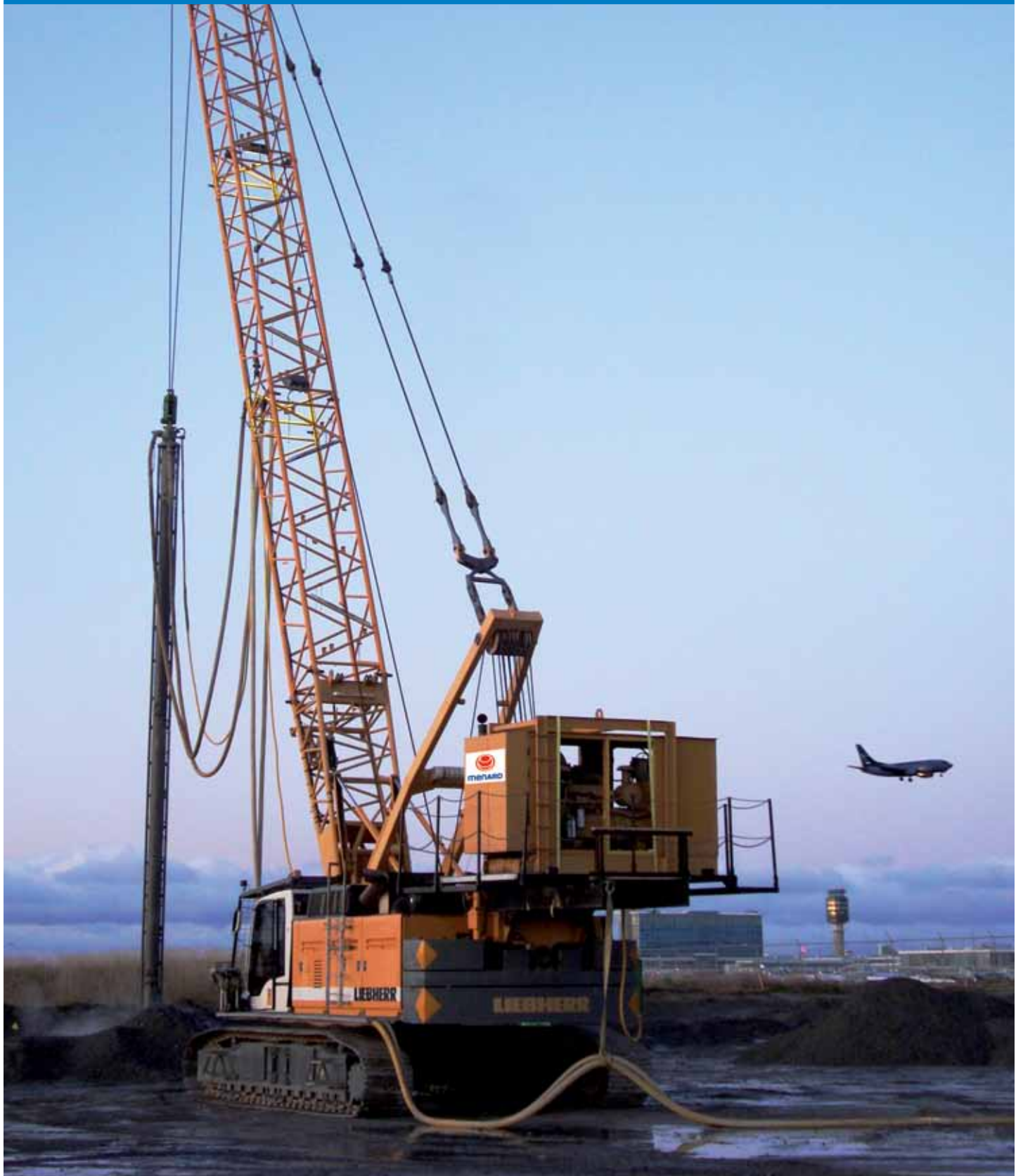
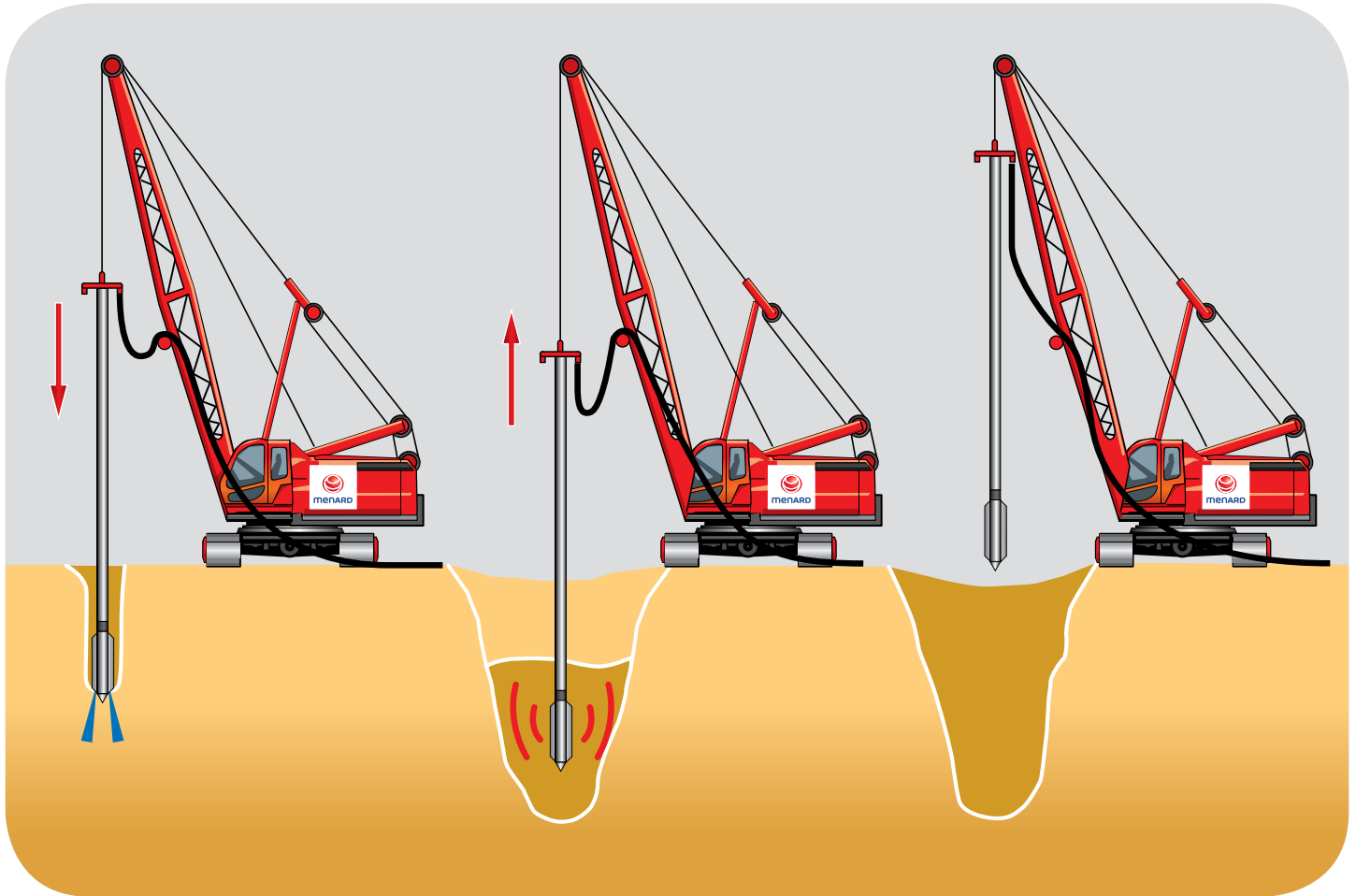


Vibroflotation (VF)



ground improvement specialists

First attempts of using the Vibroflotation (VF) technology, also known as a vibrocompaction method, took place in the year 1934. Since then, the method of the loose soil compaction has been repeatedly improved and is in use till the present day. Currently, the method is applied in projects around the world and is one of the leading methods of improvement of non-cohesive soils.



Technology specification

The Vibroflotation (vibrocompaction) is a method of improvement of non-cohesive soils by re-arranging the grain distribution pattern while applying cyclic vibrations which cause the outflow of granular soil. As a result, the compaction of soil and the pore volume reduction are obtained. The main equipment used for the vibrocompaction is heavy plunge vibrators called vibroflots.

The vibroflots are cylindrical in shape with a diameter ranging from 30 up to 50 cm; the drive unit is mounted in the bottom part generating lateral vibrations with an amplitude ranging from 5 up to 20 mm. Often, the bottom part of the vibroflot is equipped with jets where water or air is pumped in order to enhance the soil compaction. The vibroflot with a leading pipe penetrates the ground under its own weight or – in case of the vibroflot suspended on the self-support structure – under the pressing force with simultaneous action of vibration. The compaction occurs as the vibroflot is surged up and down. In the loose soil the compacted column has a diameter ranging from 1.5 up to 2.5 m depending on the grid of compaction points and the type of soil.

When compacting loose soil the ground surface is lowered. The depression in the ground surface depends on the thickness of the compacting layer and the degree of loosening the soil to be compacted.

In any case, it is necessary to compact the surface layer between 0.5 and 1 m which is loosened by the application of the vibroflotation. For this purpose the conventional equipment such as heavy vibrating road rollers is used.

Application

The Vibroflotation (VF) is best suited for non-cohesive soils such as loose sands, gravels and sandy gravels. Good results are obtained for non-cohesive mining waste, etc. which contains up to 5% of fines: silts and clays. The soils containing over 10% of silt and clay fraction are not suitable for this method.

The Vibroflotation (VF) is often used for the compaction of thick silted up surface fills on flooded areas - the silting method.

The Vibroflotation (VF) can be used for the foundation of various facilities such as parking lots, airport runways, road embankments, enclosed buildings and structures on areas reclaimed from the sea (harbors, hydraulic structures). This method is particularly well suited for the foundation of facilities with uniformly distributed pressure onto the subsoil.

The use of the VF method in non-cohesive soils significantly reduces the soil settlement after applying loads, decreases the soil filtration coefficient and leads to the unification of the foundation conditions (minimization of the differential settlement).

Compaction points – the vibroflot is introduced into the soil in a triangular or square grid with the side dimensions ranging from 1.5 up to 5,0 m. The depth of the compaction varies from 3.0 m up to 20.0 m, but it can be carried out up to 40 m. The obtained compaction index (I_d) is ranging from 0.5 up to 0.9.

The vibroflotation is often applied as an auxiliary operation in cases where it is impossible to avoid deep foundation. In such cases the vibrocompaction of the subsoil helps to achieve sufficient compaction index which favors piling and allows for shallow foundation of the facility floors.





Advantages:

- **Economy** – one of the most economical methods of the soil improvement, particularly effective in case of deeply deposited non-cohesive soils.
- **Comprehensive improvement** – applied to improve geotechnical parameters of compacted soils in the entire volume.
- **Simplicity of implementation** – application of this technology does not require delivery of materials, additional equipment. The success of the project depends on the proper selection of operational parameters of machines and location of compaction points.
- **Settlement control** – application of the VF technology leads to the reduction of settlements and minimizes differential settlements which significantly contributes to safe foundation of the structures.
- **Scale of operation** – one of the few soil compaction technologies used for the layers with considerable thickness up to a depth of 40 m.
- **Hydraulically effective** – this technology is often used for hydraulic structures such as harbor bottoms, improvement of quays; it is the only effective method of improvement of the soil conditions.
- **High performance** – the VF technology is highly effective reaching several thousand of cubic meters of improved soil per day (using a single working unit).

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