



FLOTTWEG CENTRIFUGE TECHNOLOGY FOR THE CLEANING AND PROCESSING OF TAR

Maximize Profit and Recovery!



MECHANICAL SEPARATION FOR CLEANING AND PROCESSING OF TAR IN COKING PLANTS

Increase the Value of High Temperature Tar through Higher Purity

The reason for cleaning and processing tar is clear: the value is increased if the purity of the tar reaches the highest level. In other words, the purer the tar, the higher its value. Furthermore, with increased purity of the tar, the cleaning intervals of storage tanks can be reduced significantly. Therefore, operators can save time and money.

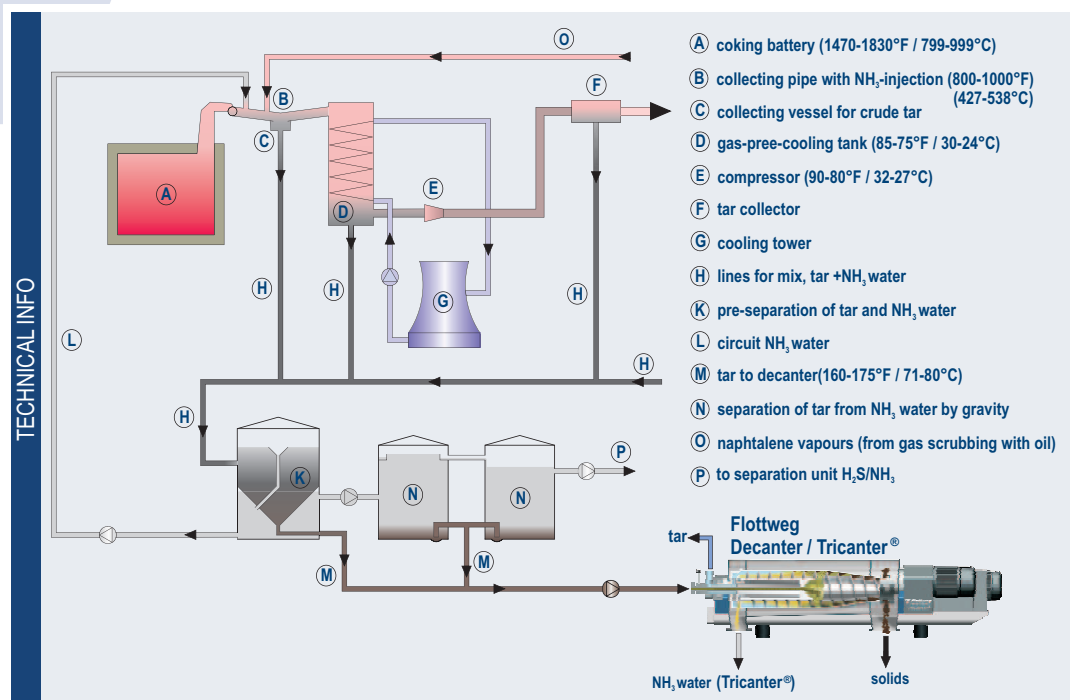
Tar is produced while processing hard coal into coke and it contains not only water but also dissolved ammonia, hydrogen sulfide, aluminum chloride and carbon dust. While the cleaning and processing of the tar is in progress, water and solids are widely separated. This is ensured by using a Decanter or Tricanter® from Flottweg. By using these machines, smooth operation as well as a high efficiency are guaranteed.

While processing the tar, a decanter separates the impurities from the tar. The "cleaned" tar contains less than 0.3 % of quinoline insoluble solids bigger than 30 - 50 micrometers (µm). The separated solids contain a dry matter of more than 40 % and these are lumpy and semisolid.

By using a Tricanter®, it is possible to separate the ammonia, water and solid particles simultaneously (**Tri = three** phase separation). The cleaned tar attains a content of less than 2 % of water.

The economically most important tar products are aromatic hydrocarbons such as naphthalene, anthracene, acenaphthene, carbazole, pyrene, tar and pitch. Tar is mainly used for road construction, roofing or cardboard coatings.

For a better overview and understanding how tar is cleaned and processed by a Flottweg Decanter or Tricanter®, please have a look at the process scheme below as an example for a typical tar process.



Process scheme as an example for a typical tar process

MECHANICAL SEPARATION FOR CLEANING AND PROCESSING OF TAR

Additional Tar Applications

MEDIUM AND LOW-TEMPERATURE TAR

Medium and low-temperature tar is specified as a different product group compared to that obtained from conventional high-temperature tar separation in coking plants. These tars are mainly generated as a by-product of a thermal decomposition or pyrolysis reaction of natural organic substances such as brown coal, wood, peat or shale. For efficient downstream processing, unwanted substances like ultrafine solid particles, ash and water need to be separated out. The main difference in low and medium-temperature tar lies in its different and more challenging physical and rheological properties such as density difference and higher viscosity.

SPECIAL FLOTTWEG HIGH-TEMPERATURE APPLICATIONS FOR HIGHLY VISCOUS PRODUCTS

Continuous ongoing process development is required in order to maximize yield and to derive high-value products from residues. This imposes more demanding requirements on decanter centrifuges. In conventional separation equipment, the separation efficiency is often insufficient due to the viscosity of the product being too high. In most cases, the main reason for this is the temperature limit of the separation equipment. Flottweg broke new ground by addressing one of the key parameters in separation, namely temperature. With the development of special centrifuges for high-temperature processes, Flottweg offers solutions for multiple special applications. Flottweg Decanters for process temperatures above 150 °C enable effective processing of highly viscous products, even with the highest separation efficiency.



Flottweg Machines for high-temperature applications

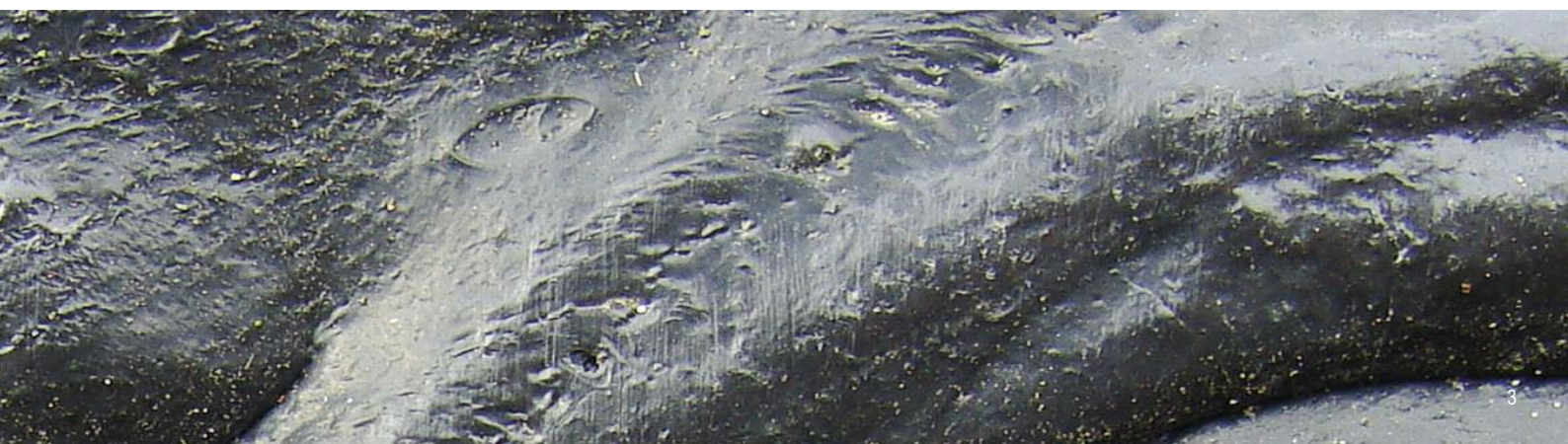
SOLVENT APPLICATIONS

Several processes require solvents for an improvement in separation abilities, or because they are required for process reasons. Besides special technical demands on the separation equipment, there are very high requirements on the safety concept. Flottweg offers sophisticated explosion prevention and protection concepts that enable safe integration of Flottweg Decanter Centrifuges without any procedural limitations.

Flottweg Tar Centrifuges and State-of-the-Art Technology completely fulfill the requirements of even very challenging tar applications such as high-temperature applications, safety-relevant solvent applications or highly viscous products. Our know-how in the different tar processes enables us to offer a solution for the best possible separation in the tar processing industry.



Separated solids as a result of highly efficient Flottweg Machines



OPERATING PRINCIPLE 2-PHASE

The Flottweg Decanter

FEED

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



SCROLL

The scroll rotates with a slightly different speed than the bowl and conveys the separated solids toward the conical end of the bowl. The differential speed determines the time the solids spend in the bowl. This time is a critical factor for cake dryness. It can be automatically adjusted by changing the differential speed of the scroll thus providing optimal separation. Depending on the physical properties of the product, Flottweg Decanters can be supplied with a different scroll design or by modifying an existing scroll. Scroll pitch and single or multiple lead configurations are important design variables.



BOWL

The bowl has a cylindrical and conical section. The rotational speed is pre-set optimally to the application and requirements. The slurry rotates with the bowl at the operating speed and forms a concentric layer on 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.

SOLIDS DISCHARGE

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



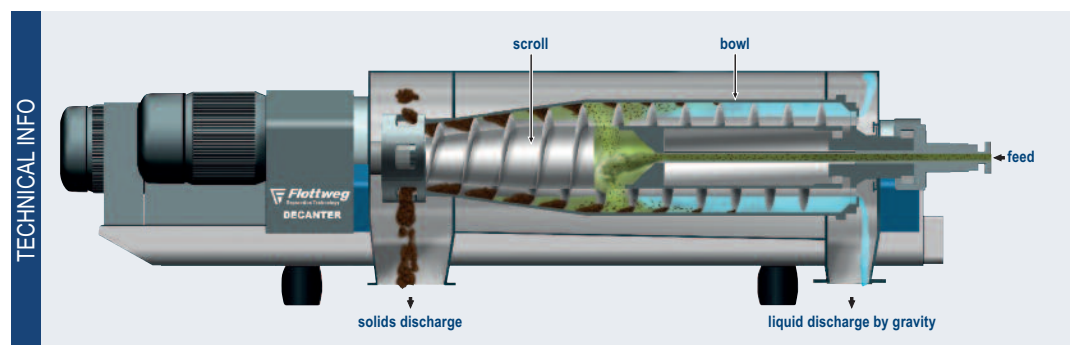
OVERFLOW WEIRS

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.



VARIABLE IMPELLER

The clarified liquid can also be discharged with an variable impeller under pressure which in turn represents another method of discharging the liquid. The liquid is discharged from the bowl under pressure which eliminates the need for a separate chamber pump. A variable impeller allows for precise on-the-fly adjustment of the pond depth and liquid separation zone. This optimizes the purity of the liquid.



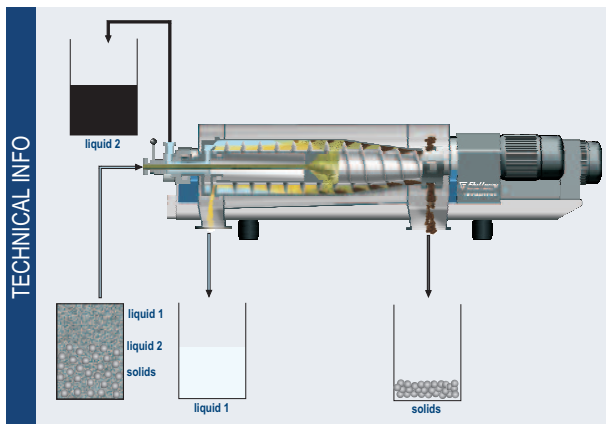
Flottweg Decanter for the separation of solids from liquids with discharge of the liquid phase (centrate) by gravity

OPERATING PRINCIPLE 3-PHASE

The Flottweg Tricanter®

The Flottweg Tricanter® performs a three-phase separation, i.e. the simultaneous separation of two immiscible liquids with different densities and one solid phase, provided that the solid phase is the heaviest

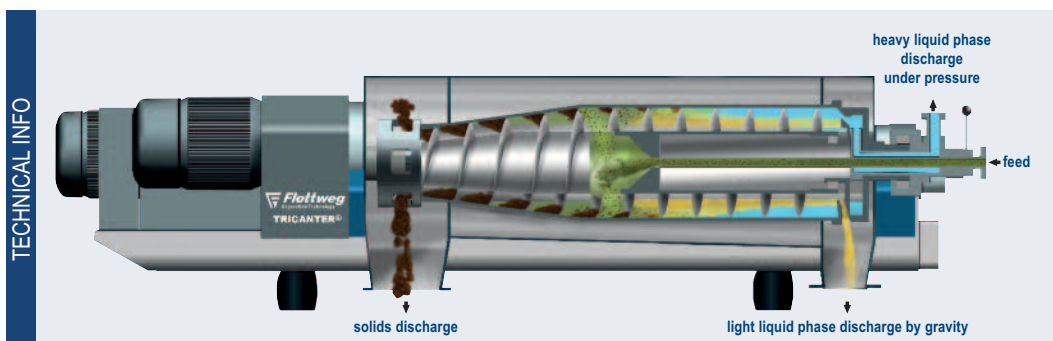
phase. The main difference from a decanter is the separate discharge of the two liquid phases.



Flow of liquids and solids in a Flottweg Decanter

Customer benefits of variable impeller

- Immediate adjustment of the pond depth and liquid-liquid separation zone
▶ optimum results
- Savings in costs due to the needlessness of a separate chamber pump
- Easy reading of the variable impeller scale ▶ ease of adjustment



Flottweg Tricanter® (Three Phase Decanter). Discharge of the centrate: heavy liquid phase under pressure, light phase by gravity

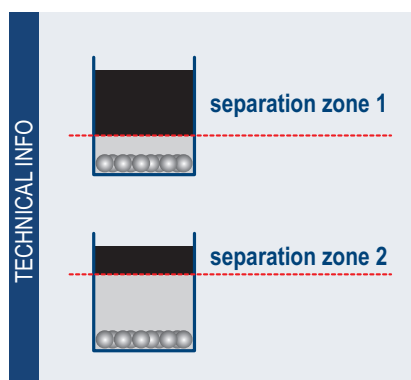
NO MATTER IF FEED CONCENTRATION VARIES

The Flottweg Tricanter® discharges the heavy liquid through an adjustable impeller under pressure and the light phase by gravity. The variable impeller allows for precise on-the-fly adjustment of the pond

depth and liquid-liquid separation zone. This optimizes the purity of the liquids and may eliminate downstream equipment.



Feed and discharge devices with control lever for the adjustable impeller of the Flottweg Tricanter®



No matter if feed concentration varies: Best separation results with the Flottweg Tricanter®-System

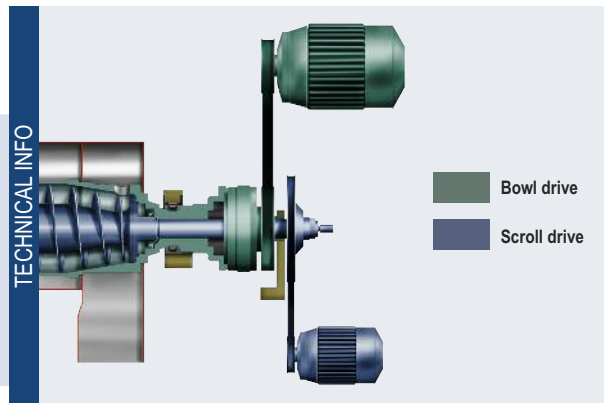
FLOTTWEG PRODUCT FEATURES FOR TAR CLEANING AND PROCESSING

Benefits by using the following product features



SIMP DRIVE®: SIMPLE, INTELLIGENT, MODULAR AND POWERFUL

The Simp Drive® regulates the differential speed between the decanter bowl and scroll depending on the prevailing scroll torque. The differential speed determines the length of time the solid remains in the bowl, and thus has a significant influence on the separation process. The bowl speed and differential speed can be adjusted independently of one another during ongoing operation. This is guaranteed by a special transmission mechanism of the Simp Drive® (special planetary epicyclic gear unit).



Flottweg Simp Drive®

Customer benefits of Flottweg Simp Drive®

- High flexibility in selection of the operating speed (high g-forces do not matter)
- High throughput performance due to high bowl speed and precisely adjusted differential speed
- Simp Drive® for a broad range of applications in which continuous adaptation of the operating parameters is required
- Lower energy requirements than conventional gear units due to higher efficiency (cost saving)

Customer benefits of lubrication systems

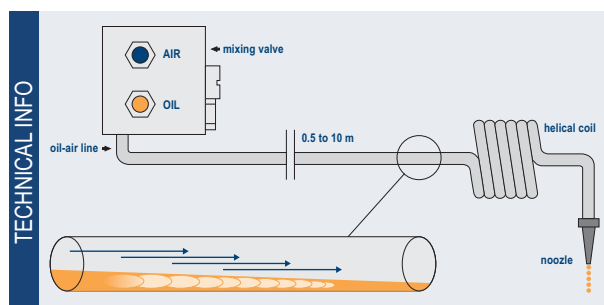
- Suitable for high g-forces
- Highest process reliability through constant monitoring of oil and air pressure
- Always fresh oil available
- No cooling necessary due to disappearance of return flow

Customer benefits of Flottweg Wear Protection

- Increased temperature resistance
- Increased wear resistance
- Improved surface characteristics
- Enhanced durability of the machines

LUBRICATION SYSTEMS (Oil-Air Lubrication for Tar Cleaning)

There are various forms of lubrication systems available which all guarantee not only a continuous but also a flawless process (manual lubrication, central lubrication, automatic grease lubrication or automatic oil droplet lubrication). However, due to prevailing high temperatures and possible utilization in explosion-hazardous areas (pneumatic design), the fully automatic oil-air lubrication system ensures for minimal quantity lubrication with oil droplets transported via a stream of air to the bearings. Optimal lubrication is achieved at high speeds, with low oil consumption and no loss in performance. Monitoring of the oil and air pressure guarantees high operational safety.



Oil-Air Lubrication for Tar Cleaning



WEAR PROTECTION

Optimum Wear Protection is crucial by using a Decanter or Tricanter® for many applications. All wearing parts are protected by special metal hard surfaces utilizing tungsten carbide, and replaceable wear bushings. Under operating conditions, the Flottweg wear protection lasts more than 15,000 operating hours (tar cleaning).

FLOTTWEG DECANter CENTRIFUGES FOR CLEANING AND PROCESSING OF TAR

As described before there are numerous advantages of using a Flottweg Decanter or Tricanter®.

SAVING COSTS

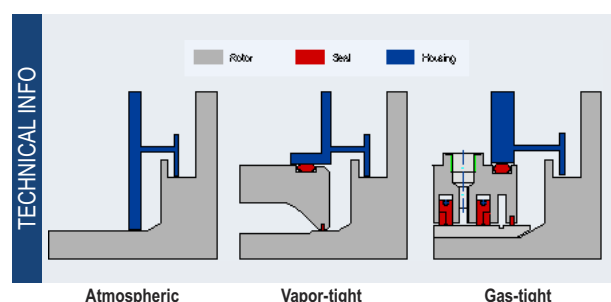
Maintenance and service creating significant cost savings, due to the fact that by using a Flottweg Decanter or Tricanter®, the wear of system components (pumps, valves etc.) is reduced to a minimum. Moreover, less impurity of tar storage tanks saves costs for cleaning. Last but not least, by using a mechanical separation equipment/machine from Flottweg, the purity of the tar can reach the highest level, which increases its value.

EXPERIENCE

Flottweg has been developing and manufacturing decanter centrifuges for more than 60 years. When it comes to tar cleaning and processing, we are not only recognized as one of the world's leading decanter manufacturers, but also beyond the reach of our competitors in using decanters for tar cleaning and processing. In other words: The most experienced provider for YOUR best outcome.

USE OF GAS-TIGHT CENTRIFUGES

Flottweg Gas-Tight Centrifuges allow for a safe operation with toxic, corrosive or flammable media by applying inert purge gas to rotor seals and by inerting the process chamber and centrifuge housing. Slight 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.



Key success factors

- High g-forces are crucial for tar cleaning and processing.
- A high temperature resistance is significant while cleaning and processing the tar.
- An automatic operation for a faster and more efficient process is needed.
- The Flottweg Simp Drive® enables high throughput performance due to high bowl speed and precisely adjusted differential speed.
- Unique wear protection is a key success factor due to the fact that it enables an optimum process even under difficult conditions.
- Flottweg Machines are designed and manufactured to fulfill the aforementioned success factors, so as to ensure and provide the best possible results for an operator.



Flottweg Control Unit for the purging and blanketing with inert gas



TAKE ADVANTAGE OF OUR EXPERTISE and Many Years of Experience in Processing Tar

Flottweg Oil-Air Lubrication System

for the use of processing
and cleaning of tar

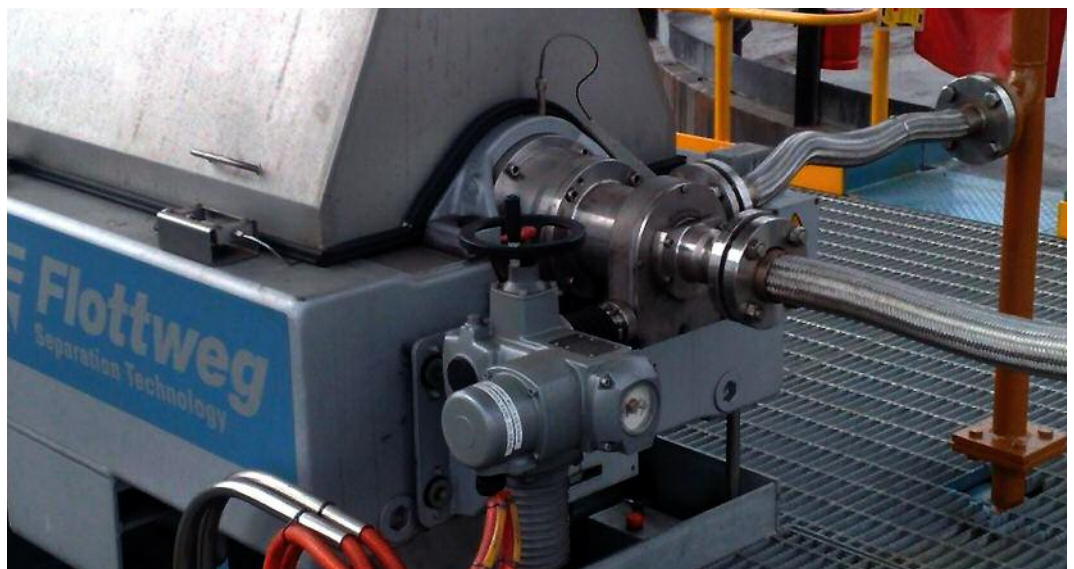


Flottweg Systems and
Plant Engineering

Especially designed,
engineered and manufactured
for use in coking plants

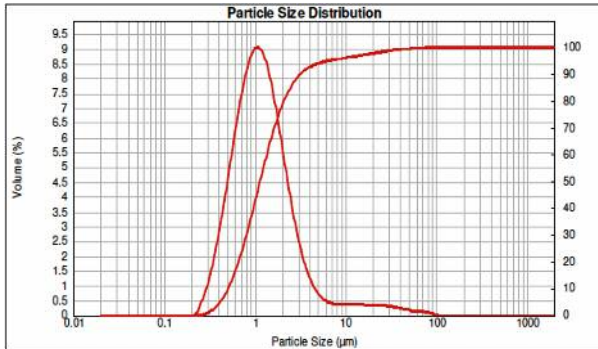


Best results in terms of high dry-
ness of solids and high throughput
with a Flottweg Decanter

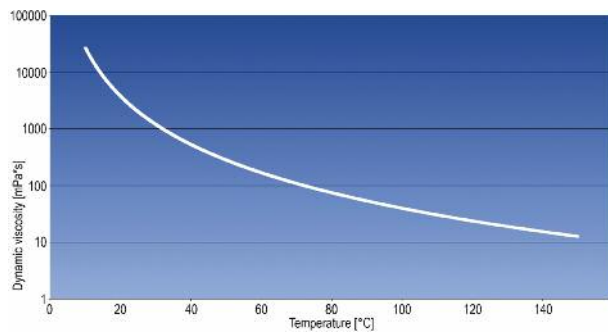


Ask our sales agents for
more references!

Every process is different. The various parameters have a significant influence on the separation efficiency. Knowing these parameters means increasing the efficiency and yield of your separation process.



Typical particle size distribution of high temperature tar before separation



Sample analysis of dynamic viscosity and its relation to temperature

We support our customers along the entire process chain from R&D raw material analyses to approval tests. Flottweg offers all necessary methods for analyzing your products and evaluating new potential.

Our worldwide locations and networks guarantee support and service for our customers. With the help of our experience and testing capability we develop made-to-measure solutions to meet your individual requirements.

Our services

- Laboratory analysis – discover new options and performance parameters
- Processing department – performance optimization of our separation solutions
- Project planning department – customized systems and solutions



GLOBAL AFTERMARKET SUPPORT NETWORK

No Matter Where You Are in the World

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 in order to avoid interruptions in production.

QUALITY "MADE IN GERMANY"

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



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

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.



Flottweg Service Technicians are always available for you

FLOTTWEG WORLDWIDE

Flottweg is headquartered in Vilsbiburg (near Munich), Germany, and has branch offices in Cologne and Leipzig as well as subsidiaries in Australia, Brazil, Canada, China, France, Italy, Mexico, Peru, Poland, Russia and the United States plus representatives in nearly all countries worldwide.

Check out our website at www.flottweg.com to find a competent contact person.



TECHNICAL DATA

Decanter Z-Series and Tricanter®

Decanter



Z3E-4 4500 x g*



Z4E-4 4140 x g*



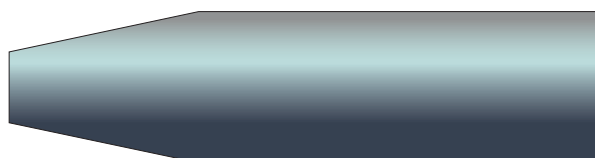
Z5E-4 3620 x g*



Z6E-4 3550 x g*



Z8E-4 3000 x g*



Z92-4 2600 x g*

Tricanter®



Z3E-4 4500 x g*



Z4E-4 4140 x g*



Z5E-4 3620 x g*



Z6E-4 3550 x g*



Z8E-4 3000 x g*

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

TECHNICAL DATA OF FLOTTWEG DECANTERS AND TRICANTERS®						
Model	Z3E	Z4E	Z5E	Z6E	Z8E	Z92
Dimensions* (L x W x H)	2950 x 840 x 800 mm 116 x 33 x 32 inch	3500 x 1000 x 1200 mm 138 x 39 x 47 inch	4200 x 1300 x 1150 mm 165 x 51 x 45 inch	4800 x 1800 x 1250 mm 189 x 70 x 49 inch	6200 x 2000 x 1500 mm 244 x 78 x 59 inch	5900 x 2800 x 1750 mm 232 x 110 x 69 inch
Gross weight*	1760 kg / 3880 lb	3000 kg / 6600 lb	6200 kg / 13600 lb	9750 kg / 21500 lb	14150 kg / 31200 lb	18000 kg / 39700 lb
Motor for bowl drive	18,5 kW	45 kW	90 kW	132 kW	160 kW	250 kW
Motor for scroll drive Flottweg Simp Drive®	7,5 kW	15 kW	55 kW	110 kW	110 kW	110 kW
Max. hydraulic capacity**	15 m³/h	35 m³/h	60 m³/h	80 m³/h	160 m³/h	180 m³/h

* The listed figures are to be understood as guidelines. Actual capacity will depend on the individual characteristics of the feed product.

** Data based on water, g-force depending on temperature, special material and product density. Data to be understood as guidelines.

Flottweg Separation Technology – Engineered For Your Success



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