Dynamic compaction and replacement

Cost effective ground improvement method for use in various soil conditions.

Geotechnical solutions for the construction industry
Introduction
Dynamic compaction (or dynamic consolidation) is a ground improvement technique which involves the use of freefalling weights (or pounders) to improve the density, bearing capacity, stiffness and liquefaction resistance of granular soils. The choice of pounder and drop height depends on site conditions, compaction depths and materials to be compacted. Improvement depth of up to 12m can be achieved using dynamic compaction to provide allowable bearing pressures of up to 300kPa and settlements of 10-20mm for conventional structures.

For soils not suitable for compaction, dynamic replacement can be used. Dynamic replacement is a variation of the technique whereby selected material is driven to partially or completely displace the in-situ material to form columns of compacted material up to a depth of ±6m which transfer the load to underlying more competent horizons. A surface blanketing layer consisting of compacted selected material is required to effectively transfer load to the compacted columns.

Benefits
Dynamic compaction/replacement is one of the most cost-effective ground improvement methods available. The technique can be used in a large variety of soil types, including rock dumps, uncontrolled fills, waste disposal sites where conventional piling or ground improvement techniques cannot be practically implemented.

Applications
Dynamic compaction/replacement can be used for a variety of structures such as commercial/residential buildings, warehouse and industrial structures, storage tanks, wind turbines, or any structure where foundation pressures can be practically limited to 200-300kPa.

The technique can be used to pre-collapse soils with unstable soil structures, or to reduce liquefaction potential of liquefiable soils.

Dynamic compaction can also be used in karst conditions where there’s a risk of sinkhole formation and to repair a sinkhole that’s already formed by constructing a compacted rockfill plug to bridge its throat.
Technical highlights

• Cost effective ground improvement method
• Applicable to a large variety of soil types
• Applicable for rockfill, waste dump, uncontrolled fills
• Bearing capacity up to 300kPa
• Treatment depth up to 12m

The procedure

Deep compaction is done initially on a widely spaced grid. This is followed by secondary, closer spaced, drops to compact the intermediate layers of soil. A final shallow ‘ironing’ compaction is carried out to compact the upper surface soil layer. Phasing of the compaction operation is dependent on soil type, in-situ moisture content and groundwater conditions. A continuous compaction operation can be carried out on partially saturated soils above the water table, but recovery periods may be required between compaction phases for saturated or clayey soils with low permeability.

Quality assurance

Improved soil properties are verified using plate load tests and penetration tests to ensure the required improvement is achieved. In addition, pre-construction and full-scale field tests are often carried out to verify design assumptions and finalise energy input, layout and phasing of production work. Where penetration tests are impractical (such as rockfill or waste dump sites), surface wave testing can be used to estimate the properties of the improved soil mass.
HEADQUARTERS

Keller Group Plc
5th Floor, 1 Sheldon Square
London W2 6TT
Tel: +44 020 7616 7575
Email: info@keller.co.uk
Web: www.keller.com

Keller Asia Pacific Limited
18 Boon Lay Way
#04-104 Tradehub 21
Singapore 609966
Tel: +65 631 68500

Keller ASEAN
www.kellerasean.com

SINGAPORE

Keller Foundations (S E Asia) Pte Ltd
18 Boon Lay Way
#04 – 104 TradeHub 21
Singapore 609966
Tel: +65 631 68500
Web: www.kellerasean.com
Email: info@kellersing.com.sg

MALAYSIA

Keller (M) Sdn. Bhd.
B5-10, Block B, Plaza Dwitasik
Bandar Sri Permaisuri
Off Jln Tasik Permaisuri 1, 56000
Kuala Lumpur, Malaysia
Tel: +60 3 917 33198
Web: www.kellerasean.com
Email: info@keller.com.my

Johor Bahru
Wisma SP Setia No. 05-21,
Jalan Indah 15
Taman Bukit Indah, 81200
Johor Bahru, Malaysia
Tel: +60 7 239 5294
Web: www.kellerasean.com
Email: info@keller.com.my

Kuching
Height Drive Commercial Centre
No. 437, 1st Floor, Lot 14659
Jalan Stutong, 93350
Kuching, Sarawak
Tel: +60 82 450 231
Web: www.kellerasean.com
Email: info@keller.com.my

INDONESIA

PT. Keller Franki Indonesia
Gedung Graha Kencana Lt. 7 Unit B-1
Jl. Raya Perjuangan No. 88
Kebon Jeruk, Jakarta Barat, 11530
Indonesia
Tel: +62 21 53660778
Web: www.kellerasean.com
Email: franki@indo.net.id
info@kellersing.com.sg

VIETNAM

Keller Foundations Vietnam Co., Ltd
2nd Floor Van Loi Building
24 Dang Thai Mai, Phu Nhuan District
Ho Chi Minh City, Vietnam
Tel: +84 8 3551 5022
Web: www.kellerasean.com
Email: lequang@keller.com.vn

Keller Group Plc
Geotechnical solutions specialist
www.keller.com