SEASCOUT

Introduction

The SEASCOUT is a lightweight Cone Penetration Test (CPT) system that operates from an underwater ground surface such as the seabed. Its purpose is the rapid and accurate determination of subsurface soil conditions to a penetration of about 6 m. Further developments will extend this to 10 m. The basis of the light-weight design is a miniature cone penetrometer with a 100 mm' cone base area, rather than the conventional 1000 MM2. This results in a substantial reduction of the thrust and the reaction equipment requirements.

Cone Penetration Tests involve the measurement of the resistance of the ground to the controlled penetration of push rods that have an instrumented "Cone" at their tip. The instrumentation measures vertical penetration, cone resistance and, as options sleeve friction and porewater pressure. These measurements permit high quality interpretation of the ground conditions encountered.

SEASCOUT Apparatus

The SEASCOUT apparatus incorporates various components including a reaction frame, a thrust machine, a coiled push rod, a cone penetrometer and data acquisition system.

Thrust machine and push rod

An underwater hydraulic power pack drives the patented thrust machine. Push rod handling is by a mechanical coiling/straightening device. This permits a very low apparatus height while maintaining continuous, rather than stroke-based, penetration and retraction of the cone penetrometer.

Reaction Frame

Reaction equipment usually comprises a ballasted underwater frame (such as that shown in Fig.1), which can be deployed from small vessels equipped with a suitable crane or 'A' frame. Alternative operational modes include an underwater sledge, which can be winched from shore or from a vessel, and Remotely Operated Vehicles (ROVs). Downward thrusters, water ballasting and suction anchors can be used to provide additional ROV reaction. The system can also be modified for installation on pipeline ploughs and other trenching machines.

Cone Penetrometer and data Aquistion system

Typical features of the SEASCOUT measuring system include:

- a cone base area of 1 0 mm' and an optional friction sleeve area that is dimensionally proportioned to 1500 mm'
- 10 kN cone penetrometer load sensor(s)
- optional pore pressure measurement at the face of the cone (face filter) or immediately above the base of the cone (base filter) for maximum 2.5 MPa pressure
- an inclinometer within the cone penetrometer
- data transmission by communication cable to surface-based recording and read-out apparatus
- storage of the signals from the internal sensors of the Figure penetrometer in digital form for subsequent computer-based processing and presentation.

SEASCOUT

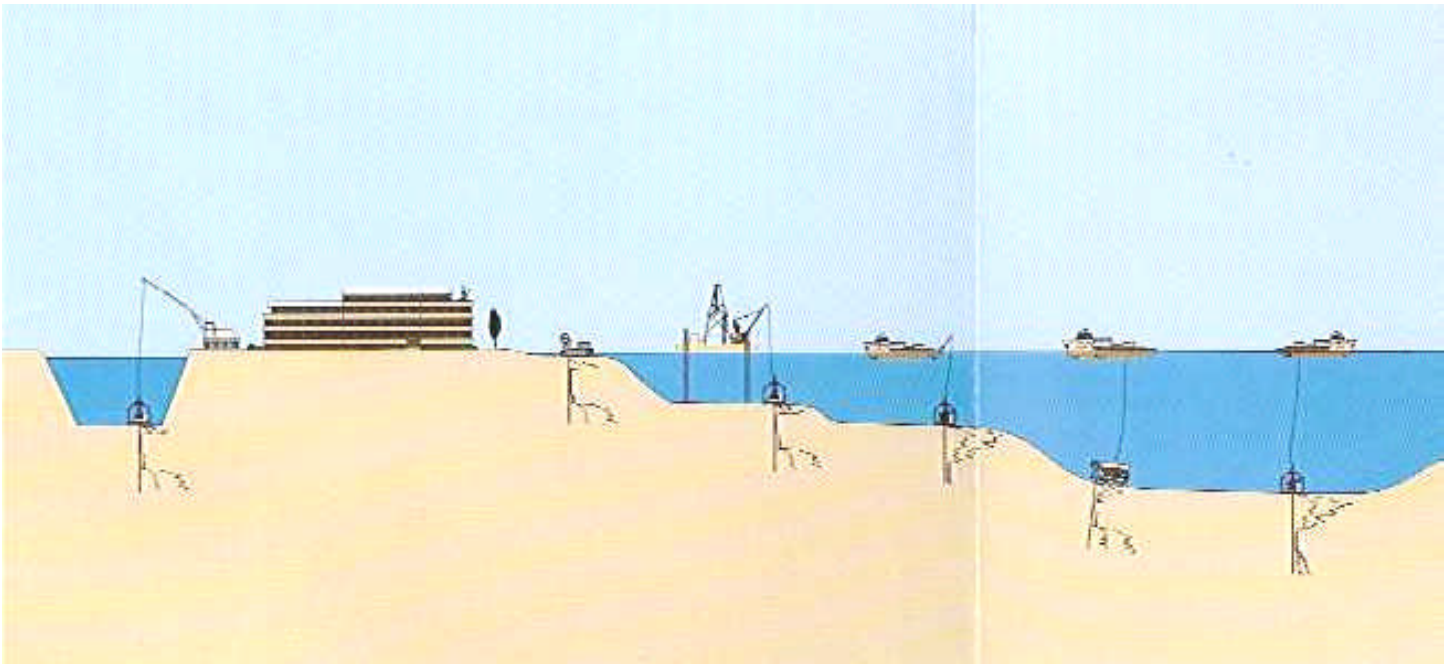
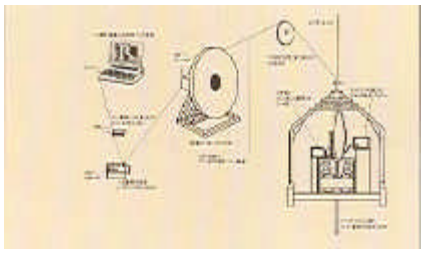


Figure 1: Typical applications of the SEASCOUT system

SEASCOUT

Test Procedure
The SEASCOUT test procedure includes the following steps:

- positioning of ' the SEASCOUT at the required test location, for example by lowering the frame to the seabed
- penetration of the cone penetrometer to the required test depth, while monitoring data acquisition
- retraction of the push rods and cone penetrometer from the ground
- lifting the SEASCOUT and moving to the next test location
- data processing.

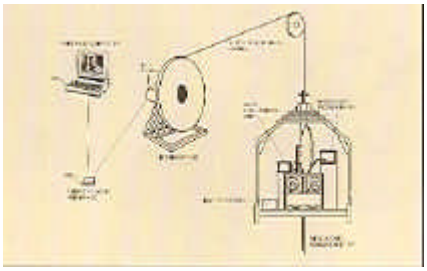


System Advantages
The SEASCOUT system provides numerous advantages over conventional systems, with typical benefits including:

- Lightweight unit with minimal deck equipment that can be deployed from smaller, less expensive vessels
- Small operational team
- Very quick mobilisation and demobilisation operations
- Rapid testing, real time display of results and on site evaluation of ground conditions
- System flexibility which permits installation on other seabed machines and ROVS.
- Facility for soil testing on sites with difficult or restricted access such as beneath oil production platforms and within pipeline trenches

Operational Specifications
Equipment specifications for the frame mounted SEASCOUT are as follows:

- Mass of SEASCOUT and unballasted frame: 1 ton
- Frame base area: equal-sided triangle with 2 m sides
- Frame height: 2.4 m
- Minimum vessel crane or A-frame: 25 kN SWL
- Required vessel power supply: 380/44OV, 50/60 Hz, 5 kVA
- Minimum vessel deck space: 2.5m by 2.5 m plus a sheltered area for the operator.
- Winch lift capacity 1400 kg



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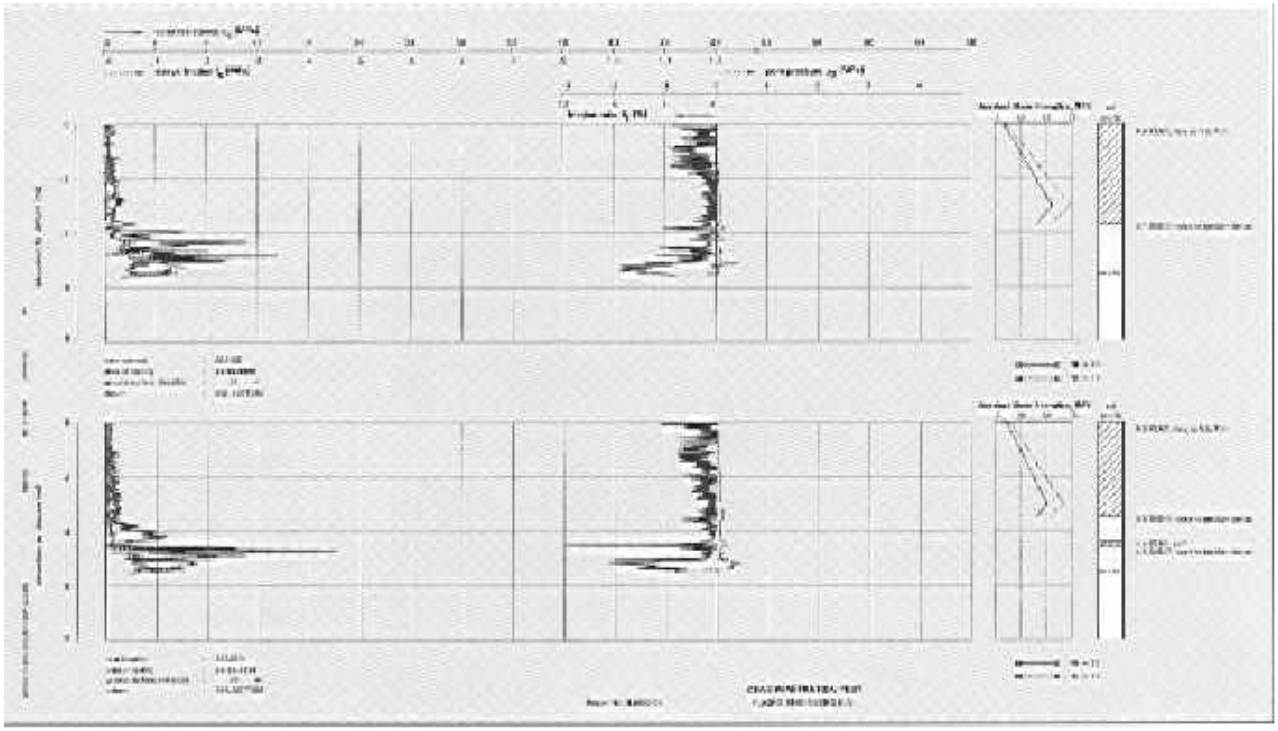

Figure 4: Example of data obtained with SEASCOUT and interpreted soil profile from CPT data

SEASCOUT System Specification

3 channel Piezo-cone penetrometer: 100mm² cross sectional area 1 tonne capacity

Seascout Cone Penetrometer Selection

2 channel Friction-cone penetrometer: 100mm² cross sectional area 1 tonne capacity

Typical Equipment set

Item no.	Approximate Dimensions (m)	Gross Weight (Kg)
SEASCOUT Unit	2.0 * 2.0 * 2.4	1000
Spare parts	1.8 * 1.8 * 2.0	1200 (water depth >50m)
Umbilical Reel with cable	0.3 * 0.3 * 0.1	5
Portable computer	1.0 * 2.0 * 0.6	150