Casing oscillators address many obstacles facing DoTs

The benefits of oscillators in the construction of case-drilled shafts on infrastructure projects

Ed Robinson

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Case-drilled shafts are nothing new in the construction industry. However, advancements in equipment and technology are allowing engineers to use drilled shafts in a greater variety of applications and with more reliability than ever before. This is enabling US Departments of Transport to be more efficient and effective in their quest to replace aging infrastructure.

Specifically, casing oscillators, such as those from Roc Equipment, have become a preferred construction technique when installing shafts with temporary or permanent casing because they can provide torque

and pressure several times greater than that of the conventional rotary drilling rig, and their capacity to sink and pull out the casing is much greater than that of the casing driver.

Effective solutions

Oscillators provide effective solutions to difficult foundation engineering problems, such as how cutting power gives rise to axial and lateral resistance. Unlike traditional methods that apply vertical force, a casing oscillator provides rotational force to drive the casing. The twisting motion enables the oscillator to cut through obstructions and dense layers more efficiently. One advantage is that socket piles can be created in the rock, offering large axial resistance that can withstand severe earthquakes.

Additionally, casing oscillators can drill shaft diameters between 610mm and 4.25m. The large-diameter reinforced concrete shafts can provide substantial resistance to lateral and overturning forces, thereby increasing long-term stability for the shaft and structure it supports.

In areas where space is at a premium, such as a widening project or an interchange with flyover ramps, a single drilled shaft under a single column can avoid the large footprint that would be necessary with a group of piles.

Ground stability

An additional benefit is that the technique provides ground stability and the ability to control groundwater. The design of oscillators allows for simultaneous drilling and casing. The casing can deliver temporary support during construction, or it can be installed as a permanent part of the foundation when the drilled shaft must extend through open water or extremely soft and unstable soil layers. The simultaneous action offers several benefits:

- In loose soil, there is immediate support which prevents borehole collapse
- Where existing structures are present, the casing works as temporary shoring, allowing safe excavation of the pile soils without removing soils from existing structures
- Casing the shaft allows for accurate control of concrete placement and reduces concrete overrun
- Oscillators, with their sealed design, can effectively prevent groundwater intrusion. This helps ensure the integrity of the foundation and keeps the worksite safe

Since casing oscillators do not rely on hammering (meaning noise is minimal) or vibration to drive casing into the ground, they can reduce the impact on surrounding areas, which is especially important when drilling in urban areas or near existing foundations and structures. This is helpful in situations where a replacement structure must be constructed in advance of the demolition of existing structures,

such as bridge replacement, reducing the impact of construction on the travelling public. The oscillating method also helps reduce and even eliminate soil displacement from existing structures.

Environmentally friendly

Using a casing oscillator limits and, in some cases, eliminates the impact on the surrounding environment. When utilizing a wet construction method, water alone can be used minimizing impact on surrounding areas.

Cuttings can easily be controlled, and excavated soil can easily be placed in a truck or retaining pond for disposal, making for a cleaner job site.

Roc Equipment provided the equipment and staff used to drill for treasure on The History Channel show "The Curse of Oak Island" Credit: Roc Equipment

It has been studied that hammering and vibration create a sound in coastal conditions, hindering the sonar soundwaves used by marine animals to see and communicate. Oscillating eliminates this impact on marine life.

Transportation projects are at the forefront of oscillating methodology, and the US has seen an increased demand for oscillating technology due to the many benefits that the equipment offers. Several high-profile transportation projects have already utilized oscillators successfully.

Gerald Desmond Bridge

A new 2000ft-long cable-stayed bridge, consisting of six lanes, was constructed in Long Beach, California to replace the Gerald Desmond Bridge. The new bridge was supported by about 350 foundation piles, with diameters of 6ft and 8ft, up to 200ft deep. The foundation piles were drilled with a 2.5m and 3.0m BUMA oscillator.

Honolulu Authority for Rapid Transportation

The Honolulu Authority for Rapid Transportation built America's first fully automated light metro rail system. A 5.2-mile section of the elevated railway required 227 large-diameter drilled shafts and over 100 small-diameter shafts. One shaft was 350ft deep, the deepest shaft of its kind in recorded history. Most shafts were temporarily cased; both a 2.2m and 3.6m BUMA oscillator were used during the project.

Increased demand

The use of casing oscillators will continue to increase as DoTs and contractors look for creative ways to repair and replace infrastructure. They can be used in a variety of geologies and environments, produce a high-quality pile, are easy to control, and can reduce construction costs.

Given the increased focus on precision, quality, safety, and minimizing impact on adjacent surroundings, casing oscillators will be a reliable solution for drilled shafts for years to come.