ELIQUO | HYDROK

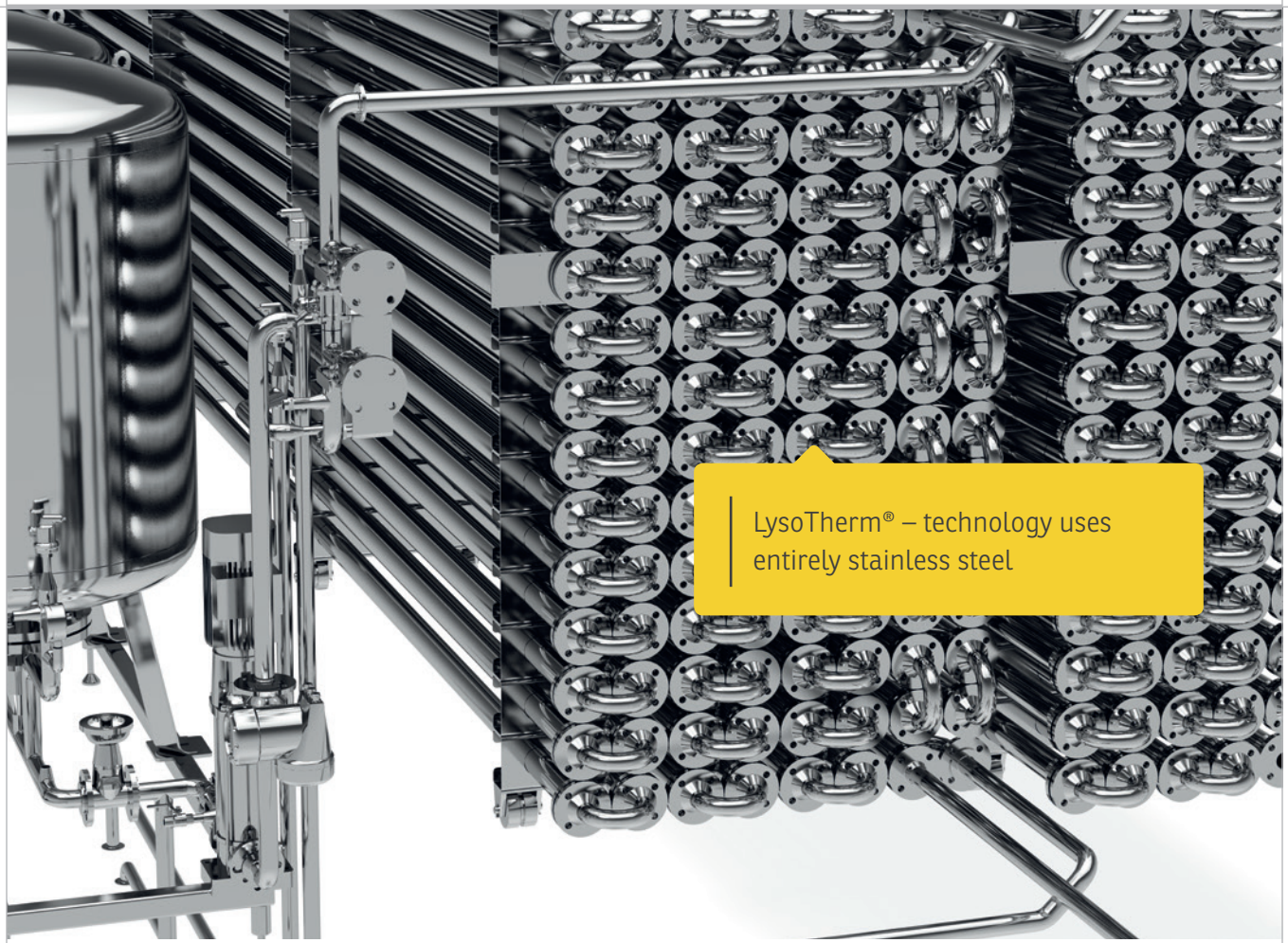
LysoTherm®

Thermal sludge disintegration

LysoTherm®

IS A NOVEL, PATENTED SYSTEM FOR THE THERMAL DISINTEGRATION OF ORGANIC SLUDGE, ESPECIALLY SEWAGE SLUDGE.

IT IS SPECIALLY DESIGNED TO ENABLE THE EFFICIENT, COST-EFFECTIVE AND SAFE DISINTEGRATION OF SLUDGE, AND IS PARTICULARLY SUITED FOR SMALLER SEWAGE TREATMENT PLANTS.



Goal

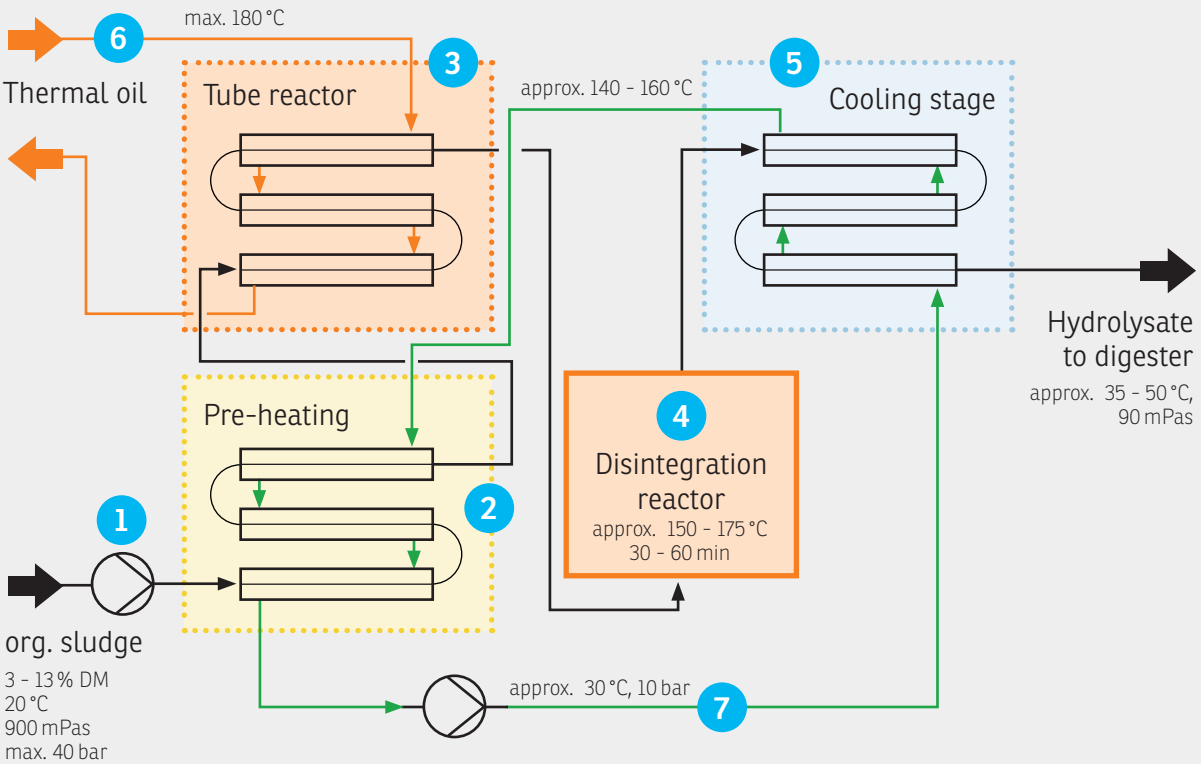
The goal of thermal disintegration is to enhance the anaerobic stabilisation (digestion) of organic sludge, especially sewage sludge and, hence:

- increase the gas yield
- decrease the amount of organic residues in digested sludge
- increase the dry matter content (DM) in the digested, dewatered sludge
- reduce polymer consumption used in the dewatering process
- reduce the amount of sludge to be disposed of
- reduce digestion time
- increase digestion capacity

Further advantages of thermal disintegration are:

- reduction of sludge viscosity in the digester
- reduction of foaming in the digester
- increase potential to recover phosphorus as magnesium-ammonium-phosphate from the sludge
- elimination of pathogenic bacteria

Operating principle



Sludge is fed via the sludge pump (feeding pump, 1) into a multistage heat exchanger system. The feed is a continuous process.

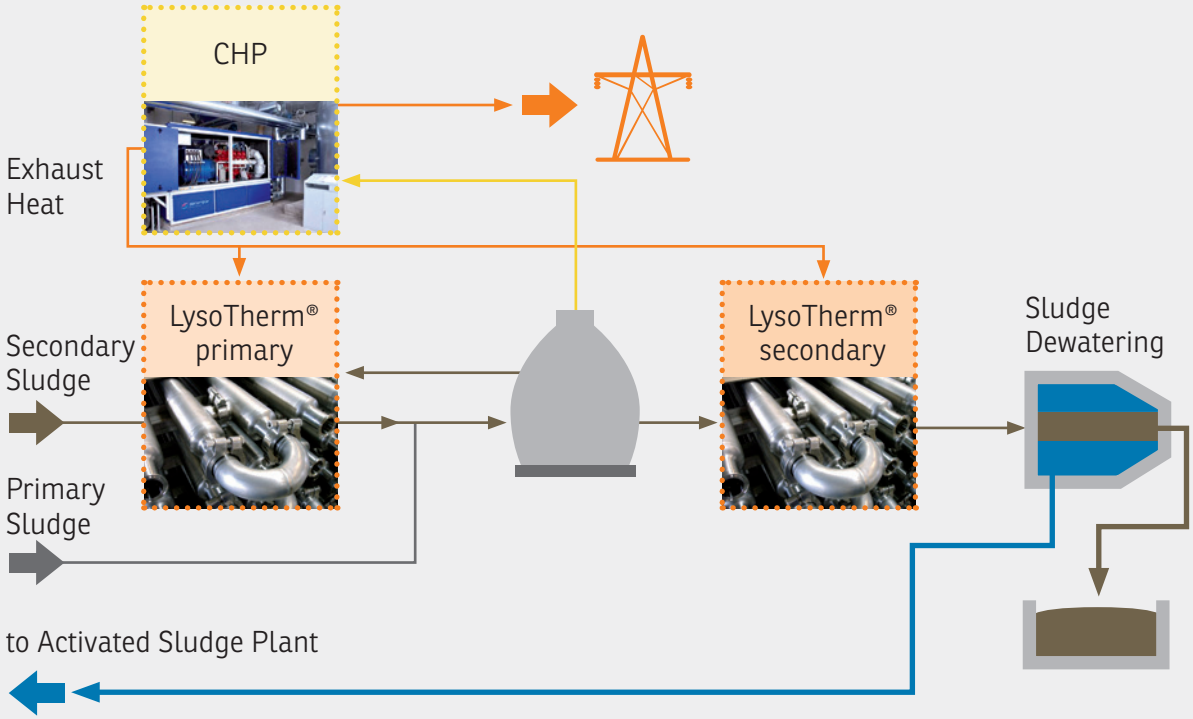
Pre-heating takes place in the first stage of the heat exchanger system, 2 then the sludge is heated up to reaction temperature within the tube reactor 3

The proper disintegration process takes place at the pre-determined reaction temperature in the disintegration reactor 4 where the sludge usually remains for 30 - 60 minutes. After the disintegration is completed, the sludge is cooled down in the cooling stage 5 to the temperature required for entering the digestion tower; alternatively, it can be mixed with cold primary sludge in order to be cooled down to digestion temperature.

The system is heated via two heating circuits:

- the thermal oil circuit 6 to create the necessary process heat in the pipe reactor. The process heat is typically recovered from the exhaust gases of the CHPs
- the regenerative circuit 7 using water as heat transfer medium. This circuit makes the heat recovered from the disintegrated sludge in the cooling stage available for pre-heating.

Design-concept



PERFORMANCE DATA

The LysoTherm® system is flexible and versatile. In addition to the thermal disintegration of excess sludge (primary disintegration), it can also be used for the conditioning of digested sludge (secondary disintegration).

PRIMARY SLUDGE DISINTEGRATION

Sewage sludge disintegration

Main advantages

- Applicable for sewage sludge with a dry matter content of 3 - 13 %
- Increase of gas production by up to > 50 %
- Reduction of oDM by up to > 50 %
- Improvement of dewatering by approx. 3 - 5 % DM (e.g. from 27 % DM to 32 % DM in the dewatered sludge)
- Increase of digestion capacity by up to > 100 %
- Elimination of pathogenic germs
- Net win of produced electricity by the CHP due to higher gas yield

SECONDARY SLUDGE DISINTEGRATION

Conditioning of digested sludge

Main advantages

- Improvement of dewatering by approx. 10 % DM (e.g. from 25 % DM to 35 % DM in the dewatered sludge)
- Reduction of sludge volume by up to 50 %
- Elimination of pathogenic bacteria
- Only negligible reduction of sludge heating value as the oDM-content of the sludge cake is only marginally decreased by the thermal conditioning.

USER- AND MAINTENANCE-FRIENDLY

Another major advantage of the LysoTherm® system is its high user-friendliness:

- Fully automated operation
- Easy accessibility to all critical items including isolated parts
- Easy inspection and cleaning of the sludge-pipes: The pipe bends within the pipe bundle system can be removed with only a few steps if maintenance becomes necessary; the complete interior of the sludge pipes can be visually inspected and easily cleaned. By default the system is equipped with a fully automated CIP-system (clean-in-place).

> For pilot testing we have a mobile test rig with a capacity of 1000 kg/d DM ready for use.

OPERATIONAL SAFETY

An additional benefit of the system is its high operational safety. During the step-by-step heating of sludge up to reaction temperature, the temperature difference between heat transfer medium and sludge is kept low and is carefully controlled, thereby reducing the risk of deposits and adherence of burnt materials to a minimum.
Possible scaling of the heat transfer surfaces are removed efficiently and automatically by the CIP-cleaning procedure. For the operation of the plant, there are no special assessments or inspections required as they are mandatory for the operation of steam boiler systems.

PROFITABILITY

The LysoTherm® system is characterised by a favourable price-performance ratio and low operating costs:

- Less requirement for measuring and control technology due to the continuous operation of the system and the system structure.
- Few potential wearing parts: The only pump which is indispensable for the operation of the system – the sludge feed pump – operates at normal temperature.
- Space-saving system structure and high-quality materials: By selecting the corresponding pipe lengths and number of bends, the heat exchanger system can easily be adjusted to fit in the existing space and there is also the option to supply it within containers. LysoTherm®-plants are manufactured completely in-house.
- Modular plant design: The modular plant design allows for simple and cost-efficient expansions and modifications.
- High energy efficiency: The high energy efficiency of a LysoTherm®-plant is due to the high degree of heat recovery through the heat regenerative circuit. Thermal oil used in the heat circuit can be heated using the exhaust heat of the CHP. The plant can be designed in such a way to fully provide the digestion heating demand.
- The reduced viscosity of the sludge by approx. 70 % as a result of the disintegration reduces the energy demand for mixing of the digester significantly.

INSTALLATION

The system´s plug & play design makes it easy to install and put into operation.

FEATURES

Efficient, versatile, indirect thermal process for the disintegration of organic sludge with the following results:

- increased gas yield
- decreased amount of organic residues in digested sludge
- increased dry matter content (DM) in the digested, dewatered sludge
- reduced polymer consumption used in the subsequent dewatering process
- reduced amount of sludge for disposal
- reduced digestion time
- increased digestion capacity
- reduced sludge viscosity in the digester
- reduced risk of foaming in the digester
- increased potential to recover phosphorus as magnesium-ammonium-phosphate from the sludge
- elimination of pathogenic bacteria

Multi-stage heat exchanger system for continuous operation and utmost operating safety

No steam necessary

No additional water into the substrate during heating

Robust, low wear, space-saving system structure

Standard modular assembly sizes

Highly user and maintenance friendly

Low operating costs, especially low energy costs due to the high heat recovery rate in the regenerative circuit and using thermal oil heating from the waste heat of the CHP.

For the operation of the plant, there are no special assessments or inspections required as they are mandatory for the operation of steam boiler systems.

APPLICATION

Thermal disintegration from low- to medium-viscosity organic sludge, especially of sewage sludge from municipal and industrial waste water treatment plants:

- Thermal disintegration of excess sludge (primary hydrolysis)
- Thermal conditioning of digested sludge (secondary hydrolysis)

Thermal disintegration of other organic sludge

TECHNICAL DATA

Influent temperature	approx. 20 °C
oDM influent	approx. 3 - 13 %
Viscosity influent	up to approx. 900 mPas
Reaction time	approx. 30 - 60 min
Reaction temperature	> 100 - approx. 175 °C
Pressure	approx. 5 - 15 bar
Effluent temperature	approx. 35 - 50 °C

We are happy to carry out laboratory testing to determine the additional gas yield as a consequence of thermal disintegration.

LysoTherm® – efficient and low-cost sludge disintegration – also suitable for small sewage treatment plants.

Version 001

ELIQUO HYDROK LTD

Indian Queens Ind Estate, St. Columb | Cornwall, England | TR9 6TL
T +44 1726 861 900
sales@eliquohydrok.co.uk | **www.eliquohydrok.co.uk**

MEMBER OF **ELIQUO WATER GROUP**