

Mineral Based Sustainable Dewatering Solution

Sustainable use of resources by way of example of the dewatering of sediment from the River Elbe

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Introduction:

With the official launch at IFAT 2016 in Munich Clariant introduces INVOQUE™, a unique mineral-based performance dewatering system.

This innovative, high-performance system is an exceptional fit for dewatering hard-to-treat and fine sediments in a variety of industrial settings, across the fresh- to salt-water environmental spectrum, which can lead to substantial economic, environmental and sustainability benefits for users.

By way of example of the METHA plant of the Hamburg Port Authority AöR (HPA), a completely acrylamide-free and therefore environmentally friendly harbour silt dewatering system is described for the first time. The results from the large-scale experiment, which was accompanied and analysed by CUTEC Institut GmbH, Clausthal-Zellerfeld, showed a number of advantages compared with the traditionally used treatment concept which arise both in technical operations and in the area of the sustainable use of resources.



Fig. 1: CUTEC pilotplant at the METHA

Methods:

(2015) Preliminary experiments with a mobile test system to optimise the dosage, and planning in preparation for a large-scale experiment.

(2016) Large-scale experiment using a 3-phase acrylamide-free high-performance dewatering process:

→ Omyased / Promoter / Starch KCG 750

Results:

In the large-scale experiment conducted in the METHA plant in the spring of 2016 around 1,000 t of dewatered harbour silt was generated over a period of around 2 weeks using an acrylamide-free high-performance dewatering process. Following prior thickening, the dewatering process took place on a membrane chamber filter press (MCFP). The following results were achieved with the dewatering concept (acrylamide-free dewatering process) to be tested:

- Good pre-thickening of the harbour silt
- 15 - 20% higher solids content in the dewatered sediment
- Approx. 20% higher shearing resistance in the sediment

It was also possible to distinctly improve some of the operating parameters of the MCFP:

- Batch throughput up to 25% higher
- Longer cleaning cycles of the filter cloths
- Increase in the availability of the plant
- Low staffing requirements at the plant

Discussion:

In view of the advantageous change in the mechanical parameters of the produced sediment (e.g. residual humidity and coefficient of permeability (k_f value) for use as sealing materials ($<5.0 \times 10^{-10}$ m/s)), it would appear probable, according to the current level of knowledge, for the material to be used in dyke construction. From the point of view of the sustainable use of resources, this would enable the owner to sell the produced sediment as a raw material and avoid or offset further deposition of the material by landfill/landbuild, contributing significantly toward circular economy goals around sustainability and resource stewardship.

References: [1] Sievers, M., Niedermeiser, M., Döring, U., Lehmann, K., Bonde, L.-S. (2016) : Entwässerung von Elbsedimenten – ein Beispiel für nachhaltigen Ressourceneinsatz. Wasser und Abfall, Heft 12/2016.
[2] Trubkat, M. (2016) *Bachelorarbeit Hochschule für Angewandte Wissenschaften Hamburg*: Einsatz acrylamidfreier Flockungshilfsmittel bei der Entwässerung mineralischer Elbsedimente in Hamburg