

# FLOTTWEG DECANTER TECHNOLOGY





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# DECANTER TECHNOLOGY

In many processes, mechanical separation has a decisive influence on product quality, production efficiency and environmental impacts. Mechanical separation processes are found in practically all industrial sectors, including, but not limited to, food, chemical, pharmaceutical, biotech, mineral, and environmental processes.

The basic principle of the solid bowl centrifuge has been known since the end of the 19th century. Over the course of time, technological improvements along with the availability of high strength and corrosion-resistant construction materials have allowed solid bowl decanters to be applied to many processes for mechanical separation of solids and liquids.



## Benefits of Modern Decanter Centrifuges

- Optimum separation efficiency
- Small footprint
- Sealed construction to control odor emissions and avoid contamination of the product
- Ease of operation due to continuous and automatic operation
- Limited consumables such as filter media or filter aids





# BASIC PROCESS OPERATIONS


To obtain optimum results, solid bowl decanter centrifuges must be custom designed to suit specific separation processes.

Flottweg meets the needs of the vast range of applications by offering a variety of basic designs, such as the decanter, Tricanter®, Sedicanter®, and Sorticanter®.

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## The Following Basic Process Operations Are Possible Using Solid Bowl Decanter Centrifuges

- Clarification of liquids
- Dewatering of sludge and suspensions
- Thickening of sludge
- Separation of three-phase mixtures; i.e., two immiscible liquid phases and a solid phase
- Classification of solids in a suspension according to particle size (wet classification)
- Sorting of solids by density



# EFFICIENT, ECONOMIC, COMFORTABLE

## How the Flottweg Decanter Works

A decanter centrifuge can be viewed as a settling pond wrapped around an axis. In the settling pond, solid particles that are heavier than the liquid settle to the bottom, driven by gravity, building up a sediment layer on the bottom of the pond. In the rotating bowl of the centrifuge, solid particles that are heavier than the liquid move to the inner diameter of the bowl driven by centrifugal force and build up another sediment layer on the inner surface of the centrifugal bowl.

Since the centrifugal force in the decanter is approximately 3000 x g instead of 1 x g in the gravitation field, separating solids from a liquid in a centrifuge becomes much faster and more efficient.



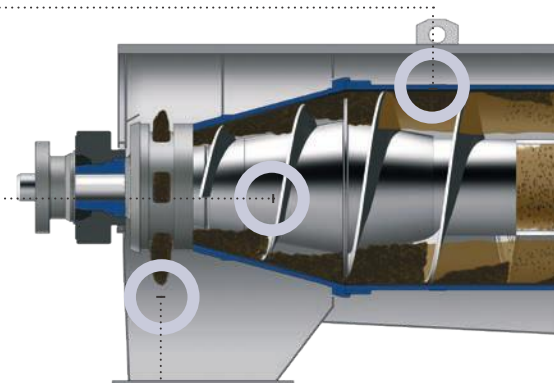
### Bowl

The bowl has a cylindrical/conical shape and rotates at a pre-set speed optimally adjusted to the application. The slurry rotates with the bowl at the operating speed and forms a concentric layer at the bowl wall. The solids contained in the product are packed against the bowl wall by centrifugal force. The length of the cylindrical bowl section and the cone angle are selected to meet the specific requirements of an application.



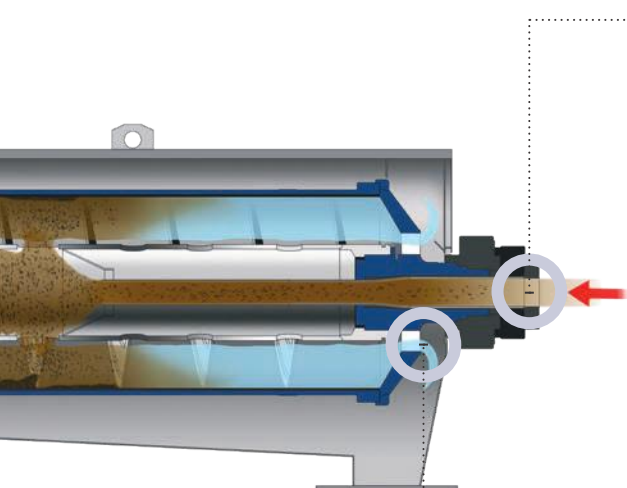
### Scroll

The scroll rotates at a slightly different speed than the bowl and conveys the separated solids toward the conical end of the bowl. This differential speed determines the residence time of the solids in the bowl. Residence time is a critical factor for cake dryness. It can be adjusted by changing the differential speed of the scroll thus providing optimal separation. The scroll design depends on the application and the separation task.



### Solids Discharge

Settled solids are ejected through ports at the conical end of the bowl into the solids housing and fall through the discharge chute.



### Feed

The product is fed through a stationary pipe into the feed zone located in the center of the scroll. The product is then accelerated circumferentially and delivered through distribution ports into the bowl.



### Adjustable Impeller

The clarified liquid can also be decanted with an impeller and discharged from the bowl under pressure. This eliminates the need for a separate chamber pump. The Flottweg Adjustable Impeller is an engineering refinement that permits quick and precise adjustment of the pond depth during operation to accommodate for changing process conditions.



### Overflow Weirs

The clarified liquids flow to the cylindrical end of the bowl where they exit over weir plates. Easily adjustable weir plates allow for precise adjustment of the pond depth in the bowl. The liquid overflow is then collected in a centrate chamber and discharged by gravity.



### Materials

Flottweg uses high-quality stainless steel for all product-wetted areas. The bowl and scroll body are made of high-strength centrifugal Duplex stainless steel casting.

# A DECANTER PRODUCT LINE FOR THE WASTE- WATER BUSINESS

## The Flottweg C Series

Over the last five decades, Flottweg has acquired a great deal of expertise in sludge thickening and dewatering.

We know the special requirements of the wastewater industry. Flottweg therefore decided to create a new decanter series solely manufactured for sludge separation, called the Flottweg C Series. This new decanter series incorporates the latest know-how in mechanical engineering, manufacturing, and control system design. The result is a new series of environmental centrifuges featuring Flottweg's quality, reliability, and optimal price/performance ratio.

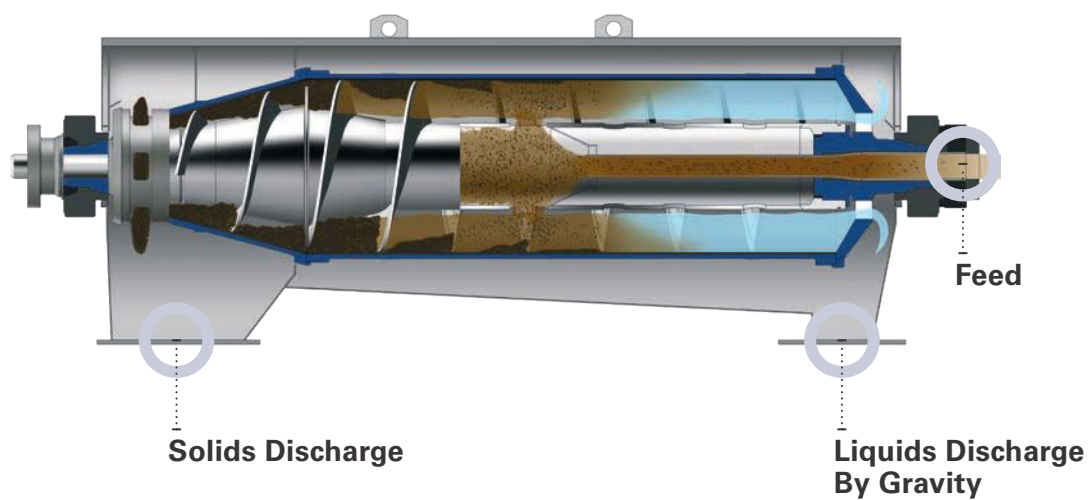


## The Flottweg Recuvane® System

The Recuvane® System helps reduce the energy consumption of the decanter. The decanter needs energy to accelerate the sludge to the rotational speed. Normally, the centrate discharges radially by gravity over conventional weir plates. The energy included in the water, however, gets lost. Thanks to the special construction of the Flottweg Recuvane® System, the centrate water can be discharged in a specific way. The energy recovered during discharge supports the main drive, thus, saving 10 to 30% of the operating power, depending on the pond depth and the sludge.







### Benefits of the C Series

- Continuously optimal separation results, thanks to the Simp Drive®
- Maintenance friendly – minimum downtimes
- Up to 40% less energy demand (if using Recuvanes®) compared to former decanter series
- Durable wear protection
- Reduces polymer demand – optimized operation costs



# THE NEW XELLETOR SERIES

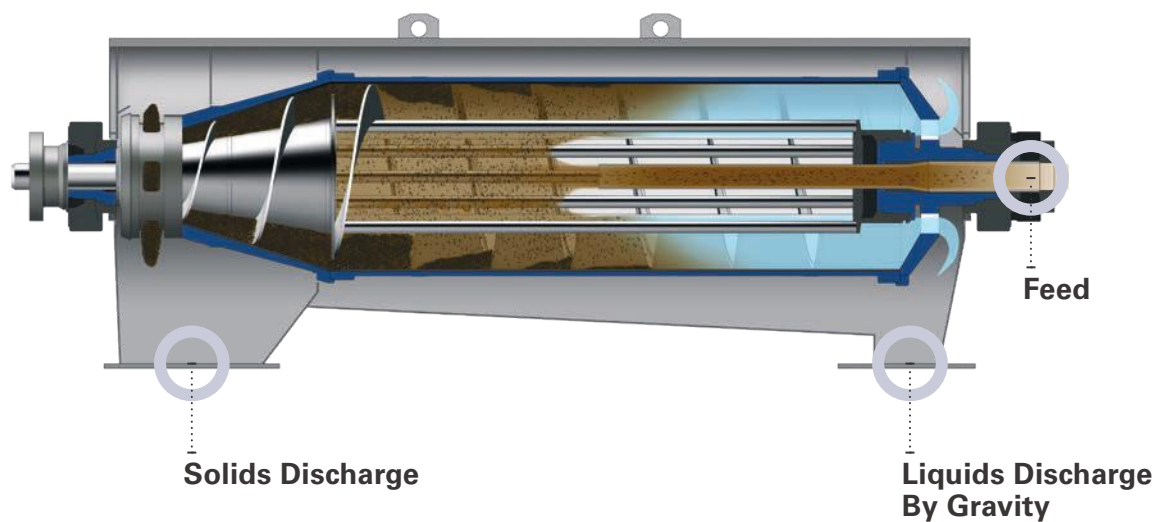
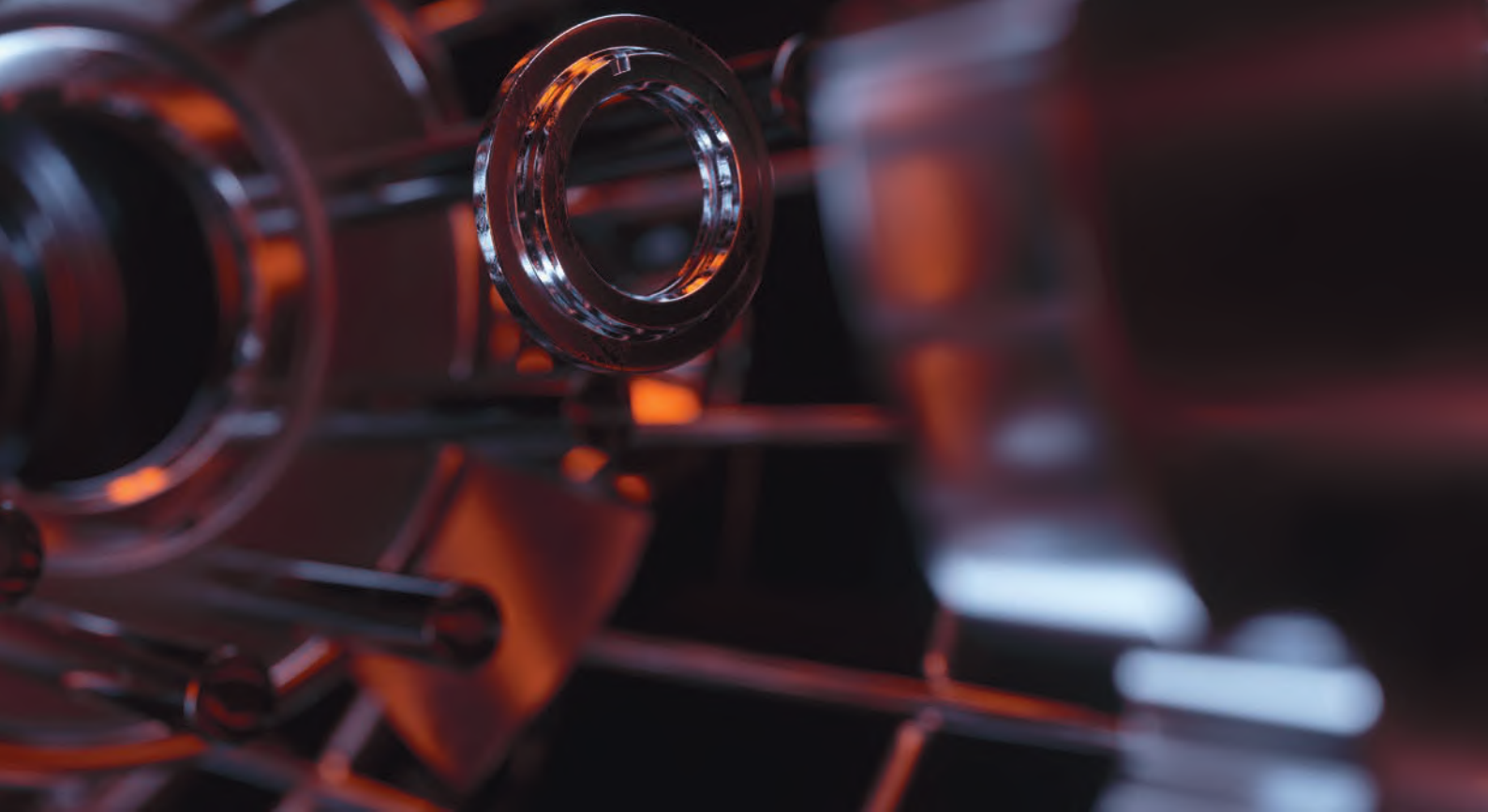
## The Next Evolution in Centrifugal Sludge Dewatering

**Flottweg has developed a unique centrifuge concept specifically designed for the high-efficiency dewatering of sewage sludge: The Flottweg Xellektor Series.**

Sewage sludge dewatering offers a wide range of potential savings for the operators of sewage sludge treatment plants. Often, costs for transport and disposal of dewatered sewage sludge can amount to 80% of the operating costs in mechanical dewatering. The dewatering efficiency of our machine is considerably higher than that of our previous models. Moreover, the Xellektor series machines set new standards for capacity and dry matter as well as for polymer and energy consumption. This has a very positive impact on your sludge disposal process, regardless of whether you dispose of the sludge or thermally treat it.

Just a 1% increase in dry matter in the dewatered sludge means 5% less sludge to be disposed of.





## Benefits of the Xelletor Series

We have set the bar high – by comparing the Xelletor System to our high-performance C series

- **Xtra dewatering performance**  
up to 10% less sludge due to a high dry-matter content in the dewatered sludge – thus high savings potential
- **Xtra polymer savings**  
up to 20% savings in polymer consumption
- **Xtra capacity**  
up to 15% more capacity
- **Xtra energy savings**  
additional energy savings of up to 20%

# FLOTTWEG TRICANTER®

## 3-Phase Separation

The Flottweg Tricanter® performs a 3-phase separation; i.e., the simultaneous separation of two immiscible liquids of different densities and one solid phase, provided that the solid phase is the heaviest phase. The main difference from a decanter is the separate discharge of the two liquid phases.

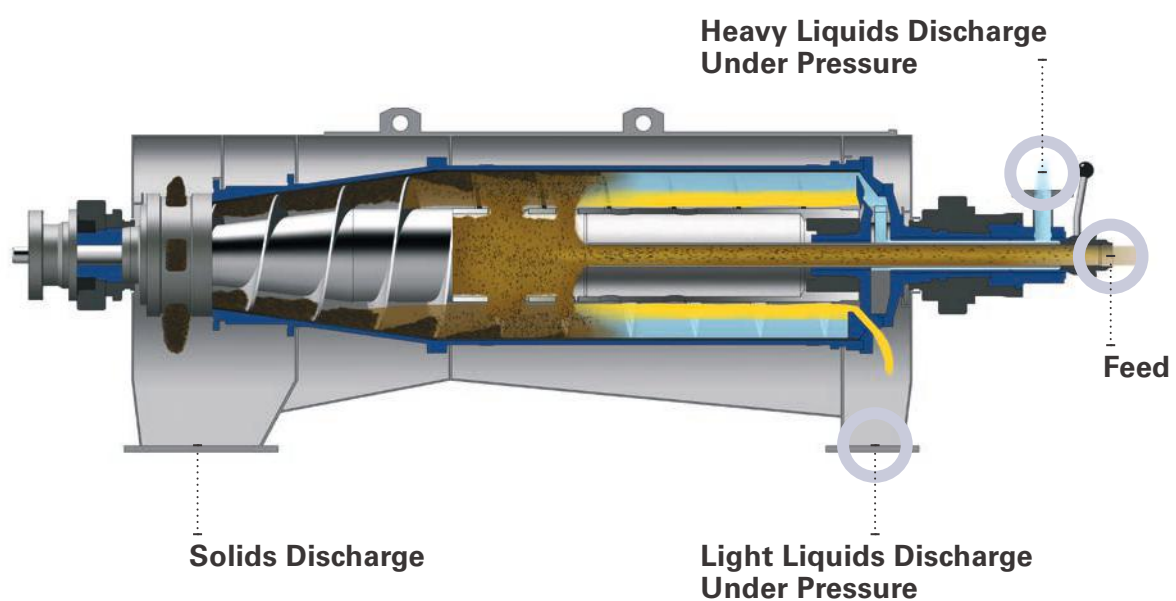


### The Adjustable Impeller

The Flottweg Tricanter® discharges the heavy liquid phase through an adjustable impeller under pressure and the light phase by gravity.







### Advantages of the Tricanter® with Adjustable Impeller

- Adaptation of separation zones during operation
- Greatest possible purity of the liquids to be separated
- Adaptation to changing conditions (product in the feed) possible at any time
- Easy automation possibilities



# FLOTTWEG SORTICANTER®

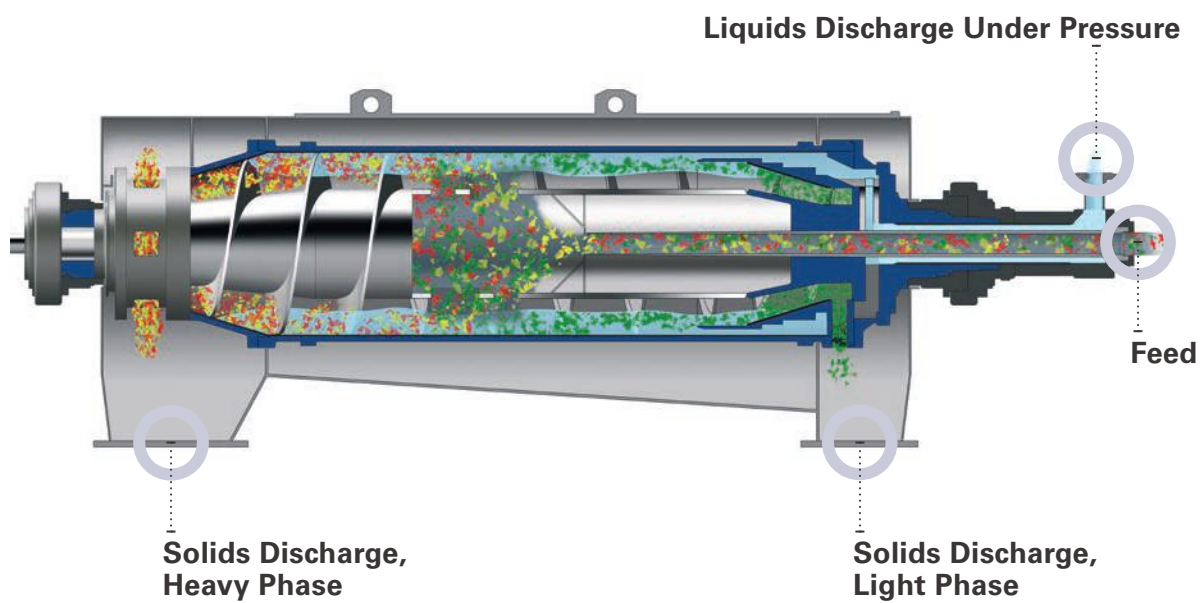
## Solids Sorting; e.g., Plastic Recycling

**The Flottweg Sorticanter® is specifically designed for the separation of solids by density. The process is aided by a carrier liquid with a specific gravity that is between the densities of the two solid streams to be separated.**

The Flottweg Sorticanter® is ideally suited for plastics recycling. Here, having materials of a single type is of central importance. Because many plastics differ from one another in density, the sink/swim separation process proves to be the most efficient solution for recycling. In this separation process, a separation liquid with a specific weight between the types of plastic to be separated is used. As a result, the “heavy” plastic sinks (higher density) to the bottom of a container. The “lighter” plastic (lower density) floats at the surface of the container. The separation process in a container takes place simply using the force of gravity.

In a centrifuge, gravity is replaced by centrifugal force, which makes the separation process faster and more efficient because the forces acting are many times higher than the force of gravity.





### Benefits of the Sorticanter®

- High separation efficiency, better purity
- No blow-in of air bubbles or other disruptive effects
- Processing of particles smaller than 1 mm
- No additional downstream dewatering required



# FLOTTWEG SEDICANTER®

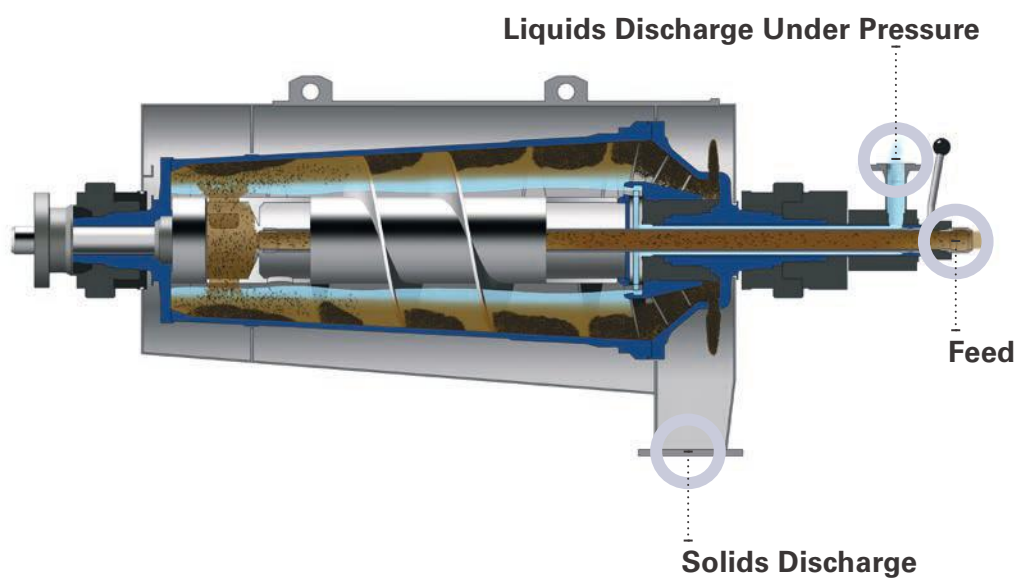
## Separation of Soft Solids

**The Flottweg Sedicanter® is used for the separation of solids from liquids when the solids form a soft-to-flowable sediment.**

The Sedicanter® is used in cases where the solids are too fine to be processed in a normal decanter and the sediment cannot be easily discharged from the decanter due to its soft consistency. During the separation process, the liquid and the solids move in the same direction without having to pass through a turbulent inlet zone. The centrate is discharged through an adjustable impeller. The sediment accumulates in the Sedicanter®, and is then hydraulically pressed out of the bowl beneath an immersion disc.

Applications for the Sedicanter® include “soft products” such as biomasses, yeast suspensions, protein suspensions, fermentation broths, and many more.





### Benefits of the Sedicanter®

- Up to 10,000 x g centrifugal force possible to facilitate the separation of very fine, slowly settling solids
- Uniquely designed feed distributor and bowl seal to prevent foaming in the product inlet zone
- Can be used in areas exposed to explosion hazards
- Clean-in-Place (CIP) provisions available to meet pharmaceutical industry standards
- Fluoropolymer rotor seals available for critical applications

# DECANTER DRIVES AND OVERLOAD PROTECTION



## 01

A decanter drive has two components or two tasks:

### The Bowl Drive

generates the centrifugal area in the bowl and accelerates the product to be separated to circumferential speed.

## 02

### The Scroll Drive

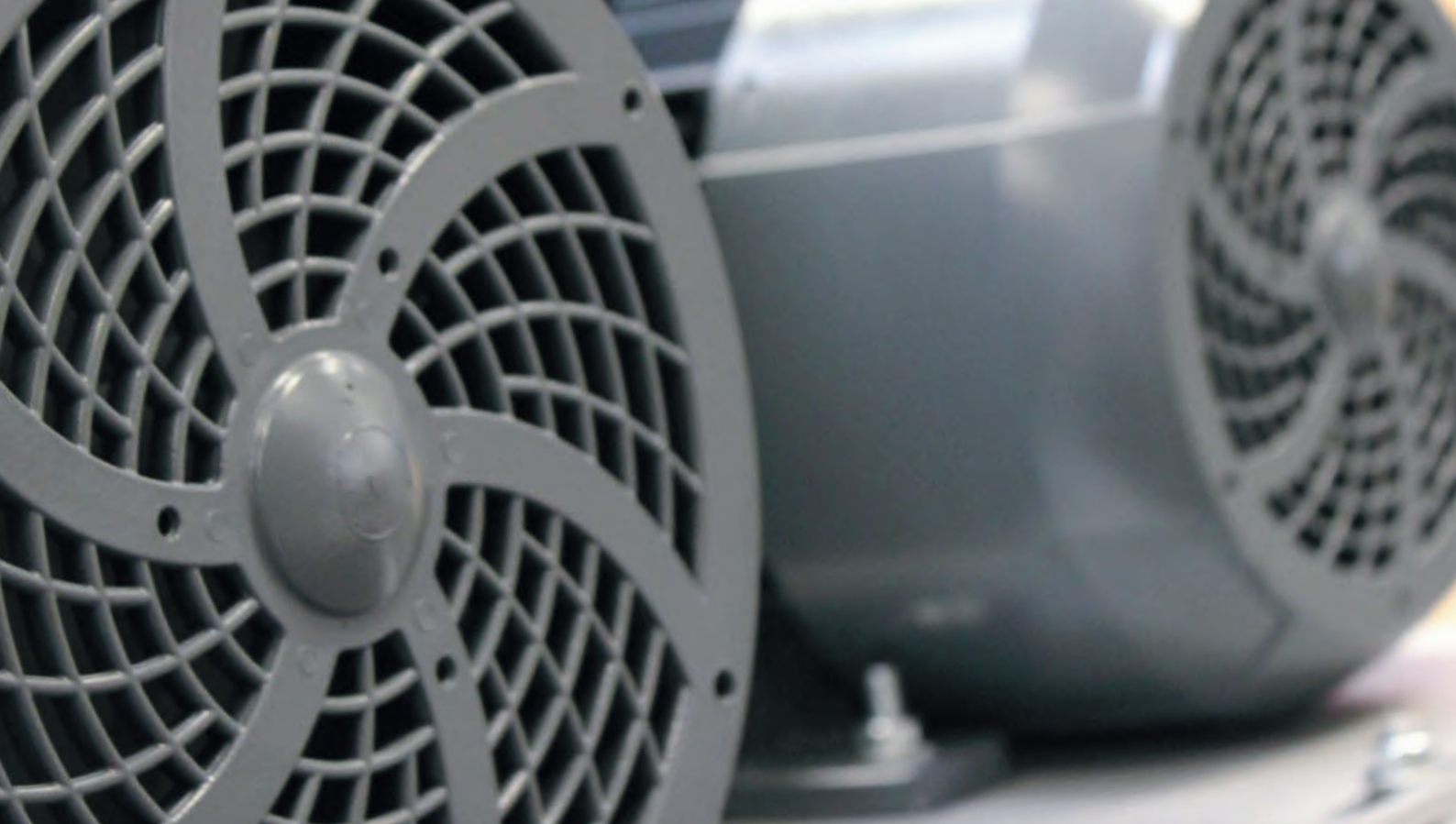
conveys the separated solids within the bowl and assures continuous solids discharge. Concerning the scroll drive, we distinguish between regulated and unregulated systems. In both cases, a planetary gear is mounted on the rotor.

**In regulated systems**, the differential speed is determined by the scroll load. The following principle applies:

In order to discharge the separated solids as dry as possible from the bowl, differential speed has to be as low as possible; that is, the residence time of the solids in the bowl and, therefore, in the centrifugal field, should be as long as possible. If the scroll load is too high, there is a risk of blockage. If everything is adjusted correctly, the differential speed is regulated and, thus, stays in the optimum range. The result: optimum separation of the liquid from the solids is assured, while overload and congestion are avoided. In this case, the system would react automatically by raising the differential speed.

For **differential speed regulation based on load**, Flottweg has been using its Simp Drive® for years. Hydraulic drive and back-drive are available upon request.





# FLOTTWEG SIMP DRIVE® – SIMPLE, INTELLIGENT, MODULAR, POWERFUL

In modern drives, the bowl and the scroll are completely decoupled; i.e., the scroll can turn independently from the bowl.

Compared to other regulated drives, the Flottweg Simp Drive® is more energy-efficient and regulation is more precise, especially at low differential speeds.



## Benefits of the Flottweg Simp Drive®

- Optimum dry matter content, even when there are fluctuations in the feed
- High security against overload
- The scroll rotates independently from the bowl – machine can be cleared out even at standstill
- High throughput performance thanks to high bowl speed and precision-adjusted differential speed

# AUTOMATICALLY GOOD

## The New Flottweg InGo

Automation technology has become an integral part of modern industry. An optimally programmed system helps increase and assure product quality. Intelligent networking of machines accelerates processes and increases the degree of automation of your system.

Automation today is the alpha and omega of mechanical engineering. To lower costs, nearly all of our customers now rely on fully automated, un-supervised operation of their systems. Since high-speed centrifuges are naturally used in key industries, such as the pharma and chemical industry, subject to extreme safety requirements and using complex process technology, this means that automation technology is facing a significant challenge. Efficient and perfect concurrence of all automation components is essential for a flawless process and one of the characteristics of our visualization system for machines and systems, called InGo.

Flottweg was awarded the German Design Award 2018 for its new interface. I

### Advantages

- Revolutionary color design
- Perfect concurrence of individual components (high process security)
- Easy integration into existing systems
- Complete control over all process parameters at all times
- Intuitive user guidance
- Complete customer documentation can be displayed in HMI
- Visually based on PC and smartphone interfaces



# FLOTTWEG SIMP CONTROL® – SAFE, INTELLIGENT, MODULAR, PERFORMANT

The Simp Control is a safety and control module for decaners. It has the look and feel of the operating standard. All customers, even those whose control system was not purchased from Flottweg, are guaranteed identical machine performance and safety systems no matter where they are in the world. This is how we ensure our customers can relax when it comes to issues like functional safety in centrifuges.

### Advantages

- Optimum adjustment of the Simp Control® to the functions of the Flottweg Decanter
- Modular compact control system
- Small number of components, thus, low amount of installation work
- Easy integration





# CENTRIFUGE CLEANING

**Centrifuges are usually flushed clean before shutdown. Depending on the application, different cleaning systems may be incorporated into the centrifuge design.**

Flottweg Centrifuges are designed for continuous operation and do not have to be opened for cleaning. Flottweg Centrifuges for pharmaceutical, biotech, and food processing applications are designed for the integration into Clean-in-Place (CIP) systems.

## **Cleaning of Centrifuges in Standard Applications**

For the majority of applications (e.g., wastewater, separation of crystalline products), it is sufficient to flush the centrifuge, before shutdown, through the feed pipe to remove deposits of solids. The flushing time and the type of cleaning fluid are product-dependent. In most cases, the use of solids-free centrate will be adequate. Additional rinsing nozzles for cleaning the housing, the bowl exterior, and the scroll interior can be installed if requested.

## **Cleaning of Centrifuges for Pharmaceutical, Biotech and Food Processing Applications**

The requirements for efficient cleaning are particularly high in the biotech, pharmaceutical, and food industries. Flottweg designs its centrifuges to meet the rigid cleaning requirements in these industries.

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## **Characteristic Features of Centrifuges That Meet Hygienic Requirements**

- All welds are ground to meet specific sanitary finish standards (optional).
- All product-wetted parts are provided with a surface finish in accordance with specified surface roughness values.
- Spray nozzles are provided for the centrifuge housing and for the interior of the scroll body.
- The centrate impeller is adjustable to facilitate flushing of the bowl.
- The drives are frequency controlled for CIP-cleaning at low speed.
- FDA compliant seals are available.



# SEALING SYSTEMS

Most sizes and models of Flottweg Centrifuges are available in a variety of rotor and housing seal designs for different operating conditions.

## Atmospheric Centrifuges

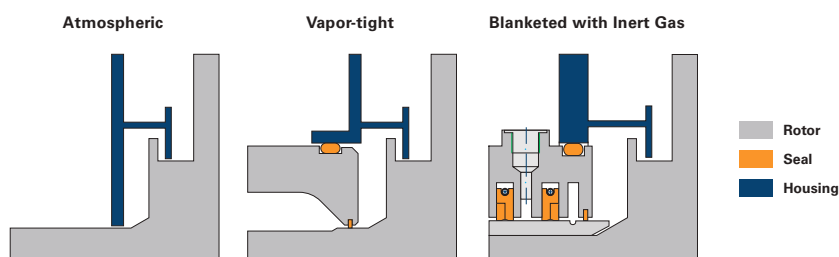
Atmospheric Centrifuges are used for applications where there is no harm from products or vapors released to the environment.

## Vapor-Tight Versions

Flottweg Centrifuges are the right choice in cases where substances emitted from the process could pollute the environment if contact of the product with ambient air is undesirable. Additional seals on rotor shafts and housings provide the necessary seal. Emissions can be eliminated when purge gas/air is applied to seals or when the centrifuge housing is vented.

## Centrifuges Blanketed with Inert Gas

Centrifuges blanketed with inert gas allow for safe operation with toxic, corrosive, or flammable media by applying inert purge gas to rotor seals and by inertizing the process chamber and centrifuge housing. Slightly positive or negative pressures can be maintained in the process area by regulating the purge gas supply. Special sealing elements minimize the seal gas consumption.



Flottweg Centrifuges adapted to operate in closed-loop systems



# PURGING WITH INERT GAS

If centrifuges are used to process products whose vapors together with oxygen may form a flammable suspension, any risk of explosion must be avoided by substituting air with inert gas. Generally, nitrogen is used.

## Purging

Before starting, the entire system, including the centrifuge, is purged. In order to do this, large volumes of inert gas are flushed through the system until the amount of oxygen is reduced to a non-critical and safe level. Purging is complete when the amount of inert gas delivered to the system reaches a multiple of the system volume, or when an oxygen probe at the centrifuge housing shows a safe oxygen concentration.

## Blanketing

After successful purging and during operation with the product, sufficient inert gas is fed into the system to ensure a small overpressure. This prevents atmospheric air from entering the system.

## Control of Centrifuges Purged with Inert Gas

This control is accomplished with a differential pressure monitoring system with integrated automatic control. Thus, a fixed overpressure in the sealing system is constantly maintained using control valves. Manual re-adjustment is not required anymore.

## Safety First – the Flottweg Sealing Principle

The Flottweg Sealing System prevents the exit of vapors into the atmosphere as well as the entry of air into the system. This system is called technically tight. The sealing effect is assured due to the interaction of the seals used and the feed of inert gas controlled by pressure. The differential pressure resulting from pressure control is controlled automatically and clearly laid out in the screen of the Flottweg Control System.

## Processing Materials Susceptible to Oxidation

In particular, processing beverages and food requires the product be prevented from undergoing oxidation. For this purpose, the leakage of air into the centrifuge is prevented with relevant design features and the centrifuge is purged with inert gas. In many cases, carbon dioxide is used as the inert gas. A system monitoring the flow of gas is commonly used.

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## Benefits of Blanketing

- Can be done for different applications
- No undesired product emissions into the environment
- No formation of an inflammable mixture
- Safety-relevant functions are compliant with IEC 61508 / IEC 61511, classified and done in accordance with SIL 2.

# LUBRICATION

**Flottweg Centrifuges can be provided with different lubrication systems in accordance with customer requirements.**

The lubrication system depends on the type of operation, (e.g., batch or continuous) and the degree of automation of the entire system. Flottweg Lubrication Systems allow for the re-lubrication of rotor bearings during operation. The availability of the different lubrication systems depends on the centrifuge model.

## Manual Lubrication

Direct lubrication at both rotor bearing blocks via a manual grease pump

## Central Lubrication System

From a central manually operated pump, the lubricant is accurately dispensed through a piston distributor to the designated greasing points.

### Benefits:

- Very precise metering of grease
- Simplest possible handling with a single pump
- Little time needed for re-lubrication

## Automatic Grease Lubrication

In contrast to the manual central lubrication system, the greasing system can be operated automatically.

### Benefits:

- No overlubrication and no excess greasing
- No personnel overhead for lubrication
- Lubrication quantity and grease reserves are monitored

## Automatic Oil Droplet Lubrication System

The fully automatic oil-air lubrication system ensures for minimal quantity lubrication with oil droplets transported via a stream of air to the bearings.

### Benefits:

- Permanent lubrication and cooling of the rotor bearings
- No oil changes needed – oil consumption reduced to a minimum
- Slight overpressure at lubrication points prevents the penetration of gases or aerosols into the rotor bearings
- High operational safety thanks to the monitoring of oil and air pressure







# WEAR PROTECTION

High forces are involved in the mechanical separation of liquids and solids using decanter centrifuges. Abrasive materials, or media with corrosive properties, give rise to wear, abrasion and degradation.

Flottweg offers a wide range of wear protection to meet the requirements of the many different applications in which centrifuges are installed:

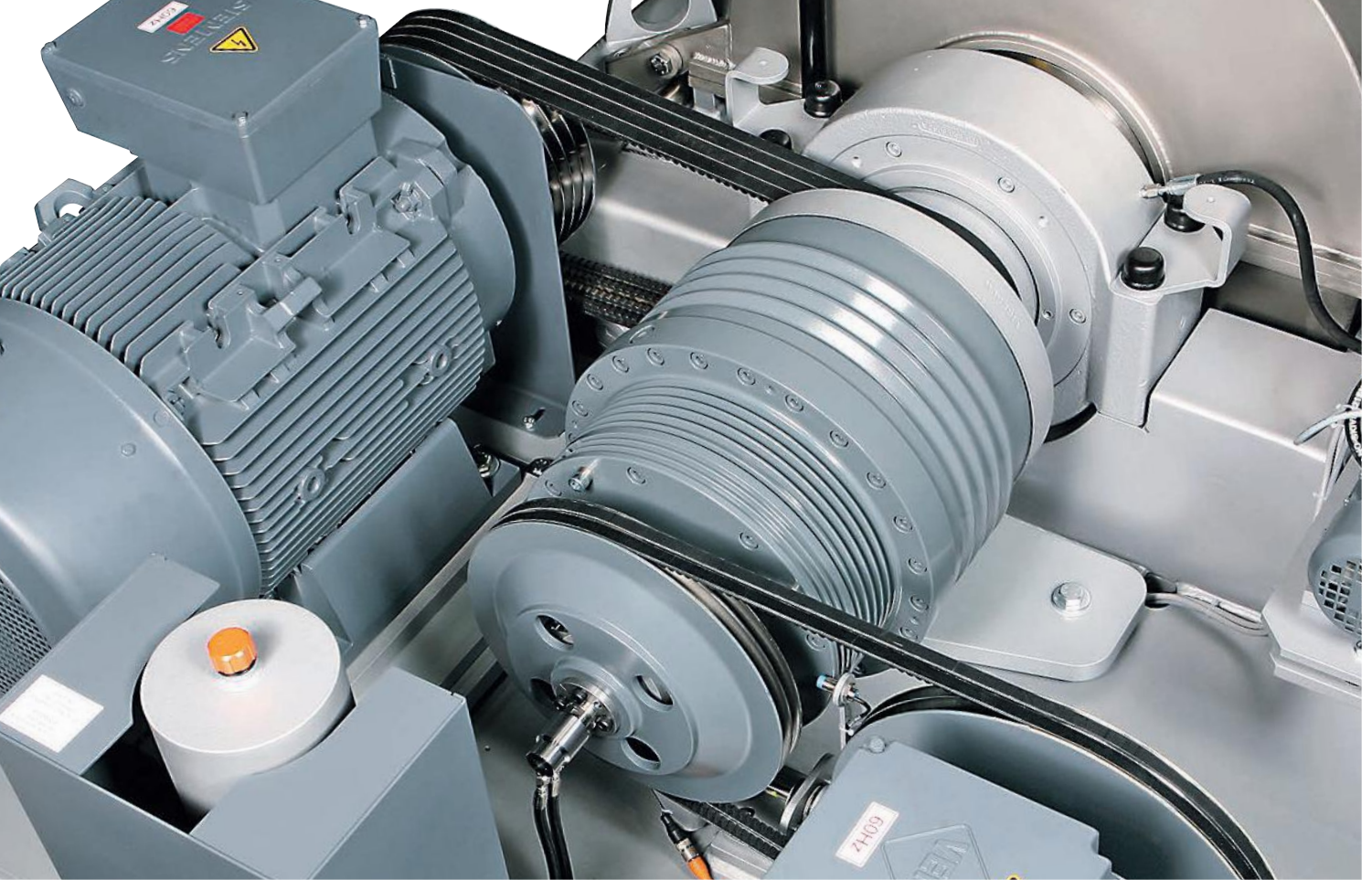
1. Welded hard facing or spray coating
2. Ceramic
3. Tungsten carbide tiles
4. Chilled hard
5. Plastic liners



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## Benefits

- High resistance to wear of the decanter centrifuge
- Longer service life of the decanter
- Reduced costs, because only wearing parts are renewed



# DECANTER CONTROL

## **Vibration Monitoring (Standard)**

Vibration sensors transmit acceleration signals to an analyzer that sounds an alarm or shuts the centrifuge down upon reaching the maximum permissible level.

## **Speed Monitoring (Standard)**

Bowl speed and scroll differential speed are each measured by an inductive proximity switch and shown on a digital display. Continuous monitoring of maximum and minimum values during operation helps to minimize preventable failures and maintain acceptable safety standards.

## **Temperature Monitoring (Option)**

Bearing temperatures are continuously monitored on Flottweg Centrifuges by means of resistance thermometers. Upon exceeding pre-set temperature limits – between 100°C and 130°C depending on the individual application – the centrifuge gives an alarm or shuts down. This preventive measure safeguards against bearing failure or machine damage.





## Customer Service is Our Strength

Application-based project planning, high-quality manufacturing and professional after-sales service are prerequisites for a trouble-free operation. Experienced and reliable service engineers from our customer service department are ready to respond quickly if needed. The Flottweg Service Group is also available to perform preventive maintenance to avoid interruptions in production.

## Quality Made in Germany

Flottweg is ISO 9001 certified and manufactures its products in compliance with the latest technical standards.

## Flottweg After-Sales Customer Service

Even the best machinery needs to be maintained and serviced. Flottweg has established a worldwide service network consisting of its own subsidiaries, branch offices, and representatives to provide our customers with localized service and spare parts. Our service engineers and technicians are qualified for any kind of installation, commissioning, repair and maintenance.

**International  
service hotline (24/7):**

**+49 (0) 180 50 35 135**



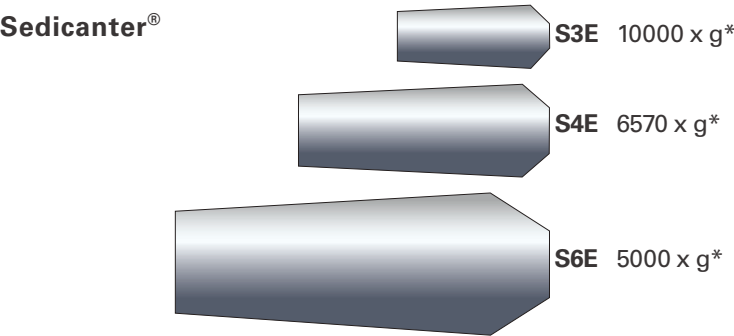
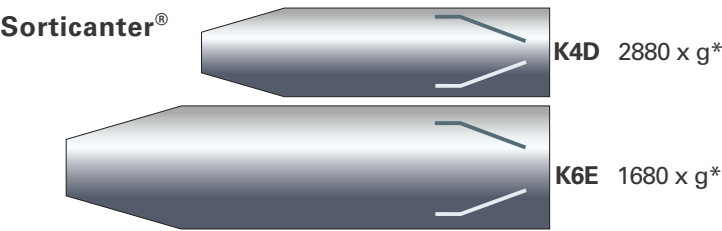
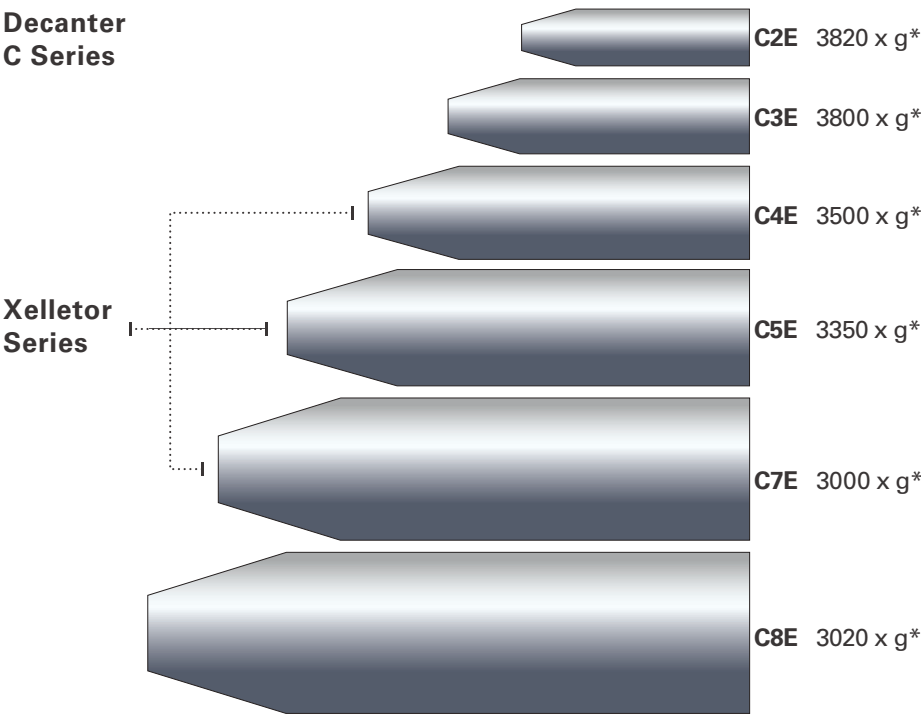
## Flottweg Services Include

- Experienced advice on separation processes
- Pilot tests on-site or at the Flottweg Laboratory and Test Center
- Selection and sizing of appropriate equipment
- Customer-specific automation/control systems and process integration
- Design and construction of complete process systems
- Installation, commissioning, maintenance, repair, and spare parts service worldwide





# SOLID BOWL CENTRIFUGES PRODUCT LINES AND MODELS



\* Acceleration in g, depending on the temperature and the density of the product



## Decanter/Tricanter®



**Z2E-4** 4590 x g\*



**Z3E-4** 4620 x g\*



**Z4E-4\*\*** 4140 x g\*



**Z5E-4** 3620 x g\*

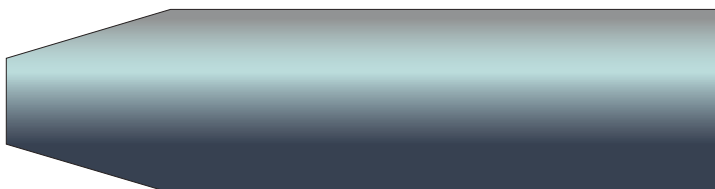


**Z6E-4\*\*** 3550 x g\*



**Z8E-4** 3000 x g\*

## Decanter



**Z92-4\*\*** 2600 x g\*

\* Acceleration in g, depending on the temperature and the density of the product

\*\* Available also as -2/-3 models



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