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PlaTO - Development of a Planningtool for vapor condensates

The novel sewage sludge ordinance (AbfKlärV) of 03.10.2017 stipulates that phosphorus (P) must be recovered from sewage sludge or sewage sludge ash from 2029 onwards. Due to the insufficient development status of wet P recycling processes, the recovery from ash and thus the thermal utilization in sewage sludge incineration plants is currently gaining in importance. The split between material and thermal recycling has already shifted from an equal distribution in favor of incineration (approx. 65 %) between 2007 and 2016. Current data confirms the trend and shows that in 2017, 30.5 % of the 1.71 million tons of dry matter arising was treated and 69.5 % of the 1.19 million tons of dry matter was thermally treated. Vapours produced by drying prior to incineration must be condensed and cleaned in a biological treatment plant due to high concentrations of nitrogen compounds and COD. They may cause severe return loads and possibly overload of the wastewater treatment plant.
Planning instruments such as DWA worksheets, for example, do not currently provide reliable information regarding the return load of the biological wastewater treatment plant with vapor condensates, unlike for sludge dewatering processes. Furthermore, there are no extensive analyses of the condensate constituents available. It is merely known that the constituents in the condensate seem to vary considerably depending on the drying technique and the sludge composition employed, although the few publications available provide contradictory information. Additionally, acceptance and combustion of foreign sludges can lead to a change in the condensate composition as well as high return loads on the wastewater treatment plant. There is also no information available on the degradation or inhibition behavior of the condensate constitutens when discharged into the biological treatment.

In the context of the great demand for capacity for sludge drying/incineration and the open questions regarding the constituents and the resulting treatment processes of the condensate, a planning tool for the calculation and evaluation of the return load caused by condensate is to be developed. With the data sets given, which, in addition to the constituents of the vapour condensate, also include the current load and the size of the receiving wastewater treatment plant, the tool is to check whether the discharge limits are adhered to:
(1) vapour condensate can be treated in the main stream in dry weather conditions,
(2) or what measures need to be taken to enable treatment in the main stream (e.g. storage management and delivery in low-load periods, increasing the oxygen content in the biological stage, adding an external carbon source to increase denitrification),
(3) or whether an extension of the wastewater treatment plant is required,
(4) or a separate (pre-)treatment of the condensate is recommended.
In addition, the tool can be utilized to identify critical wastewater constituents (e.g. high ammonium concentrations) so that specific solutions for the operation of the treatment plant can be developed. Figure 1 shows the required data as a technical functional diagram with the relevant input parameters.
In addition to the data on the vapour condensates obtained in the scope of the sample campaign, extensive data of the respective wastewater treatment plant as well as the dryer technology responsible for the vapour production must be included.
The planning tool should take into account different drying aggregates, such as belt dryers, thin film dryers or disk dryers as well as different process chains of wastewater treatment plants, such as classical activated sludge, high load biology or sequencing

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batch reactor (SBR). The respective input data receive information about the cleaning performance, capacity and utilization, prescribed limit values or the drying performance.
The input data of the condensates include not only quantity and time of condensate generation but also all relevant ingredients such as COD, nitrogen and phosphorus compounds, degradability, nitrification behaviour, temperature, and pH value.
The method for developing the tool is composed as follows:
1. Data collection and survey of the necessary input data concerning the wastewater treatment plant and the dryer technology.
2. Development of a reproducible and transferable test procedure to determine the effect of the condensate constituents on the biological treatment.
3. Selection of representative plants for sampling.
4. Development of a sampling strategy and analysis of the vapour condensate samples
5. Designing of the planning tool.
6. Validation of the tool with the measured data and control of the calculated planning recommendations.
7. Development of a training concept including training documents.

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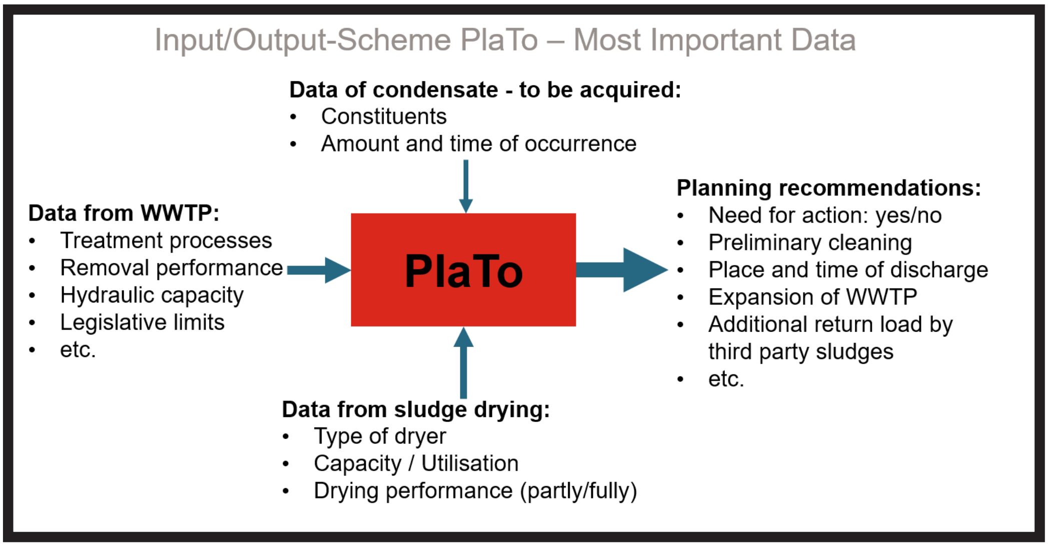

Image 1

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