DREDGED SEDIMENT CHARACTERISTICS AFTER TREATMENT BY GEOSYNTHETIC DEWATERING TUBES

Dipl.-Ing. Markus Wilke

What has been done?

What has been done?

Two harbor remediation projects

Marina in Verden, 2010 (source: google maps)

Port in Husum 2013/2014 (source: google maps)

Sediment monitoring plan

HUESKER
Ideen. Ingenieure. Innovationen.

Following analysis were performed

- Determination of density of soil according to DIN 18125
- Water content - Part 1: Determination by drying in oven according to DIN 18121
- Determination of ignition loss according to DIN 18128
- Determination of particle size distribution in mineral soil material - Method by sieving and sedimentation according to DIN ISO 11277
- Determination of density of solid particles according to DIN 18124
- Determination of lime content according to DIN 18129
- Subsoil - Field testing - Part 4: Field vane test according to DIN 4094-4

Project impressions

Small Marina: 1,000 m³ of sediment to be removed

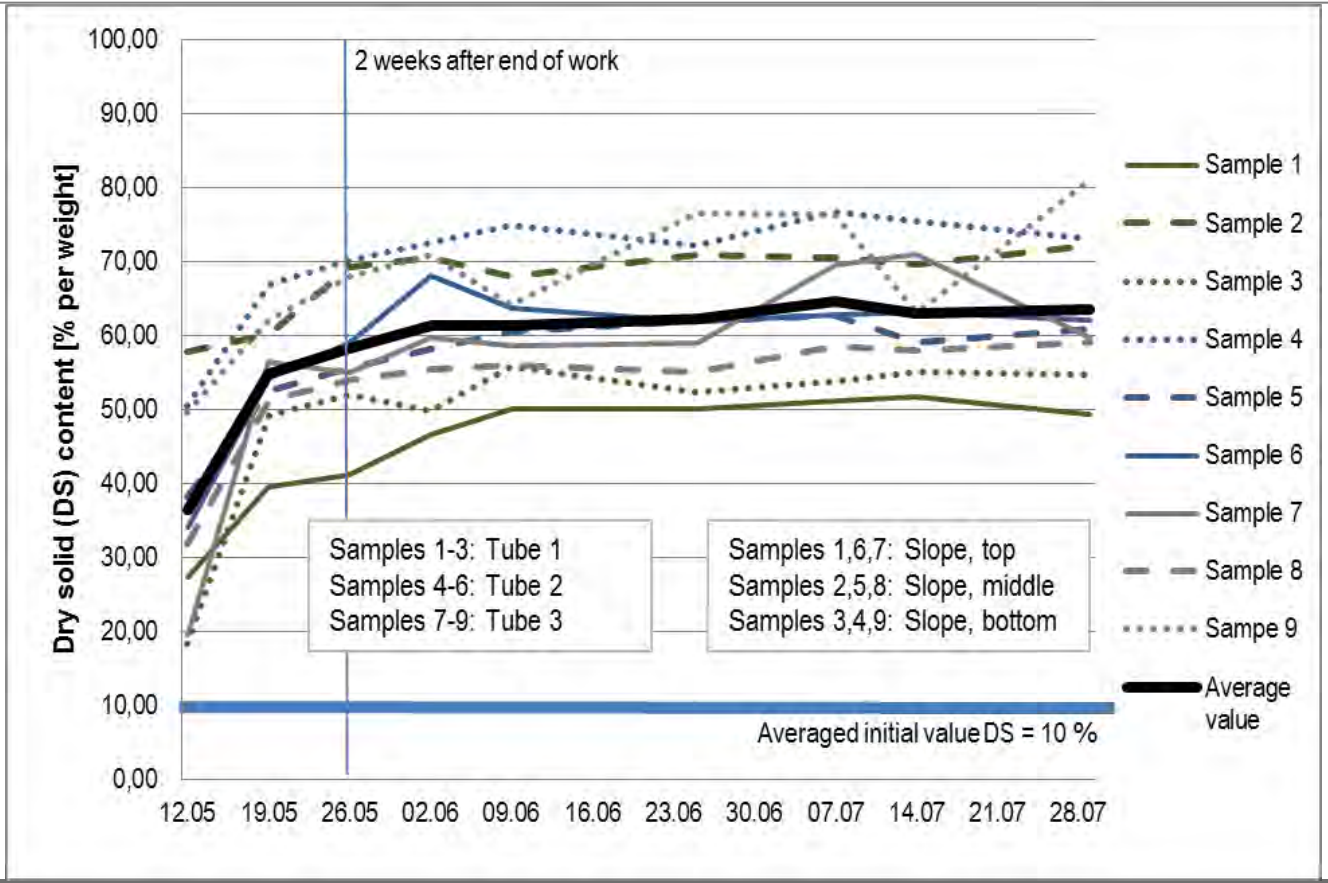
The dewatered material

Verden 2010

HUESKER
Ideen. Ingenieure. Innovationen.

DS data

Overview



Location and site overview

Approx. 50,000 m³ sediment, heavily contaminated with TBT, heavy metals, PCB's (source: google earth)

Site overview

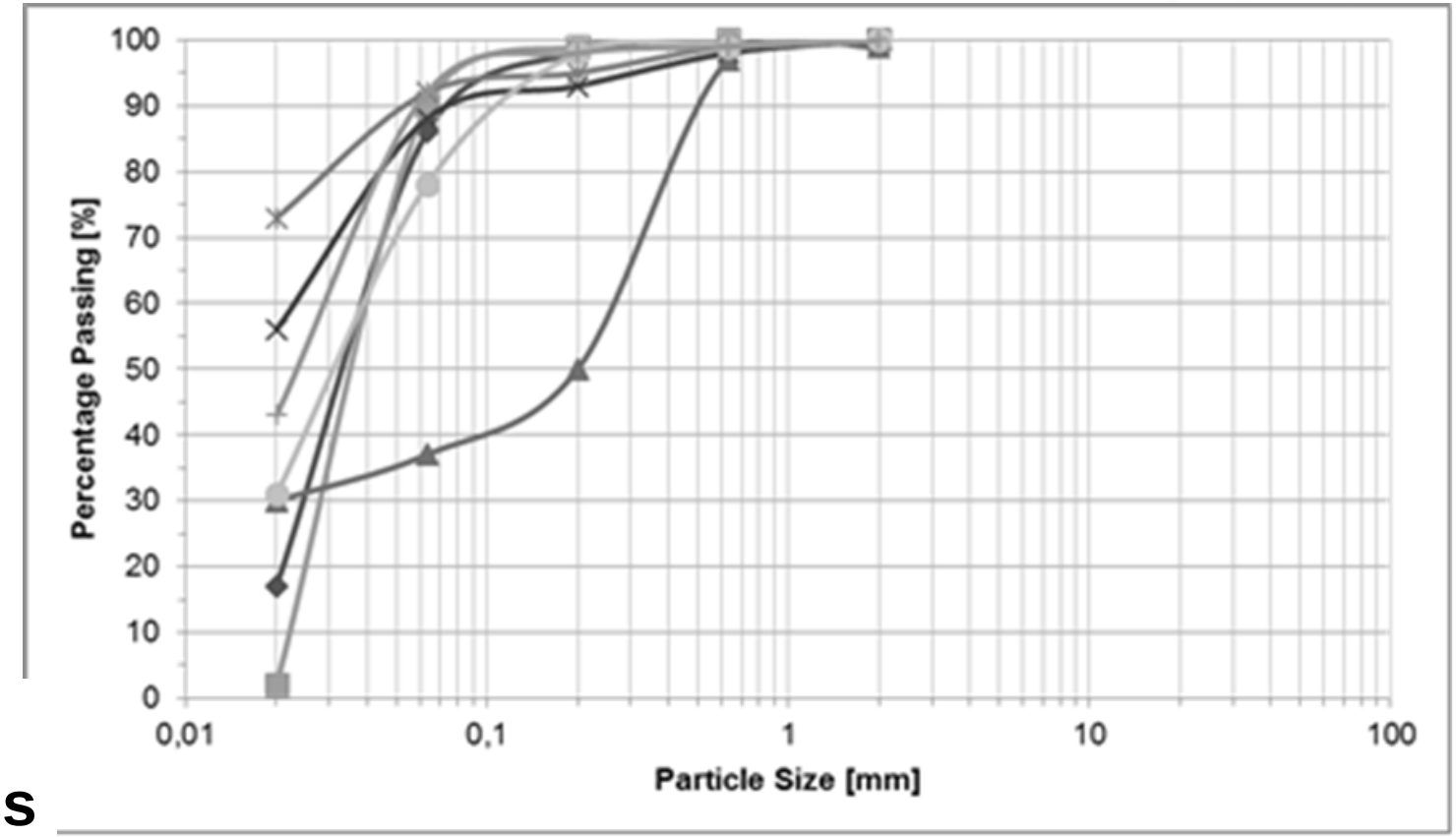
Sediment characteristics

- Cadmium
- Mercury
- Chrome
- Copper
- Lead
- Nickel
- Zinc and
- Arsenic.

- gasoline derivatives polycyclic aromatic hydrocarbons (PAH)
- polychlorinated biphenyls (PCBs)
- tributyltin (TBT) Nickel

Husum 2014

HUESKER
Ideen. Ingenieure. Innovationen.



Sediment characteristics

Sediment characteristics

Untreated sediment

Flocculated sediment

Site impressions

The dewatering field

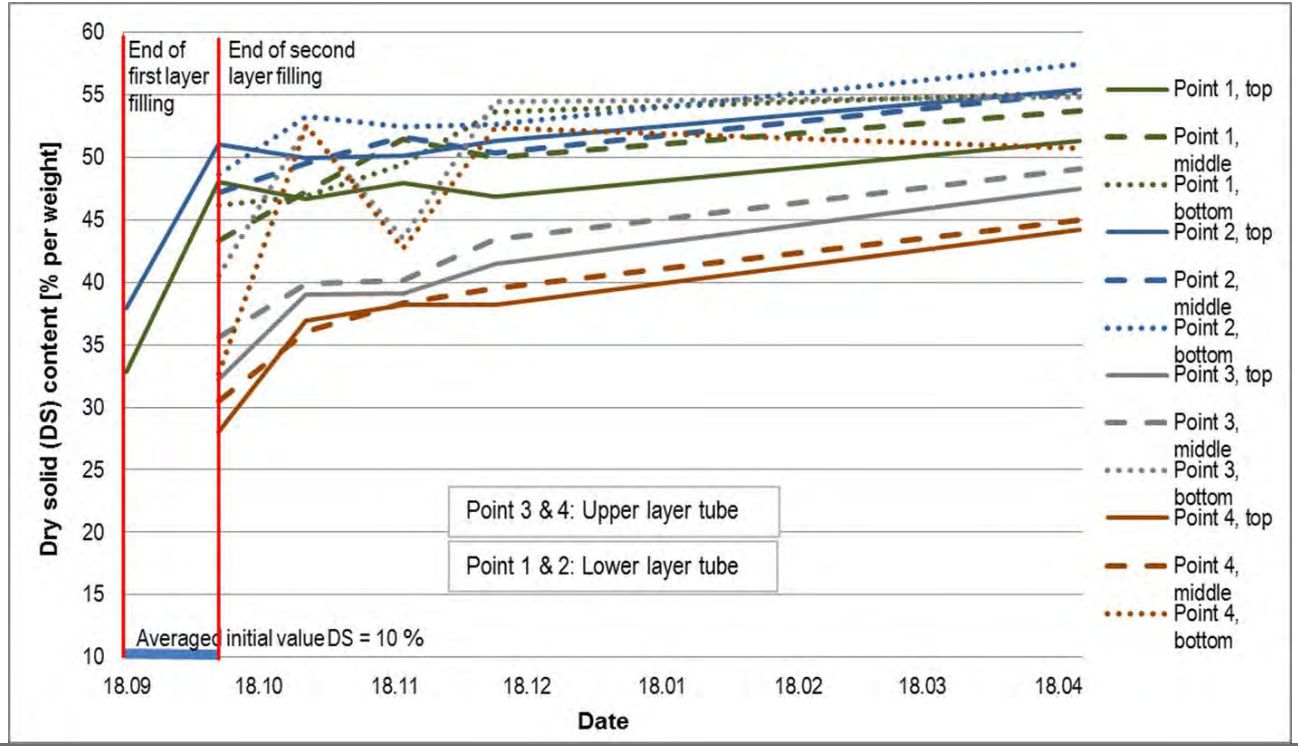
The dewatering field

Trial section and analysis

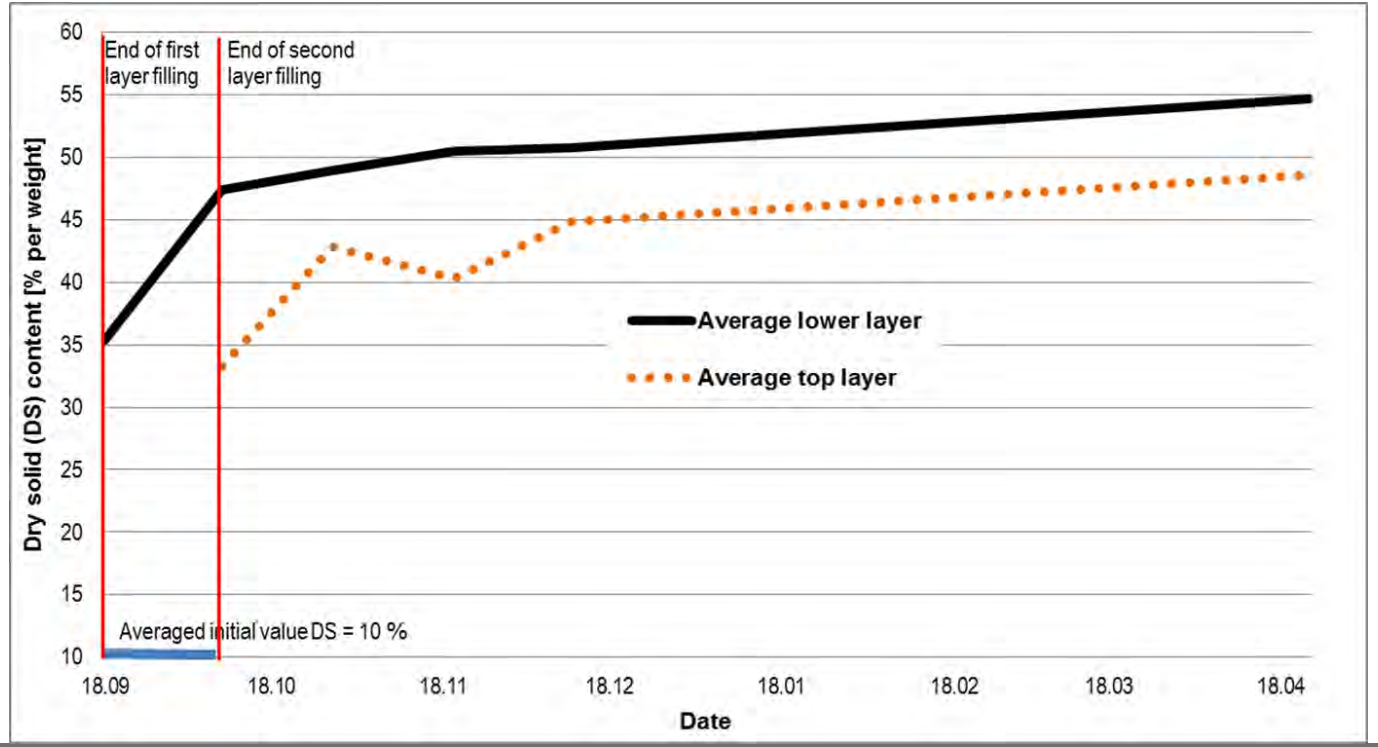
Trial section

Sampling pit on the tube

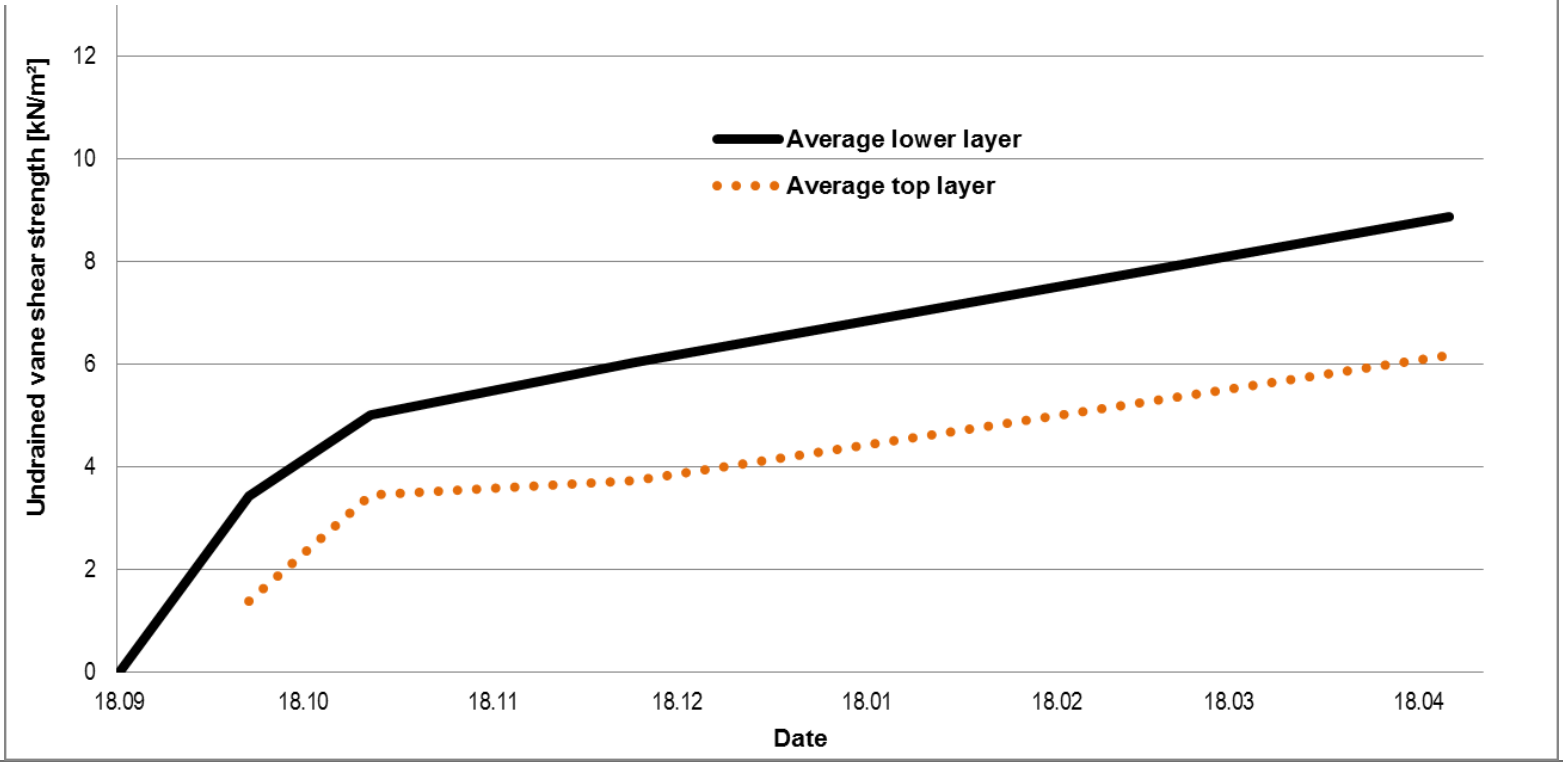
Overview of the measured DS data



Processed DS data



Processed un-drained vane shear strength data



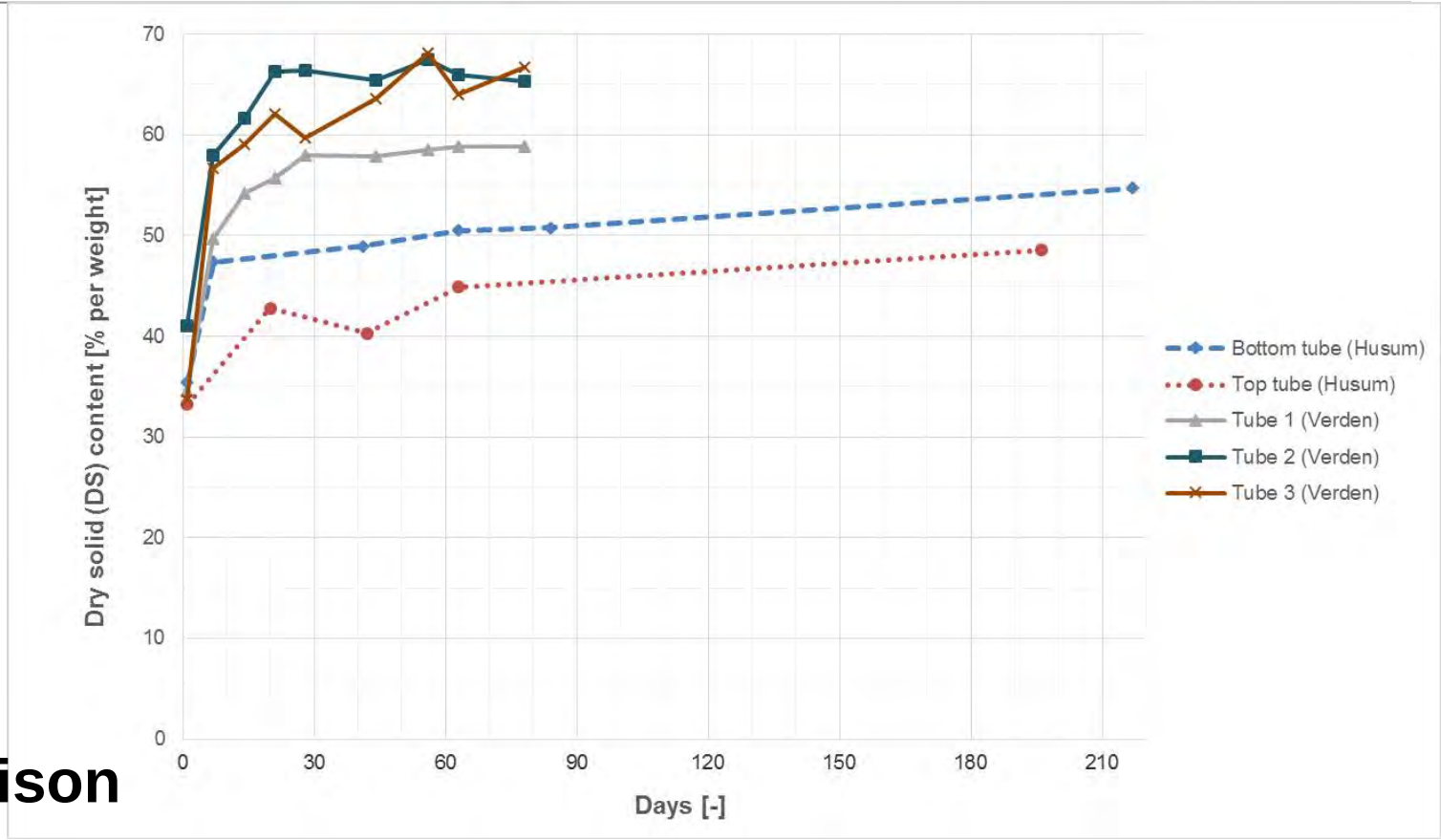
Dewatered material characteristics

Finally a three layer stack

Harbour sediment after dewatering (DS after 6 month between 46 % to 56 %)

Summary

Data comparison



Conclusions

- The principal trend of the derived DS curves is similar for both projects and all analyzed locations, independent from tube layer or project.
- The absolute values of the DS contents vary. Main variations are due to the different sediment characteristics of the two projects.
- The “dewatering process” for the Verden project seems to be complete whereas it is still ongoing for the Husum project.
- Stacking of tubes (application of a surcharge load) results in an increase in the DS content and the undrained vane shear strength in the lower layer.
- The curve of the dry solid content development approaches a horizontal asymptote. As the projects are located in quite rainy regions, it can definitely be concluded that overall rainfall does not negatively affect the dry solid contents of materials encapsulated within geosynthetic dewatering tubes.

Thank you for your attention

High Flow Dewatering Tubes