



Think plant-based

Pioneering extraction technology
for oat, spelt and rice beverages



Deliver the alternative

Cereal-based beverage products are seeing rapid growth in variety and market share worldwide. GEA offers leading experience to producers attracting modern, conscious consumers with plant-based “milk”.

Oat, spelt or rice – the fast-growing alternative

Plant-based beverage products are increasingly taking up space alongside traditional milk in today’s cafés, supermarkets and kitchens. Like soybean and almond variants, modern oat, spelt or rice products are particularly in demand with young urban consumers who value individual taste, health and fitness and who are asking for lactose-free, climate-friendly and animal-friendly foods. Plant-based beverages are highly sustainable products, entailing less energy consumption, use of agricultural land, ocean acidification and greenhouse gases. Around the world, producers are seeing growing market opportunities and rely on GEA to deliver efficient processing systems for these beverages.

Turning ancient crops into tasty drinks

Oats, spelt and rice are among the oldest cultured crops. But transforming them into consistently

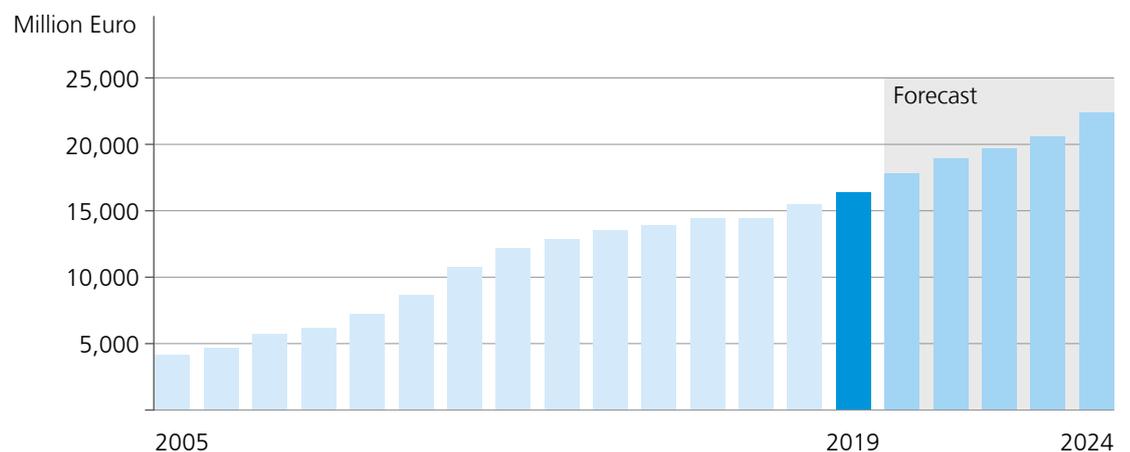
satisfying drinks still poses challenges. It takes sophisticated extraction technology to obtain beverages from cereals, with the full range of quality properties that consumers demand. Much fine-tuning is required to get the flavor and feel in the mouth just right.

From GEA for you: The complete solution

GEA is a partner for you to achieve the best results, with comprehensive process know-how and technology solutions based on decades of expertise for the full process – from conditioning of raw materials, high-shear dispersion and enzymatic treatment to the extraction stage with decanter centrifuges, mixing, blending and packaging.

The time is right for ambitious manufacturers and GEA experts to bundle their knowledge to make the most of your ingredients

GLOBAL SALES OF PLANT-BASED BEVERAGE PRODUCTS COMBINED



Smooth power for high yield, quality and hygienic safety

A decanter centrifuge is the indispensable tool for beverage producers to extract liquid product from mashed and watered cereal grains, ensuring high yield, optimum hygienic purity and premium taste.

Efficient extraction of liquids from high-solid dispersions

Decanter centrifuges are used in food, beverage and dairy processing systems (and in numerous other industries) for juicing, clarification, product recovery and other purposes, with consistent success. A decanter centrifuge separates the liquid phase from dispersions with high solid content and does it more efficiently than a filtration solution can.

The machine operates without a filter, simply by centrifugal force. Its two key components are a cylindrical-conical bowl and a scroll inside of it, both rotating at high, but differential speed. This setup ensures smooth product transport at high volumes, gentle extraction of the liquid and efficient discharge of the fully dried solids.

High-performance GEA CF Decanter Centrifuge design

State-of-the-art GEA CF Decanter Centrifuges present the most efficient solution to extract liquids in large quantities and at optimum product quality.

Special reasons for their top performance include high bowl speeds and an enormously high scroll torque in conjunction with an effective control system to synchronize differential speed and solids load.

The machines are easy to integrate and ready for fully automated continuous operation, ensuring results that are always first-class, fully reproducible and traceable.





Trusted hygienic excellence

Producers within the food chain must meet high hygienic standards in terms of raw material quality, handling and processing. These high requirements are setting the standards for GEA as a supplier. GEA centrifuges are conceived for application in the most hygiene-sensitive industries, such as dairy and chemical manufacturing as well as food production. The sanitary GEA CF Decanter Centrifuges provide the highest hygienic standards available on the market for food and beverage processing.

Treating microbially sensitive products in a GEA CF Decanter Centrifuge is a sealed process, ensuring exceptionally high product and process safety. The special design of the machine prevents product residues and improves CIP-ability. A feed

system with optimized product distributor ensures smooth acceleration of the cereal slurry. Solids and liquids discharge port designs are hygienically optimized. Our machines are equipped with smooth surfaces (Ra 0.8µm) in all product-wetted areas. We use FDA-approved components for these areas and for other machine parts. Special weld-on spray nozzles are in place to clean outside surfaces in an optimized spray cycles sequence.

Improved CIP-ability

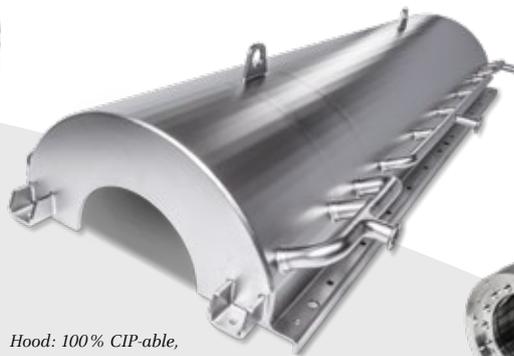
Fully automatic CIP routines ensure product safety and smooth operation with minimum effort.

- Safely clean machine
- No dead ends or dirt traps
- No product or CIP residues
- Minimum loss of CIP liquids

SPECIAL HYGIENIC COMPONENTS AND MATERIALS



Scroll: Smooth surfaces, minimized gap widths, no edges in inflow



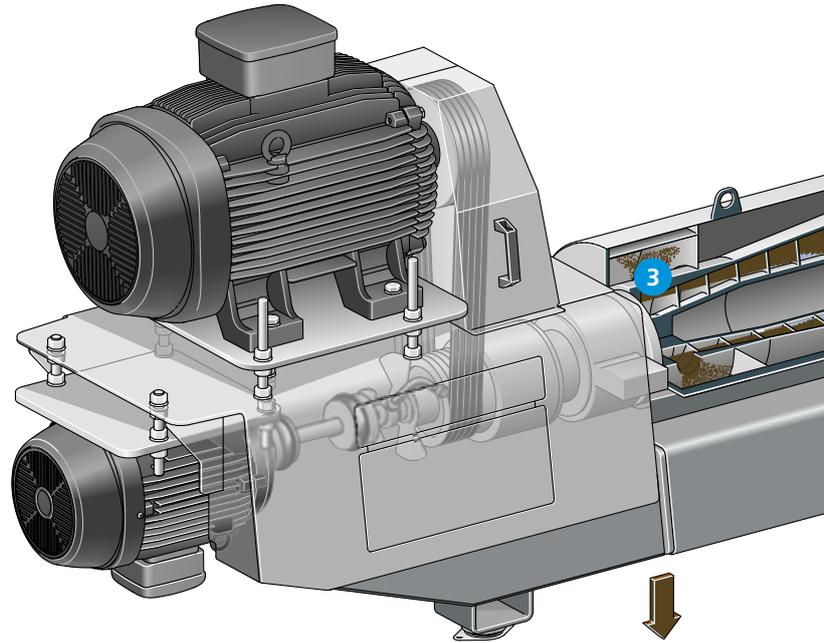
Hood: 100% CIP-able, inert sealings



Bowl: Smooth surfaces, minimized gap widths

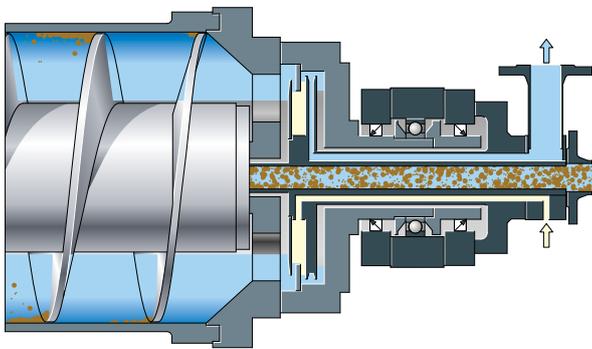
HOW GEA CF DECANter CENTRIFUGES WORK

- 1 The product enters the machine through the feed tube.
- 2 A distributor conveys it into the separating chamber where it is accelerated to operating speed. Through centrifugal force the solid particles sediment on the bowl wall.
- 3 In the conical bowl section the solids are fully dried, then discharged through openings in the rear.
- 4 The clarified liquid flows through the flights of the scroll to the front end and leaves the separation chamber by means of centripetal pumps.



GEA varipond® – reliable mastery of performance settings

Each GEA Decanter Centrifuge is optimized for maximum efficiency. GEA varipond means “variable pond depth with machine running”. To adjust the centrifuge operation to the different process conditions, the GEA varipond technology flexibly adapts the pond depth, and thus the liquid level, resulting in longer retention time for the solids under g-forces. In consequence this achieves higher clarification efficiency. It also keeps the concentration of the ejected solids at a constant, pre-set value, even in cases of dramatically fluctuating feed conditions.



The unique GEA varipond design fits perfectly into the concept of hygienic design by avoiding mechanical parts in the product area and dead ends.

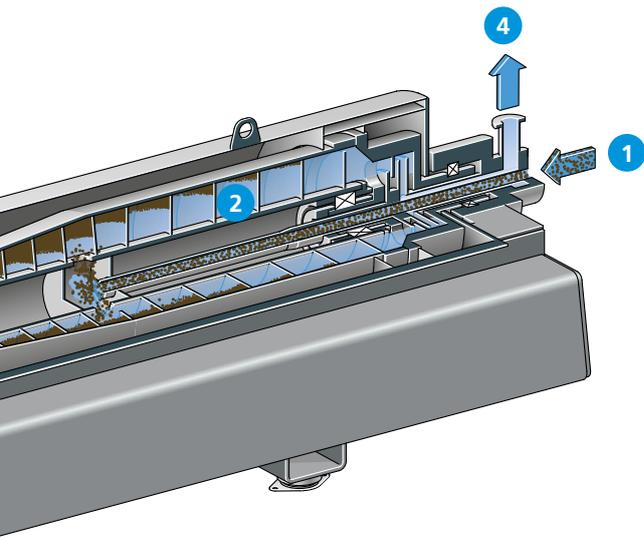
The possibility of automated operation and parameter settings in a recipe program ensures perfect performance with changing process conditions, raw materials and different requirements of the final product.

Superior design features and benefits

GEA Decanter Centrifuges offer outstanding results in terms of first-class separation performance and high feed capacities.

High rotor speeds ensure maximum separation efficiency and high through-put capacities, but also high dry substance values of the ejected solids and thus superb yield.

The hydrohermetic sealing in GEA Decanter Centrifuges is an essential feature when it comes to sensitive and foamy products, setting the standard to ensure reliable product handling and prevent foam formation. This system is wear-free and also reduces oxygen pick-up by the product.



GEA CF DECANTER CENTRIFUGES AT A GLANCE

- High yield and throughput – more product in less time, from less resources
- Effortless processing control – thanks to continuous, fully automatic operation
- Easy CIP-able, hygienic integration
- Superior product safety and quality – reproducible and traceable
- Less consumption and lower costs, thanks to high separating efficiency
- Simple maintenance and repair

Smooth flow paths as well as gentle product feed systems have been engineered to prevent all excessive force for the best possible quality of the product. A deep pond, a sensitive centripetal pump and a gentle distributor all guide the product with minimum pressure, resulting in gentle product handling overall.

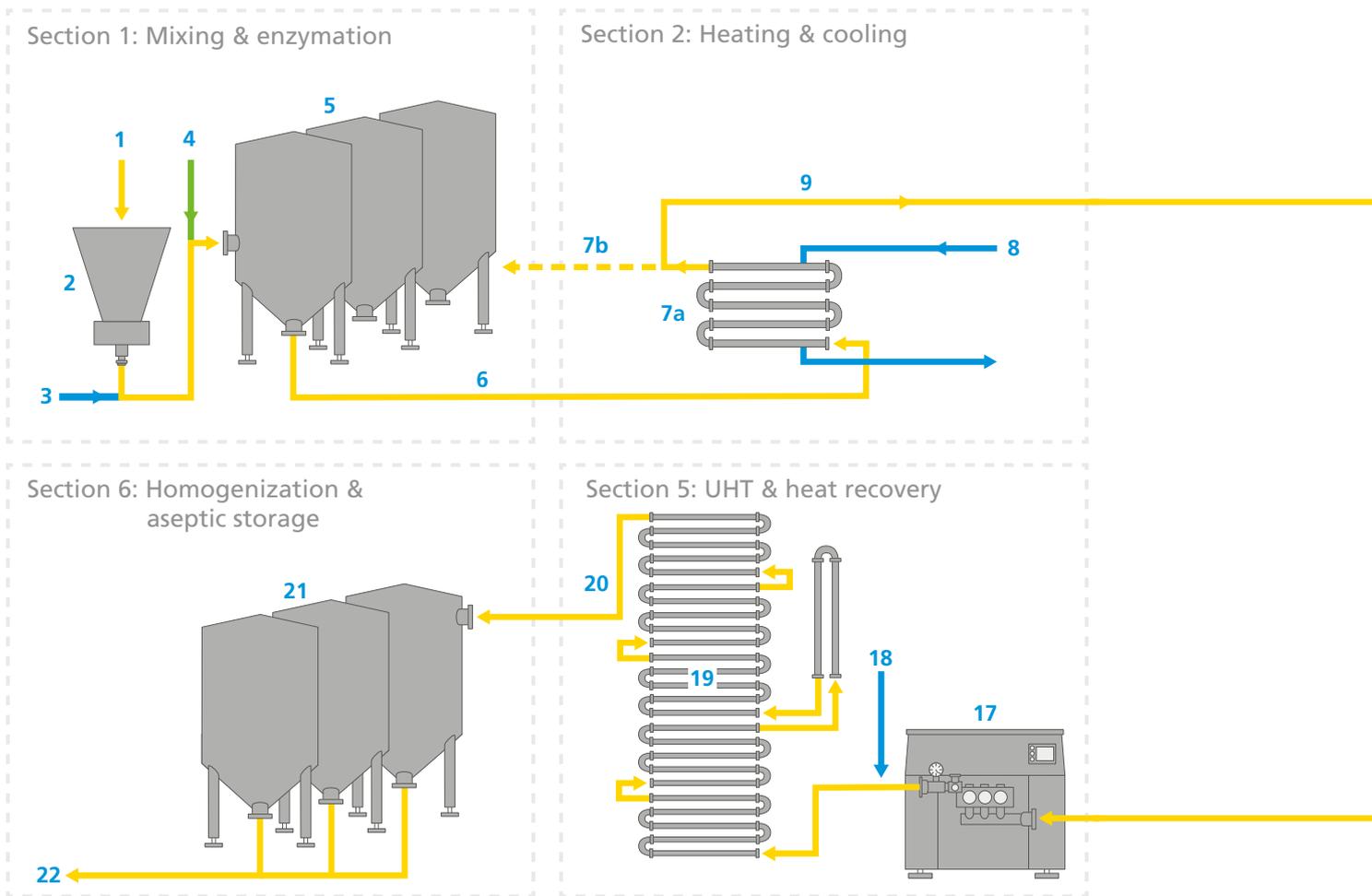
Reproducible and traceable results are key in many processes today. GEA Decanter Centrifuges offer comprehensive and flexible recipe administration in the control unit, allowing for reliable adjustments of machine and process conditions from one batch to the next one.



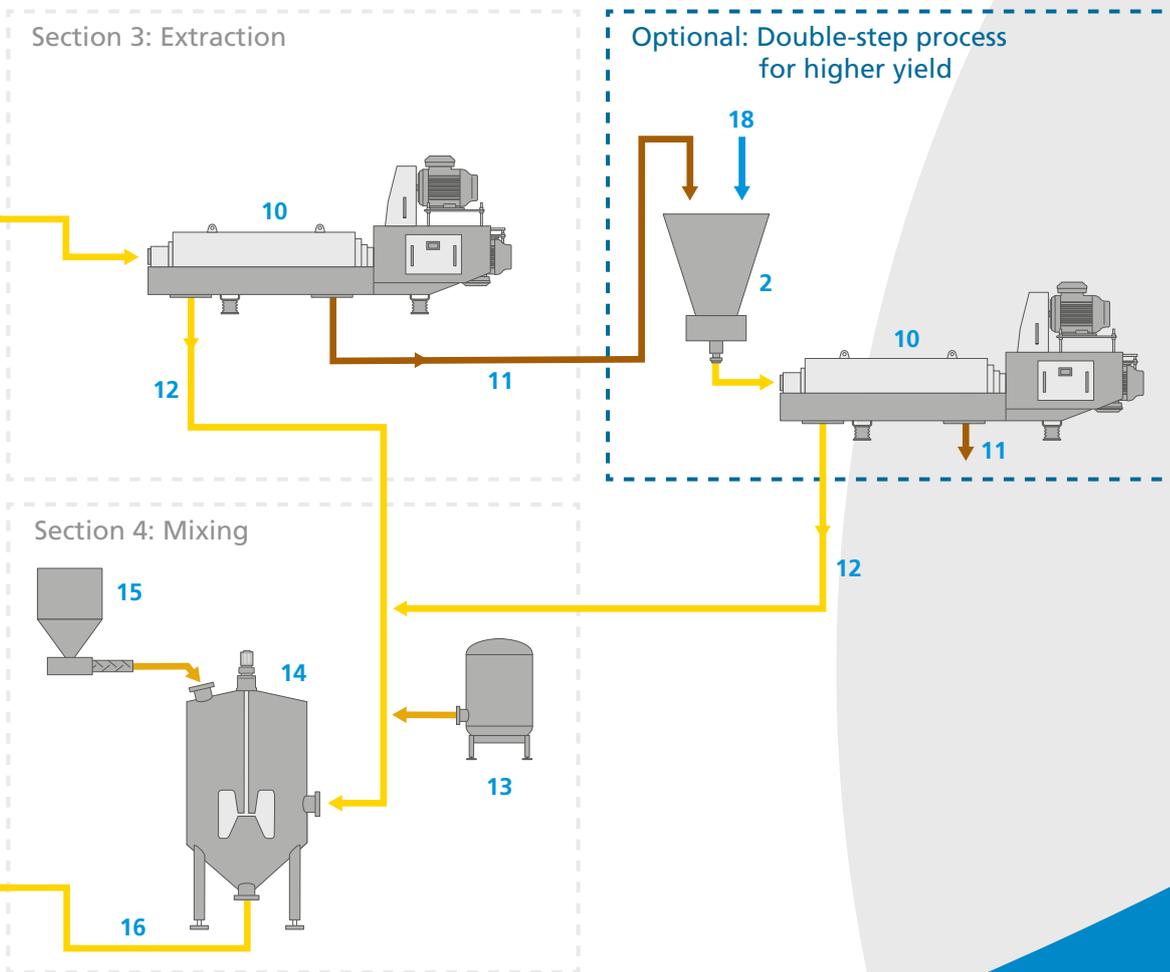
The plant-based beverage process

Oat, spelt and rice beverage products are produced in a single- or double-step extraction process.

SINGLE- AND DOUBLE-STEP PROCESS FOR OAT, RICE AND SPELT



- | | | |
|--------------------------------------|--------------------------------------|---|
| 1 Flour | 8 Hot/cold water | 16 To homogenization |
| 2 Mixing station | 9 Decanter feed | 17 Homogenization (opt.)
before or after UHT |
| 3 Water | 10 Decanter | 18 Diluting |
| 4 Inline enzyme dosing for 1st stage | 11 Okara or grain solids | 19 Heat treatment |
| 5 Tanks farm | 12 Starch drink base | 20 To store |
| 6 Slurry | 13 Dosing station liquid (e.g. oil) | 21 Aseptic storage tanks |
| 7a Heating/cooling | 14 High shear mixing | 22 Final product to filling |
| 7b 2nd stage enzymation (opt.) | 15 Dosing station powder (e.g. salt) | |



The process steps with GEA

GEA provides solutions to cover each step of the plant-based beverage production process (example: oat processing).

There are two main options for the raw materials to start with: whole oat kernels or oat flour. The use of oat kernels means high investment and operating costs for grinding equipment, but the raw material is cheaper. Oat flour, on the other hand, is more expensive but keeps investment and operating costs low and flexible – this is the option most commonly used.

Section 1: Mixing & enzymation

The flour arrives at the plant, e.g. in big bags, and is first mixed with hot water – innovative GEA inline systems prevent clogging. The hot water makes the oat starch gel to increase viscosity and optimize the efficiency of the enzyme reaction.

After inline enzyme dosing and high-shear mixing, the subsequent enzymatic reaction breaks down the starch into dextrin or sugar (while quickly reducing the viscosity).

Section 2: Heating & cooling

A return loop for a second enzymatic reaction can be added to the process layout to break the dextrin down into different saccharides according to the given sweetness profile. In that case the slurry is first cooled to optimum reaction temperature. An option could be to deactivate the enzymes just before extraction, this would be realized by heat treatment.



Section 3: Single- and double-step extraction

The slurry is now fed into the GEA CF Decanter Centrifuge for the central step: to separate the undesired fibers and keep the desired starch and β -glucans in the product.

A second extraction step can be added, with an additional GEA CF Decanter Centrifuge, to increase solid and protein yield. The grains from the first step are washed with water, resulting in a water-adding reduction before heat treatment.





Section 4: Mixing

The extracted oat base is then formulated with different ingredients, e.g. oil for giving a better mouth feeling, as well as salt or other flavors. Dedicated dosing and high-shear mixing systems are used for this.

Section 5: UHT & heat recovery

Oat drinks are sold as a ready-to-drink beverage in a container with long shelf life. To make this possible, the beverage undergoes Ultra High Temperature treatment (UHT) and is then filled using aseptic equipment. The direct method to realize this, putting the product in direct contact with the hot steam, achieves a fast heat transfer and a gentle product flow. Alternatively, a safe and

economical process is also possible where the product is not in contact with the heating media. The selection of method depends on product properties and production mode. Heat recovery equipment can be included to save energy in both processes.

Section 6: Homogenization & aseptic storage

The homogenizer in the plant will take care of the required fine distribution of particles and fat bubbles in the product. A deaerator will be used to reduce oxygen from the beverages. Both processes lead to an aseptic beverage that can be stored under aseptic conditions before filling.

Turnkey solutions from GEA

In addition to GEA CF Decanter Centrifuges for the central extraction step, GEA's solution portfolio includes compatible solutions for feeding, inline dosing, high-shear mixing and all heating and cooling steps. Fully automated GEA systems deliver a continuous process to ensure maximum use of plant time.

From testing to reliable upscaling

Minimize your investment risk. Our GEA Test Center Separation offers fascinating options for reliable, scalable testing of your next process ideas.



GEA's Process Test Center Separation offers fascinating options



Both process steps and entire processes may be tested



Real-life tests ensure your investment and reliable upscaling

Plant-based beverage processes are in constant evolution in order to satisfy consumer' tastes. Minimize your investment risk: With GEA it is easy to test new processes and product concepts in economical real-life simulations that can be scaled to any production goal.

Your needs are individual and important to us; our worldwide network of test centers has been created to meet those needs. The test results can be scaled with elaborate methods to any planned production volume to enhance production and expedite time-to-market. Often in collaboration with universities and depending on the application, GEA engages in scientific research to better understand the procedures and processes involved in manufacturing.

GEA Test Center Separation

GEA's separation experts at our test center in Oelde, Germany, show you the way to adjust the extraction flow and speed to the finest degree, to yield exactly the product that you want and the quantity you need.



Book your ticket to success at gea.com/contact



[GEA Test Center Heat Treatment/Aseptic Filling](#)

At our test center in nearby Ahaus, Germany, you can complete your product and production tests with simulations of heat treatment and aseptic filling processes.

[Test machines and services at your facilities](#)

Test machines from GEA are available for trials at your production site under real-life conditions. Our on-site process development assistance is available anytime to help during the start-up phase with a new machine, train your staff or to make changes at a later stage.

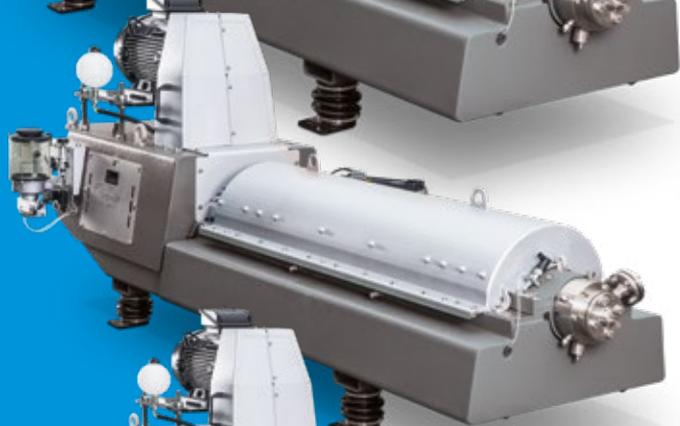
Wherever you are, a GEA Test Center representative is near you to discuss your test or research program with you.

We are ready for you

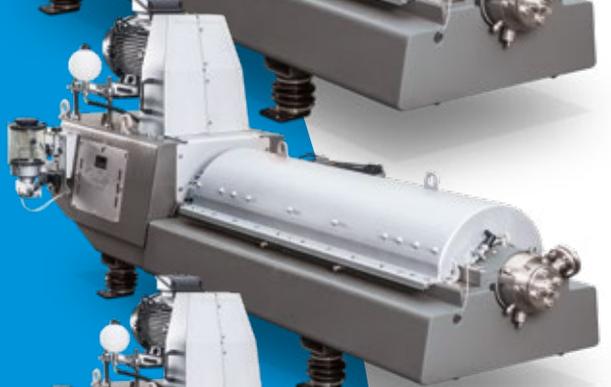
Find the right solution for your plant-based beverage product in the GEA CF Decanter Centrifuge performance range.



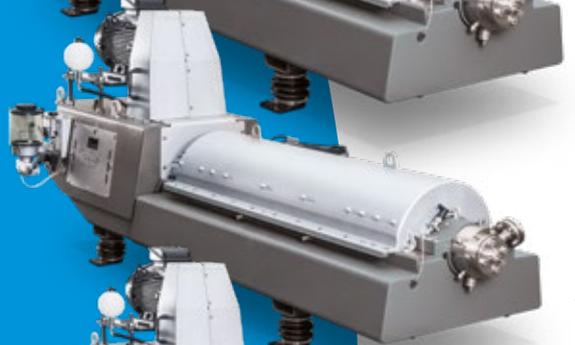
*CF 7000
20,000 l/h*



*CF 6000
14,000 l/h*



*CF 5000
11,000 l/h*



*CF 4000
8,000 l/h*



*CF 3000
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*CF 1000
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GEA Service – For your continued success

GEA Service offers dedicated teams of service experts. Our focus is to help our customers build, maintain, and improve their performance, market presence and competitive edge for the entire life cycle of their plants and equipment.

Partnering with GEA gives you the benefit of our world-renowned, customer-tailored service and recommended spares upgrade, modernization and optimization services. With our support you can be certain that every piece of GEA equipment and technology will operate optimally from day one, and for its complete lifespan, to give you maximum return on your investment.

- Getting you started – Seamless support for instant productivity and performance
- Keeping it running – The cost-efficient way of ensuring safety and reliability
- Constantly improving – Sharing our knowledge to safeguard your investment
- Together with you – Enduring commitment to you and your business



We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA is one of the largest technology suppliers for food processing and a wide range of other industries. The global group specializes in machinery, plants, as well as process technology and components. GEA provides sustainable solutions for sophisticated production processes in diverse end-user markets and offers a comprehensive service portfolio.

The company is listed on the German MDAX (G1A, WKN 660 200), the STOXX® Europe 600 Index and selected MSCI Global Sustainability Indexes.

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