



CAPABILITY SHEET

Cofra Vibro Compaction

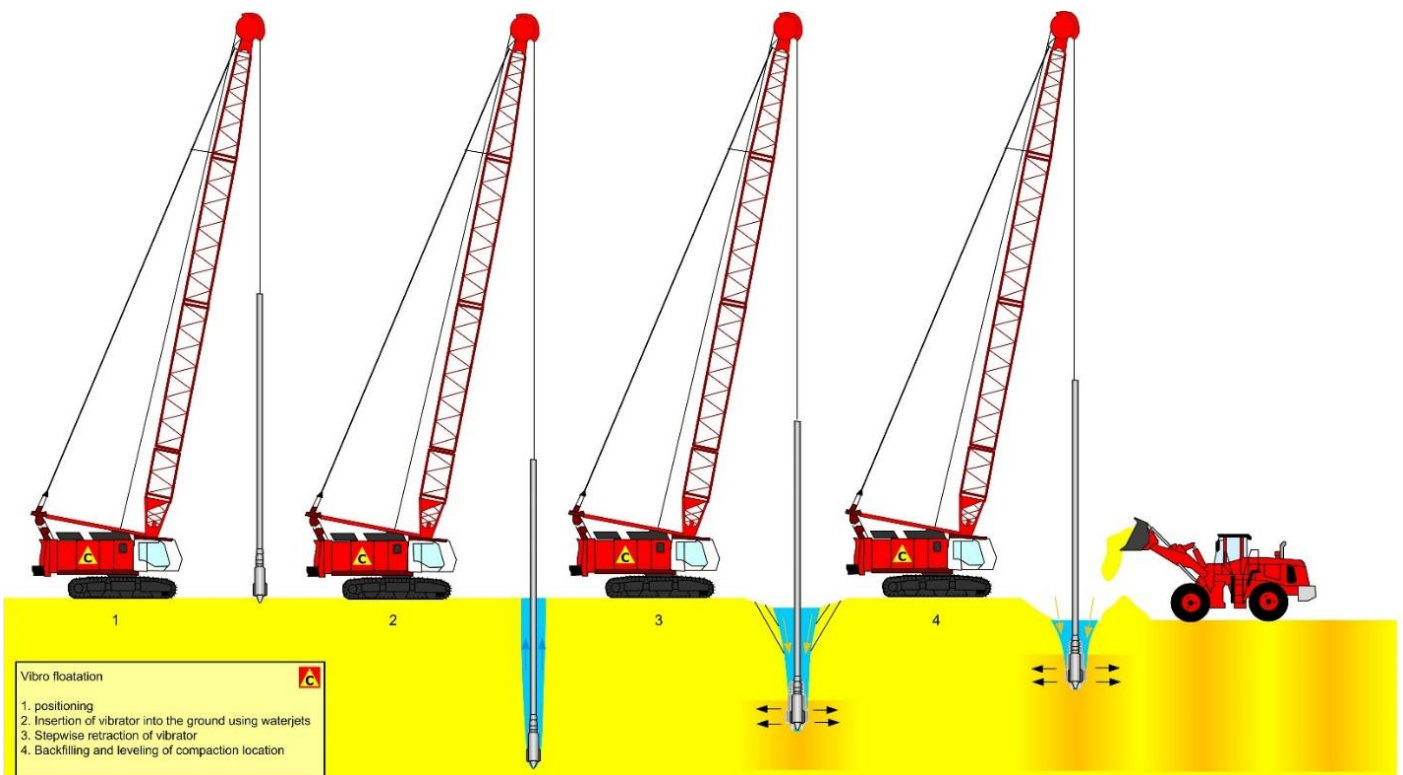


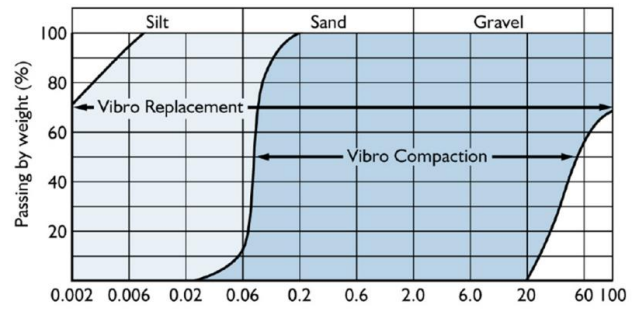
General

The Cofra Vibro Compaction (CVC) method, also referred to as Vibro flotation, is a technique used to densify loose granular materials at greater depths.

The CVC method is executed by driving a large vibrating needle, called vibroflot, into the ground by means of water- and/or air-jetting. At depth the compaction phase starts and the vibroflot is either gradually, or in steps withdrawn, while vibrating heavily. The vibrations are generated by the winged vibrator-section, with an eccentric weight located at the bottom of the vibroflot.

The subsoil compaction is initiated by high frequency vibrations, causing the particles to rearrange within the horizontal influence zone. While compacting, granular material is added from the surface to fill the voids.





'B.McCabe et al, Ground improvement using the vibro-replacement technique, 2007

During field trials at the start of a project, the horizontal influence zone is determined under different operational procedures and related to the project requirements. The outcome results in a center to center distance, also referred to as grid size.

Monitoring

The compaction operation is controlled by the use of an advanced real time GPS guided monitoring system, measuring amongst others, the applied energy and the compaction time at each depth interval. The operation can be adjust-ted to the local ground conditions, thus providing the most optimal homogeneous reclamation after compaction.

The Cofra geotechnical engineers are at hand to review the initial data and make the site-specific correlations between the monitoring data and the hand over criteria. They will also perform the final testing if required.

Suitability

The suitability of the method is more than other compaction techniques dependent on the grain size distribution and fines content. The material needs to be permeable enough to allow quick drainage of the added water during the compaction process. In practice this means less than 10% fines and less than 2% clay.

Results

The CVC results and required effort are related to the soil type, fines content and requirements. Applying Vibro- compaction will result in the following effects:

- Soil densification due to vibration and particles re-organization
- Friction angle increase
- Stiffness increase
- Bearing capacity increase
- Liquefaction mitigation
- Limitation of settlement when applying load

Characteristics

We see the following specific CVC characteristics:

- No depth limitations
- Easy to combine with our other compaction methods CDC and CRC.
- Advanced GPS monitoring of production data, forming the basis for process control adjustment to the local ground conditions.
- Multiple units available to accommodate for large projects
- Cofra internal geotechnical department with a large track record on compaction projects.

