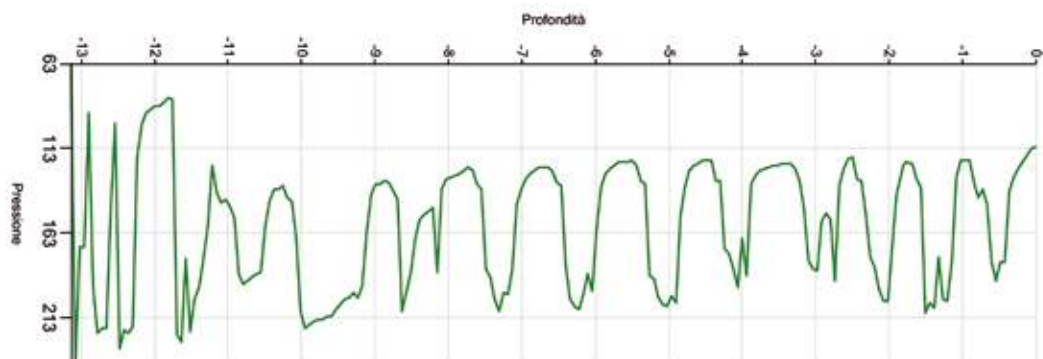
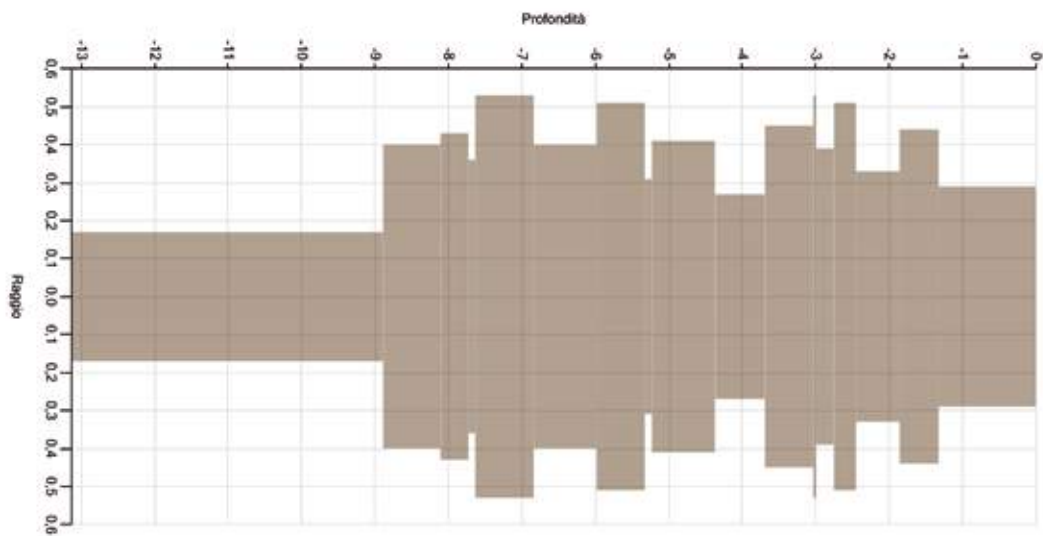
Data Inizio: 10/03/2016 07:17:32  
Data Fine: 10/03/2016 07:34:21  
Totale Volume (M<sup>3</sup>): 5,5  
Numero Fori: 1



— Profondità



— Pressione







## Power Packs

TECNICAL DATA	POWER PACK	VIBRO STA
Engine	Caterpillar	CAT C9
Power	Kw	261
Frequency	rpm	2200
Hydraulic flow	l/min	400
Hydraulic pressure	bar	360
Oil tank	lt	1.400
Weight	Kg	6.000
Length	mm	3.200
Width	mm	2.000
Height	mm	1.950

STA Power Pack mounted on crane. Dry Bottom Feed stone Columns  
Chennai India.

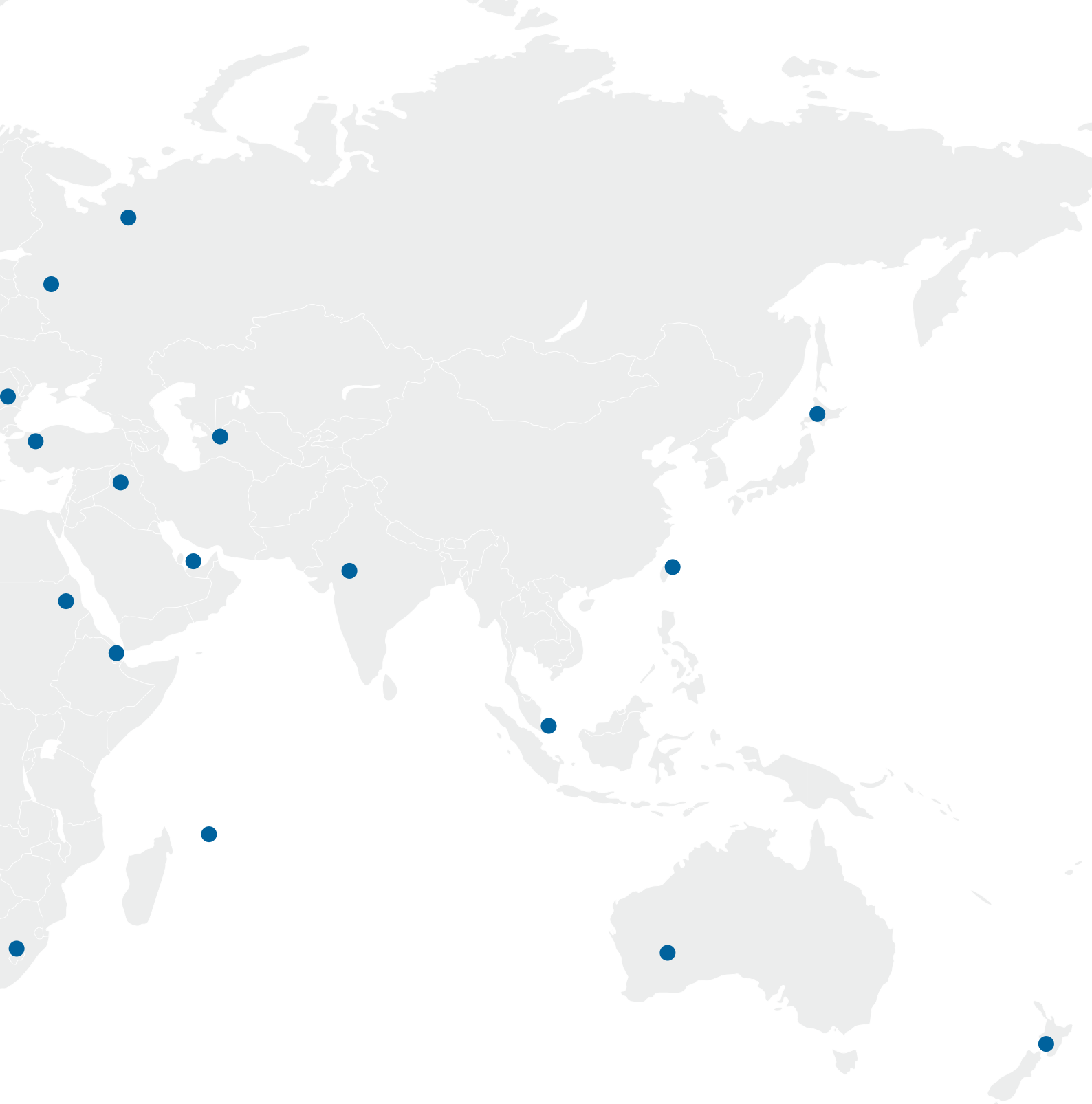
STA Power Pack separated from base machine. Wet Top Feed  
Mathura India.







Global presence  
Local service







**STA**

Via delle Industrie 2  
20060 Mediglia  
Milano, Italy

T +39 02 90661181  
contact@sta-srl.info

**[STA-MILANO.COM](http://STA-MILANO.COM)**