GEA VARIPOND® – RELIABLY CONTROLLING SLUDGE PROCESSES

Automated control system simplifies
and optimizes the decanter operation

GEA Engineering for a better world.

GEA.com

CONTENTS

VARIPOND® THINKS AUTOMATICALLY

Video

Patented control and regulating system for decanters simplifies the infrastructure of the centrifuge, optimizes energy consumption and stabilizes discharge concentration

varipond® offers three key benefits

Minimizes liquid overflow to the solids side during startup and shutdown of the decanter, resulting in a simplified infrastructure with no slide gate

Stable discharge of solids during pre-dewatering (in Cambi's Thermal Hydrolysis Process [THP]) **and thickening**: automatic, constant solids concentration even with a fluctuating feed

Energy optimization: reduction of up to 30% of the specific energy consumption of the decanter for thickening

With GEA varipond®, which stands for "variable pond depth" with a running decanter centrifuge, GEA offers a patented energy- and resource-saving optimization solution for the treatment of sludge and wastewater. Operators of municipal wastewater treatment plants in particular will appreciate this – not least because of the simple and economical retrofit version.

Variable pond depth while the machine is running

Wastewater treatment plants that use anaerobic digestion must ensure accurate and reliable process operation under a wide range of conditions. For example, when pre-dewatering and thickening primary and secondary sludge in wastewater treatment plants. The control and regulation system varipond® reacts quickly to changing requirements, such as during a cloudburst, and ensures the stable discharge of solids by means of a variable pond depth while the decanter is running. The time-consuming and costly process optimization previously required for this is no longer necessary with varipond®.

Dewatering: Minimize flooding of the solids end when starting up and shutting down the decanter

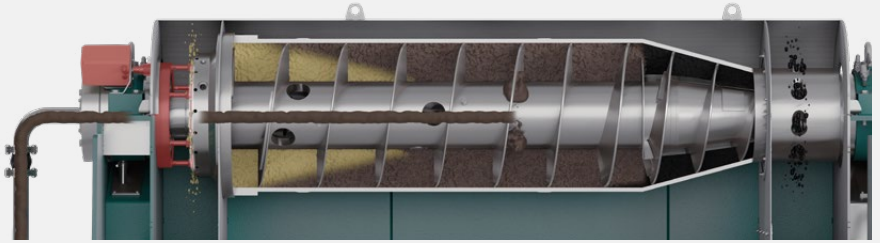
With its variable pond depth, varipond® offers simplified infrastructure and operation during start-up and shut-down of the decanter without liquid overflow to the solids end. Startup and shutdown are also easier and less expensive without the solids valve.

How it works

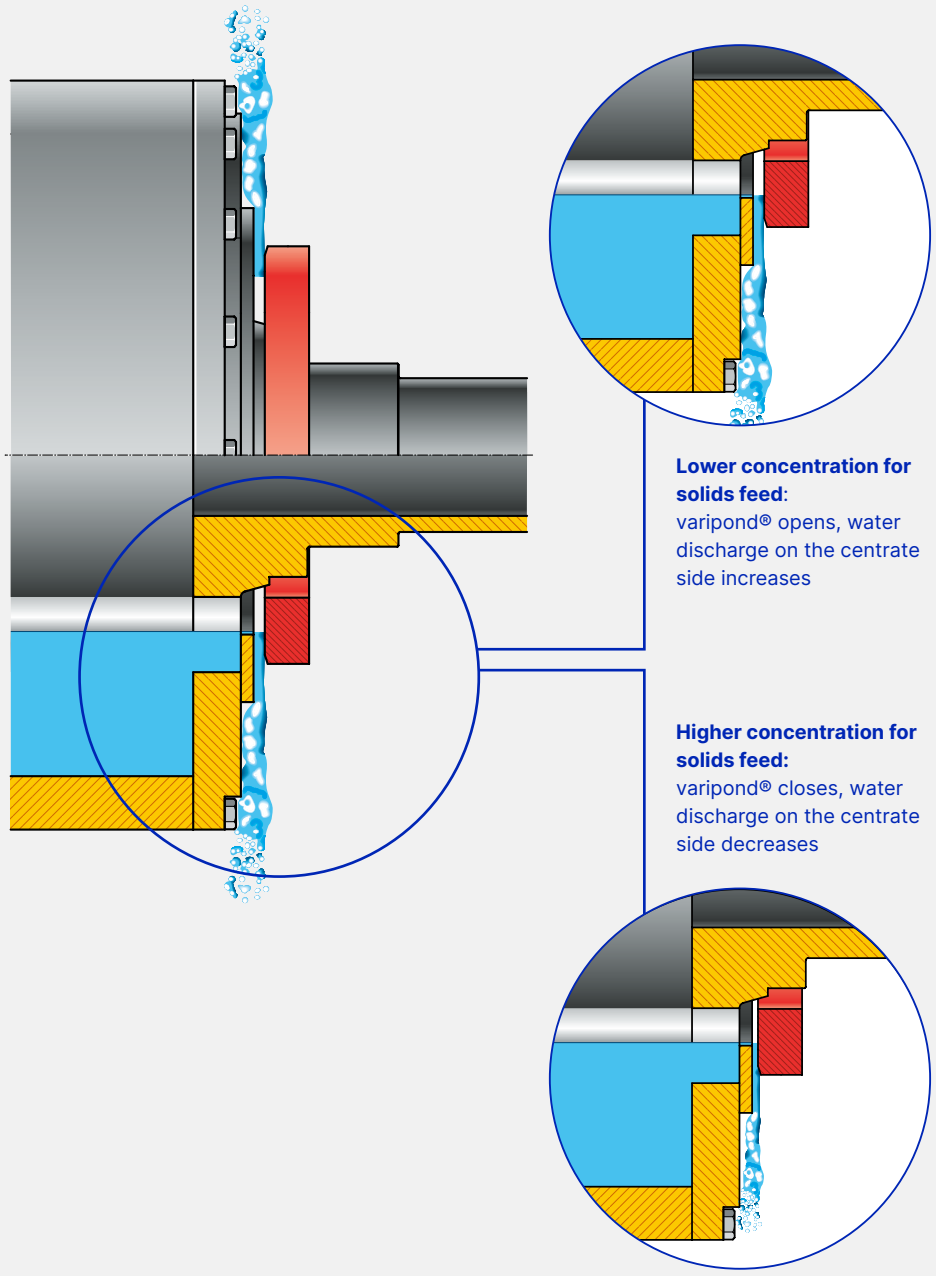
- When the decanter is started, varipond® is open and the liquid level is below the solids discharge opening.
- The sludge settles in the bowl and the clarified liquid is discharged only on the centrate side.
- A solids seal is formed on the solids side to prevent liquid overflow.
- varipond® closes, the liquid level rises up to the scroll body thus above the solids discharge opening (negative/flooded operation).
- Utilizes the maximum g-volume.

When the decanter is shut down, the same process takes place in reverse order.

varipond® fully open: start and stop the decanter without liquid overflow the solids side



varipond® fully closed: continuous operation of the decanter with maximum g-volume (g-volume = content x bowl speed)

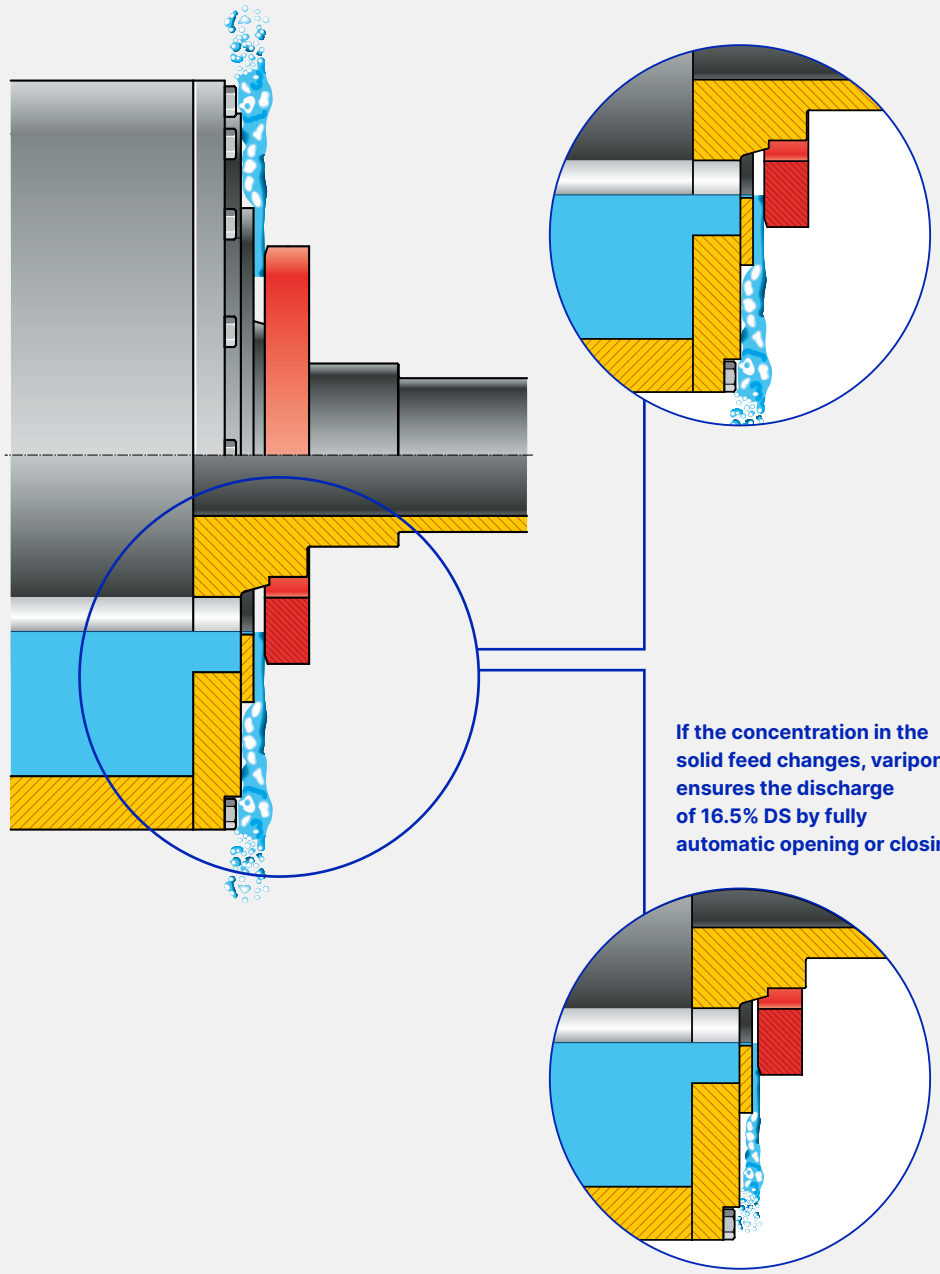


Lower concentration for solids feed: varipond® opens, water discharge on the centrate side increases

Higher concentration for solids feed: varipond® closes, water discharge on the centrate side decreases

Automatic, consistent discharge of solids with pre-dewatering and thickening

With varipond®, the GEA engineers have developed a process solution, which automatically ensures that the decanter is adjusted to the modified feed conditions during plant operation. In this way, varipond® regulates the liquid level in the bowl so precisely that the concentration of the thickened solids is adjusted to a constant value and is maintained exactly. Optical sensors measure the solids content of the thickened sludge, comparing it with the preset target value and the regulating facility keeps the concentration constant – all fully automatically. This means that unsupervised operation at night or at weekends is also possible.



If the concentration in the solid feed changes, varipond® ensures the discharge of 16.5% DS by fully automatic opening or closing.

Best practice: pre-dewatering in the Cambi process with 16.5% dry substance discharge

The Thermal Hydrolysis Process (THP) from Norwegian specialist Cambi is a highly efficient technology for cost-saving anaerobic digestion of sludge. For THP, precise machine performance in the treatment of sludge is essential – in particular the automatically controlled constant discharge of 16.5% dry substance (DS) in the pre-dewatering stage. A THP specification that no other decanter supplier has been able to meet with the reliability offered by GEA.

Energy optimization: reduction of up to 30% of the specific energy consumption by the decanter

varipond® with energy optimizer: slower decanter bowl speed saves up to 20% of operating costs by minimizing energy consumption and reducing the effects of wear.

One source of energy consumption in a decanter centrifuge is the power required to discharge the clarified liquid. This can represent up to 50% of the decanter's total energy requirement.

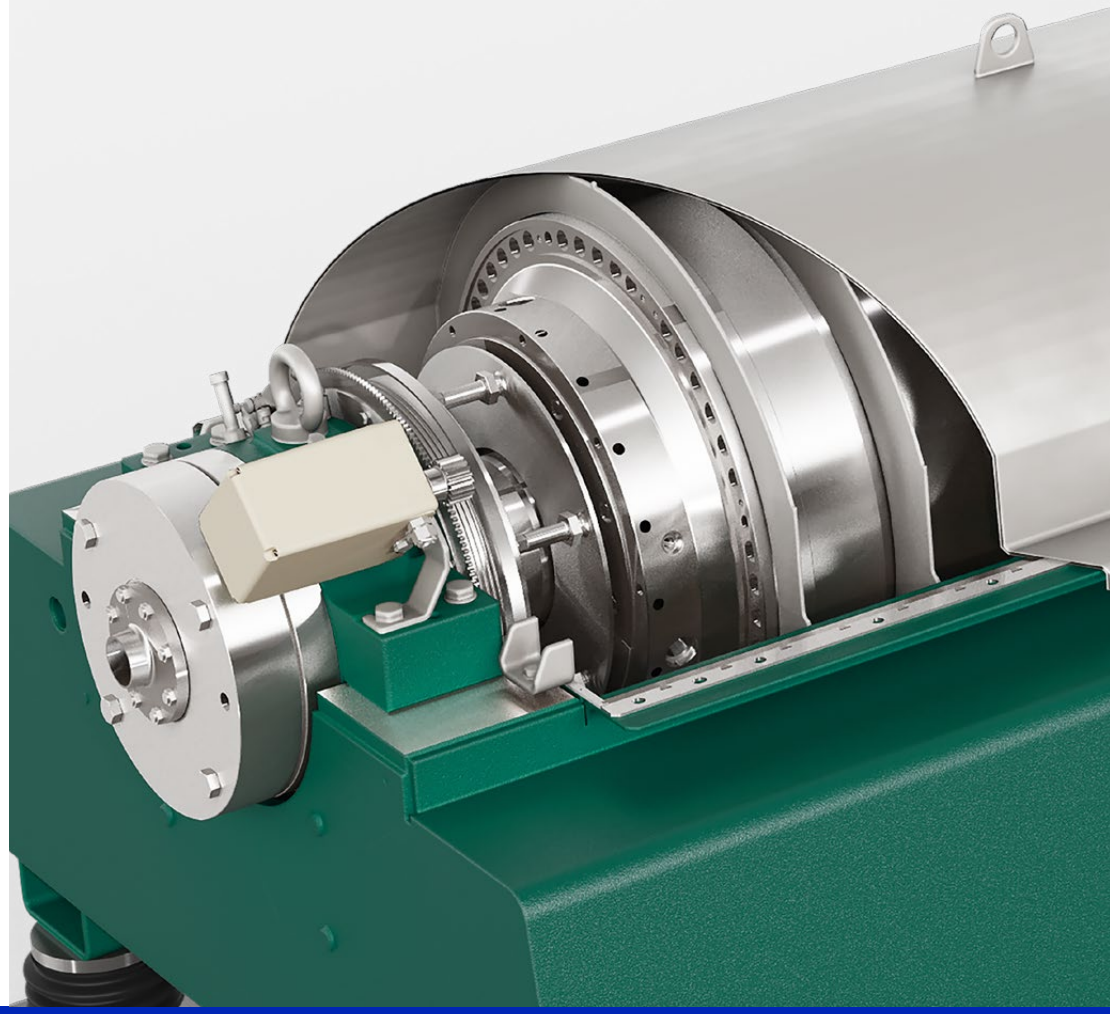
In order to achieve the ideal separation efficiency for dewatering and thickening, specific G-values are required within a defined range depending on the sludge quality and flow volume. This means that it is often not necessary to continuously maintain the maximum G-value; the bowl speed could be reduced accordingly. This has not been the case in practice so far, leaving valuable energy saving potential untapped. With varipond®, this energy saving potential is now „leveraged" thanks to an energy optimizer. A special control circuit uses a sensor to detect unnecessarily high bowl speeds and optimizes them by constantly maintaining the specified output concentration. The rotor geometry provides additional energy savings.

The design of the bowls in the GEA deep-pond model ensures optimized flow behavior, improved clarification and less energy required to discharge the product.

In short, this means that, depending on the decanter model used, the specific energy consumption may be reduced by up to 30%.

VARIPOND®: HOW IT WORKS

Previously, varying feed conditions meant that decanters had to be stopped and mechanically adjusted by hand. With varipond®, this adjustment is now automatic.

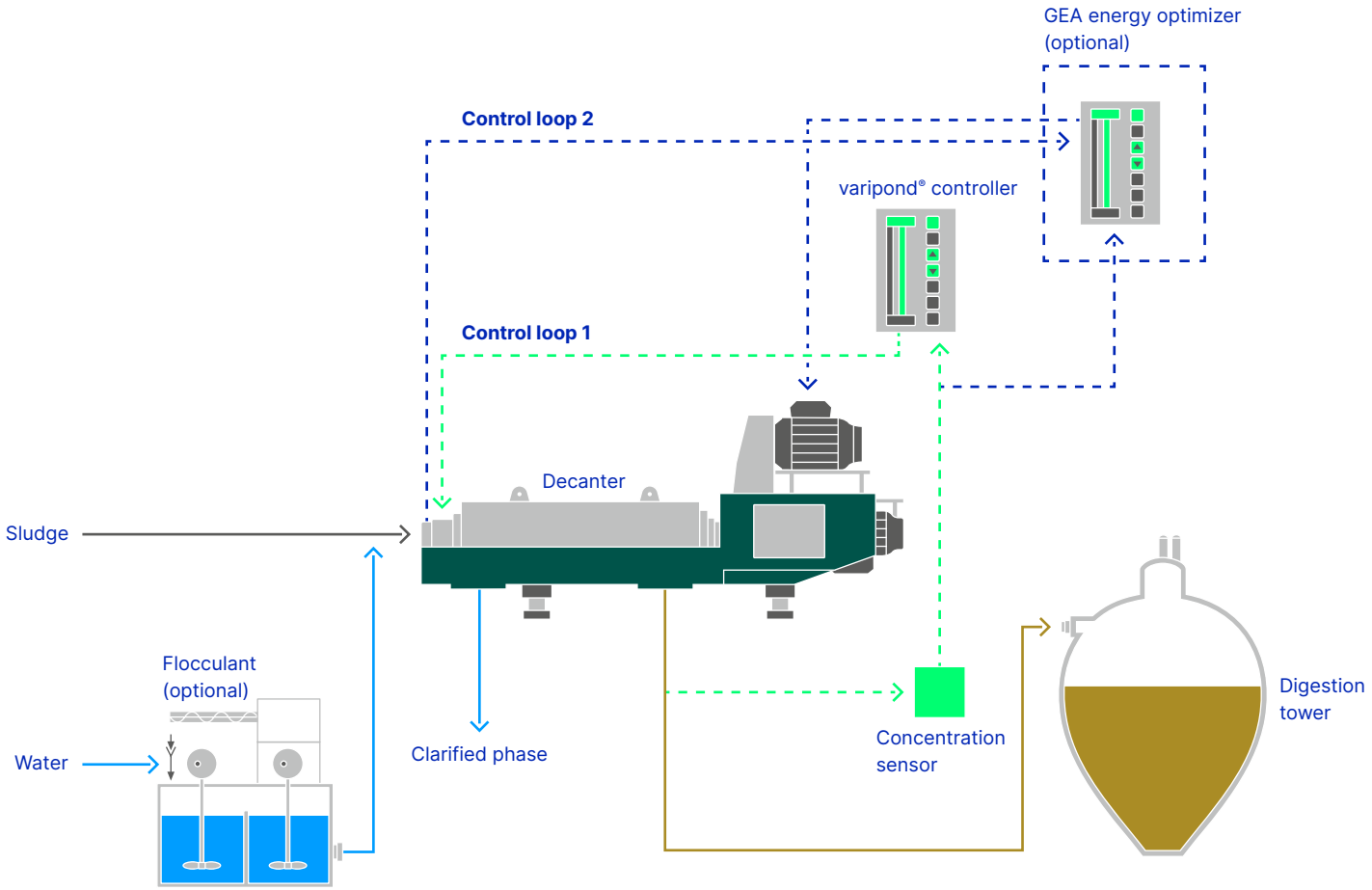


As standard, decanters are equipped with interchangeable weir plates that can be used to change the water level in the bowl when changing feed conditions require it. In that case, the decanter must be stopped and the weir plates changed by hand – which costs time and money. With varipond®, the adjustment to changes in sludge consistency occurs automatically during operation, depending on the process conditions.

Where the clarified liquid is discharged from the decanter bowl, there is an axially adjustable throttle valve that determines the gap width of the outlet opening. A smaller gap means greater resistance, less water discharge and a higher liquid level. Intelligent sensor technology detects the required throughput volume at any given time and automatically adjusts the gap width to the desired liquid level in the decanter bowl by moving the throttle plate to the optimum position while the machine is running.

The varipond® process ensures that the infrastructure around the decanter consists of fewer components and enables optimum efficiency combined with a significant reduction in operating and maintenance costs. All downstream processes are thus also optimized.

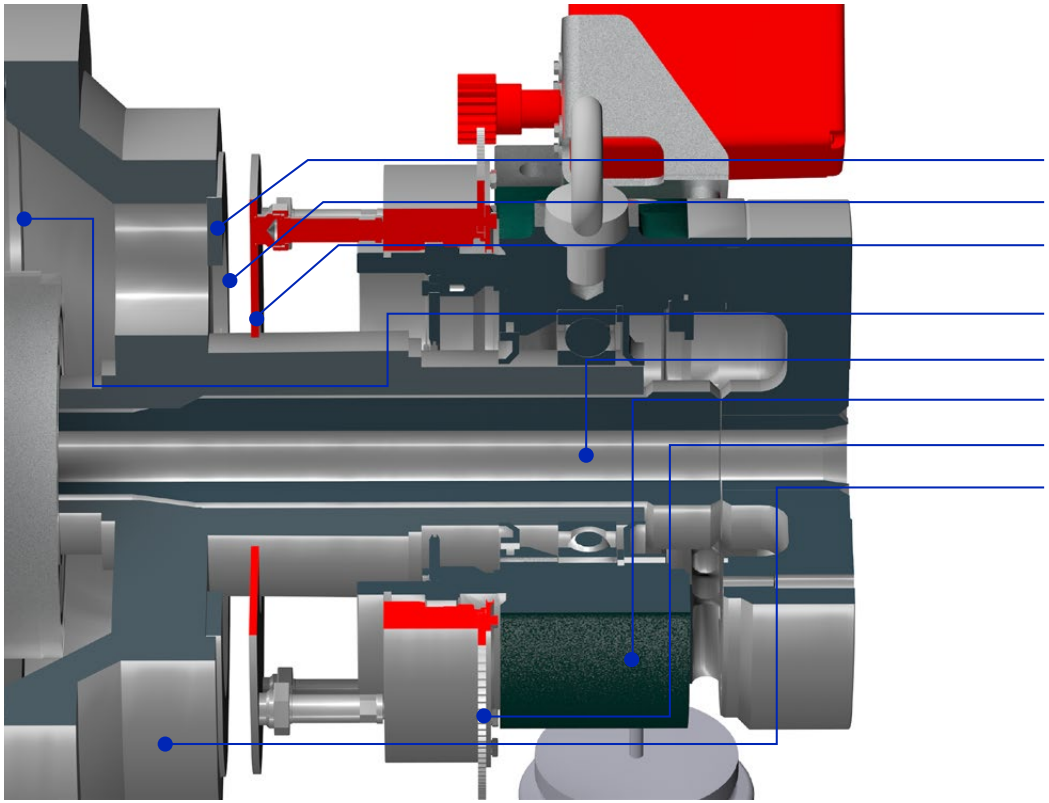
Operating principle of varipond® – with optional energy optimizer



Precise automatic regulation in real time ensures optimum process results with minimum energy input.

The optional energy optimizer detects excessive bowl speeds and adjusts them automatically – reducing energy consumption by up to 30% while maintaining output concentration.

Operation of the varipond® control in the decanter



1 Regulating plate (rotating)
2 varipond® gap
3 Throttle plate (not rotating, but movable on an axis)
4 Scroll
5 Inlet tube
6 Bearing housing
7 Toothed rim
8 Bowl

The throttle plate, which can be shifted axially, is moved into the optimum position by means of sensors while the machine is running.

varipond® automatically regulates the gap width of the opening on the centrate side:

Open during start-up: the liquid level is above the opening for the solids discharge

Closed during continuous operation: the liquid level rises up to the scroll body beneath the opening for solids discharge (negative operation utilizing the maximum g-volume)

THE RIGHT MODEL FOR EVERY USE

GEA offers a wide range of decanter models equipped with varipond® for customized (pre-)dewatering and thickening of sludge.

With varipond®, GEA biosolids Decanters prime find specific separation solutions for different performance requirements in their areas of application. These decanters thereby always ensure a constant concentration for downstream processes, for example, in order to constantly feed digestion towers after sludge thickening with a precisely defined solids concentration that achieves a maximum gas yield.

Retrofit – available at any time

varipond® can be easily integrated into existing GEA biosolids Decanters prime 5000-8000. For the operator, this means that no new decanters are necessary, there are no long stagnation periods and no complete conversion is necessary. By retrofitting with varipond®, it is possible to optimize processes and products that were previously always associated with large financial investments and were very labor-intensive.

OPTIMIZING OPERATING COSTS SUSTAINABLY WITH VARIPOND®

Efficiency gains over the entire life cycle of the system

The efficiency gains that can be achieved with varipond®, particularly in terms of process reliability, product quality, and energy and resource consumption, optimize the operating costs of treating wastewater and sludge in a sustainable manner. This is a valuable aid that ensures competitiveness for the operator over the entire life cycle of the plants. In this respect, GEA decanters equipped with varipond® also occupy a leading position worldwide.

Key benefits at a glance

- Automatic pond depth while the machine is running
- Simplified infrastructure without slide gate and return piping for liquid overflow during startup and shutdown
- Energy- and resource-saving startup and shutdown without liquid overflow on the solids side
- Simple, precise pre-dewatering and thickening with stable discharge concentration
- Accuracy ± 0.3% DS, infinitely adjustable
- Thickening without polymers possible
- Highest possible throughput for the decanter
- Up to 30% energy savings
- Optimization of all downstream processes
- Minimal wear and tear, long service life
- Unsupervised operation at night or at weekends possible
- Economically retrofittable at any time