

**FLOTTWEG CENTRIFUGE TECHNOLOGY FOR
PROCESSING TAPIOCA / CASSAVA / MANIOC STARCH**
High Quality Separation Technology For Your Profit



FLOTTWEG TECHNOLOGY FOR THE PRODUCTION OF TAPIOCA STARCH

Efficient Centrifuge Technology Made by Flottweg

Tapioca starch, also known as manioc or cassava starch is extracted from the roots of the cassava plant. For example, to obtain one kilogram of tapioca starch, approximately 4.4 kilograms of cassava roots are required (25 percent of starch content). The cassava plant has spread throughout Africa and South America; however its use for culinary purposes has become important and has spread all over the world. Additionally, besides corn starch, tapioca starch has evolved as one of the most important sources of starch across the globe.

Often used as a thickener, tapioca possesses a neutral flavor and consists of almost 100 percent of carbohydrates. Moreover, tapioca is protein and fat free and does not contain gluten which symbolizes its importance for today's industry sectors. As a result, the demand for tapioca starch has been increasing, generating applications on an industrial scale (textile, paper and food industry) and showing the importance of this common ingredient.

The steps of the actual process can vary depending on the scale of factories, the availability of cassava roots and on the desired quality etc.

Flottweg Separation Technology, however, satisfies varying customer and consumer needs by using high quality separation technology regardless of prevailing conditions, industrial sectors, or scale of factories.

Flottweg Separation Technology – Your Benefits

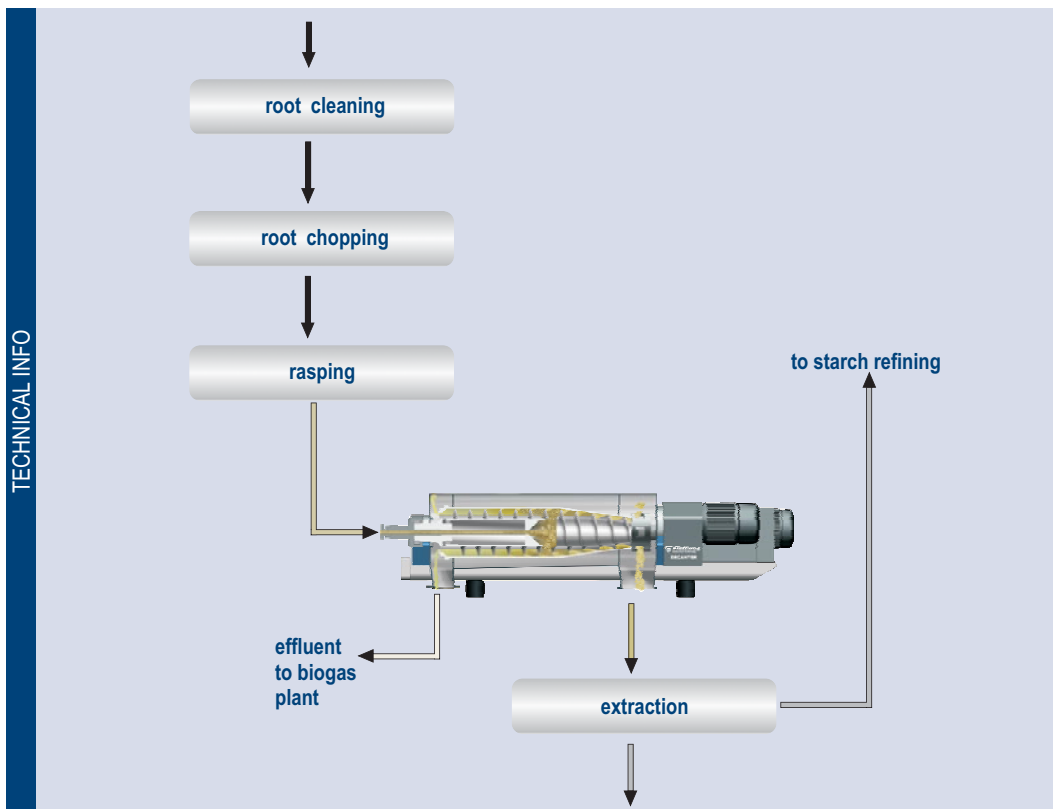
- The Flottweg Decanter convinces customers all over the world with efficiency, durability and high quality, especially when it comes to the processing of starch.
- Flottweg provides almost 60 years of outstanding experience in the field of mechanical separation.
- Plant and system construction for satisfying individual customer requirements as well as perfectly adjusted processes
- 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 because it enables an optimum process even under difficult conditions.
- Flottweg Machines are designed and manufactured to meet all these requirements in order to ensure and provide customers with the best possible results.



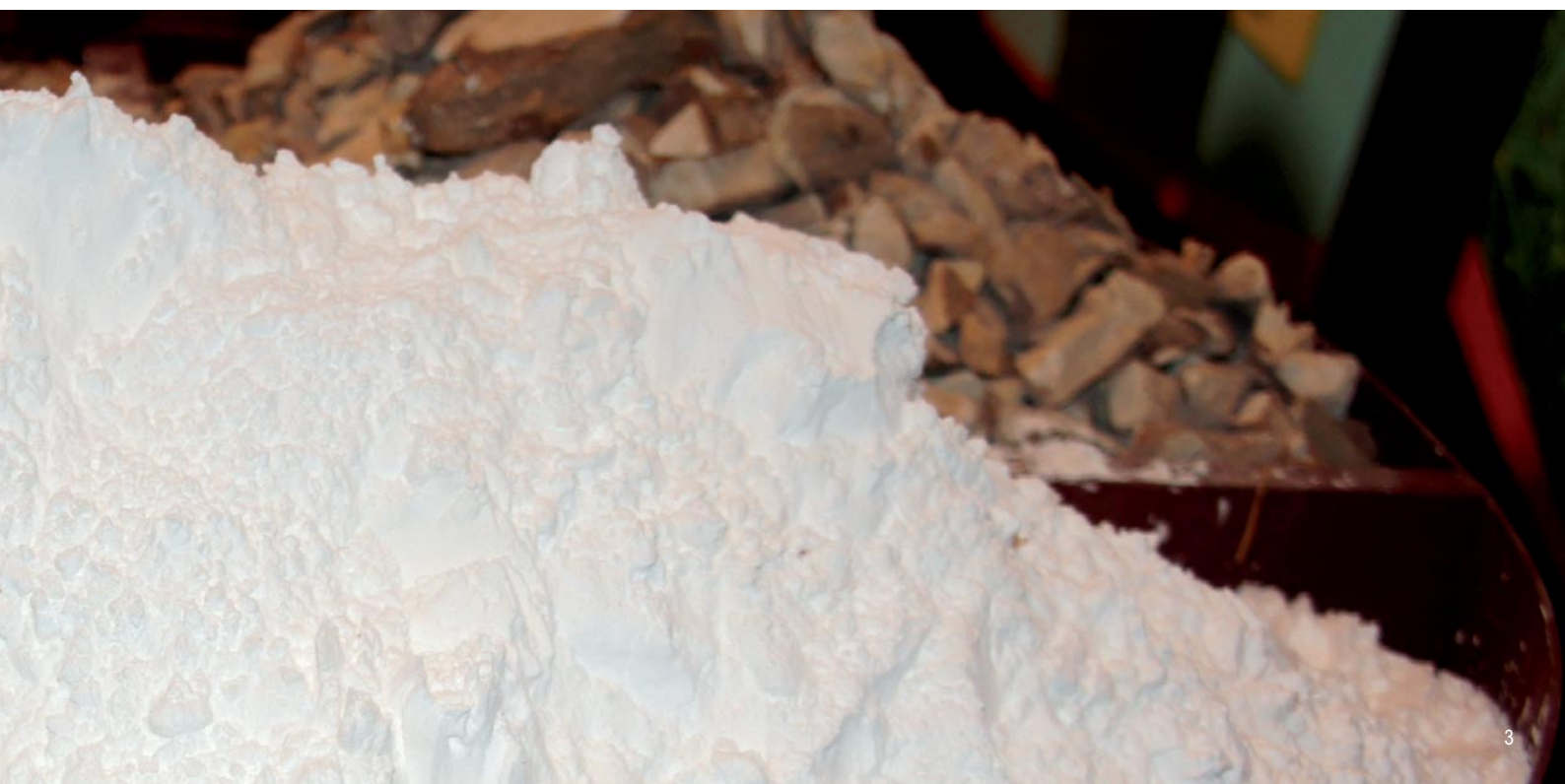
ENGINEERED FOR YOUR SUCCESS

The Process of Obtaining Tapioca Starch

The first step of the process includes cleaning the roots of any impurities, such as sand, stones, or dirt. This pretreatment ensures the faultless function of the decanter or system.



Process overview: obtaining high-quality tapioca starch



2-PHASE OPERATING PRINCIPLE

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 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 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.

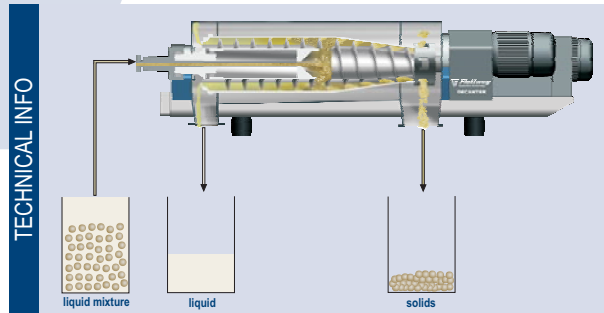


BOWL

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.

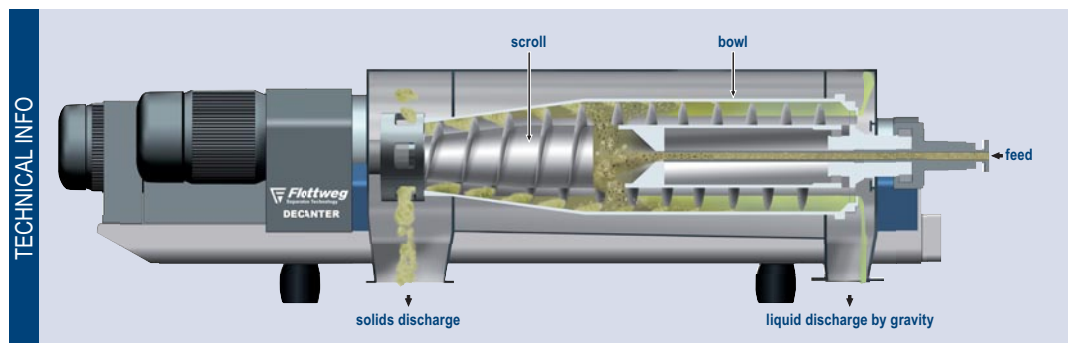


Flow of liquids and solids in a Flottweg Decanter



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.



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

The picture shows a decanter scroll

FLOTTWEG SEPARATION TECHNOLOGY

Power Meets Quality



Flottweg has been developing and producing centrifuges for more than 60 years, including successfully providing high-end machinery for the production of starch. Flottweg impresses customers all over the world with an unique experience as well as an outstanding expertise, especially when it comes to applying and using separation technology for the purpose of processing tapioca starch. Even more, by using Flottweg Systems and Equipment, customers receive significant and unique benefits in comparison to other providers of mechanical separation equipment or systems which will be explained in the following.

As an example: What does it really mean to have 3,000 g and 24,000 Newton meters in a machine? And what role does quality play in terms of that kind of power? Please see the examples below.

As you can see, power in form of high g forces or high torques exist and are present when it comes to mechanical separation with a decanter centrifuge. A continuous and faultless process can only be guaranteed by the high quality of the decanter itself, the materials used and all the other parts involved in the system. Moreover, you as a customer have now a better idea of why you should consider Flottweg as your partner, especially when high quality, durability, and efficiency are indispensable.

Come convince yourself of ultimate Flottweg Quality at www.flottweg.com

Roller coaster: Causes a gravitational force on the human body that is 5 to 6 times higher than normal.

Sportscar (620 hp):
Torque of 700 Newton meters

Flottweg Z8E:
Causes a torque of 24,000 Newton meters while a gravitational force of 3,000 g is present



FLOTTWEG PRODUCT FEATURES

Customer Benefits by Using Flottweg Equipment



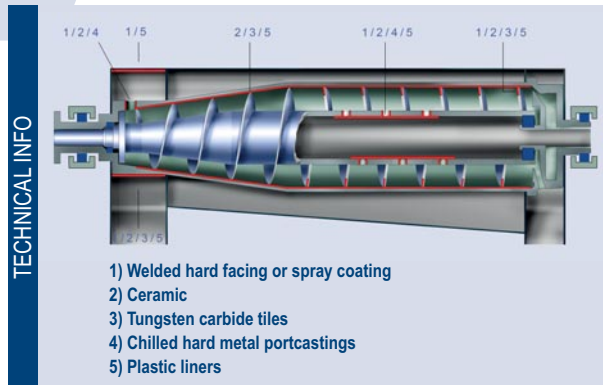
SIMP DRIVE®: SIMPLE, INTELLIGENT, MODULAR AND POWERFUL

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



WEAR PROTECTION

An optimum wear protection is crucial when using a decanter for many applications, especially for starch. All wear parts are protected by special hard surfaces utilizing tungsten carbide or SIC, as well as replaceable wear bushings. Under operating conditions, the Flottweg Wear Protection lasts more than 15,000 operating hours (depending on applications).



Replaceable wear protection elements

ANTI CHATTERING DEVICE

To prevent damages of the centrifuge or the whole system caused by chattering, the centrifuge/system needs to be shut down if chattering vibrations exceed a determined scale. Chattering is defined as rotational vibrations in the power train of the scroll which are measured as increased vibrations at the torque support. Chattering depends on influencing factors such as differential speed, the amount of throughput and/or product characteristics. Flottweg enables a proper and faultless process by measuring the above named rotational vibrations with an appropriate sensor at the torque support. Depending on the degree of these vibrations, operational parameters can be adjusted, so that chattering can be avoided and the process continues flawlessly. Moreover, to guarantee a continuous process, a strengthened scroll shaft and a shock absorber are implemented.

Customer Benefits of the Flottweg Simp Drive®

- High flexibility in selection of the operating speed (differential speed can also be perfectly adjusted)
- 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)
- Machine can be cleared out even without bowl rotation, because the scroll can nevertheless still be turned (no need to dismantle system components)

Customer Benefits of Flottweg Wear Protection

- Increased temperature resistance
- Improved corrosion resistance
- High hardness and protection
- Enhanced surface characteristics
- Improved durability of the decanter
- Increased consistency and reliability of the process

Customer Benefits of the Anti Chattering Device

- No damage to the centrifuge or the whole system
- A sensor monitors the rotational vibrations which can lead to a shut down of the centrifuge/system if chattering exceeds a determined scale
- A reinforced scroll shaft and a shock absorber are provided to guarantee a continuous process.

HIGH QUALITY, EFFICIENCY, AND DURABILITY

Recuvane® and Technical Data



RECUVANE®

The Recuvane® system (recovery vane) is used for cutting the operating costs of the decanter centrifuge used by reducing energy consumption.

Working principle of the Flottweg Recuvane®:

Energy is required in order to accelerate the separation medium to operating speed. The liquid separated from the solid is normally discharged without pressure. This means that the energy contained in the water is lost. The Recuvane® system enables this rotational energy to be recovered by targeted centrate discharge, thus supporting the main drive and reducing energy consumption. It is possible to save 10 to 20 percent of the work energy (depending on the pond depth and the prevailing conditions).



Customer Benefits of the Flottweg Recuvane®

- Less energy consumption of your decanter
- Purely mechanical operating principle, meaning that it is robust
- Cost saving: the drive consumes less energy because the recovered energy can be reused.
- When large quantities of liquid are processed, it is possible to save up to 20 % of the work energy.
- An exact separation process is maintained.
- In addition, several pond depths can be set (eccentric screws).
- Amortization within 1 to 2 years depending on the throughput; or within only a few months if running in 24-hour operation
- Upgrades to existing machines possible without large investments

TECHNICAL DATA

TECHNICAL DATA FOR FLOTTWEG DECANTERS				
Model	Z4E	Z5E	Z6E	Z8E
Bowl diameter	420 mm (16,5")	530 mm (21")	620 mm (24")	770 mm (30")
Rotation speed of the bowl	4200 / min	3500 / min	3200 / min	2650 / min
Materials	All parts in contact with product are made of high-grade stainless steel			
Dimensions (L x W x H)*	3500 x 1000 x 1200 mm	4200 x 1560 x 1140 mm	4900 x 1770 x 1260 mm	6400 x 2000 x 1500 mm
Gross weight*	3000 kg	6200 kg	9750 kg	14400 kg
Motor sizes*	30 + 18,5 kW	75 + 55 kW	132 + 55 kW/75 kW	160 + 90 kW
Capacity*	up to 25 t/h	up to 50 t/h	80 - 90 t/h	up to 170 t/h
Options	Electropolished surfaces, frame in stainless steel, hydraulic, and drive motors			

* The figures listed are guidelines only. Actual capacity will depend on the individual characteristics of the feed product.

Flottweg Separation Technology – Engineered For Your Success



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