ARCADA II, MASS STABILISATION EQUIPMENT DEVELOPMENT AND TESTING

Introduction

The prototype of the first mass stabilization equipment was introduced in mid 1990`s. The mixing head of the prototype was a swinging screw which was able to mix the binder and the soil mass both vertically and horizontally into a depth of 3,0 meters. Mass stabilization of peat and sediments has been mostly the stabilized media. Such soil types mostly have extremely low bearing capacity and hence the actual mixing with binders does not have needed significant power/torque from mixing machines. Usually the bulk density of such materials varies from 1000 to 1300 kg/m^3 with extremely high water content.

The binder feeding into stabilizing material has been performed by mainly using single binder. Mostly the binder has been cement and single pressure feeders have been used.

In the ABSOILS project different types of excavated soils are planned to affine into different construction materials by using stabilization. In the first pilot (Arcada II) excavating clays were planned to use as lightweight structure. Stabilisation depth will be from 3 to 7 meters and excavated surplus clay material density up to 1900 kg/m^3 with low water content. In the pilot nr 1 the development and testing of quality mixing of materials were prioritized. Also for forthcoming pilots the two type binder feeders were tested and modified.

Equipment study

In the pilot nr 1 the testing and development of high quality mixing performance were priority nr 1. Possible manufactures of mixers were searched and tenders for most promising mixer manufacturers were inquired. Possible manufacturers were:

- Allu Finland Oy
- Simex
- Boart Longyear
- Sandvik

In the technology survey within the mixer performance it was found out that manufacturers Simex and Sandvik had few possible mixing models, however those mixers are mainly used in limestone mining and hence the suitability to mixing different type of soils were questioned. Also Simex and Sandvik only manufacture the mixing heads not the essential lightweight arm (3 to 7 meter) which would have to manufacture somewhere else.

Furtermore Boart Longyear uses Japanese based technology such as hydraulic motors etc. During the negotiations it was realized that most of the manufacturing facilities were situated near the tsunami catastrophe area in Japan and hence the overall manufacturing of the mixers were stopped.

Therefore the new mixers were acquired from Allu Finland Oy (see figure 1).

Figure 1. Mass stabilization mixer

Equipment testing

Mixers were tested during the period of April 2011 to August 2011 in the pilot 1. In the testing the adjustment of hydraulic oil pressures that controls the speed of rotation and torque of the mixers were tested. As a result the vital knowledge between the density of the stabilized material and oil pressure demand were achieved.

During the pilot 1 the following information were gained through testing:

- It is possible to penetrate into ground (test lagoons) down to 7 meters. This gives new possibilities to design further projects in where the stabilization depth is not “normal”, i.e. 3 meters
- The mixing performance (quality/homogeneity of mixing of clay and cement) is in sufficient level
- The mixer can be adjusted to mix different type of soil materials, e.g. silty material in where the bulk density is higher (1900 kg/m^3) than usual (1300 kg/m^3) and also with materials whose water content may change.

In the following pilots in ABSOILS project the mixing performance will be further studied and adjustments of the machinery may continue.

In Nurmijärvi Finland 20.9.2011

Ville Niutanen

Biomaa Oy
Development Director