

Expert Solution in



VIBROFLOTTATION • STONE COLUMNS • INCLUSIONS • SOIL MIXING • SOLID INJECTION •
DYNAMIC COMPACTION • DYNAMIC REPLACEMENT • VERTICAL DRAINS

PLATFORMS AND SOIL IMPROVEMENT



SOLETANCHE BACHY

GEOTECHNICAL AND CIVIL ENGINEERING CONTRACTORS

BUILD ON US

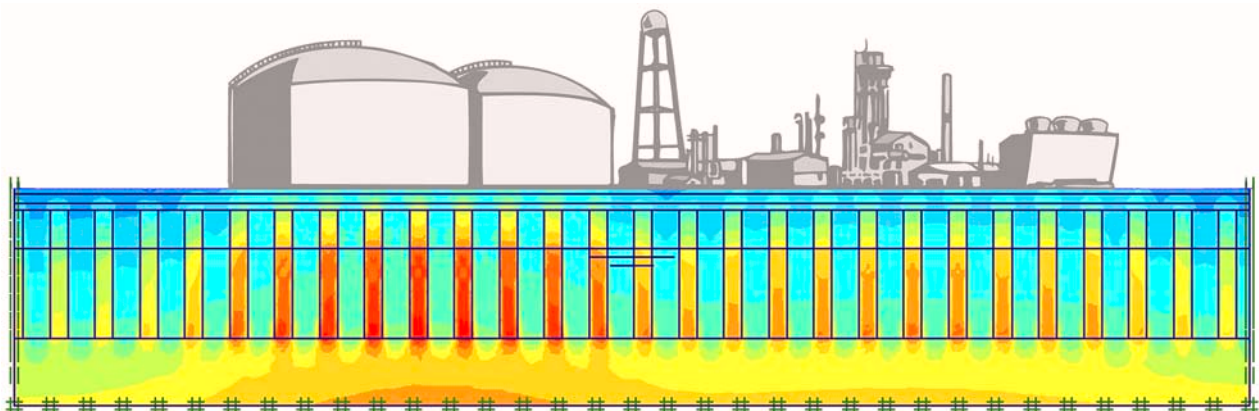
Soletanche Bachy - worldwide leader in ground technologies - has a wide range of processes for soil improvement.

These solutions allow works to be completed without using traditional deep foundations.

Thanks to the know-how of its engineers and technicians, Soletanche Bachy can provide global solutions to the problems encountered in the ground while building:

- **Communication networks: roads, railways**
- **Industrial buildings and platforms**
- **Commercial buildings and storage areas**
- **Harbour platforms**
- **Airports**

Our tools for design provide at the same time the definition of the ground improvement needed and the design of the formation layer as well as the foundation structures. Soletanche Bachy can deliver a platform ready for building.





INCLUSIONS

This technique is designed to provide structural support on all compressible soils. The process permits settlement reduction within acceptable limits.

The inclusions are generally vertical and arranged in a regular grid. They should display deformation and stiffness characteristics appropriate for the surrounding ground and the structures to be supported.

Different methods can be used (drilling with or without displacement, driving, vibrating) and different types of fill (ballast, gravel, soil-cement mixing and all types of



mortar or concrete) are usable to allow the construction of a superficial foundation system with minimal cost when compared to a deep foundations system.

VERTICAL DRAINS



Vertical drains are used to improve saturated fine soils. The technique consists in driving prefabricated drains

vertically into the ground, following a regular grid. When the ground is loaded, the drains aid the evacuation of the pore water to the surface, allowing rapid consolidation of the ground. The surcharge is provided either with a pre-loading fill, or with other methods.

DYNAMIC COMPACTION AND REPLACEMENT

This method allows the treatment of the ground at depth, through surface action. The dynamic consolidation provides the compaction of loose granular soils.

The principle consists of dropping, in repeated free fall, a weight of several tons from a height some of ten meters or more.

On clayey soils, stone is placed across the site under the mass, making the dynamic replacement effective.

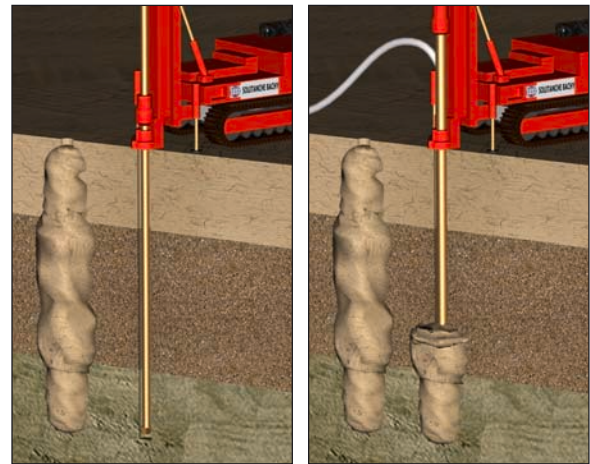


PLATFORMS AND SOIL IMPROVEMENT

SOLID INJECTION

This technique can be used for the treatment of moist or saturated sandy silty or clayey soils. The process consists in injecting a viscous mortar under pressure, in a specific grid pattern designed in accordance with the ground conditions and required improvement. The process is designed in such a way as to provide horizontal densification.

The technique has a proven efficiency, is economical and flexible, allowing among other results to reduce liquefaction sensitivity in case of earthquakes. It can also be used under existing buildings, unlike other techniques.



SOIL MIXING



The technique consists in the construction of columns of mixed in place soil with a cementitious material, normally cement.

The in situ remoulding and mixing of the soil is achieved with rotary tools. Various tools have been developed

(simple rotary tools, multiple augers overlapping or not) allowing the formation of single columns, panels or blocks.

For the remediation of polluted grounds this process is applied to the whole volume.

The binder can be introduced as powder or slurry. The cement content can be varied to obtain a wide range of strengths and more flexibility in the mix properties, appropriate to the project requirements.





VIBROFLOTATION

The vibroflotation (sometimes called vibrocompaction) is applied essentially to granular and not coherent soils, such as sands and gravels.

The vibrations induce a temporary liquefaction of the soil around the vibrator. In this case, the intergranular strengths are almost cancelled, and the grains are rearranged in a more compact pattern offering better characteristics.

This technique is often used on large works for the densification of hydraulic fills for reclamation.



STONE COLUMNS

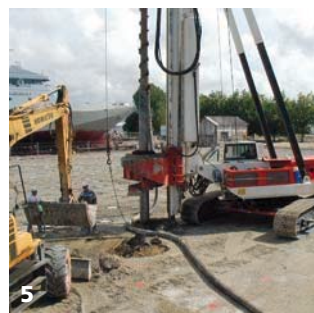
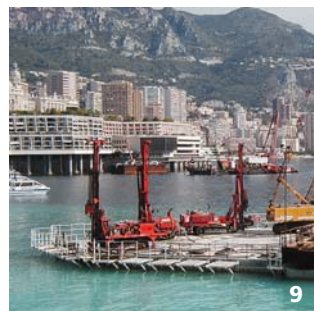
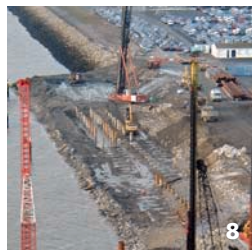
The stone columns process is an extension of the vibroflotation for ground containing silty or clayey layers, the particles of which cannot be rearranged by vibration. The stone columns allow the treatment of these types of



ground through the incorporation of granular materials (sometimes called ballast) compacted by ascending steps. These columns can also have their stones concreted or just made of mortar.

They also serve as drains and allow an acceleration of the consolidation of the surrounding ground. In a seismic area, they can reduce the ground liquefaction risk.





- 1 - **INDONESIA**
Industrial platform
- 2 - **FRANCE**
Cannes Mandelieu's airport
- 3 - **HONG KONG**
Vibroflottation of a sandy fill
- 4 - **FRANCE**
Nantes Mitterrand Quay
- 5 - **FRANCE**
Lorient, boat lift and naval repair area

- 6 - **UNITED STATES**
San Diego, foundation of a building for the US Navy
- 7 - **FRANCE**
Concarneau dry dock
- 8 - **FRANCE**
Montoir de Bretagne, extension of the harbour
- 9 - **MONACO**
La Condamine, extension of the harbour



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