

Press release

BIBKO® INFRA^{TEC} - Recycling of bentonite suspensions

Solution examples for the processing of large and small quantities

Bentonite is a naturally occurring clay with a high swelling capacity. When bentonite is stirred into water, a liquid is formed that remains fluid when stirred but becomes a solid when at rest.

Due to this property, bentonite-water mixtures are used, among other things, as a supporting liquid in civil engineering. Furthermore, these mixtures are used for filling and grouting cavities, as well as for horizontal and geothermal drilling.

Disposal of bentonite suspensions

Due to the wide range of applications, large quantities of used bentonite suspensions are produced that have lost their construction-related properties. Further use is no longer possible, so these suspensions have to be disposed of. However, since they are stable and do not segregate independently, disposal is difficult. Disposal in landfills is not possible without prior treatment for reasons of landfill construction.



Reprocessing: large/small quantities

Depending on the company's orientation, different quantities of bentonite slurry are recycled by the disposal companies. These quantities represent a first criterion for the selection of a recycling solution.

In addition to the quantities produced, however, the results that can be achieved represent further important features in the selection of a recycling solution. These include, among others:

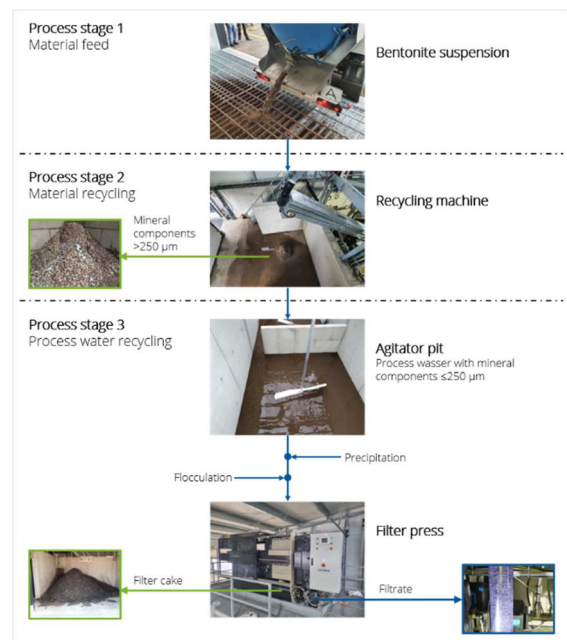
- Achievable material/recycling flows
- Achievable dry substance content
- Achievable filtrate quality

The results achieved subsequently influence the economic viability of the investment. Two recycling solutions for the recycling of bentonite suspensions are presented below.

-  Recycling solution I - for large quantities (Stationary systems)
-  Recycling solution II - for small quantities (Semi-)Mobile systems

Recycling solution I - for large quantities

The recycling solution for large quantities is divided into a total of three process stages.



Scheme recycling solution for large quantities

Sequence of the recycling process

After the recycling system has been started, the bentonite suspension is fed via the material feed (process stage 1) into the recycling machine for the actual material recycling (process stage 2).

In the recycling machine, the undesired components $\leq 250 \mu\text{m}$ are washed out in a wet-mechanical process and discharged from the machine together with the excess process water. The washed material $> 250 \mu\text{m}$ is removed from the recycling machine via a bucket elevator and discharged via the spiral conveyor.

In order to achieve an optimum recycling result, water flows through the recycling machine in countercurrent.

The discharged process water enters an intermediate buffer. This buffer contains agitators to keep the solids in suspension and thus prevent sedimentation. The chamber filter press is fed from the intermediate buffer. Precipitants and flocculants are added to the process water. The correct dosage is ensured by a density sensor installed in the pipe.

In the chamber filter press, the solids are filtered out and pressed into filter cakes. These filter cakes are usually disposed. The resulting filtered process water (filtrate) is fed to a buffer tank. A pump takes the water for the recycling process from this basin. Surplus water is discharged after analysis and approval.






Discharge of vehicle

Application

Recycling solution I is usually used when the recycling quantity is more than 2,500 - 3,000 t/year.

Achievable material/recycling flows

Recycling solution I achieves a total of three material or recovery streams:

- 
 Mineral components >250 µm
 from: Recycling machine
 use: Secondary raw material
- 
 Filter cake
 from: Filter press
 use: none → disposal
- 
 Filtrate
 from: Filter press
 use: Recycling process

Achievable dry substance content

The dry substance content (DS content) that can be achieved with recycling solution I can be up to 70%, depending on the design of the filter press.

Achievable filtrate quality

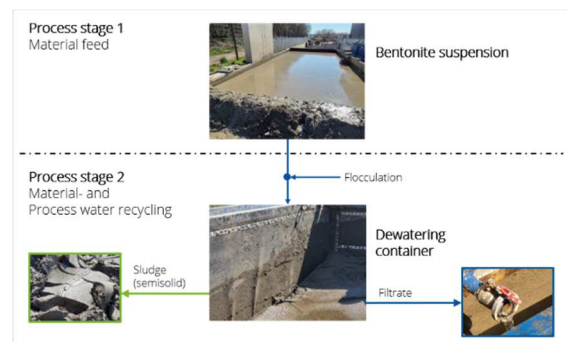
After the filtration process, the filtrate no longer contains any solids. The filtrate is only slightly turbid.



Filter cake and filtrate

Recycling solution II - for small quantities

The recycling solution for small quantities is divided into a total of two process stages.



Scheme recycling solution for small quantities

Sequence of the recycling process

In this recycling solution, the bentonite suspension is first placed in a standard settling container or alternatively in a basin provided by the customer. In the next step, the bentonite suspension is pumped from the settling container or existing basin into a dewatering container.


Flocculant is added to the bentonite suspension. The bentonite suspension is then dewatered in the dewatering container. The result is filtrate and semi solid sludge.


Application

Recycling solution II is usually used when the recycling quantity is up to 2,500 t/year.

Achievable material/recycling flows

With recycling solution II, a total of two material or recovery streams are achieved:

-  Sludge
 from: Dewatering container
 use: none → disposal

-  Filtrate
 from: Dewatering container
 use: Recycling process

Achievable dry matter content

With recycling solution II, a semi solid sludge can be achieved. Depending on the composition and dewatering time, the dry substance content (DS content) is approx. 20 - 30%.

Achievable filtrate quality


The quality of the filtrate is similar to that of the filter press. After the filtration process, the filtrate no longer contains any solids. The filtrate only has a slight turbidity.




Filtrate discharge dewatering container

Steps to the optimal recycling solution

A first indication for the selection of the optimal recycling solution is the quantity to be processed (t/year). However, the following aspects must also be considered:

-  Can the desired filter quality be achieved?

-  Can the required dry substance content (DS content) be achieved?

In the case of recycling solution I, the corresponding data are determined in the process engineering laboratory. Due to the simpler design as a semi-mobile solution, the data for recycling solution II are determined directly on site as part of a pilot test.





Filter cake recycling solution I

The determined data also provide conclusions about the achievable material-/ reuse flows.

Comparison of the solutions

The following matrix gives an overview of the characteristic properties of the two solutions. The following evaluation scale was used:

-  suitable/ applicable
-  less suitable/ less applicable

Criteria - technical	Rec.solution I - large quantities -	Rec.solution II - small quantities -
Recycling quantity >2.500-3.000 t/year		
High DS content after process (>30%)		
High filtrate quality		
Low space requirement		
Simple system		
Pilot test		
Criteria - economic	Rec.solution I - large quantities -	Rec.solution II - small quantities -
Low investment costs		
Short Return on Investment (ROI)		
Scalability during project planning		
Scalability during operation		
Production of secondary raw material		
Optimised disposal costs		

Summary

The above matrix for the comparison of the solutions offers a first orientation for the selection of the appropriate recycling solution. Since the selection depends on further, company-specific factors in addition to the factors presented, the evaluation should not be seen as an exact delimitation. Rather, based on the initial orientation, a more detailed analysis must be carried out in the next step.

From a technical and economic point of view, both recycling solutions are efficient solutions in their respective segments. However, the most important criterion in the selection process is ultimately the economic viability of the investment.