

# Cofra



compaction

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# © CDC **compaction**

*Due to the increased scale of dredging equipment, dredged material is often deposited on sites at a much greater rate than was the case 10 years ago. As a result, there is less time to compact the sand in thin layers and, the compaction is forced to take place over thicker layers. Few compaction techniques with a high production rate and a reasonable price are available for these thicknesses. With the development of the CDC technique, Cofra has provided this niche market with a promising technique that compacts the subsoil homogenously and accurately. Depending upon the soil type and the energy input, compaction of the subsoil can be achieved to a depth of approximately 9 metres below the surface.*



**Compaction at the Khalifa Port project**



**Compaction at the Vopak terminal site**



**GPS monitoring**



**Sounding vehicle**

### **The CDC technique**

Compaction using the CDC technique takes place from the surface of a site. The CDC machine consists of a hydraulic excavator base with a strengthened arm to which a compaction hammer is attached. A weight within the hammer generates vibration by the repeated drop onto a compaction foot that remains in contact with the ground. These vibrations bring the soil particles into a more densely packed structure. The increased density of the ground both improves its strength and increases the safety against liquefaction.

### **Why CDC?**

The CDC technique is cost-effective thanks to the high production rate of 1,500 to 10,000 m<sup>2</sup> per 12 hours (depending upon compaction requirements and soil conditions). Influence can extend to a depth of approximately 9 metres. The very high compaction levels in the upper 4 to 6 metres makes this technique ideal for land reclamation projects or in general in sandy soils. CDC uses “real-time monitoring” during the compaction process, which means that the compaction pattern, number of strokes and the foot diameter can be quickly adapted to local soil conditions.

### **Operation of the CDC system**

Within the compaction hammer, a 9- to 16-tonne weight is hydraulically lifted to a pre-determined height and then dropped with hydraulic acceleration on top of the compaction foot. This takes place at a rate of 40 to 80 times per minute.



**Compaction in a regular pattern**

The compaction of the subsoil is initiated by the vibrations generated by the impact of the weight upon the foot, and by the movement of the foot into the ground pushing the material into a denser structure. Furthermore, the dense compaction pattern with overlapping influence zones guarantees homogenous compaction.

**Applications of the CDC technique include:**

- > Land reclamation projects
- > Tank terminals
- > Large infrastructure projects on granular soils
- > Compaction of embankments

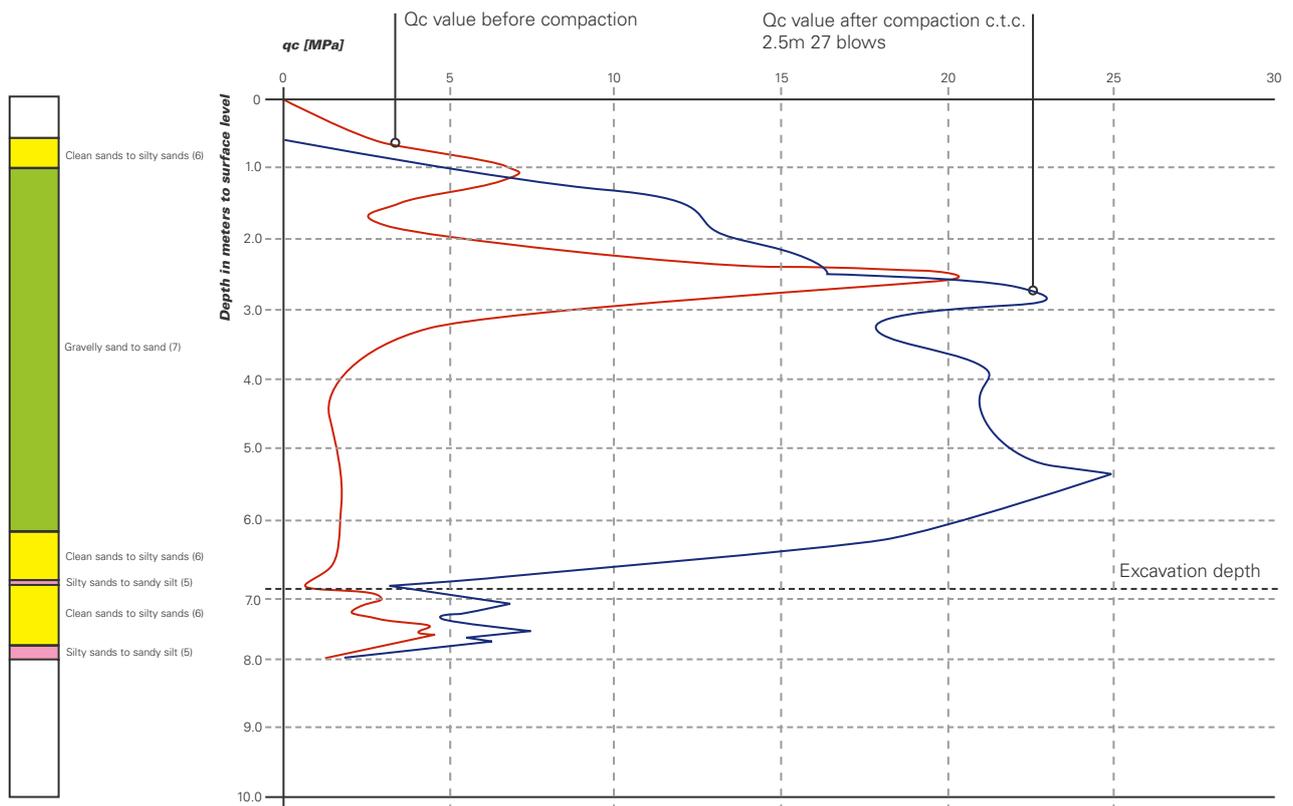
**Advantages of the CDC system:**

- > Cost effective
- > Influence possible to a depth of 9 metres
- > Real-time GPS monitoring
- > Flexibility
- > High efficiency

**Compaction takes place quickly and efficiently**



**CPT before and after compaction (sand with less than 2% fines)**



Classification by Robertson 1990



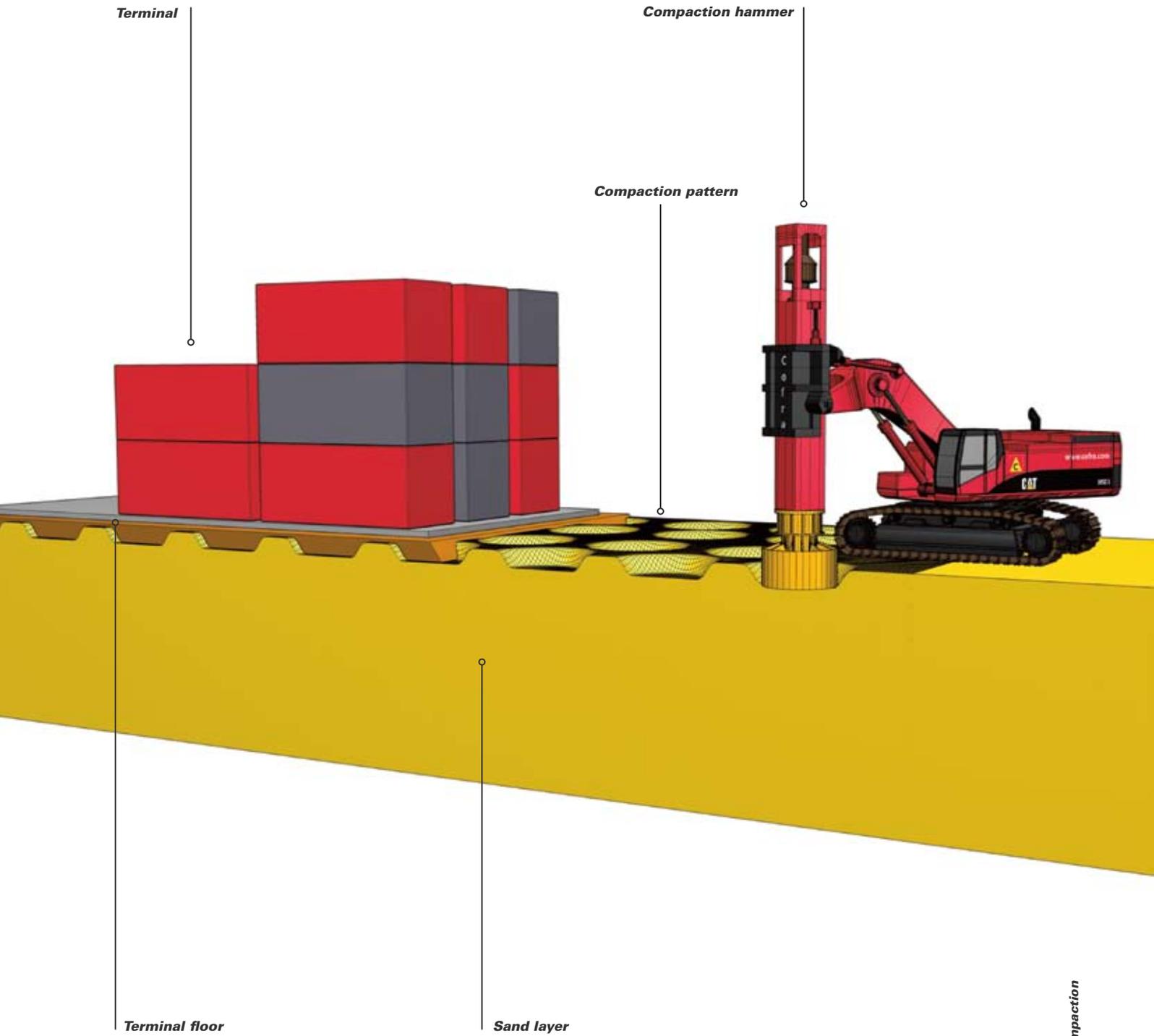
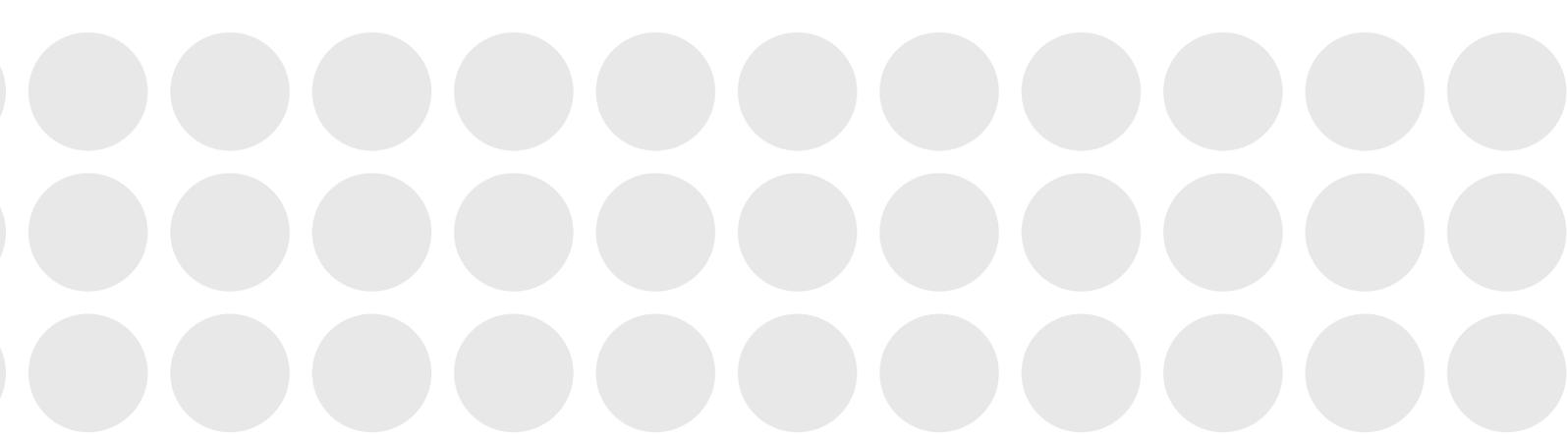
### **Cofra**

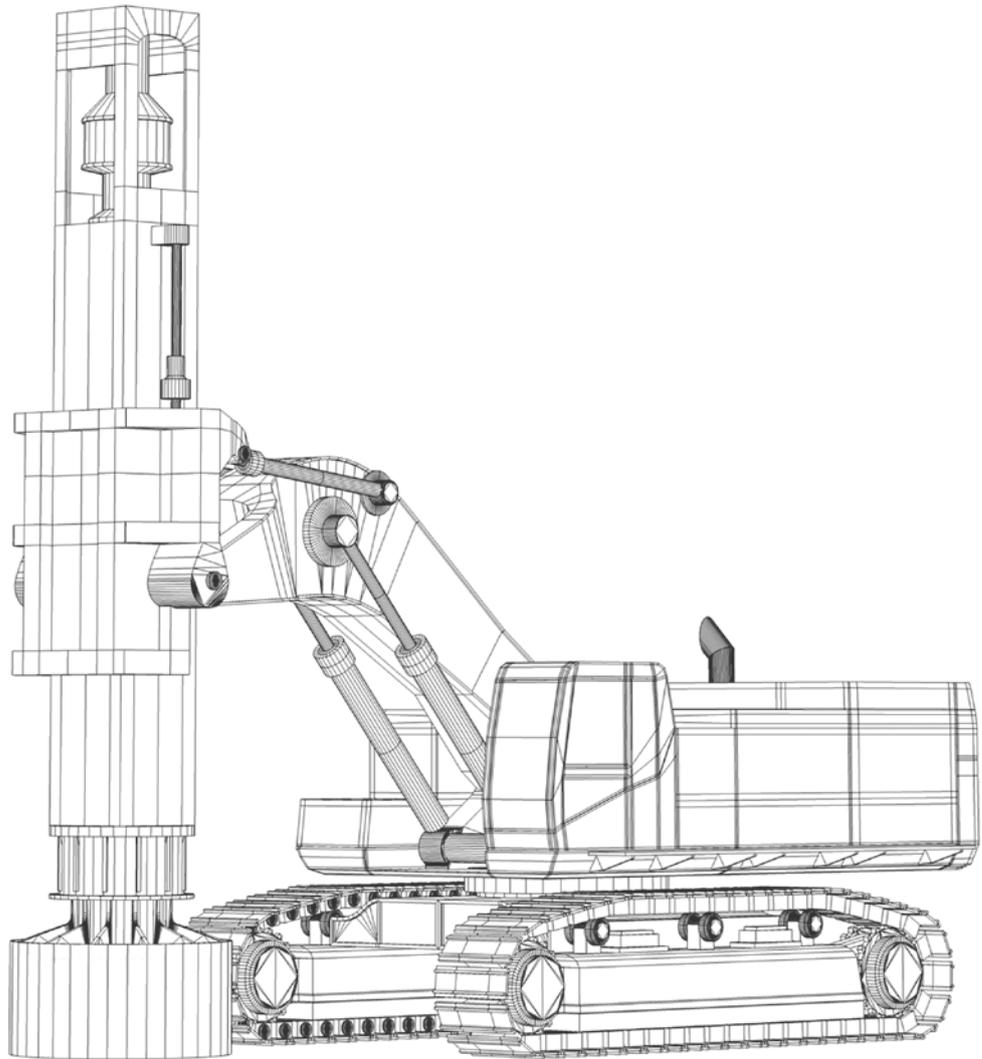
Cofra B.V. is an innovative contractor specialising in ground improvement techniques and membrane construction. Quality is everything to us and thanks to our high level of experience and expertise we can provide the entire process from design to implementation all under one roof. Cofra, and, its sister company Geotechnics, is part of the internationally operating company Royal Boskalis Westminster. Cofra is active in specific sectors of civil engineering, ground improvement techniques and geotechnical hydraulic and gas barriers. Cofra is always working on the development of new ground improvement techniques.

### **Other Cofra techniques:**

- > AuGeo
- > HDPE seals
- > BeauDrain(-S)
- > Vertical drainage
- > Geolock

*You can find further information about the CDC technique and other Cofra techniques on our website [www.cofra.com](http://www.cofra.com).*





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