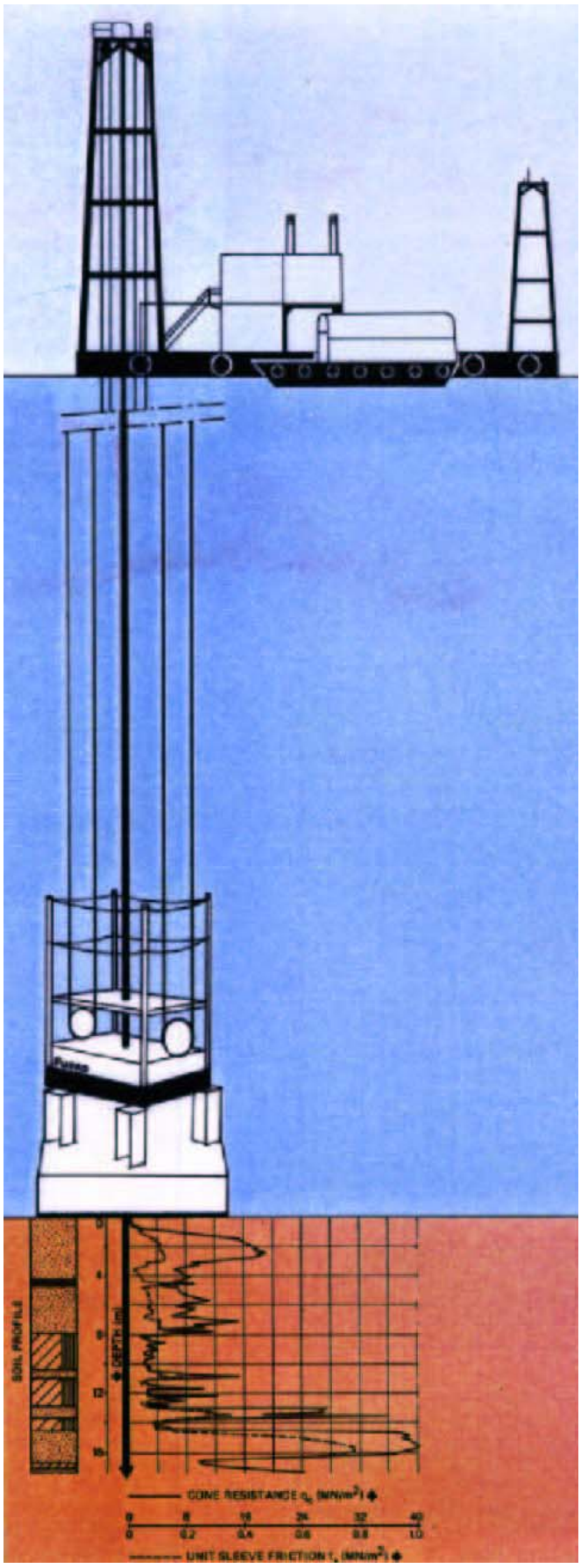
MINI-SEACALF



The onerous requirements of over water site investigations have resulted in the development of specialized equipment. The "Mini-Seacalf" is a lightweight, Fugro designed, cone penetrometer system purpose-built for deployment from conventional barges and vessels. It allows high quality continuous, in situ soils data to be economically collected. The system comprises:

(i) a cone penetrometer and push rods
(ii) a seabed deployment frame with ballast
(iii) a wheel drive system to push the rods into the seabed
(iv) a data acquisition and processing package (mounted on deck)

The system is shown schematically in the adjacent figure with the Mini-Seacalf unit being deployed off the side of a moored barge. The unit is lowered onto the seabed by either a crane or frame with hoist.

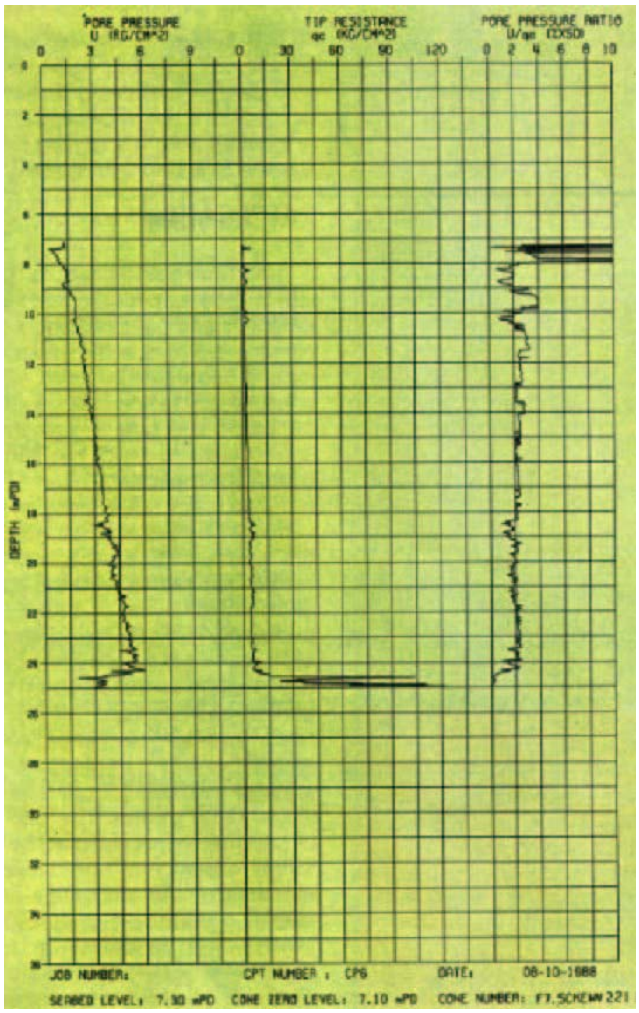
APPLICATIONS

The Mini-Seacalf unit is particularly suited to projects such as predredging and postdredging surveys, pipeline surveys and exploration for marine aggregate sources, where it is necessary to accurately profile the thickness and type of soil layers. It is also used to check the density of hydraulically placed fill. The CPT system has many advantages over conventional boring and vibrocoring as the test provides an accurate and continuous profile with the ability to differentiate soil strata. The piezocone is able to differentiate changes in soil type/material properties in layers as thin as 5mm. In addition to the standard electric resistance cone and piezocone, electrical resistivity and temperature cones are also available for specialized environmental studies. The total depth of penetration is controlled by the 6T thrust capacity of the equipment, stiffness of the soil layers and the lateral support provided by upper layers. Test depths of up to 30m have been achieved in Hong Kong. The unit is designed to operate in water depths exceeding several hundred metres.

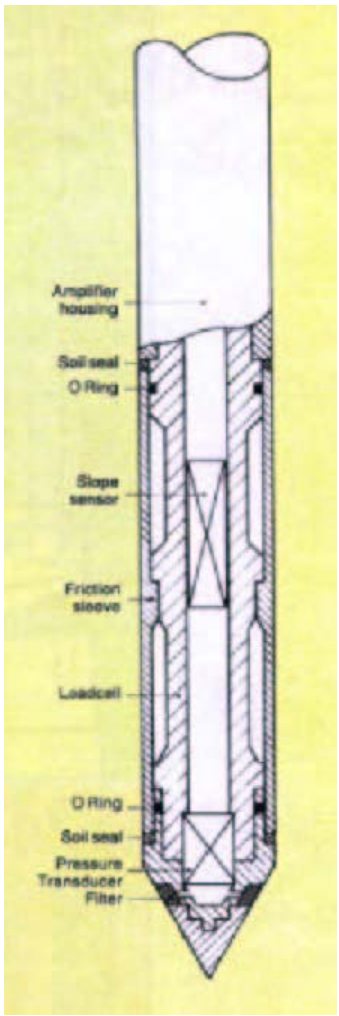
Mini-Seacalf being deployed

TEST PROCEDURES

Testing is carried out using the most appropriate Fugro electric cone, which is pushed at a constant rate of 2 cm/sec into the seabed. Strain gauges are incorporated into the cone and provide a direct measurement of the total resistance to penetration of the tip (qc) and the friction sleeve (fs). Induced pore water pressures are also measured with the inclusion of a porous element in the piezocone. The penetrometer produces a continuous record of qc and fs during penetration and an inbuilt inclinometer unit can be used to check the vertically of the penetration over the full test depth. The signals from the strain gauges are transmitted via built-in amplifiers through an umbilical cable running inside the hollow push rods to data receivers and processors, which are situated on board the barge. Data is stored on disk and is also received on a pen chart. All data is received in real time to ensure that the test is proceeding satisfactorily.

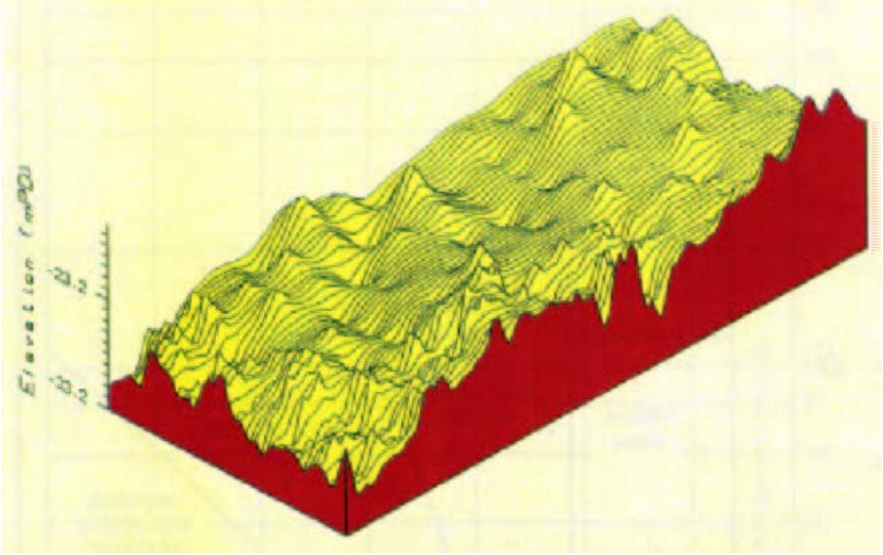


Typical plot of cone and pore pressure data



Fugro piezocone penetrometer

A single wheeldrive unit comprises four hydraulically powered wheels, which advance the cone and push rods. The ballasted weight of the unit can be varied depending on the resistance of the material to be penetrated and typically reactions between 3T and 8T can be achieved. The wheel drive system is so designed that there is no slippage between the rods and the wheels. When a piezocone is used, the test can be stopped to allow pore pressures to return to their equilibrium condition. By recording these changes in pore pressure with respect to time, the pore pressure dissipation tests provide valuable information to the geotechnical engineer on the consolidation characteristics of the deposits being tested.



Three dimensional plot of CPT data showing the interface between two soil types

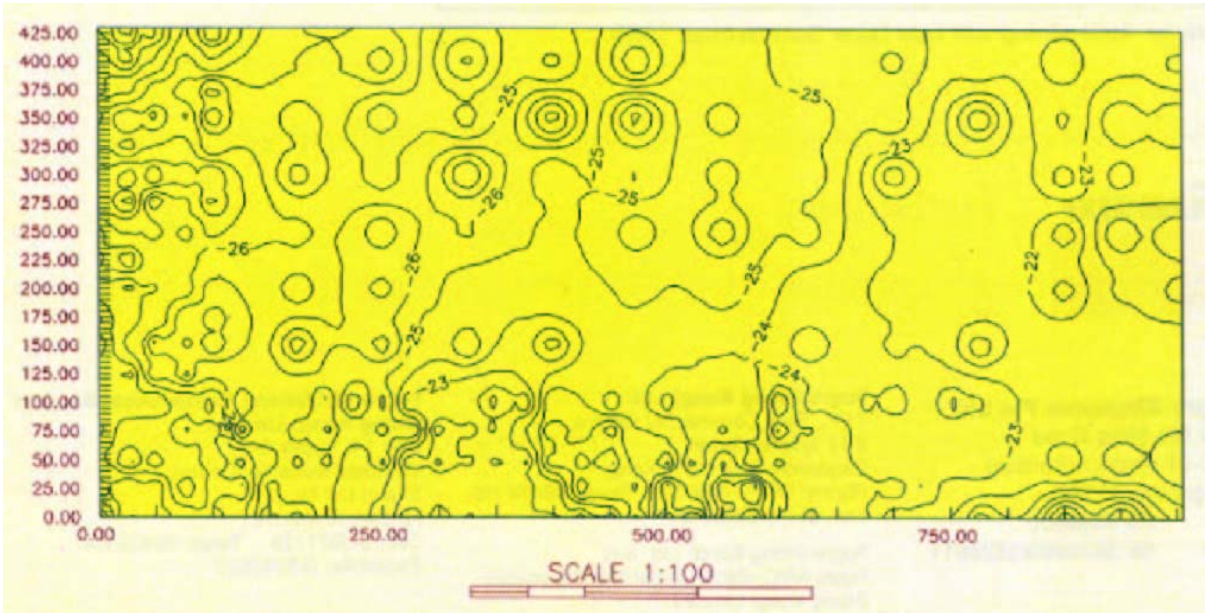
TEST INTERPRETATION

The record of a typical CPT test shows the variation of cone resistance and sleeve friction with depth of penetration into the soil. From the cone resistance, the density of granular soils and shear strength of cohesive soils can be determined. The ratio of the sleeve friction to the cone resistance – the "Friction Ratio" – enables the main soil type and its constituents to be determined. When a piezocone is used the ratio of pore pressure to tip resistance – the "Pore Pressure Ratio" provides complimentary information on the material types and properties.

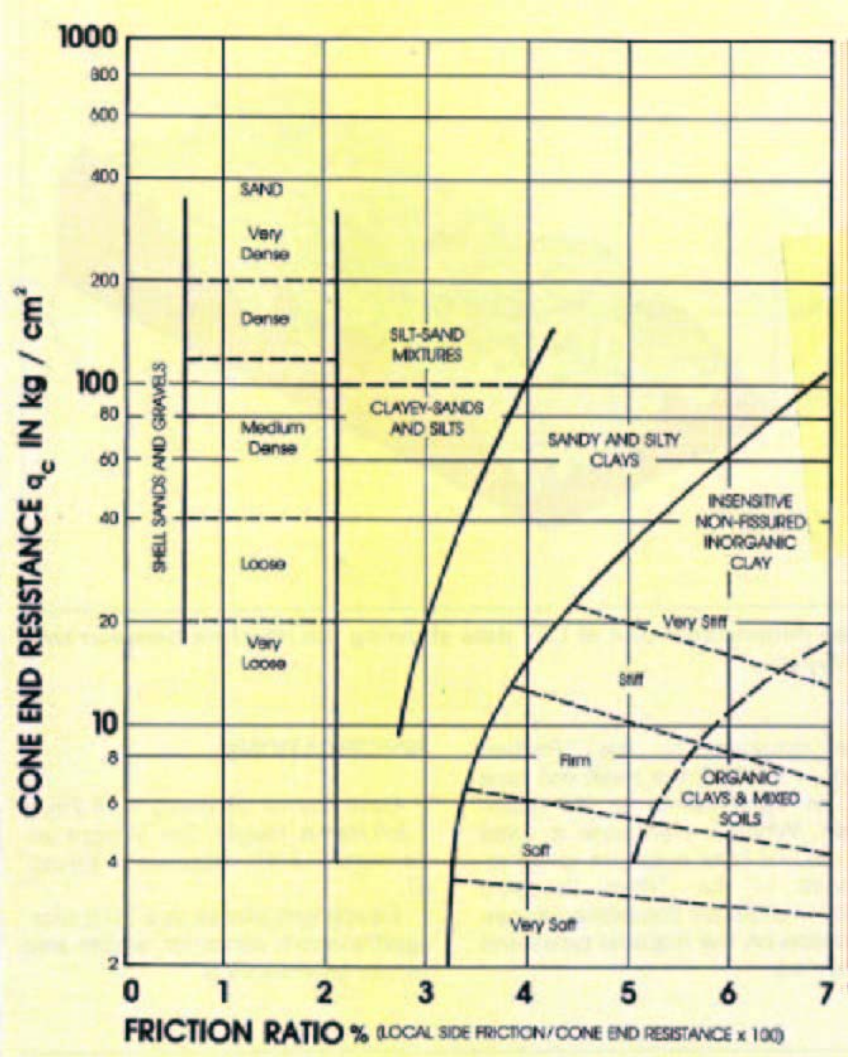
SPECIFICATIONS

Base frame dimensions: 2.2m x 2.2m frame. Height 3m. Weight underwater: 5-8T Maximum thrust: 6T.

Equipment comes in a 20-ft storage / transport container which also serves as workshop.



Changes in soil type are readily contoured by computer to assist the engineer with interpretation



Guide for determining soil type (after Schmertman 1969)

The specification of the equipment in this data sheet may be subjected to modifications without prior notice.

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