Press release

BIBKO® INFRA*TEC* - Recycling of drilling fluid

GRAALMANN GmbH in Leer invests in own recycling system

Drilling fluids are liquids that are used for backfilling and grouting cavities, as well as for horizontal and geothermal drilling. In addition to cleaning the borehole, the drilling fluid also cools the drilling tools, stabilises the borehole wall and reduces the friction between the drill string and the rock.

Emptying drilling fluid from silo vehicle

Drilling fluids are initially a mixture of water, bentonite and minerals. Other substances are added to control the properties.
Due to the wide range of applications, large quantities of used drilling fluids are produced which have lost their construction-relevant properties. Further use is no longer possible, so they have to be disposed of. However, as these are stable and do not separate on their own, or only very slowly, disposal is difficult. Due to the high liquid content, disposal in landfills is not possible without prior treatment for landfill construction reasons.

GRAALMANN GmbH - A company with ideas

Environmental protection, legal certainty and sustainability are the cornerstones of responsible disposal and logistics at GRAALMANN GmbH in Leer.

Founded in 1999, GRAALMANN GmbH today specialises in the professional processing of mineral waste, such as drilling fluids.
The motto here is not to dispose of waste wherever possible, but to utilise and reuse it sensibly. Special emphasis is placed on sustainability and environmental protection. In this way, resources and thus the environment are conserved.

Removal of recycled minerals after the recycling process

Recycling system for drilling fluid - Building block for implementing the company strategy

Prior to the installation of the BIBKO® INFRA*TEC* -recycling system, the processing of drilling fluid essentially consisted of buffering the delivered drilling fluid in large polders. Dewatering and volume reduction was carried out by wind and sun. For further dewatering, the partially dewatered material was also moved several times a year using excavators.

Limits of the original system

In principle, the use of wind and sun for dewatering and volume reduction had the advantage that only renewable energies were used. However, this also resulted in dependencies that influenced the throughput and thus the amount and quality of waste that could be processed.

Furthermore, drainage areas were only available to a limited extent. Continuous processing and reliable planning, in particular of the quantities accepted, was therefore only possible to a limited extent.

Polder

GRAALMANN therefore decided to invest in a complete solution for the recycling of drilling fluid. BIBKO®, INFRA*TEC* division, was commissioned to design a suitable recycling system for this purpose. This recycling system has now been successfully in operation for several months.

System parameters

The following parameters were used for the conceptual design of the recycling system.

- Waste type: Waste from freshwater drilling (Drilling fluid)
- Waste code: AVV 01 05 04
- Composition: variable (depending on region)
- Input quantity: 10.000 t/year
- Material feed: 2 vehicles at the same time

The integrated, 4-stage recycling solution

Based on the system parameters, the recycling system was designed as a 4-stage recycling solution:

- Process stage 1: Material feed
- Process stage 2: Material recycling
- Process stage 3: Fines separation
- Process stage 4: Process water recycling

The aim of the recycling system is to achieve the following points in particular:

- Volume reduction through separation of the water content
- Recovery of the minerals contained (sand) as a secondary raw material
- Recovery of the remaining solids in stab-proof form
- Recovery of the water content

Simultaneous material feed by two vehicles

Process stage 1: Material feed

The drilling fluid from the vehicles is first fed into the dosing buffer via a feed hopper. There, the drilling fluid is buffered and then continuously transported to the recycling machine (process stage 2). Excess water is channelled directly from the dosing buffer to the recycling machine in a free fall.
The dosing buffer thus decouples the material feed and the material recycling and therefore equalises peaks and fluctuating volume flows during the material feed. The continuous feed of material to the recycling system ensures a constant separation cut.

Dosing buffer (right) with recycling system (left)

Minerals >63 µm - suitability-tested building material

Process stage 2: Material recycling

In the recycling machine, the drilling fluid first enters the pre-wash chamber. This contains a water bath. A rotating spiral conveys the drilling fluid through the water bath and segregates it in the process. At the same time, water flows through the chamber using the counter-current principle. The minerals ≤250 µm are washed out and discharged from the system together with the excess process water.

The pre-washed minerals >250 µm are removed from the pre-wash chamber via a bucket elevator and fed into the main wash chamber. The main washing process takes place there, similar to the pre-wash chamber, in which the minerals are mechanically conveyed through a water bath again. In order to achieve an optimum washing result, water flows through the chamber using the counter-current principle.

A second bucket elevator removes the washed minerals from the main washing chamber and feeds them to the spiral conveyor. The material is partially dewatered via this conveyor and conveyed into the material box.

The discharged process water enters an intermediate buffer. This contains an agitator to keep the solids in suspension and thus prevent sedimentation.

Process stage 3: Fines separation

To further reduce the proportion of minerals ≤250 µm in the process water, the process water is fed to the fines separator in the next step. This is where the components >63 µm are separated.

Fines separation

On the one hand, minerals are recovered through the reduction and, on the other hand, the required addition of precipitants and flocculants for the treatment and recovery of the water content is reduced.

In addition, the lower mineral load in the process water reduces wear during treatment (process stage 4).
The remaining process water with minerals ≤63 µm from the fines separation is fed into another intermediate buffer with agitator.

Agitator tank with feed pump centrifuge

Process stage 4: Process water recycling

The centrifuge is fed from this second intermediate buffer via a feed pump. The process water is conditioned by adding precipitants and flocculants.

Centrifuge

The solids are separated in the centrifuge and discharged into a material box. This solid matter is disposed of (material utilisation).

The resulting centrate (recycled water) is fed into another tank and is used in the cycle for the recycling process in the recycling machine and as process water. Excess water is discharged after being analysed and released.

Material flows and utilisation

The recycling process described above results in a total of three material flows.

- Minerals >63 µm from recycling machine
- Solids ≤63 µm from centrifuge
- Centrat from centrifuge

Drilling fluid (Input) I Centrate (Output)

Suitability-tested building material

Due to the good quality of the recycled minerals >63 µm, they can be sold as a suitability-tested building material and reused as a secondary raw material. The resulting centrate is also reused in the recycling process. In this way, reutilisation conserves natural resources and contributes to sustainability.
Only the solids from the centrifuge ≤63 µm are disposed of (material recycling). Possible further uses are still being investigated.

Minerals >63 µm (left) I Solids ≤63 µm (right)

Projected and annual quantity

Now that the BIBKO® INFRA*TEC*-recycling system has been in operation for some time, the settings with regard to processing capacity, quality of the material flows and the consumption of precipitants and flocculants have been continuously improved. This means that the entire system can be operated in an economically optimised range. As a result, the projected input quantity of 10,000 tonnes per year is expected to be significantly exceeded.

Complete solution - partial solution

The recycling system described above is a complete solution which, in addition to volume reduction, production of solid material and recovery of the water content, also includes in particular the recovery of the minerals contained as a *certified building material* (secondary raw material/ process stages 1-4).


Recovery of minerals – secondary raw material

Small quantities – more cost-effective variant

If the recovery of the minerals contained is only of minor importance or if only small input quantities are available, the recycling system can also be implemented as a partial solution. In this case, *process stage 2: material recycling* and *process stage 3: separation of fines* are omitted. These are replaced by a special screen with a separation cut of 250 µm. In this case, the recovered material is not washed and therefore does not have the same material properties or qualities as the complete solution.
However, by eliminating process stages 2 and 3, the investment costs for this solution are lower than for the complete solution.

Summary

With the BIBKO® INFRA*TEC*-recycling system supplied, the targets set in advance have been fully achieved or even exceeded. This now leads to reduced costs in day-to-day operations and makes the investment in the BIBKO® INFRA*TEC*-recycling system a profitable investment in economic efficiency and environmental protection at GRAALMANN GmbH.

Video

The corresponding video of the project can be downloaded using the QR code below.

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