Efficient sewage sludge system for mono-incineration at EVO Offenbach waste-to-energy plant

Phosphorus is an essential element for humans as well as the flora and fauna around us. But phosphorus deposits are not always easily accessible and it is not a renewable resource.
As part of the mandatory recovery of phosphorus from sewage sludge, the disposal avenues for this source of raw materials will change significantly in future. Mono-incineration of sewage sludge is predominantly the method of choice to recover phosphorus from the resulting ash.

Waste water and sewage sludge have a high phosphorus content. Phosphorus and phosphorus compounds are contained in all foods but also in soil. Phosphorous waste water reaches sewage plants via the sewer system.

Depending on the region, the sewage sludge remaining after waste-water treatment is sometimes returned to the soil in the form of fertiliser. However, this also introduces additional pollutants into the soil. The additional fertilisation of agricultural areas can lead to overfertilisation. This cycle, in turn, results in a high level of pollution in bodies of water.

The other method for disposing of sewage sludge is co-incineration. The ash is used in road construction or simply disposed of as waste. None of these disposal methods are sustainable. Valuable substances contained in the waste water and sewage sludge are lost.

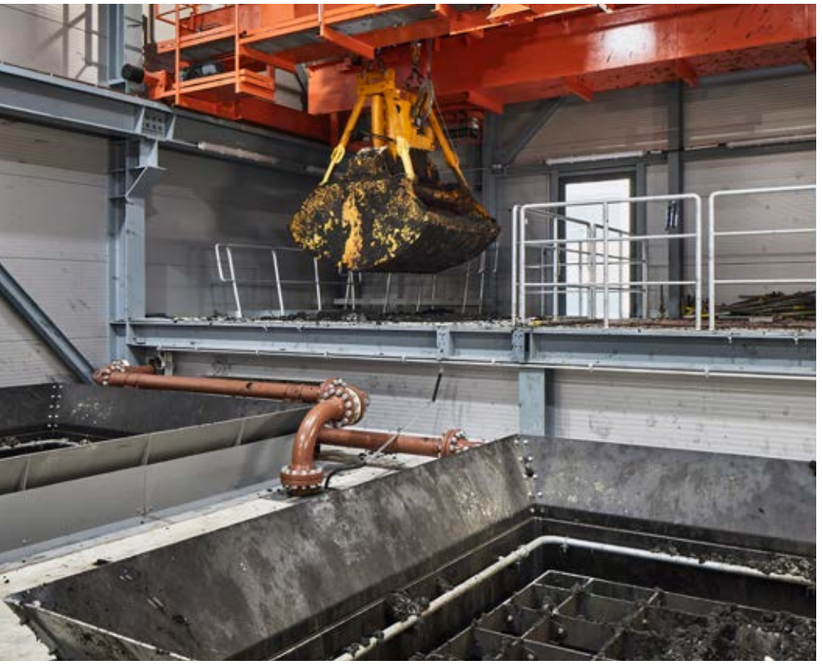
This applies in particular to phosphorus. Instead of recovering and reusing this resource, it is destroyed. The reform on sludge reuse is setting the course towards greater sustainability.
The energy supplier EVO (Energieversorgung Offenbach) has been co-incinerating sewage sludge in its waste-to-energy plant in Offenbach for several years. Since then, the sewage sludge has been dumped into the garbage bunker and dropped onto the plant's waste chutes along with household waste.

KOS high density solids pump with S-tube technology under crane drop bunker

The introduction of a mandatory requirement to recover phosphorus from sewage sludge marks an end to co-incineration in the long term while launching the mono-incineration of sewage sludge.

Behind this reform is the better recovery from pure sewage sludge ash, due to the higher phosphorus content, compared to mixed ash from sewage sludge and waste. That is why EVO decided to install just such a system at its Offenbach site.

The ash is expected to contain approximately 10 – 14% phosphorus.
The ash is intended for use in the fertiliser industry.



Loading of the crane drop bunker

As before, the sewage sludge is delivered to the plant by trucks, but only dumped into a specially constructed reception bunker. From there, a crane system moves the sludge into a storage bunker in which the sludge can be mixed as well as stored. A second crane system then delivers the sludge to two crane dump bunkers, from where high-density solids pumps convey it to the two rotary kilns.

To achieve this, Putzmeister has planned, supplied, assembled and finally commissioned the sewage sludge system from the two crane dump bunkers all the way to the injection point at the rotary kilns.

The plant throughput according to the approval is 100,000 t OS*/year (*OS = original substance). The operating company is currently expecting approx. 80,000 t/year. The crane dump bunkers were designed with two lines so that a dedicated line is available for each rotary kiln. Each crane dump bunker has a volume of approx. 50 m³.

The two crane dump bunkers are installed on top of load cells in order to measure the weight or discharge capacity. This provides an elegant solution for measuring the plant's throughput.

The sludge is dumped into the bunkers through a grate. This grating is used for the first rough separation of contaminants that may still be included in the sludge. The sludge is then transported through a sliding frame and to a double-shaft discharge and pre-compression feeder, which in turn supplies the KOS 1070 piston pump.

The Putzmeister KOS high-density solids pump is particularly suited to transporting contaminants that may still be contained in the sludge due to its S-tube. Contaminants that are up to 80% of the size of the smallest cross section in the system can be pumped reliably with this technology. That is something the Putzmeister KOS pump has proven without a doubt over the last 40 years.

To further protect the downstream processes, a foreign body separator is integrated in the delivery line downstream of the S-tube piston pump. This is also a Putzmeister development which has been successfully used in many sewage plants for decades. It is particularly useful when handling third-party sludge delivered by truck. In this case, the well functioning and reliable separation of contaminants is particularly important.
Due to the crane system principle, where contaminants cannot be identified immediately upon delivery and initially disappear into an reception bunker and later a storage bunker, they also cannot be assigned to a specific supplier.

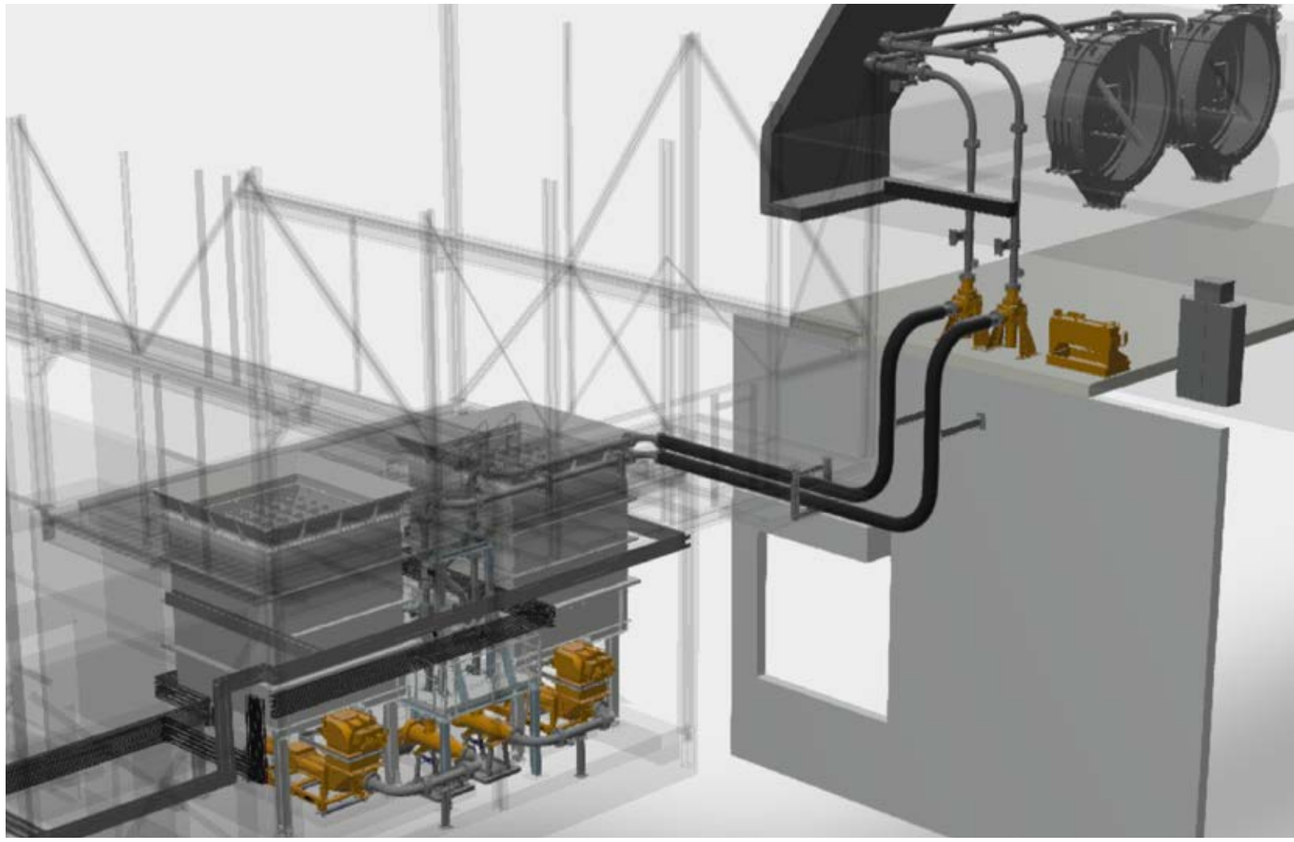
If a line should fail, for example due to a contaminant, there is always a second line available. The pump system is designed such that it can also convey the sludge to the two rotary kilns with double the output. Each of the pump lines is designed for a maximum output of 16 m³/h, but is only operated at approx. 8 m³/h in normal operation.

In order to distribute the sludge to both rotary kilns, the delivery lines are switched crosswise, meaning that each of the rotary kilns can be supplied by either pump.

In addition, two cycle valves were integrated in the delivery line system so that the supply of sludge to the two rotary kilns can be synchronised. This significantly increases the availability of the plant for the operating company.

The distance between the crane dump bunkers and the two rotary kilns in the boiler house is approx. 60 m.

The decision of having a pump system transport the sludge from A to B has the advantage that it allowed for a pipeline to be installed that perfectly adjusts to the conditions of the existing site and buildings.



Plant layout

Delivery line cross connection

Hydraulic power packs with noise protection hood and external oil cooler

Technical data

2 crane drop bunker	50 m³
2 sliding frames	PDSL 3535
2 double-shaft bunker discharge and pre-compression screws	SHS 2042 SH
2 gate valves	720 720
2 high density solids pumps	KOS 1070 HP (16 m³/h; 64 bar)
2 foreign body separators	FKA 200
2 hydraulic power packs	HA M 110 (110 kW)
2 switch and control cabinets	SEP 110
2 delivery lines each 60 m	DN 150 PN 100
4 ball valves incl. AUMA drive (cross connection)	
2 hydraulically operated cycle valves	Typ HMC-S 180
Hydraulic power pack	HA 15 CE

Foreign body separator FKA 200

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Thanks to our decades of experience in mechanical engineering for sludge handling and power plant environments, we are able to offer our customers fully comprehensive support over the entire life limit of their plants.

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