Deep Water Soil Sampling – an Operational Challenge

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Marine soil sampling was originally developed as a scientific method for describing earth history. Special tools have been developed for obtaining undisturbed samples from the sedimentary process in order to extract scientific data. The most used sampler for this purpose is the gravity corer, where a weight of 500 – 5000Kgs is used to push a steel tube into the sediments. This corer is still used and has been refined with a variety of improvements, from sophisticated core catchers to stationary pistons.

As the Oil-industry went Offshore, focus turned towards development of marine geotechnical methods. Proper knowledge of the soil down to 50m – 100m below seabed was of utmost importance for all the gravity based or piled platforms. Marine in situ Cone Penetration Tools were developed and formed the base for all offshore geotechnical work. Core sampling did not give the necessary high quality data, the samples were too disturbed for geotechnical evaluation by itself, and the method therefor only served as a verification of type of soil for the CPT method.

As the oil exploration goes to deeper waters (>300m), floating production, or light-weight subsea production systems are used. The subsea constructional work is then of a different nature than for huge gravity based structures, and therefor the extent of the geotechnical investigations are also reduced. For most projects (foundation analyses for anchor locations, subsea templates, manifold and process facilities, pipelines,,,,), a sediment sample down to 10 – 20 m below seabed is sufficient for achieving an acceptable installation risk level. It turns out that drilling, wireline coring and CPT acquisition are not economicial feasible for this type of installation in deep waters (>2500m).

High quality soil samples down to 10-20m below seabed is not achieved by using traditional gravity corers. Active devices have to be used. **Selantic Subsea AS** has developed a core sampler which uses the hydrostatic energy to hammer the core barrels into the sediments. This sampler, **Selcore**, has been used successfully on many high profiled international projects the last decade.

Selcore was developed in the early 1990's as a deep water tool, and therefor designed to be driven by the subsea hydrostatic pressure. However, the deep water oil exploration progress was slower than anticipated and the advantage of Selcore has just recently started to be verified.

Seabed sediment sampling in deep water are very much a marine operational challenge. Carefully evaluation of the client specification should be done, based on "what is good enough" and not "what would be nice to have". The cost consequence might be shocking if you specify 20-30m core sample, and you only need 10-15m. The following points should be reconsidered:

- Effort should be put on finding a corer that can give you the required sample length with a satisfactory quality, and not more than that. Reliability and efficiency in operation, together with safety must be assessed. Proven and documented technology should be used.
- The winch system is the cost critical component, since most of the time, the equipment is in transfer between seabed and vessel, and everyone is just waiting. The taximeter for the whole vessel (project) is running, while the winch is in use.
- An efficient handling system for the required barrel length, which also is capable in a safe way to operate in heavy seas, should be focused upon.
- Proper positioning of the corer, so that it is known *when* and *where* it hit the seabed, should be catered for. This will increase efficiency in use, and also improve penetration/recovered sample.
- The winch wire must be designed to cater for the weight of the corer, the pull-out force (the longer the sample, the higher the pull-out force) and the weight of the wire itself. As the water depth exceeds 3500m, winches designed for synthetic wires should be used.
- When brought onboard, the samples are of extremely high value, and should be handled respectfully, and not as just another type of mud. Proper handling procedures must be followed. Too many high quality samples of high cost have been reduced in value on its long journey (in time and distance) to the laboratory.

Selantic Subsea's hydrostatic corer, Selcore, is a light weight corer with heavy weight penetration ability that can be operated in a very efficient way, due to its simplicity in use. It combines the requirements for effective handling and penetration performance. No control umbilical or supply of energy is needed from surface. It has recovered core samples of length up to 15m, in waterdepths down to 3500m. The deeper waters, the more energy is available for Selcore, which is designed for 6000m waterdepth. Total equipment weight is around 1000Kg, which makes it possible to mobilise quickly any place around the world.

Geotechnical specifications developed for gravity based and piled platforms seems to be used also for lighter structures. These are very often an over-specification that

is not financial feasible for foundation designs in deep waters. The operational challenges in obtaining high quality soil samples in deep waters should force the industry to work out new realistic specifications for these data. The whole operation has to be assessed to achieve an acceptable installation risk level for an acceptable price. Selcore, the hydrostatic corer from Selantic Subsea AS, should be an attractive alternative to meet these challenges.