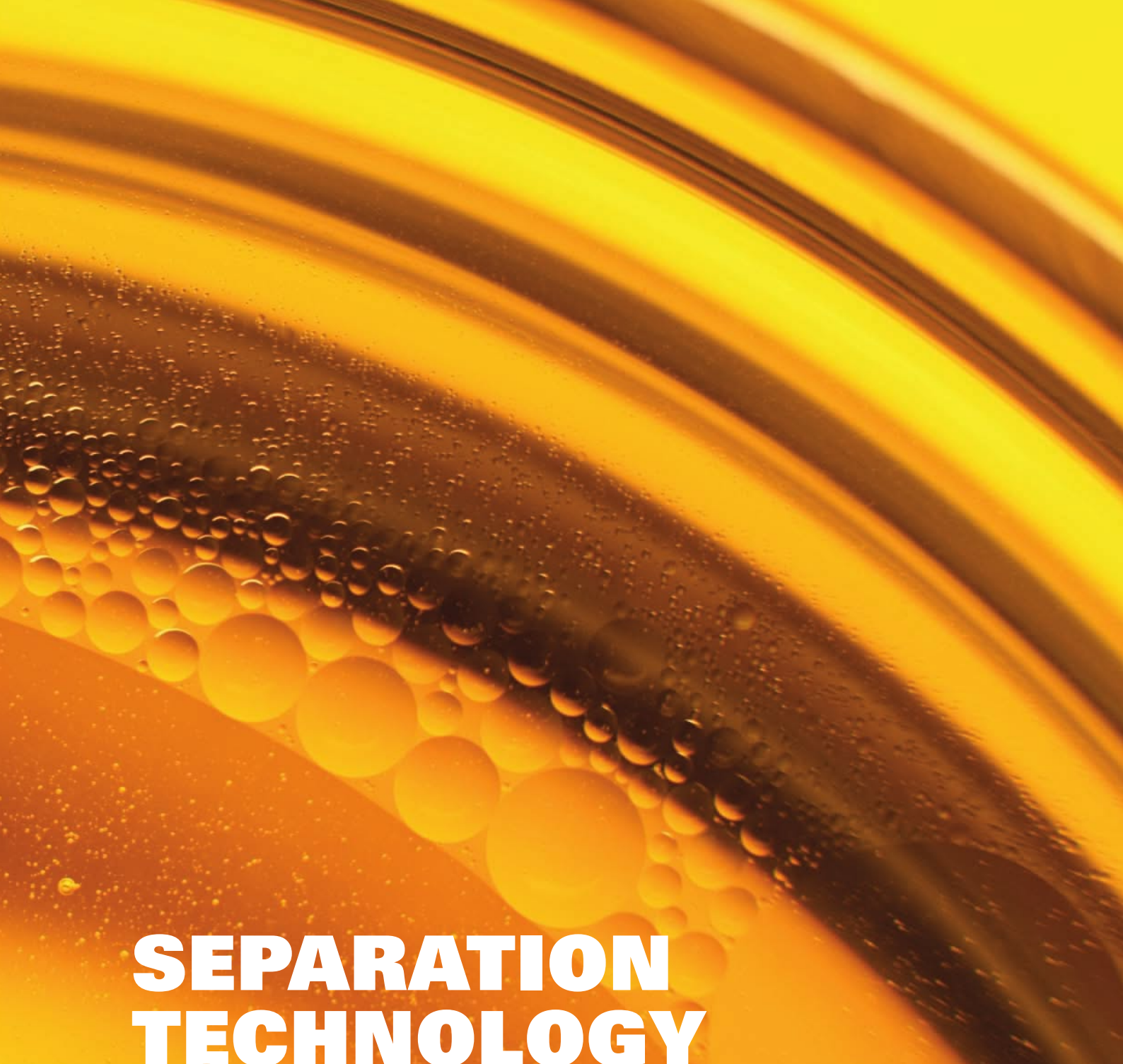




SEPARATION TECHNOLOGY FOR EDIBLE OIL REFINING

The key to high-yield edible oil production



Engineered For Your Success



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OPTIMIZED PROCESSES FOR EDIBLE OIL REFINING

Vegetable oils are among the world's most important foodstuffs. To meet the highest quality standards and ensure cost-effective production, nearly all industrially produced edible oils are refined. Depending on the raw materials and the extraction method, crude oils contain undesirable impurities such as phospholipids, free fatty acids, waxes or solids, which must be removed during the refining process.

Centrifuges are the key technology used for this process. They enable the continuous, efficient and low-loss separation of these components – and therefore play a key role in determining the yield, quality and cost-effectiveness of the overall process.

Flottweg offers the perfect solution:

As the world's leading manufacturer of industrial centrifuges, we have facilitated the extraction of vegetable fats and oils in a wide variety of applications for many decades with our high-performance centrifuges and system solutions. Our key technology can be seamlessly integrated into both existing and new refining processes – with a clear focus on performance, flexibility and maximizing yield.

The benefits at a glance

- **High separation efficiency achieved by configuring the decanter centrifuges and separators to match different feed characteristics**
- **Highly durable and reliable machines for use in chemical and physical refining**
- **High process stability, even with fluctuating feed conditions and raw material qualities, thanks to special machine features**

Flottweg – for the yield-optimized refining of soybean oil, rapeseed/canola oil, sunflower oil, palm oil and animal fats



SUCCESS IS... HIGH YIELD

Centrifuges are used in nearly all key steps in the refining of edible oils:

- Press oil clarification
- Degumming
- Neutralization
- Winterization/de-waxing
- Byproduct processing

Flottweg focuses specifically on the mechanical separation processes – the processes where yield, quality and operating costs are determined. Flottweg decanters and separators handle the solid/liquid separation in these process steps and ensure the following:

- Continuous process control
- High separation efficiency
- Minimal product losses
- Consistent product quality

The refining of vegetable oils is divided into two main areas, and Flottweg products are used in both:

01

Oil clarification (upstream)

- Separation of solids after pressing
- **Flottweg decanter centrifuges** used

02

Refining (downstream)

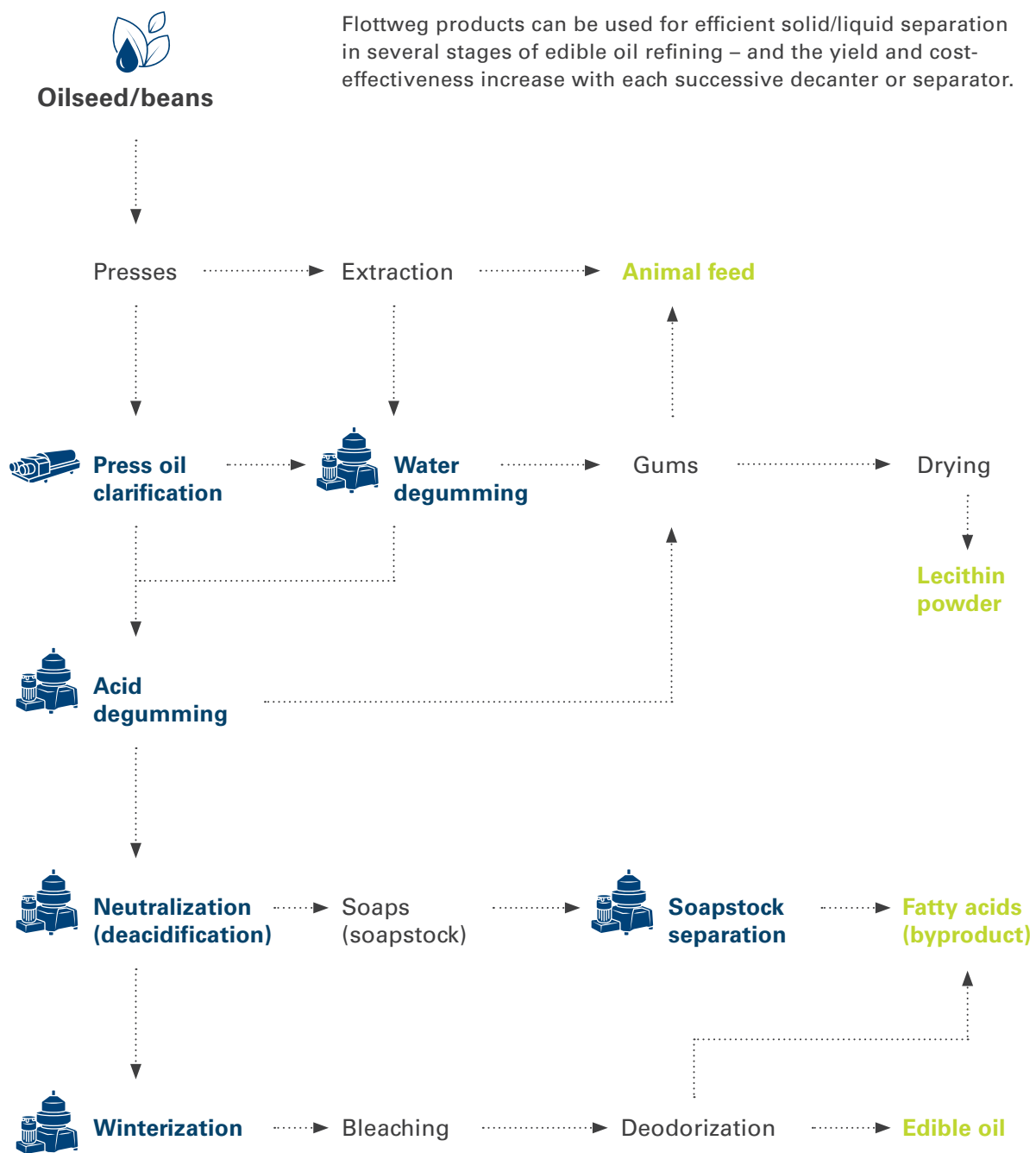
- Removal of dissolved and emulsified impurities
- **Flottweg disc stack separators** used

Typical process steps with Flottweg separation technology:

- Degumming
- Neutralization
- Winterization
- (Downstream: bleaching, deodorization)

Flottweg separation technology increases the efficiency of edible oil refining, stabilizes the overall process and optimizes the profitability of your plant.

APPLICATIONS THROUGHOUT THE PROCESS



PROCESS STEP

PRESS OIL

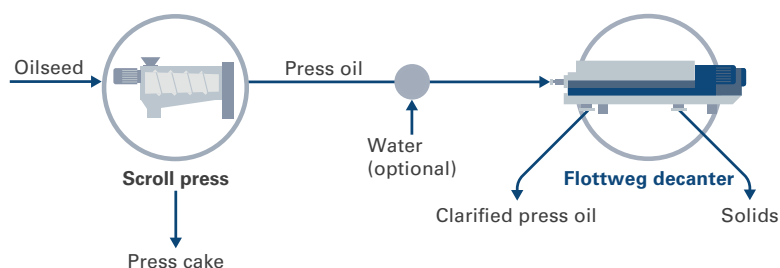
CLARIFICATION

After mechanical pressing, the crude oil contains significant amounts of solids, which must be efficiently removed before the subsequent refining processes. Optionally, about 2–5% water can be added before centrifugation to aid in the separation.

As a side effect of adding water, any phosphatides present are hydrated and can then be removed along with the solids. The purified oil is either sent immediately to further processing or, if it is to be stored or sold, it can be put through a drying process.

Flottweg decanter centrifuges designed specifically for the clarification of press oil are available in various sizes with throughflow ranges from 1 to more than 45 metric tons per hour.

Press oil clarification process using the Flottweg decanter



Benefits of the Flottweg decanter in your process

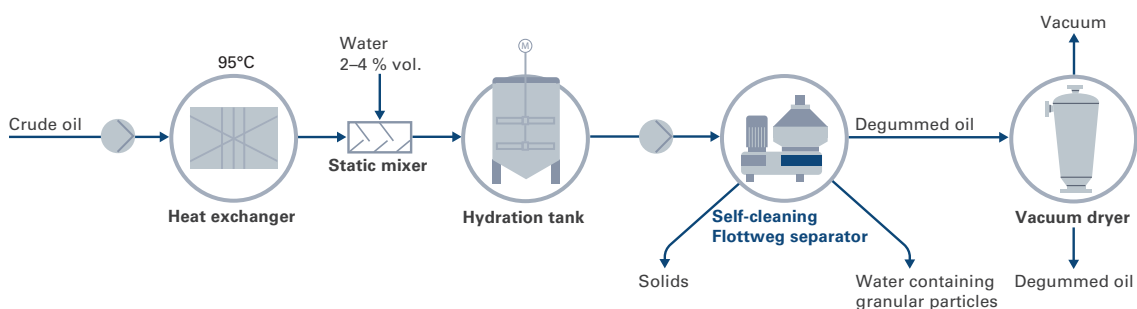
- Produces clear and pure oil thanks to the centrifuge's high clarification efficiency
- Optional addition of water to improve efficiency (some degumming already integrated)
- Higher oil yield, reduced load on downstream process stages
- Flottweg decanter centrifuges are suitable for all types of seed oils
- Stable, continuous operation
- No filter aids required

PROCESS STEP WATER DEGUMMING

The purpose of (water) degumming is to remove phospholipids (lecithin), which impair the storage stability and further processing of the extracted edible oil.

In this process step, the Flottweg separator is used to continuously separate the oil-insoluble phosphatides. The separated solids can be mixed into animal feed. When dried into lecithin, they are used as an emulsifier in the food and pharmaceutical industries.

Water degumming process using the Flottweg separator



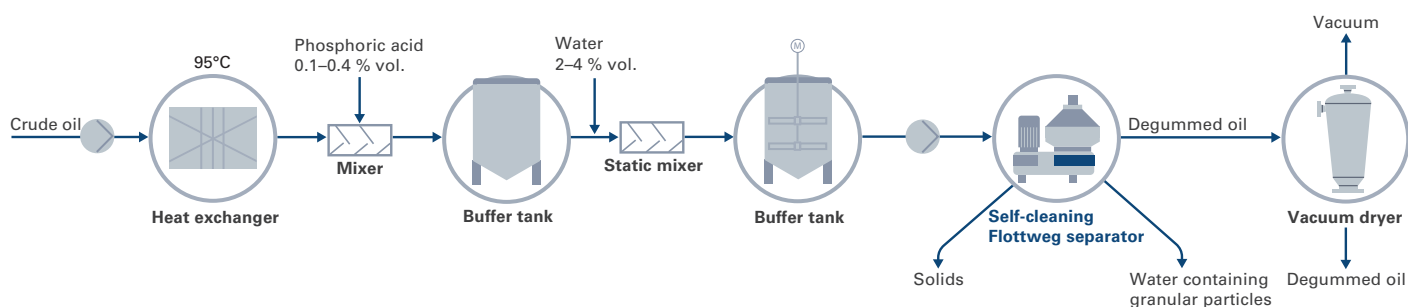
Benefits of the Flottweg separator in your process

- Reliably reduces the gum content in processed oil
- Increases the total oil yield
- Extracts valuable lecithin
- Improves the shelf life of edible oil

PROCESS STEP ACID DEGUMMING

In the processing of palm oil, coconut oil and olive oil – as well as animal fats and oils – up to 0.4 % phosphoric or citric acid is used in the degumming process. This improves the cost-effectiveness of the overall process, as it reduces the need for bleaching earth in subsequent refining steps, for example. The effective separation of phospholipids also reduces buildup in downstream evaporators. This has a positive effect on the overall energy balance and the quality of the product.

Acid degumming process using the Flottweg separator



Benefits of the Flottweg separator in your process

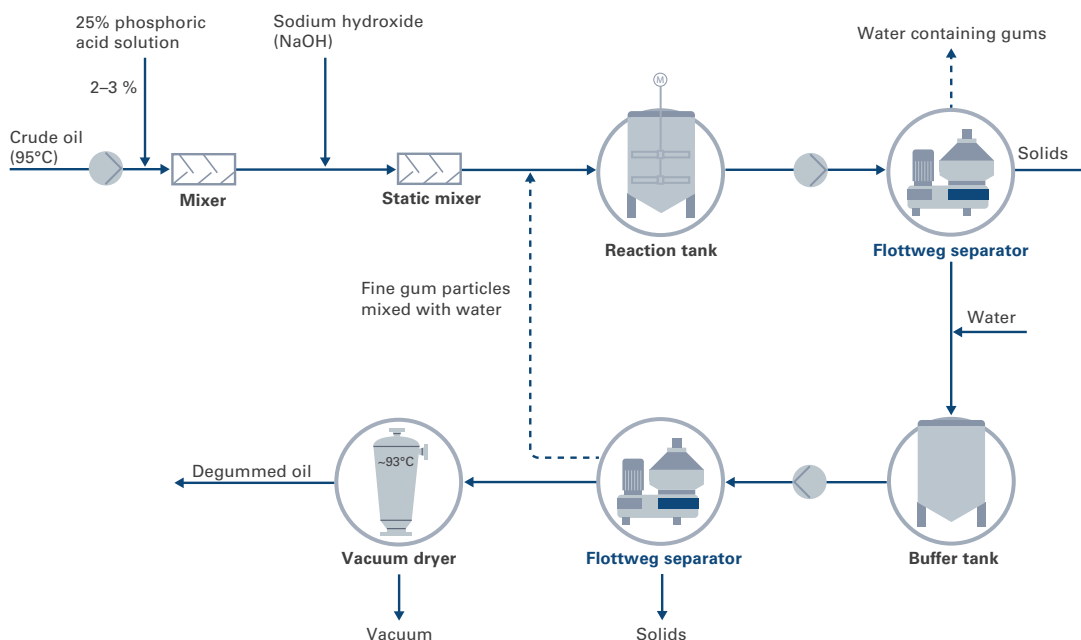
- Improves the quality of the final product
- Generates valuable raw materials for reuse
- Reduces product losses
- Improves process stability thanks to reduced fouling in downstream equipment
- Reduces the need for bleaching earth

PROCESS STEP NEUTRALIZATION

During neutralization, free fatty acids are converted into soap by adding lye and are then removed from the oil. After conditioning and intensive mixing, continuous phase separation takes place in self-cleaning disc stack separators.

Flottweg separators enable the precise separation of soapstock and wash water, even when the crude oil quality varies.

Neutralization process using the Flottweg separator (example)



Benefits of the Flottweg separator in your process

- Reliable process, even with low-quality crude oils
- High-quality end products
- Efficient continuous separation

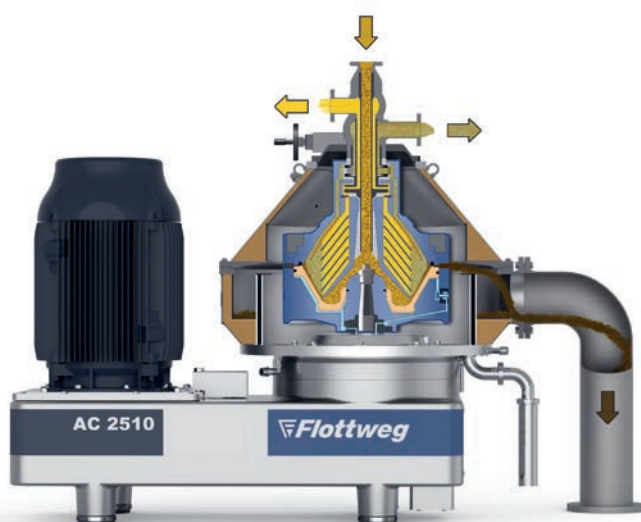
BENEFITS OF THE FLOTTWEG SEPARATOR WITH IMPELLIZER

Innovative solution for the highest yields in the edible oil industry

To meet the special needs of edible oil refining, the AC series can be equipped with the Flottweg Impellizer system to ensure the highest yields.

In the machine, a centripetal pump removes the clean (separated) edible oil from the machine under pressure and without foaming. The heavy phase (phospholipids or soaps) is discharged from the machine by means of an adjustable centripetal pump, known as the Impellizer.

With the Flottweg Impellizer, the separation zone in the machine can be flexibly adjusted. In combination with the Soft Shot® Flex discharge system, the highest yields are ensured, even under fluctuating feed conditions and during solids discharge.



Benefits of the Flottweg Impellizer system

- Optimal adaptation of the separation zone to fluctuating feed conditions
- No machine downtime required in the event of changing feed conditions
- Separated liquid phases discharged under pressure (to prevent foaming)
- Manual or automatic version available with remote adjustment



The Flottweg Soft Shot® FLEX system

Even faster, even more variable, but still quiet as always – Flottweg’s proven Soft Shot® discharge system has taken a new evolutionary step: the Soft Shot® FLEX discharge system.

- Maximum yield and high throughflow
- Silent solids discharge
- Minimized wear of highly stressed components
- Speed-independent operation



Minimal noise development

- Minimal noise: the quietest system on the market
- Water-damped system: less noise and wear
- Safe and comfortable work environment

Technical specifications and refining capacities of the Flottweg separator*

	AC1500	AC2000	AC2500	AC2600	AC2800
Centrifugal force in the bowl [g]	10,400	9000	9000	9000	8400
Installed motor power [kW]	18.5	22–37	37–55	55–75	55–90
Dimensions [mm] (L x W x H)	1535 x 1110 x 1610	1580 x 1160 x 1750	2080 x 1330 x 1970	2080 x 1330 x 1970	2410 x 1310 x 2760
Total weight [kg]	1550	2900	3900	3900	5250
Throughflow [t/day]	23–150	45–290	95–500	95–750	500–1250

* The data listed here are intended as guide values. The actual throughput depends on the characteristics of the respective product. Subject to technical changes.



THE FLOTTWEG LONGLIFE CONCEPT

Durability for demanding processes

All Flottweg disc stack separators operate under extreme conditions thanks to their operating principle – high speeds, mechanical stress and continuous operation entail very high demands on maintenance, wear resistance and availability.

This is exactly where the Flottweg LongLife concept comes in: It combines robust engineering, intelligent automation and maintenance-friendly design to create a solution that minimizes downtime and maximizes the life of your machines.

The Flottweg LongLife concept at a glance



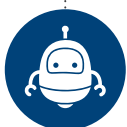
Bowl & discharge system

- “Made in Germany” – the central centrifuge components are of the highest quality
- Hydraulically damped Soft Shot® FLEX system for gentle, precise bowl discharge and long service life (with AC series)
- Contactless seals and minimum number of wearing parts for attractive operating costs
- Compact design for easy assembly/disassembly as a complete module



Drive unit

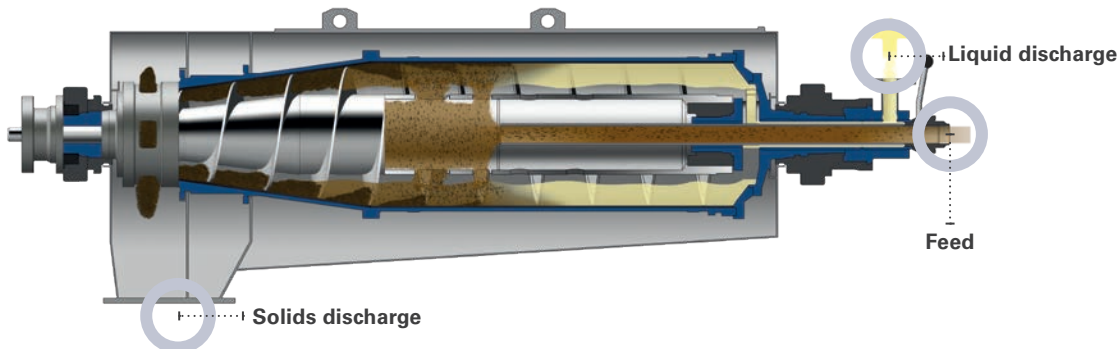
- Standard motors for high availability
- Closed lubrication circuit for long bearing life
- Maintenance-friendly compact spindle unit
- Low-vibration, quiet operation thanks to robust belt drive



Automation & monitoring

- Flottweg touch control for continuous monitoring of speed, vibration and temperature
- Early detection of abnormalities to avoid downtimes
- Advanced condition monitoring with the Motice Condition Monitoring system

BENEFITS OF THE FLOTTWEG DECANter



Adjustable impeller

The adjustable impeller can vary the pond depth continuously during operation, allowing for quick and precise adaptation to changing feed conditions.

- Highest separation efficiency, even with varying feed mixture composition
- Optionally available with automatic remote adjustment
- Discharge of the liquid phase under pressure. An additional conveying pump can be omitted, if necessary
- On request: fully automatic control by turbidity measurement in the oil or liquid phase



Flottweg Simp Drive®

The Flottweg Simp Drive® regulates the differential speed according to the scroll torque. As a result, the Flottweg decanter automatically adapts to varying load conditions, de-oils the separated solid cakes to achieve maximum total dry solids, and thereby increases the oil yield.

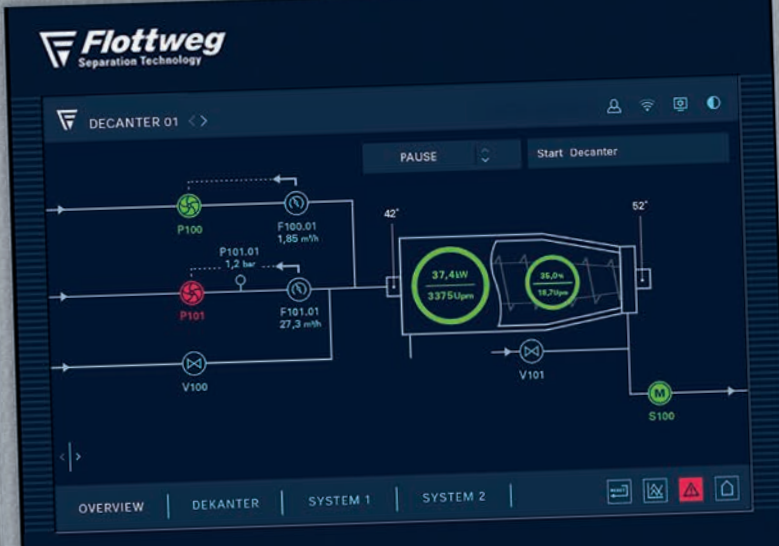
- Flexible adjustment to different process conditions (raw material qualities)
- Minimal energy consumption thanks to high efficiency
- The machine can also be emptied while it is stopped, since the scroll can be rotated independently of the bowl (no system components need to be removed).

Technical specifications and refining capacities of the Flottweg decanter*

	Z3E-4/4X1	Z4E-4/4X1	Z5E-4/4X1	Z6E-4/4X1
Solids in the feed [% vol.]	3–7 (2–4 % w/w)			
Temperature [°C]	85–95			
Capacity [m³/h]	1–5	6–16	17–27	28–45
Light phase output [% vol.]**	0.1–0.5 (0.1–0.2 % by w/w) depending on the feed and process parameters			
Drive power [kW] (bowl/scroll)	18.5/4.5	22/11	45/22	75/22
Bowl diameter [mm]	300	420	530	620

* The data listed here are intended as guide values. The actual throughput depends on the characteristics of the respective product. Subject to technical changes.

** Adding 2–5 % water before clarification can increase separation efficiency.



INTELLIGENT AUTOMATION WITH INGO

With digitization for maximum process reliability

Modern processes demand intelligent control – simple, reliable and flexible. With the Flottweg automation solution, operators of our centrifuges receive a powerful tool for optimum control and adaptation of the separation process.

The user-friendly InGo user interface with a 12" HMI and Siemens hardware is integrated as standard in all separator sizes and allows intuitive operation without restricting the range of functions.

Thanks to freely programmable recipe control, products can be processed individually with adapted process parameters. The system is complemented by numerous options such as the Safety Shot (for the AC series: safety in the event of a power failure), Flottweg Motice (condition monitoring of the bearings), the integration of peripheral devices and remote maintenance.

The plug & play solution consisting of control system, skid and machine is perfectly matched to each other.

Automated processes such as the fully automatic CIP cleaning program increase process reliability, reduce operating errors and increase productivity. The automatic feed and discharge control ensures the best possible clarification and fast reaction to changing feed conditions.

Your benefits at a glance

- Thanks to Flottweg InGo: fully automatic operation with intuitive user guidance
- Universal control with 12" HMI and Siemens hardware – standard with all separator sizes
- Freely programmable recipe control for maximum flexibility
- Advanced monitoring functions: Safety Shot (for AC series), Motice, vibration and temperature monitoring
- Plug & play system: perfectly matched unit consisting of control system, skid and machine
- Fully automatic CIP program for high process reliability
- Automatic feed and discharge control for optimum separation performance



FLOTTWEG PROCESS CENTER: WORKING FOR YOUR INVESTMENT

Flottweg decanters and separators are customized to meet the specific requirements of each industry. This ensures that your machine settings are optimally tailored to your specific application. For new applications and process variations, we test your product or raw materials at the Flottweg Process Center under real-world conditions – from the initial analysis through to industrial scales. This allows you to make decisions based on validated data before you invest. At the Flottweg Process Center, we can determine the following and more under real-world conditions:

- Whether the planned separation process will work reliably
- Which Flottweg separation technology is best suited for the overall process
- What separation results and yields can be achieved





Our approach

Laboratory > Technical center > Scale-up

- Laboratory: Rapid feasibility analysis
- Technical center: Tests using original machines
- Scale-up: Transition to industrial processes

Our specialists will help you make informed decisions and get the most out of your application.

Typical use cases

- Development of new applications
- Optimization of existing processes
- Scale-up from the laboratory to production
- Comparison of process variants
- Analysis of optimization potential

Your benefits

- Optimized machine design
- Faster commissioning
- Greater process reliability
- Verifiable performance metrics

Less investment risk overall



FLOTTWEG QUALITY AND SERVICE



Guaranteed Flottweg quality

Typical “Made in Germany”: we have a clear understanding of what quality is and do not compromise on it. In the food industry, our products must comply with high standards of hygiene. Therefore, the Flottweg centrifuge components that come into direct contact with the medium to be processed (e.g. bowl, scroll, and feed) are made exclusively of high-grade, rust and acid-resistant stainless steels. This also makes it possible to increase the strength and improve the resistance.

Our machines are equipped to meet your requirements permanently – in extreme cases 24 hours a day, 7 days a week. Our strict quality controls (ISO 9001:2015) and the traceability of all critical components ensure additional product safety.



Our service – always there for you!

Over 1,100 employees worldwide in a network of more than 60 sales and service locations are available to assist you. We not only strive for first-class advice on the selection and design of our systems, but we are also there for you afterward, whenever you need us – in more than 100 countries around the world.



Success can be planned. In just three steps.

Are you planning your own success story for your products?
Then get in touch with Flottweg and benefit from our 3-step roadmap:

01

We discuss your separation task and business goals with you.

02

In the pre-engineering stage, we analyze your raw materials in our laboratory and carry out customized tests at the Flottweg Technical Center or on site at your business premises. The first product samples can also be provided at this point.

03

After the design and detailed development process, you will receive a concrete offer including all relevant line figures for your individual Flottweg application.

Make Flottweg the engineer of your success:
Our sales partners are looking forward to hearing about your ideas and challenges!



Flottweg worldwide

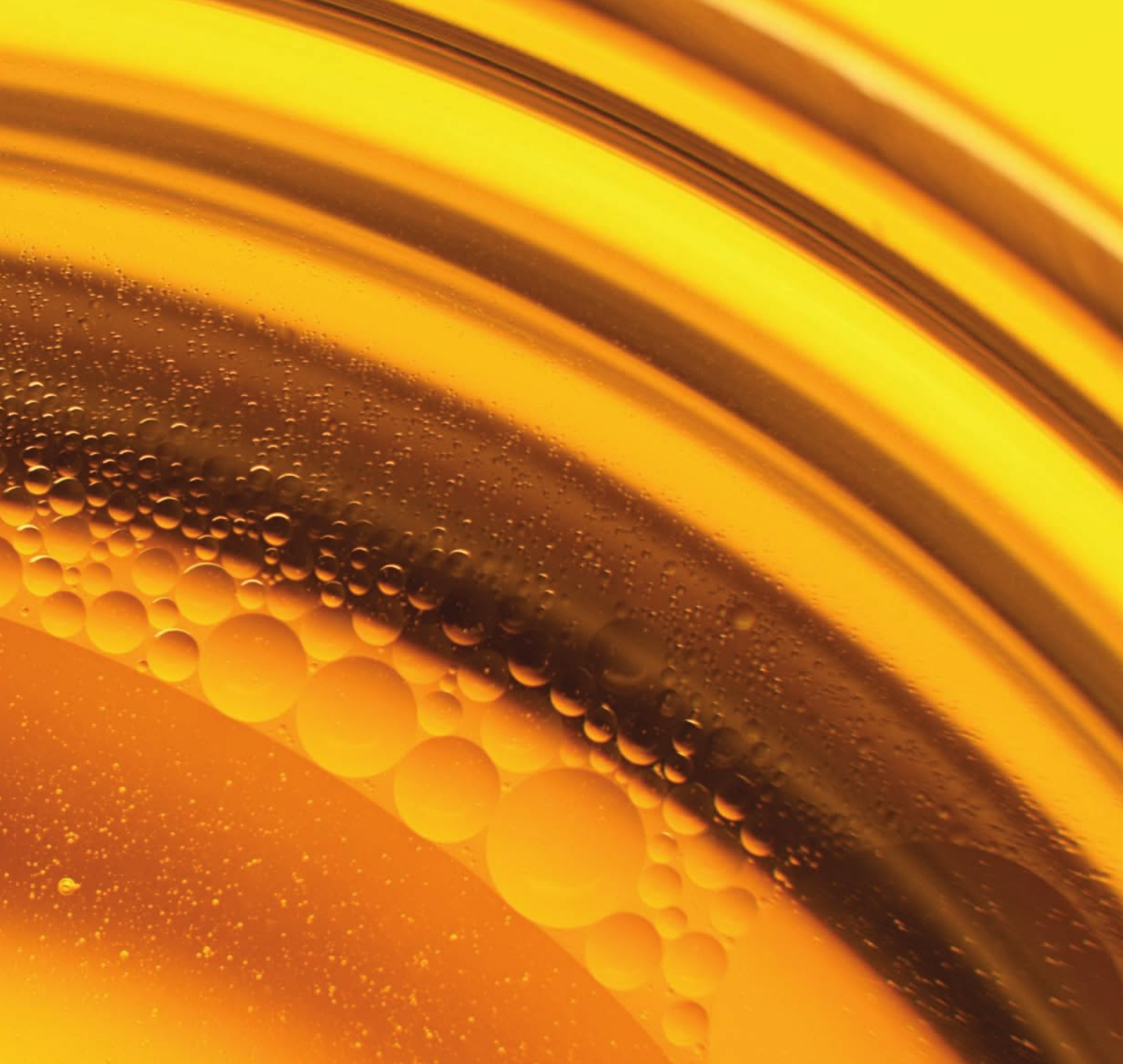
To be able to serve our customers worldwide, we maintain an international sales and service network: we are represented in over 100 countries. All branches and representatives have specially trained service technicians, some of whom we train in our in-house Flottweg Academy.

12
international
subsidiaries

Projects in over
100
countries

Over
50
service centers

- – Headquarters
- – Subsidiary
- – Representative



Flottweg SE

Industriestraße 6-8
84137 Vilsbiburg
Germany
Tel.: + 49 8741 301-0
[Contact form](#)
mail@flottweg.com
www.flottweg.com

