

MORE POWER, LESS CONSUMPTION - THE REVOLUTION OF CENTRIFUGAL SLUDGE DEWATERING

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Abstract

Flottweg presents its innovation in the area of decanter centrifuges: the Flottweg Xelletor series. The centrifuges in the Xelletor series significantly improve performance in sludge dewatering: less energy, more power!

Our C series already sets the benchmark in the centrifugal dewatering of sewage sludge. In May 2018, Flottweg will go further. The brand-new Xelletor series will raise the bar for mechanical separation processes to an entirely new level. The centrifuge will provide significantly better dewatering performance with lower consumption.

To make that possible, the X series has entirely redesigned the core components. The secret to the outstanding performance of this decanter centrifuge is inside, in the heart of the machine. The rotor, and especially the scroll, have a design never seen before.

Sewage sludge dewatering has enormous savings potential for sewage treatment plant operators. The **drier the sludge** coming out of the system, the smaller the quantity of sludge. Less sludge means lower costs for disposal and further treatment. To make dewatering more efficient, operators also use **flocculants**. The advantage of decanter centrifuges: In comparison with other dewatering systems, they need less flocculant. At the same time, the machine scores higher on **energy consumption**.

Our C series decanter centrifuges already provide excellent results in all three areas. But the X series beats them all. Depending on sludge quality, the centrifuge can save 20% on energy while providing significantly better performance. Not only that, but:

- up to 20% more throughflow;
- up to 10% less sludge due to 2% higher total dry solids;
- up to 20% savings on flocculant consumption.

Keywords

Sewage sludge, mechanical separation, sewage sludge dewatering, dewatering, decanter centrifuges.

1. INTRODUCTION

The process of sludge dewatering in municipal sewage treatment plants plays a key role in wastewater processing. The goal is to provide the most efficient processing possible to keep the disposal costs of the dewatered sludge as low as possible. Besides dewatering performance and high dry substance content, additional parameters such as polymer and energy consumption also play a decisive role. Separation technology specialist Flottweg has now brought a machine to market that demonstrably sets new benchmarks in sewage sludge dewatering when it comes to dewatering performance, polymer and energy consumption.

2. THE REVOLUTION: THE XELLETOR CONCEPT

For many years, decanter centrifuges have defined the process of sewage sludge dewatering. These industrial centrifuges offer several advantages. Besides excellent dewatering performance

even in case of fluctuations in the feed (summer versus winter operation), these machines also achieve a high separation degree.

In the meantime, these machines have approached the physical limits of dewatering. On the hunt for maximum separation efficiency, the existing centrifuge concept was radically rethought by Flottweg Engineers and Technicians. The result is the Xelletor series. A machine that significantly tops even the existing outstanding performance.

3. MORE DRY SUBSTANCE FOR LOWER DISPOSAL COSTS

Sewage treatment plant operators are confronted with several challenges during sludge dewatering. First, the highest possible dry substance content in the dewatered sludge is one goal. But at the same time, the use of polymer flocculant should be kept as low as possible. And more than that – the separated liquid should be discharged in as clean a state as possible, meaning a high separation degree of the undissolved solids. This avoids any return burden in the other cleaning stages of the plant.



Figure 1. The Xelletor series



Figure 2. Left: Sludge before dewatering;
Right: Centrate after the centrifuge and the discharged solids

The dewatering result depends strongly on the properties of the sludge being treated. The existing decanter series from Flottweg already achieves very good results. The new machine concept in the Xelletor system has significantly improved on those results. The new machine concept achieves a higher dry substance content. That significantly reduces the quantity of sludge. Up to 10% savings in sludge disposal costs are possible. The separation degree stays constantly over 99%. That means there are almost no solids remaining in the separated liquid.

Under experimental conditions at the Rosenheim sewage treatment plant, the Xelletor was able to achieve over 2% more dry substance than the conventional high-performance series. Specifically, for the operator, this means:

For sewage treatment plants in a large city such as Hamburg, Cologne, or Munich: Quantity of wet sludge for dewatering at 3% dry substance: **500,000 m³/year**

Quantity of dewatered sludge **59,100 tons/year**
with 25% dry substance (previous machine standard)

Quantity of dewatered sludge **54,700 tons/year**
with 27% dry substance (Xelletor series)

Difference **4,400 tons/year**

Sewage treatment plants must therefore, according to this example, disposal of about 4,400 fewer tons of sludge. At disposal costs of about 70 Euro per ton, that means a savings of Euro 308,000 a year!

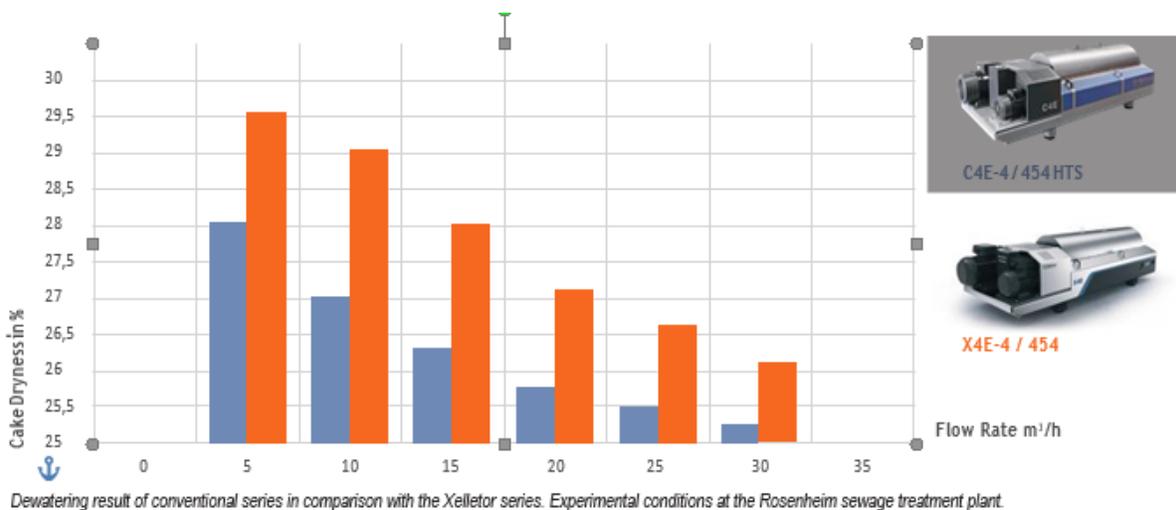


Figure 3. Dewatering result of conventional series in comparison with the Xelletor series

4. POLYMER SAVINGS

A significant portion of the costs of sludge dewatering involve the use of polymer flocculants. The use of these additives is unavoidable in most cases. Polymer flocculants enlarge the solid particles, ensuring more efficient dewatering performance. With Xelletor, due to the

gentle acceleration of the suspension and the super-deep pond concept, significant polymer savings are possible. In tests under real conditions, polymer savings of up to 25% were possible. And that was with the same dry substance content and the same high separation degree.

Here, too, the potential savings are easy to calculate. Assuming a sewage treatment plant with a yearly sludge volume of 500,000 m³ per year and a price per kilogram of polymer (a powder that is 100% active substance) of 4 Euro means that the Xelletor series can provide savings of 120,000 Euro per year.

5. ENERGY MISER

Decanter centrifuges, due to their robust design, are well known to be long-distance runners. Many centrifuges from the 80's are still going strong, day after day. So many people still have the high energy consumption of these machines in mind. In comparison with these machines, the energy savings of the Xelletor series can be up to 50%! In comparison with older machines, 20,000 Euro in energy costs per year were saved in the specific case. Depending on the throughflow, the specific energy consumption for sludge dewatering in the Xelletor series is only 0.7 kWh/m³.

The savings provided by the Xelletor series are a result of the revolutionary new design principles of the scroll and rotor.

6. „DEWATERING AT THE PRESS OF A BUTTON“

Convenience at Top Performance. In addition to the pure economic facts, convenience of use also speaks for the centrifuge.

- Fully automatic control of the bowl speed and differential speed. And the resulting continuously optimum dry substance in the dewatered solids, even when there are fluctuations in the feed, thanks to the Flottweg Simp Control®.
- Today, it's at 4.0: On demand, all the options for remote monitoring and remote service.
- Optional: Automatic flocculant dosing with real-time monitoring. Also reduces polymer consumption.
- Custom integration of the centrifuge controller into your overall system controller for peak efficiency and operational reliability of your system.
- Closed construction. Good shielding of the (workplace) environment against noise pollution and sewage sludge aerosols.

7. CONCLUSION

Extensive testing on multiple sewage treatment plants clearly show: The Xelletor system wins on all definitive requirements, such as dewatering performance, polymer consumption, and energy consumption, significantly topping the old limits. Then there are additional advantages of centrifuge technology, such the low operating overhead and low noise levels typical of centrifuges.

An examination of cost-effectiveness also pays off. The new Xelletor system permits enormous savings.