

# Company Profile for Betterground Group



## History

Betterground Group is owned by the Degen family, which has over 100 years of history in foundation engineering. The brothers Alexander M. Degen and Wilhelm S. Degen have jointly developed many patents, some of which form the basis of today's leading equipment in vibratory ground improvement.

1900:

Johann Degen bought the Johann Keller Company in Germany.

1934:

Wilhelm L. Degen, son of Johann Degen, owned numerous patents, including the depth vibrator for Vibro Compaction, which was jointly invented with Sergey Steuermann.

1938: Mr. Steuermann left Germany and set up in the USA the Vibroflotation Company specializing in Vibro Compaction.

1960ies:

W. L. Degen invented the Stone Column method, an evolution of the Vibro Compaction method. The dune sand core of the Aswan Dam was compacted under the leadership of W. L. Degen.

1974:

The Degen family sold their shares in the Keller Group and W. F. Degen (son of Wilhelm L. Degen) bought the Vibroflotation Company from Sergey Steuermann.

1974 - 1978:

Expansion of the Vibroflotation companies globally.

1980:

Wilhelm F. Degen achieves world record 35 m deep vibro compaction at Jebba Dam, Nigeria.

1986:

Alexander M. Degen and Wilhelm S. Degen set up Vibroflotation AG, an equipment manufacturing company in Switzerland. With their father, they developed the Gravel Pump, the Vibro Stitcher and the Marine Gravel Pump.

1990 – 1996:

A Joint Venture between Vibroflotation AG and Bachy-Soletanche is established in Hong Kong.

1994 – 2001:

Vibroflotation equipment dominates the Vibro Compaction market in Germany for lignite mining slope stability projects of over 70 m in depth, with a total volume of over 1 billion cubic meters.

2001:

Soletanche Bachy takes a 70% share in The Vibroflotation Group, and eventually takes over the company in 2006 entirely.

2009:

The Degen family founds Betterground Limited (Switzerland). The company designs, manufactures and services ground improvement equipment.

2009 – Today:

Subsidiaries are formed in Germany, USA, UAE, Hong Kong.

2012:

Betterground supports China Harbour Engineering Co. with low headroom offshore stone column equipment, site supervision, and engineering support on the Hong Kong Boundary Crossing Facility project, which is believed to be the largest ever stone column project.

2014:

Betterground partner firm Geoizol executes their first stone column projects in Russia.

2015:

Custom built Betterground equipment is used the first time off a jack up barge to install offshore stone columns largely independent of wave height.

2016:

Betterground supplies Dutco Balfour Beatty with the necessary equipment to compact 17 million m<sup>3</sup> of sand at Jebel Ali Terminal 4 in record time.

Betterground opens contracting company for East Coast of USA in cooperation with Wurster Construction.

By mid 2016 Betterground has license and JV agreements in place with geotechnical specialty contractors in Australia, Austria, Canada, Chile, Croatia, Germany, Greece, UAE and other GCC countries, Hong Kong, Indonesia, Malaysia, Mexico, Peru, Philippines, Russia, Singapore, Spain, Thailand, USA, Vietnam.

## Betterground Companies and Staff

The Betterground Group of Companies comprises the following entities.

### America

#### USA

Betterground Inc.  
5001 Spring Valley Road  
Suite 400 East  
Dallas, TX 75244

T+1-214-3825656  
info@betterground.com

### Asia

#### Hong Kong

Betterground (HK) Limited  
12F, 178 Queen's Road Central, Hong Kong  
(SAR)

T+852 3628 3818  
info@betterground.hk

#### United Arab Emirates

Betterground LLC  
Office 711, Detroit House  
Motor City, Dubai

T+971-4-4357430  
info@betterground.com

### Europe

#### Germany

Betterground GmbH  
Hassenham 8  
D-84419 Schwindegg  
GERMANY

T+49-8082-2713135  
info@betterground.de

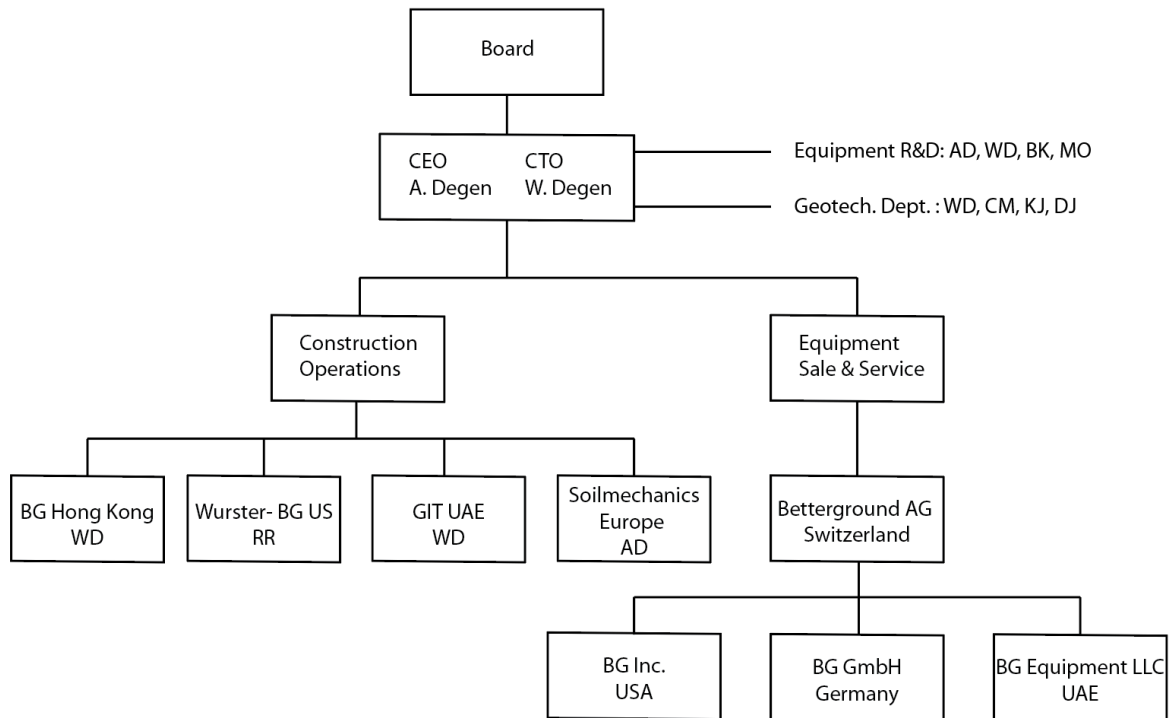
A total of over 50 staff work for Betterground, of which are

- 3 mechanical engineers,
- 6 geotechnical engineers,
- 1 marine (offshore) engineer,
- 21 field support personnel of which 10 have over 10 years and 4 have over 20 years experience specific to vibratory ground improvement,
- 15 field and workshop mechanics.

Betterground staff speaks a total of 24 languages, among which are Arabic, Chinese, Croatian, English, French, German, Hindi, Polish, Russian, Spanish, Tagalog, Thai.



## Betterground Organization Diagram



## Clients



### Aktor S.A.

[www.aktor.gr](http://www.aktor.gr)

25, Ermou St., GR 145 64 Nea Kifissia,  
Greece Athens - Lamia National  
Road, Olympic Village Interchange

T +30 210 8184000  
F +30 210 8184001  
info@aktor.gr



### BAUER Spezialtiefbau GmbH

[www.bauer.de/en/bst/](http://www.bauer.de/en/bst/)

Michael Jones International Soil  
Improvement BAUER-Straße 1 D-  
86529 Schrobenhausen

T +49-8252-97-0  
F +49-8252-971496  
michael.jones@bauer.de



### Canterbury Stone Piling Ltd.

[www.canterburystonepiling.co.nz](http://www.canterburystonepiling.co.nz)

737 Main North Road Christchurch,  
Belfast 8051 New Zealand

T +64-3-323 9960  
F  
admin@canpile.co.nz



### CeTeau Far East Ltd.

[www.ceteau.com](http://www.ceteau.com)

Sinn-sathorn Tower 38 Floor, 77/171  
Krungthoburi Road, Klongtong Sai,  
Klongsarn, Bangkok, 10600 Thailand.

T +662 862 096 0  
F +662 862 078 0  
info@ceteau.com



### China Harbour Engineering Co. Ltd.

[www.checkk.com](http://www.checkk.com)

19FL, China Harbour Building 370-  
374 King's Road, North Point Hong  
Kong

T +852 2887 8118  
F +852 2512 0427  
checkk@checkk.com



### Earth Tech, Inc.

[www.earthtech.com](http://www.earthtech.com)

2620 Hunt Road, Land O' Lakes,  
Florida 34638

T +1-813- 909-8000  
F  
info@earthtech.com



### Foundations Building Contracting Co. Ltd.

[www.fbccltd.com](http://www.fbccltd.com)

Ismet Amin Khawaja P.O. Box 31269  
Al-Khobar 31952 Saudi Arabia

T +966-13-8646593  
F +966-13-8945869  
info@fbccltd.com



### Geozol

[www.geozol.ru](http://www.geozol.ru)

Bolshoy prospekt PS, 18, St  
Petersburg, 197198 Russia

T +7 812 337-53-13  
F  
info@geozol.ru



### GK Grupa d.o.o.

[www.gkgrupa.hr](http://www.gkgrupa.hr)

Hallerova aleja 1 HR- 42 000  
Varaždin CEO Dipl.-Ing. Robert Gotic

T +385 (0)42 312 948  
F +385 (0)42 312 949  
m.klastic@gkgrupa.hr



### Kiewit Infrastructure Co.

[www.kiewit.com](http://www.kiewit.com)

302 South 36th Street, Suite 400  
Omaha NE 68131 USA

T +1-402-3468535  
F  
Andrew.Myers@kiewit.com



### Malcolm Drilling Company

[www.malcolmdrilling.com](http://www.malcolmdrilling.com)

Contact: Alec Bloem 2250 Davis Ct.  
Hayward, CA 94545

T +1-510-7801167  
F +1-510-7801168  
abloem@malcolmdrilling.com



### NSSC International Limited

[www.nsscme.com](http://www.nsscme.com)

P. O. Box 856 Abu Dhabi UAE

T +971 2 495 7000  
F +971 2 495 7111  
groundimprovement@nsscme.com



### Pilotes Terratest

[www.terratest.cl](http://www.terratest.cl)

Alonso de Córdova 5151 of. 1401 Las  
Condes Santiago Chile

T +56-2-24372900  
F +56-2-24372909  
g\_comercial@terratest.cl



### Porr Bau GmbH

[www.porr.at](http://www.porr.at)

Dr. Klaus Meinhard Porr Bau GmbH  
Business Unit 4 / Grundbau  
Absberggasse 47, 1100 Wien

T +43-50-626-5727  
F +43-50-626-1548  
klaus.meinhard@porr.at



### Vancouver Pile Driving Ltd

[www.vanpile.com](http://www.vanpile.com)

20 Brooksbank Avenue North  
Vancouver, B.C., Canada V7 J2 B8

T +1-604-9865911  
F +1-604-9900414  
vanpile@vanpile.com



### Vibroflotation & Geotechnical Nigeria Ltd.

[www.vibroflotation-ng.com](http://www.vibroflotation-ng.com)

6/8 Michael Adekoya Street, Ilupeju ,  
Lagos Nigeria

T + 234 (0) 806 649 2227  
F  
segun.ikugbonmire@vibroflotation-  
ng.com

From the above list of 16 worldwide clients some are mayor players in their respective markets, such as for example Kiewit and Malcolm Drilling in the USA, CHEC in China, or Porr in Austria. Others are very reputable long term successful specialist companies like Pilotes Terratest in Chile and Vancouver Piledriving in Canada.

A special relationship connects Betterground with BAUER Foundations. Due to their global reach and frequent cooperation on large and very large projects, they hold a worldwide non-exclusive license to use Betterground equipment in all countries.

## Betterground Business Model

Betterground's involvement can range between the following services:

- Equipment rentals and sales,
- Job to job joint ventures,
- Long term joint company for a specific country or territory.

Betterground has started in 2009 with selling and renting their specialized ground improvement equipment.

There is a large component of proprietary know-how involved in both the equipment itself and the way to optimally use it. Betterground equipment sales are therefore linked with territory restrictions to the countries where the customer has a strong standing in the market. Furthermore, the equipment is always sold with a right of first refusal for Betterground to buy back the equipment when the client would want to end involvement in this line of business.

Besides equipment sales and service, opportunities for joint venturing in construction contracts have been realized. Betterground never contracts such projects alone, but always teams up with leading local companies to build together with them a sustainable business in the field of ground improvement.

This is achieved by combining Betterground's superior equipment with the local company's market knowledge and local personnel and equipment cost advantages.

Equally important to having the best equipment is to know how to use it optimally and to maintain it well. Among Betterground's staff a large number of internationally experienced site supervisors and methods experts help to optimize installation methods on site and assure compliance with quality control requirements.

This site staff is complemented by repair mechanics that are provided by Betterground around the world and on site or work from a regional Betterground workshop.

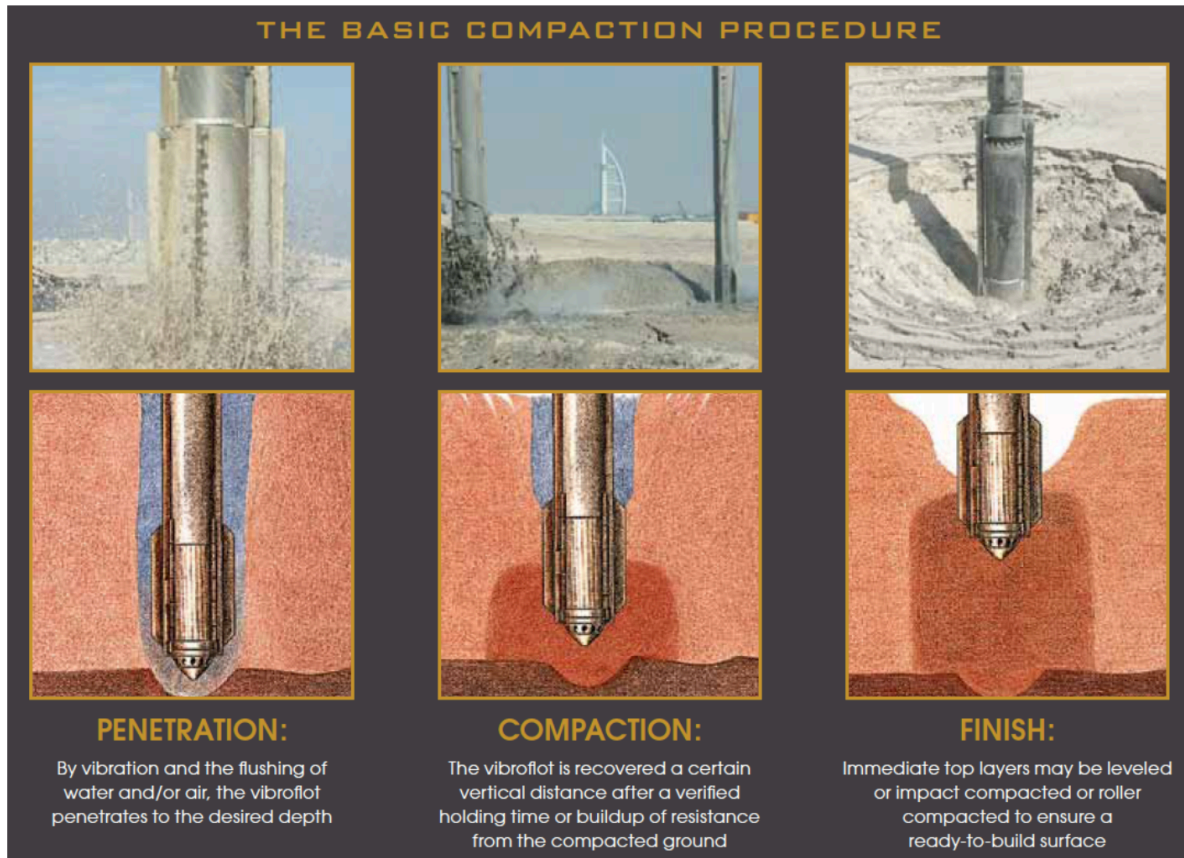
The third component to success provided by Betterground, besides specialty equipment and on-site support, is geotechnical engineering support, both in the tender phase and on running projects. Betterground assists clients with customized state-of-the-art design/build solutions, helps writing complex method statements that fulfill the highest requirements, and supports with all other expertise for which many years of geotechnical engineering experience are needed.

The fourth component of support is Betterground's in-house equipment design department. Betterground designs all specialty equipment themselves, therefore project specific equipment modifications for even the most complicated scenarios can be provided fast and efficiently according to project needs.

## Method applications for Betterground Equipment

### Vibro Compaction

This is the oldest vibratory ground improvement method, but in the clean sands where it can be applied also the most effective. The majority of the Dubai reclamation works (Palm Islands etc.) were compacted with equipment developed by the Degens.



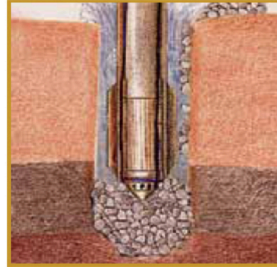


## Top Feed Stone Columns

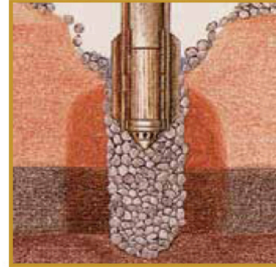
This is the older of the two Stone Column methods, but it is still the most cost effective and fastest. It requires a crew that knows their trade, but then can install often better columns than with the newer Bottom Feed technique.



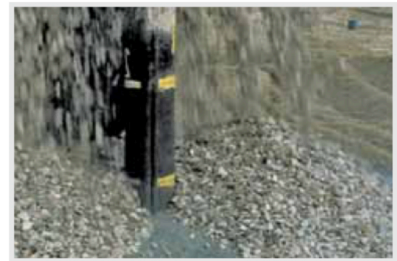
The vibroflot penetrates and 'washes' the hole in preparation for the stone transport within the hole.



During introduction of the stones, water and air are flushing in order to create a positive flow for the stone transport.



The vibroflot is frequently moved up and down in order to form and compact a column. Thereby, the surrounding ground is horizontally compressed and improved. The column is able to support high vertical loads.



## Bottom Feed Stone Columns

This product is used where Top Feed Stone Columns cannot be applied due to contaminants in the soil or on sites where either no water is available or water management is problematic.



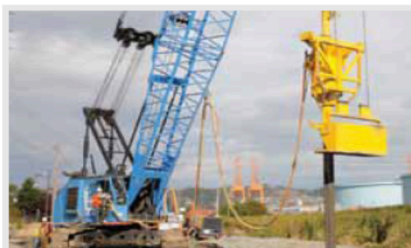
The vibroflot penetrates with the help of vibration and air flushing. (sometimes a minimal water lubrication is helpful to overcome high friction from the soils)



The stones are introduced via a tremie pipe along the vibroflot and the aid of pressurized air.



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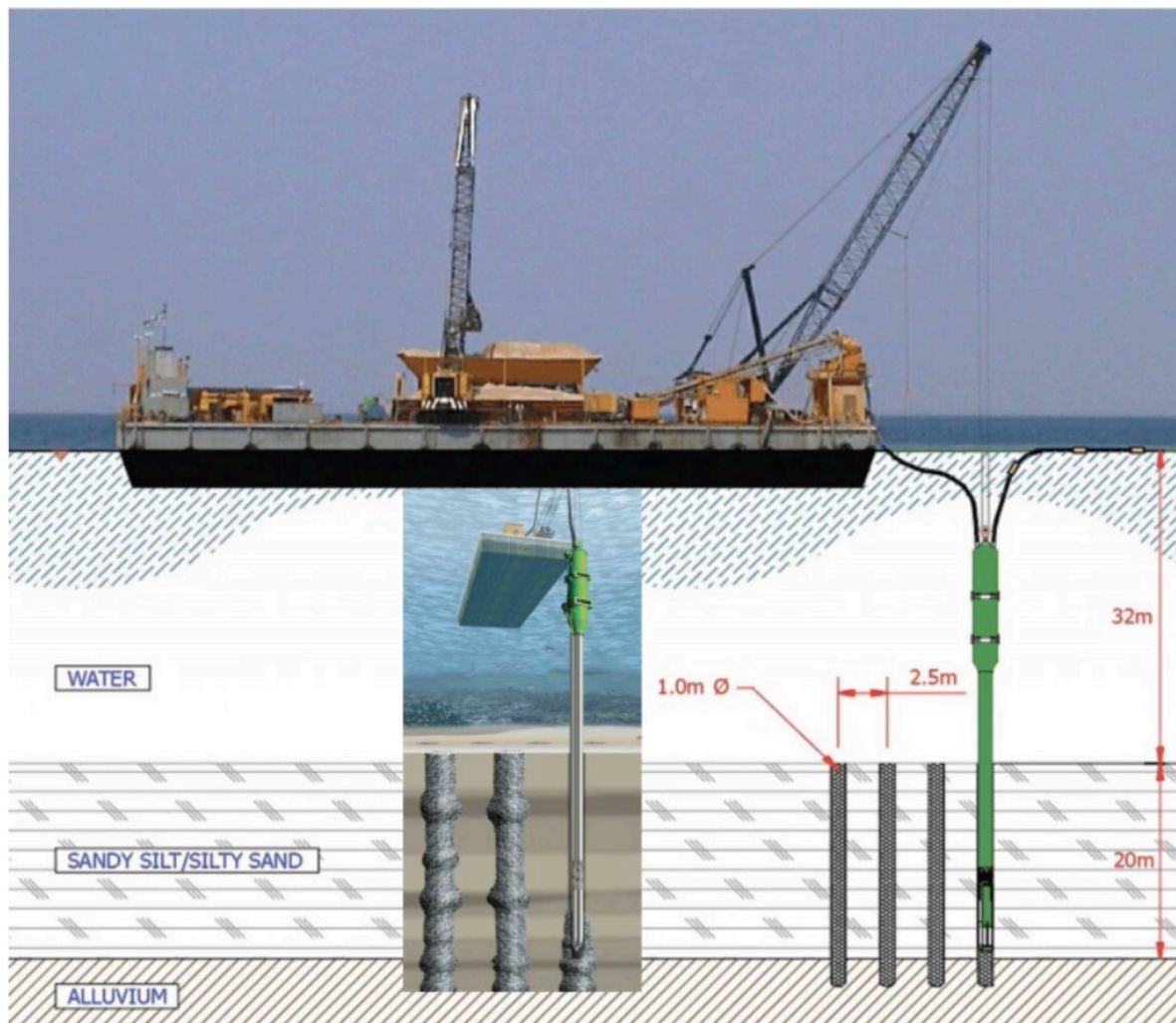


## Offshore Stone Columns

This product is used to found seawalls and other marine structures on soils that need to be reinforced rather than dredged and replaced.

This is particular of interest in areas where earthquakes threaten to liquefy loose sandy sediments or where marine sediments are contaminated and shall remain in place, or generally where permitting for large dredging operations is too expensive.

Offshore is at present the fastest growing part of Betterground's work.



## Typical Betterground Projects

### Heavy Civil Engineering Projects

- Hydroelectric and other dams (Stone columns or vibro compaction against liquefaction).
- Road and rail embankments (Stone Columns to increase stability and accelerate drainage).
- Power plants (reduce and accelerate settlements and diff. settlements)
- Wastewater treatment plants (settlement reduction, liquefaction prevention)
- Pipeline foundations.
- Grain and cement silo foundations and other large raft foundations on stone columns.
- Compaction of sands as preparation for later slurry wall construction.

### Industrial and Housing

- Factory buildings and multi-story housing developments (settlement reduction in lieu of piling).
- Reduction of water permeability of loose sands for later excavation under dewatering.

### Land Reclamations

- Vibro Compaction of large areas (e.g. Palm Islands) against liquefaction and to reduce settlements under moderate to high loads.
- Reinforce soft soils on the base of reclamations by stone columns instead of replacing such soils costly with sand

### Offshore

- Seawalls and breakwaters on soft soil founded with stone columns (prevent liquefaction, increase slope stability, reduce creep settlements)

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