

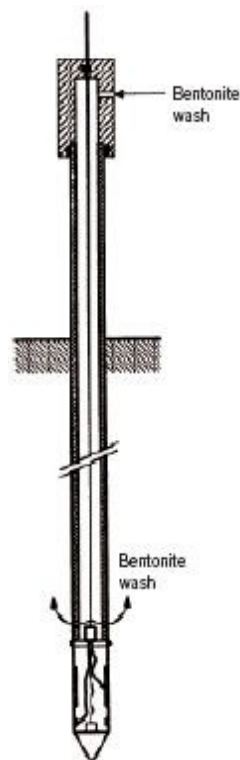
Lubricating Cone

Friction

The friction between the soil and the push-in rods limits the maximum depth of a cone penetration test. Depending on the soil type, friction can increase rapidly at greater penetration depths. A new type of cone, the lubricating cone, has therefore been developed to allow thorough investigation of the deeper sub-soil, without using more expensive and time-consuming drilling techniques. The same technique can be used to seal the hole during retraction of the rods.

Bentonite wash

During the cone penetration test a bentonite wash is pumped through the push-in rods to the outlet opening. The bentonite wash forms a lubricating layer along the entire penetration rods, so that friction along the rods is considerably reduced. The outlet opening is located behind the first friction reducer, approximately 0.5m above the cone tip. This construction prevents the soil penetration results being influenced by the introduction of the wash. The used pump pressure is the same as the hydrostatic pressure acting at the penetration depth.



Advantages

An advantage of this method is that soil penetration test can be carried out at much greater depths or in very stiff clay. Depths of more than 100m have been reached. Relatively large depths can also be reached at locations where only small and light equipment can be used. The system can be linked to any type of CPT equipment.

Retraction of rods

During retraction of the rods a hardening bentonite mixture, that is harmless for the environment, is injected at high pressure into the soil. This mixture stiffens and so seals the hole created by the CPT. A well sealed soil penetration hole is desirable in the following cases:

During environmental engineering investigations, where the soil penetration test can cause contamination leakage.

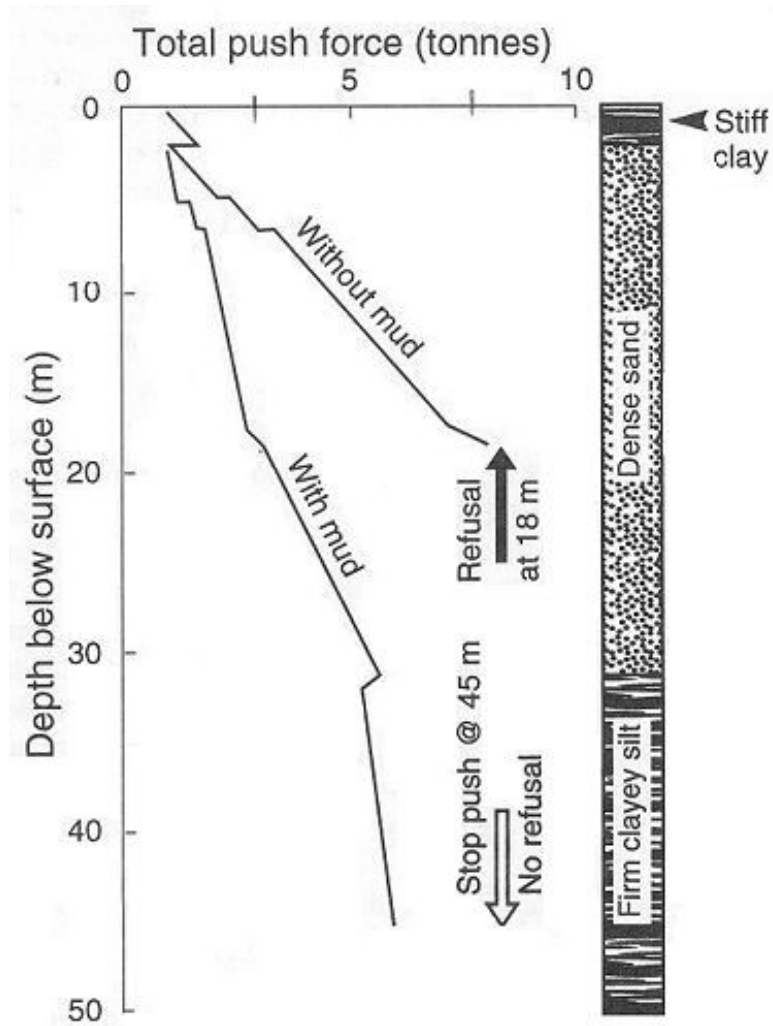
During soil investigations for bored tunnels, where 'blow-out' can lead to costly delays.

During soil investigations on sites where there is a high likelihood of well formations or on the inner foot of a dike.

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The figure below shows the difference between a cone penetron test with and without, the use of a lubrication.



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