

IntenKS – Intensification of sewage sludge treatment using thermal processes

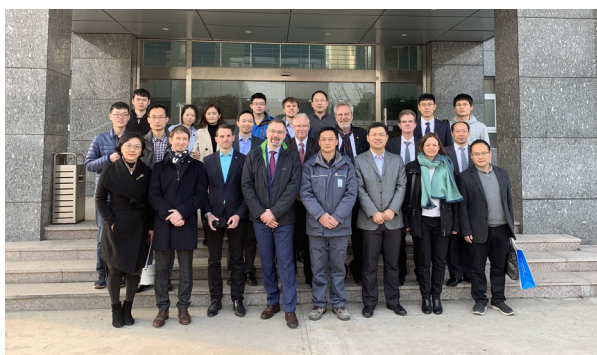
Client II – International partnerships for sustainable innovations

In the past, sewage sludge was often considered to be waste, but there is a growing awareness of its potential as a source of energy and recyclable materials. This is increasingly becoming the focus of attention when designing new sewage sludge treatment plants. Given the fact that plants are to be established in China to handle the demands of approximately one billion people in the near future, the German-Chinese research project “IntenKS” is working to develop solutions for the management of waste materials in wastewater treatment plants in China.

Integrated sewage sludge treatment

The People’s Republic of China does not currently have sufficient capacity to adequately treat and recover sewage sludge from wastewater treatment. It is largely disposed of without being reused as a source of energy or other materials.

In this context, “IntenKS” aims to develop sustainable solutions for dewatering untreated raw sludge from wastewater treatment plants and using it as a source of energy. For this purpose, the project develops and adapts technological options for intensifying sewage sludge treatment by means of thermal processes while taking local constraints into account. These sewage sludge treatment processes have a direct impact on the subsequent stages of process water treatment and waste disposal.



Project launch participants in Shanghai, China.

In light of the fact that the cleaning carried out at China’s existing large-scale facilities for nutrient elimination, especially nitrogen, is at times insufficient and there is a heavy strain on process water from thermal pre-treatment. Thus, the intensification of sludge treatment must be considered in combination with a separate, optimized process water treatment. This aspect is picked up on and scientifically examined in the “IntenKS” project.

Above all, “IntenKS” aims to develop and define an integrated concept for the management of waste materials, such as process water and dehydrated sludge, based on current circumstances in China.

Thermal processes as solutions

The project investigates two approaches to utilizing sewage sludge. The first is the thermal pretreatment of untreated sewage sludge at 120–160 degrees celsius followed by fermentation to produce biogas. This pretreatment results in increased biogas production as well as an improvement of the dewatering capability of the remaining waste sewage sludge. The second approach provides for the thermal disintegration of the untreated sewage sludge at 190–250 degrees celsius without further subsequent treatment. These high temperatures lead to coalification processes in the sewage sludge and allow direct combustion of the resulting coal (known as hydrochar or biochar) or its possible use as a soil conditioner.

There is a particular need for research into the removal of reaction by-products in the process water that are not easily biodegradable and are caused by the high temperatures of sewage sludge treatment. In this context, the removal of nutrients in the process water, especially nitrogen, is to be examined under consideration of the possible inhibition of bacteria by these very same reaction by-products. In addition to this, the input efficiency of oxygen – which is required for the biological conversion of the organic compounds – into the process water will be measured. The aim here is to demonstrate that the supply of oxygen to the microorganisms has been improved. This is associated with a lower energy requirement in a separate process water treatment.

Pilot sludge treatment plants are being planned, built and operated in China on the basis of laboratory-scale trials.

This is to be carried out in close cooperation between industrial partners and universities. An accompanying socio-economic assessment that will identify both the acceptability and conflict potential of innovative sludge treatment technologies in China will complement the holistic approach.

From research to practice

The results of this project will be used to account for the various process chains for thermal sewage sludge treatment with subsequent dewatering and utilization of residual materials and to evaluate these by means of a socio-economic analysis. The aim is to demonstrate the extent to which the investigated thermal processes are advantageous for large-scale application in China, which recommendations for action can be derived from this and how to establish such a plan. These results will be prepared for use by various target groups from policy-making, administration, industry and society. Solutions will be developed to manage resource-efficient and sustainable sewage sludge treatment. "IntenKS" therefore strives to achieve the direct transfer of the scientific results into widespread application.



HTC-treated sewage sludge at different temperatures, dried (L-R: untreated, 190°C, 220°C, 250°C).

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Client II – International partnerships for sustainable innovations

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