

ELIQUO | HYDROK

PYREG

Future-proof, decentralised sewage sludge recycling



The PYREG® process

IS A PROCESS WHICH DRASTICALLY REDUCES DRIED SEWAGE SLUDGE VOLUMES THROUGH A STAGED COMBUSTION PROCESS RESULTING IN A HIGH-GRADE RAW PHOSPHORIC FERTILISER END PRODUCT.

THE IDEAL, DECENTRALISED UTILISATION OF THE THERMAL AND MATERIAL RESOURCES IN SEWAGE SLUDGE IS COST-EFFECTIVELY ASSURED USING LOW TEMPERATURE DRYING OPTIMALLY ADAPTED TO THE PYREG® PLANT.

THE MODULAR CONSTRUCTION AND STANDARDISED PLANT DESIGN ALLOW THE RECYCLING SYSTEM TO BE DEPLOYED IN SEWAGE WORKS RANGING FROM A MINIMUM 30 000 TO 50 000 PE UPWARDS.

PYREG

PYREG is an innovative solution provider in the field of environmental technology. The company works on thermal and material recycling of various biomasses such as sewage sludge, screenings and other biomass materials.

ELIQUO | HYDROK is a **PYREG** partner

for the installation of PYREG® plants for recycling municipal sewage sludge in the United Kingdom.

Objective

The objective of the PYREG® process when used with up-stream drying of sewage sludge is the optimal thermal and material recycling of sewage sludge and, as such:

through:

keeps disposal costs to a minimum

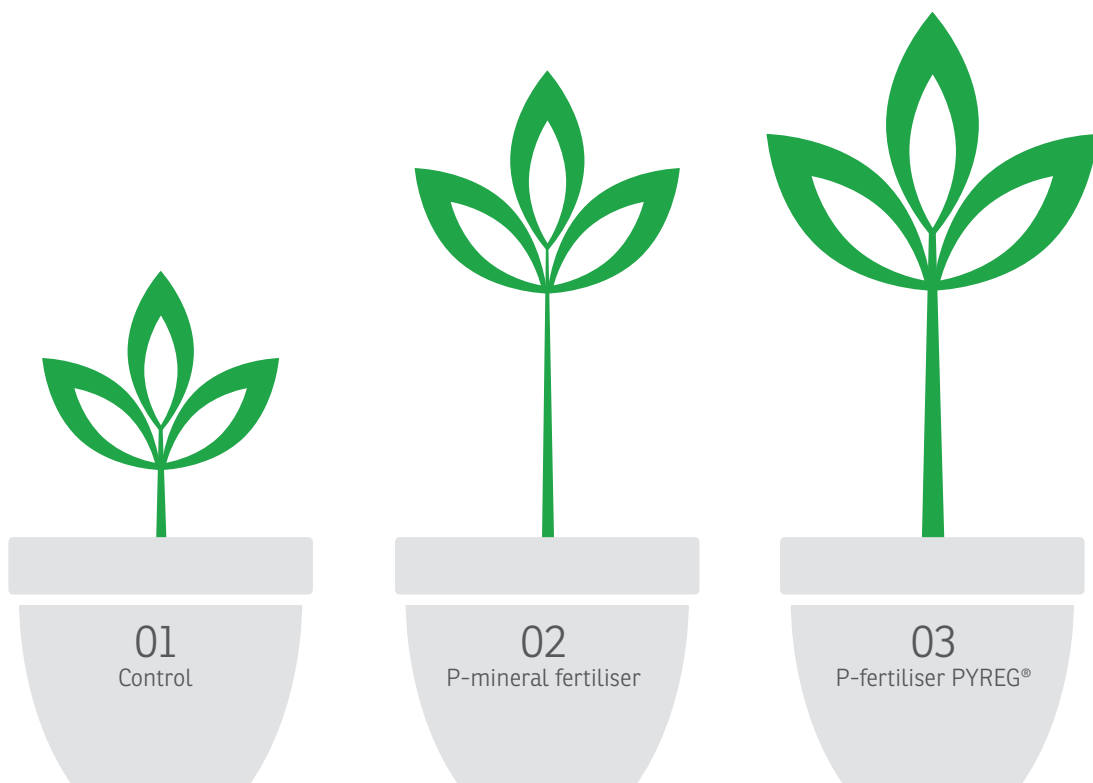
utilisation of a phosphorus resource

long-term assured recycling

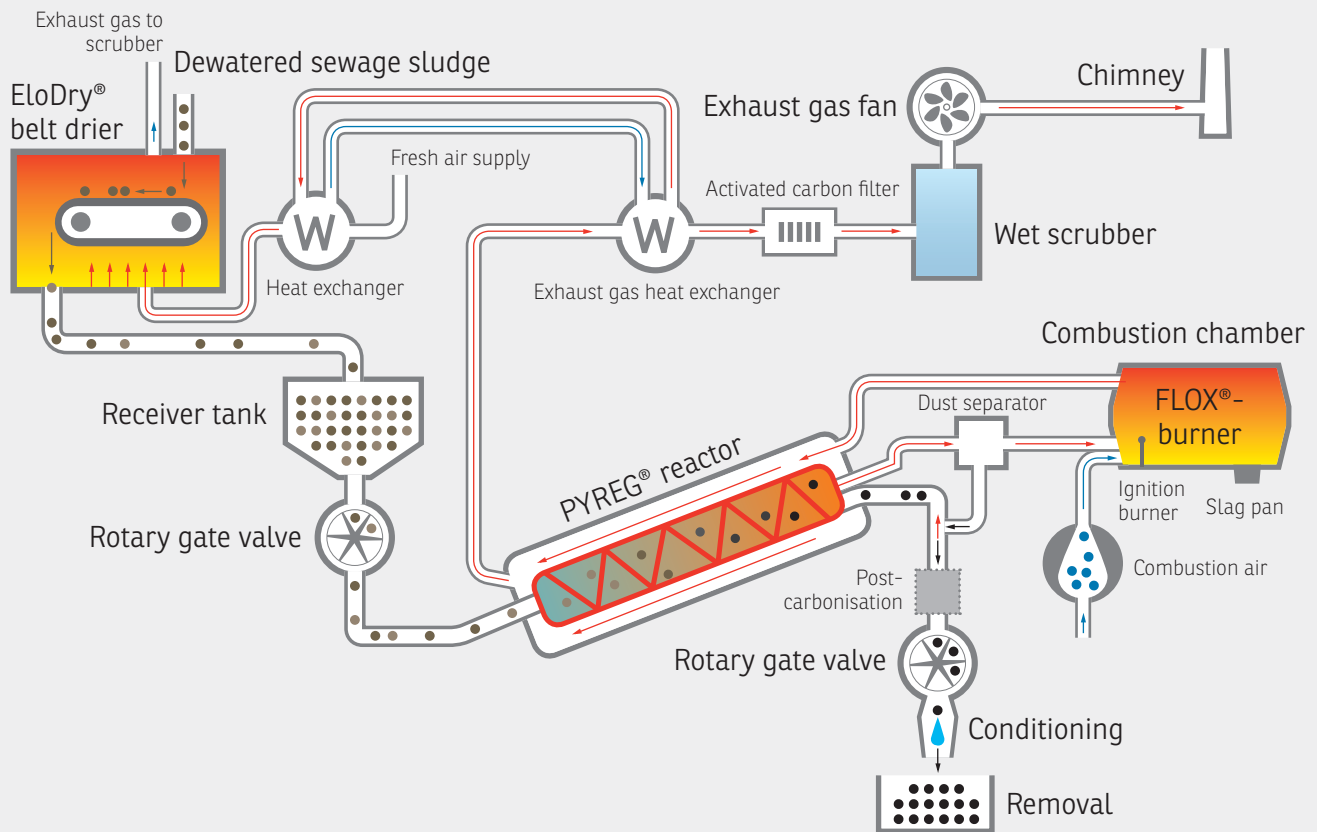
energy-efficient drying and thermal recycling of sewage sludge

conversion to sewage sludge ash containing a high percentage of plant available phosphorus

cost-effective and future-orientated decentralised recycling



Operating principle



Dewatered sewage sludge is dried on an energy-optimised low temperature belt drier, perfectly matching the PYREG® plant requirements from approx. 25 % DS, to normally 75 - 90 % DS. The drying process uses the waste heat of the PYREG® plant; the drier's waste air is cleaned to comply with appropriate standards such as TA-Luft [Technical Instructions on Air Quality Control] limits.

The dried sewage sludge is continuously fed to the PYREG® reactor via a rotary gate valve.

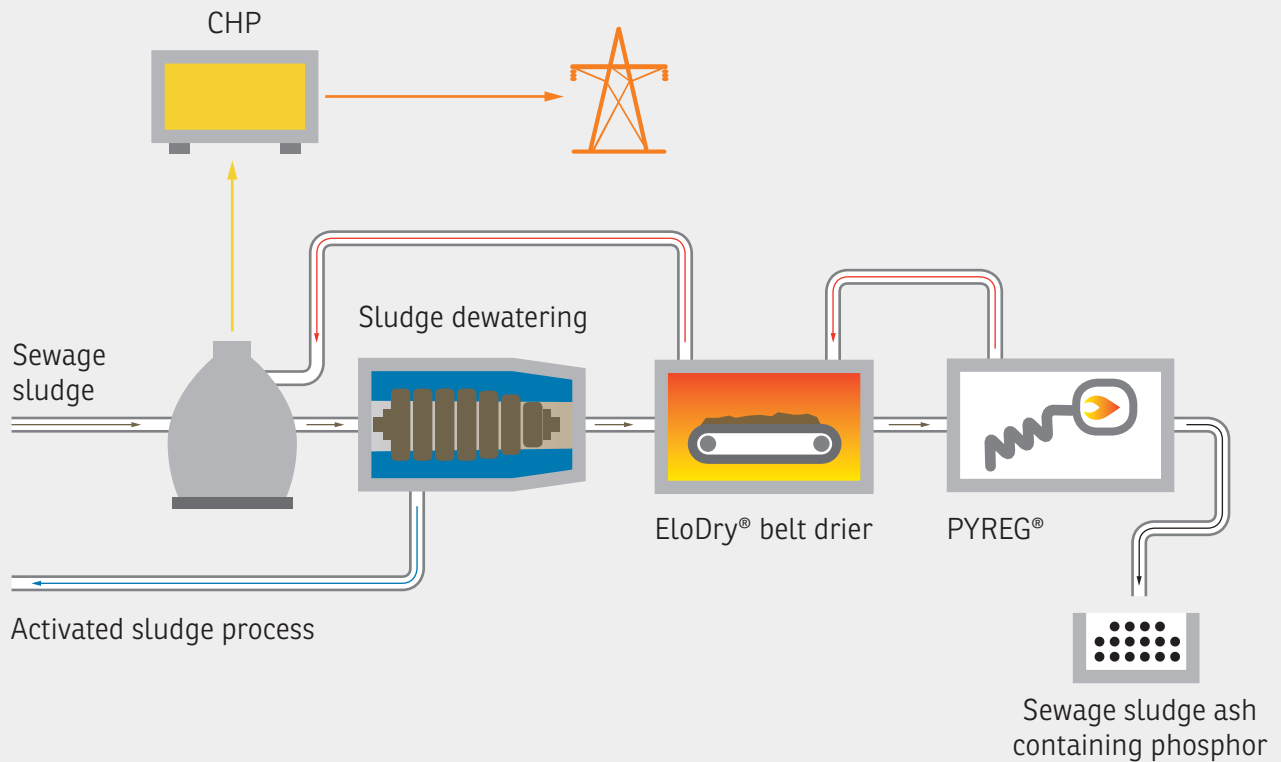
The PYREG® technology works using a staged combustion design:

Dried sewage sludge is heated to ca. 650 °C in the PYREG® reactor without fully burning, but by first degassing and then reducing to ashes under a controlled supply of air results in a fully hygienised ash containing phosphorus which can be used directly as a raw material for fertiliser production.

In a second stage the syngas developing in the reactor is completely incinerated at about 1,250 °C in the combustion chamber. The generated heat is used for heating the PYREG® reactor and for drying the sewage sludge feed.

Waste gas is cleaned through an activated carbon filter together with a wet scrubber. Harmful substances such as mercury and sulphur are separated in this process.

Design concept



PERFORMANCE DATA

The PYREG® technology solution is the optimal approach to decentralised thermal and material recycling of sewage sludge. Together with upstream low temperature drying, it constitutes an autonomous process route for the conversion of dewatered sewage sludge to sewage sludge ash whilst providing a high percentage of plant available phosphorus.

SEWAGE SLUDGE RECYCLING USING THE PYREG® PROCESS

Main advantages

Sewage sludge volumes reduced by up to 90 %

Reduction of lorry transportation by up to 90 %

Hygienisation and separation of harmful substances (e.g. mercury, microplastics, hormones)

Sewage sludge recycling in accordance with the scheduled amendment of the German Sewage Sludge Ordinance, the German Fertiliser Ordinance and BImSchV [Federal Immission Control Ordinance]

Direct use of the recycled sewage sludge in the fertiliser industry

Long-term assured recycling and cost control

USER- AND MAINTENANCE-FRIENDLY

The PYREG® module with upstream drying is particularly easy to operate and service:

- Continuous, fully automatic operation requiring few staff
- Very good access to all system components
- Robust and reliable components

PYREG



| PYREG® 500 module

EMISSIONS

The PYREG® system with sewage sludge drying meets the requirements pursuant to 17. BImSchV.

Drying

Avoidance of emissions into the atmosphere through using a fully enclosed design with operation at a slightly negative air pressure

Cleaning the drier waste air for compliance with TA-Luft limits

PYREG® plant

Reduction of fuel-based NO_x emissions by means of redox reactions in a reducing atmosphere

Prevention of thermal NO_x formation by using the FLOX® process in the combustion chamber (FLOX® = flameless oxidation) with internal flue gas recirculation.

PROFITABILITY

The PYREG® module with upstream drying offers low specific investment and operating costs:

- Recuperative process: Thermal processes in the PYREG® reactor use the energy recovered from the introduced sewage sludge. The surplus energy is used for drying the sewage sludge.
 - Energy-efficient drying of sewage sludge: The low temperature drier used for drying the sewage sludge is closely adapted to the requirements of the PYREG® plant and distinguishes itself by optimal utilisation of available process heat. Waste heat from the drier is used for heating anaerobic digestion plants and/or buildings.
 - Modular, standardised plant construction: The modular, standardised plant design offers cost-effective, flexible solutions for sewage works ranging upwards from a minimum of approx. 30 000 to 50 000 PE in multiple units.
 - Robust, user- and maintenance-friendly plant design
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OPERATING RELIABILITY

Both the low temperature drier and the PYREG® plant offer high operational reliability, thus justifying the assumption of 7,500 h/year for plant availability.

The plant is robust and not susceptible to malfunctioning due to its simplified process design.

Careful conveyance of sludge through the drier ensures minimal dust creation.

UNIQUE FEATURES

PYREG® – a modular, decentralised system for economic recycling of dried sewage sludge using staged combustion, with the following features:

- Recuperative process: Recovery of energy contained in sewage sludge for thermal processes and more
 - End-of-pipe technology: production of phosphorus rich sewage sludge ash for direct sale as a raw material for the fertiliser industry
 - Sewage sludge volumes reduced by up to 90 %
 - Separation of harmful substances from the sewage sludge
 - Flexible, modular plant, robust and simple to operate and maintain
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APPLICATIONS

The PYREG® process represents cutting-edge technology for recycling of sewage – against the background of planned phosphorus recycling from sewage sludge, putting an end to agricultural recycling of sewage sludge and the incineration of phosphorus rich sewage sludge. Optimal functionality and economy demands optimal planning, implementation and integration of the complete system, especially also need-based, adapted drying of sewage sludge and heat recovery. This is assured with the ELIQUO planned and implemented overall systems.

The PYREG® module can in addition also be used for converting various biomass types into high-quality biochar.

TECHNICAL DATA

Key data for a PYREG® 500 module

Annual throughput

Approx. 4,000 t p.a. of dewatered sewage sludge with 25 % DS, equivalent to approx. 1,250 t p.a. dried sewage sludge with 80 % DS

Minimum heating value of the dried sewage sludge

10 MJ/kg

Annual production

Approx. 500 t sewage sludge ash containing up to 20 % phosphor

Operating hours

7,500 operating hours/year

Waste heat available for drying

Up to 200 kWth

The PYREG® process - future-proof, decentralised
sewage sludge recycling.

PYREG 

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