

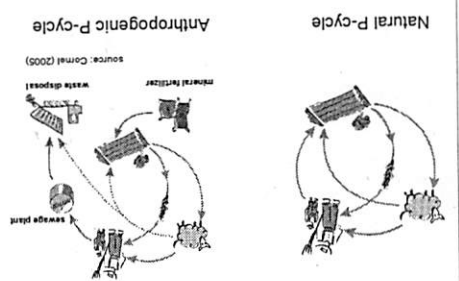
Phosphorus recovery by Crystallization using Calcium-Silicate-Hydrate: Fate and behavior of particles

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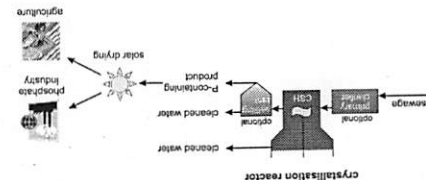
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1. Motivation

Sustainable use of limited natural resources will be an essential task for the future. The finite and quality of phosphorus resources as well as the increase of commodity prices and the increasing use of fertilizer require innovation such as P-recovery from municipal waste- and process water.

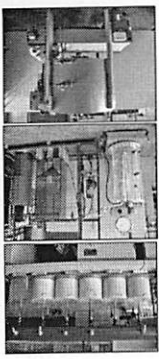


2. P-ROC process



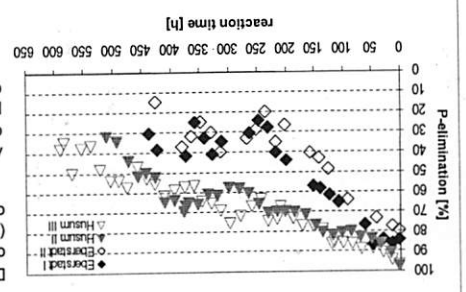
3. Methods

Due to the extensive diversity of waste- and process water a bottom-up approach was developed. It enables the evaluation of the efficiency of the P-ROC process. Short-term experiments over 24 h in bench-scale give information about the reaction kinetics. Semi-technical experiments inform about the quality of the generated products such as P-content and mineral phases. The fully automated pilot plant allows a validation of the bench-scale and semi-technical experiments.

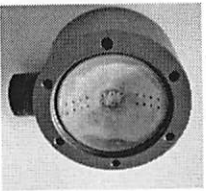
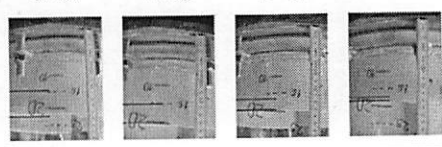


4. Results

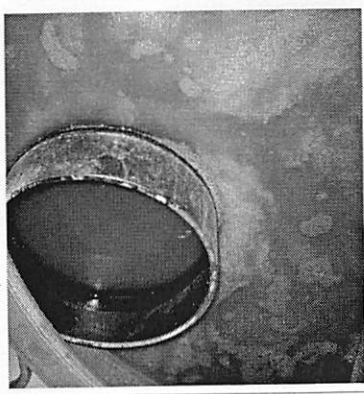
The pilot plant was operated with a bypass flow of the municipal sewage plant in Husum and with supernatant liquor from the sewage plant in Eberstadt. The progress of the P-elimination shows reproducible results.



Due to the mechanical instability of the CSH-material (shown in the figure above) and resultant a discharge of fine particles may occur. Another point may be crystallization at valves and pumps causing a degradation in functionality.



So it is important to find a way to extract the fines and flotation may be a possibility.



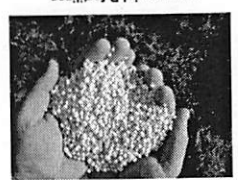
5. Conclusion

The advantages of the process are evident:

- simultaneous P-elimination- and recovery
- no need of further additives
- technical easy to apply
- products can be used in phosphate industry for further processing and in agriculture as fertilizer

6. Acknowledgement

We thank the Federal Ministry of Education and Research for funding our project within the scope of the overall project called "Recycling management of plant nutrients, especially phosphorus". Our special thank goes to the employees of the sewage treatment plants of Husum and Darmstadt-Eberstadt for the provision of the infrastructure as well as for their active support.



commercial P-fertilizer

The process is suitable for a waste water treatment in bypass flow from waste water treatment plants, waste water from animal husbandries also from food- and paper industry. Discharge of fines poses a challenge, for which flotation may represent a solution.

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