



Instant Coffee

GEA process technologies for
the instant coffee industry

Complete lines for exceptional results



Roasting

Solutions for batch mode or continuous operation and storage using technology from selected partners



Green Bean Treatment

Solutions for cleaning, blending and storage using technology from selected partners



Roast Bean Treatment

Grinding and conditioning of the roasted product



Extraction

Batch mode or continuous operation



Extract Treatment

Clarification, storage and aroma recovery from the coffee extract



Concentration

Freeze and thermal concentration, membrane filtration

CIP System

Fast and flexible Cleaning-In-Place features

Packing

Powder: Packed in bulk or retail quantities
Liquid: Supplied in cans or drums

Process Control

Plant supervision and monitoring, recipe control, and logging functionality

Drying

Agglomeration

For dustless powder and customized granules

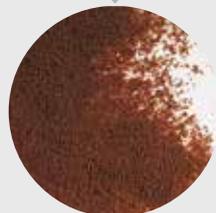
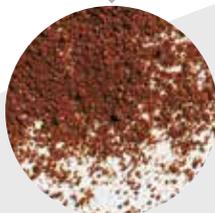
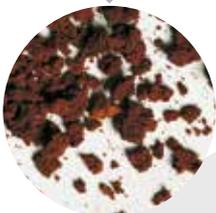
Spray Drying

The full range of solutions – only from GEA

Freeze Drying

The full range of solutions – only from GEA

Liquids



Convenient perfection for every taste

Modern technology has made the full-bodied, aromatic, perfect cup of coffee convenient. And GEA makes it possible – every day, all over the world.

Setting the standards

Coffee is pleasure. Its taste, flavour, aroma, and refreshing effect make it unique. It is also a product that attracts great attention in the food and beverage industry. And in the technology used to manufacture canned liquid coffee as well as regular and agglomerated instant coffee, GEA sets the standards for others to follow.

Helping you to the best solution

A successful delivery is more than supplying the best plant available. Consumer requirements vary from market to market, and the coffee that commands a premium price in one market may fail completely in another. From a wide range of processing possibilities, we select the best GEA plant type, layout, and operation to meet the customer's specifications of the desired product properties.

The proven ability

We have maintained our leading position by repeatedly proving our ability to provide reliable and innovative technical GEA solutions for the entire process from product testing to plant

installation and after sales support. Our constant dedication to providing cutting-edge quality to our customers is the main reason why we have installed more than 200 GEA plants for the coffee industry worldwide.

A complete range

We supply solutions for all aspects of successful coffee production, making us the obvious supplier of individual GEA plants as well as complete lines. Our solutions include our own unique GEA technologies as well as equipment from trusted partners in coffee bean handling, roasting, and packing of the finished product.

No matter the plant or process line, our customer will experience not only an increase in product quality, but also significant cost reductions due to efficient waste treatment and recycle systems.

Our commitment extends beyond the actual plants. A strong international network of companies gives our customers the comfort of local service combined with the quality that comes from global presence.

CONVENIENT COFFEE FACTS

There are two main sorts of coffee: Arabica and Robusta. The most popular is Arabica, which comprises 60% of the global coffee production.



Quality solutions at a glance

Great coffee comes from great plants

Coffee beans are seeds from coffee fruits. After removal of the pulp, the green coffee beans are dried, cleaned and packed – typically in 60 kg bags – and stored until they can be roasted and, if required, decaffeinated.

Roasting is a delicate process, part art and part science, where the roast master must decide exactly how long and hard the beans are to be roasted to get the desired result. It is during roasting that the beans acquire the flavour and colour of the finished coffee. The beans are now ready for sale to consumers.

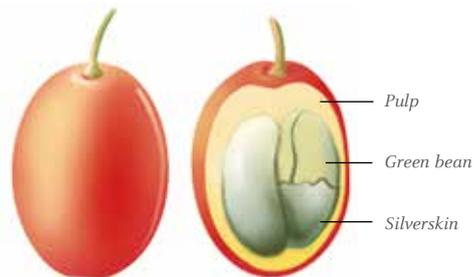
Or they can be ground and processed into convenient coffee. And no matter the process, GEA knows how.

Great powders also come from great plants

No one knows more about creating coffee powders with highly specific properties and strong natural flavours than GEA. With data gathered from over 80 years of experience and a reference list of some 10,000 GEA plants, we're perfectly equipped to engineer the exact product you want from your coffee – and the processes needed to produce them.

Our coffee powder engineering specialists will help you design the perfect system for your needs – including dedicated process control – that can meet precise specifications. Furthermore, using our advanced “gentle processing” GEA technology, the coffee's natural essence is retained, guaranteeing outstanding quality and flavour for your final product.

Coffee fruit



CONVENIENT COFFEE FACTS

Coffee beans are seeds from the fruit of the coffee bush. When roasted, the beans lose 15-20% of their weight, but increase up to 25% in size.

Quality engineering

A partnership of success

GEA is a resource in every stage of the project. We have the experience and know-how to ensure that all aspects are completed as smoothly as possible, including:

- Product testing at our test station in Denmark
- Process evaluation and optimisation
- Design and engineering
- Project management
- Plant delivery, installation and commissioning
- Training of plant operators
- Technical service and supply of spare parts
- Project financing

Ultimately, our goal is to help you maximise competitiveness through superior product quality and high-yield processes. The coffee industry is dynamic, with market demands changing over time. With a proven ability of controlling powder properties to a unique degree, GEA spray dryers can adjust production to meet market trends.

Whether you need a new investment, process modification or optimisation, it's all part of the GEA solution.

GEA KNOWS HOW

From advanced GEA equipment to complete plant design, from feed formulation to competitive powders, from sanitation to safety – GEA has the answers.



The best results begin with the best extraction

Extraction

GEA's unique Fast Instant Coffee (FIC™) extractor is a continuous system that features automated multi-extraction percolators. Fully integrated with a PC/PLC (Programmable Logic Controller) system, the FIC™ yields a uniform extract quality.

Short extraction time – superior aroma profile

The FIC™ extractor reduces the extraction time by 50%. Water is directed through the ground coffee in two stages. The process results in two separate extract fractions, aroma and hydrolysis. The FIC™ extractor gives a superior aroma profile, which is ideal for high quality convenient coffee production.

After the process is completed, aroma recovery takes place and the extract is filtered and centrifuged.

The FIC™ is available with 3 modes of extraction

Dual/Split

Dual/Dual

Single/Split

The layout of the percolator columns gives a compact design and reduces space requirements compared to standard battery extraction units.

The continuous horizontal helice extractor, GEA's CONTEX™, is specially designed for operation at atmospheric pressure and at low temperature, thus only extracting the aroma rich fraction of the coffee.

High yield

GEA's extractors are designed to process a variety of coffee types as efficiently as possible. This gives the customer unparalleled flexibility and the highest obtainable yield.

During recent years, the instant Coffee producer market companies have requested higher yields.

GEA has consequently developed the new CARINE™ extractor where focus has been on obtaining highest possible yield - still maintaining a high quality.

The CARINE™ extractor is designed for highest possible Yield - however also capable of operating as a Premium quality FIC™ extractor.



*FIC™ Extractor
– top view*



CONVENIENT COFFEE FACTS

A typical Arabica coffee bush bears about 5 kg of fruit per year. This corresponds to about 300-400 grams of instant coffee. For Robusta bushes, the yield is slightly higher.



CONTEX™

Gentle liquid processing: Extract treatment

Aroma recovery

To prevent the desired, and volatile, aroma components in the aroma extract from being lost during thermal concentration, the extract fractions are stripped of their volatiles in an aroma recovery unit. After being stripped from the extract in a flash evaporator, the aroma components are concentrated and recovered in a two-stage condenser/distillation system.

Clarification

In order to achieve international standards for convenient coffee, clarification is an essential part of the process. A system consisting of filters and centrifuges is used to separate insoluble parts from the extract.

Concentration

Concentration serves the dual purpose of increasing the solids content in the extract prior to freeze or spray drying, and making the process as economical as possible.

The aroma being quite volatile, lenient processing conditions throughout the concentration process are essential. GEA has developed a number of processes that maximize efficiency while being as lenient to the extract as possible.



CONVENIENT COFFEE FACTS

In 2014, the global coffee production reached almost 8.5 million tonnes of green beans. This corresponds to more than 708 billion cups of coffee.

Thermal concentration

Our multistage non-recirculating evaporators operate under vacuum in a plug flow mode. They concentrate the coffee extract gently, quickly, and efficiently. In combination with the aroma recovery system, the evaporator preserves the aroma and taste components and produces an excellent concentrate for the production of convenient coffee.

Freeze concentration

With GEA's freeze concentration process, aroma loss due to thermal degradation is eliminated. By cooling the extract to subzero temperatures, excess water is removed as ice crystals. And this process requires no waste-water treatment, as the melted ice crystals are pure water.

Membrane filtration

The aroma fraction of the extract can be pre-concentrated using reverse osmosis in a membrane filtration system. This slightly changes the taste profile, which is an advantage for some coffees and in some markets. Membrane filtration is in its beginning stage.



Freeze concentrator



Evaporator – bottom view



Membrane filtration



Aroma recovery

The premium product: Freeze drying

Freeze drying preserves all the desirable aspects of the concentrated coffee extract. The finished product commands a premium price across the world by meeting market demands for quality parameters such as colour, density, and solubility.

The Atlas freeze drying process from GEA enables a unique degree of control over all of these crucial quality parameters.

By using the proven Structure Control System (SCS), product colour and solubility as well as bulk density can be controlled during the pre-freezing process to meet any requirements.

Actual freezing can take place on a Continuous Air Blast (CAB) belt freezer or for smaller capacities on a Rota Drum freezer.

Granulation of the frozen coffee slabs in a carefully designed system ensures the right granule size and size distribution and completes the process prior to freeze drying.

The unique Atlas CONRAD™ freeze dryer protects all the qualities obtained in the concentrate during the full-automatic, continuous operation, and a first-class soluble coffee is produced thanks to the integrated control system for the entire process.

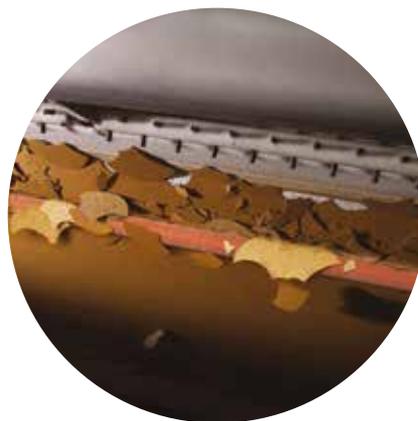
Our Atlas RAY™ batch freeze dryers are used for smaller capacity requirements or as add-on units to existing coffee processing plants.



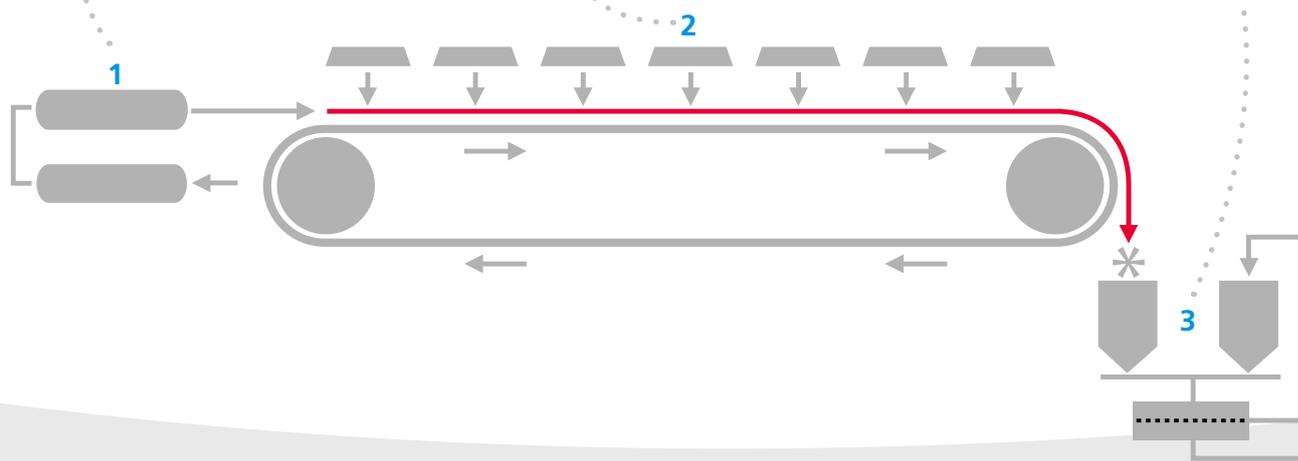
1 Foaming and prefreezing



2 CAB freezing



3 The frozen coffee is prebroken





Atlas RAY™ batch freeze dryer



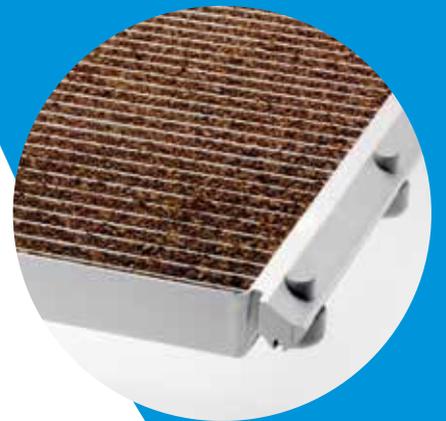
Freeze drying



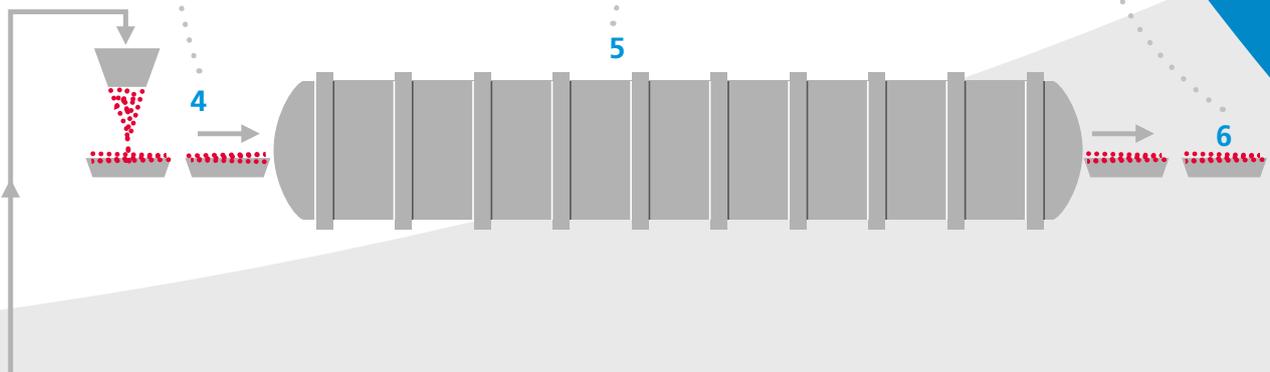
4 Freeze drying:
Tray going into
the Atlas CONRAD™
freeze dryer



5 Atlas CONRAD™
freeze dryer



6 Freeze drying:
Tray with the
finished product



CONVENIENT COFFEE FACTS

Coffee is grown in a wide belt around the Equator. Robusta coffee can grow from sea level to 700 metres altitude, whereas Arabica coffee must be grown at an altitude between 1,000 and 2,000 metres.

The proven quality: Spray drying

Spray Drying

The most economic method for producing soluble coffee is spray drying, which results in free-flowing and agglomerated/ granulated powders. Thanks to an extremely high level of control, our customers can manufacture products meeting the demands of their individual markets.

The design of the spray dryer depends upon the specified powder properties, e.g. moisture content, particle size, and bulk density.

GEA offers three designs for the manufacture of soluble coffee: NOZZLE TOWER™ (NT) spray dryers are used for producing free-flowing powders comprising individual round, soluble beads with average particle sizes ranging from 100 to 250 microns. The tower-like chamber design results in a long residence time for the product to be dried.

The most common type of spray dryers used today is the Fluidized Spray Dryer - FSD™.



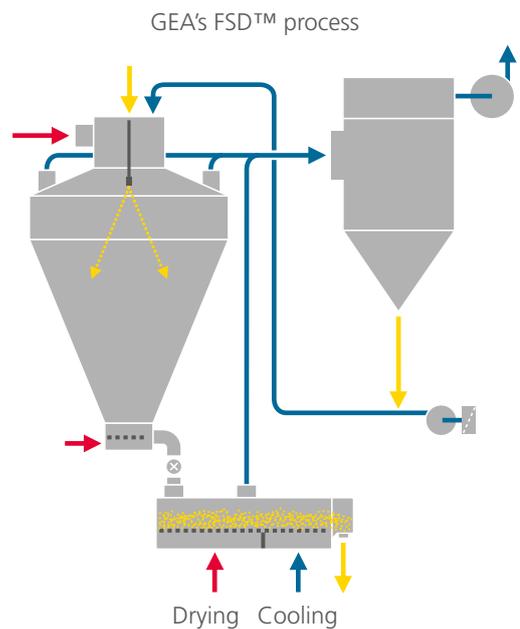
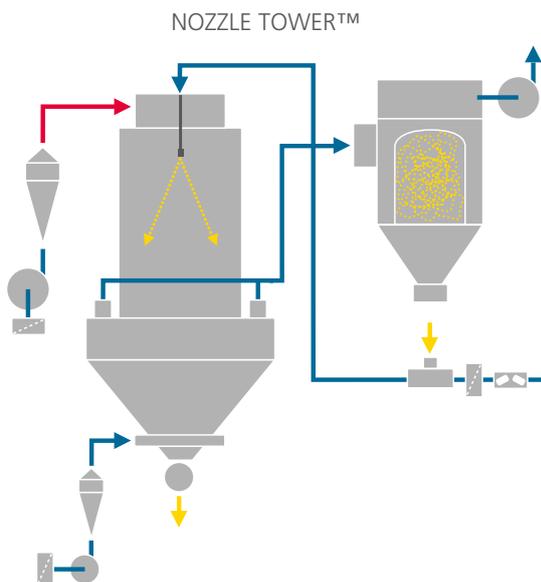
GEA Spray dryer – top view



GEA Spray dryer – side view



GEA Spray dryer – bottom view



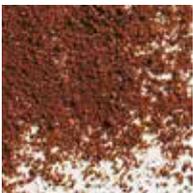
The Fluidized Spray Dryers - FSD™, equipped with an integrated fluid bed, are extremely compact. In order to achieve the required moisture content and temperature of the instant coffee, post-drying and cooling are carried out in an external VIBRO-FLUIDIZER™. The FSD™s produce a free-flowing agglomerated/granulated coffee powder with average particle sizes between 100 and 300 microns. The lower temperatures during drying give improved aroma properties.

Agglomeration

Different markets require different types of convenient soluble coffee. To meet the demand for granulated, dust-free products, the powder is processed in a REWET AGGLOMERATOR™ (RWA). Material handling during the agglomeration process itself is specially controlled according to the desired properties of the end product. Average particle size is above 1000 microns.

CONVENIENT COFFEE FACTS

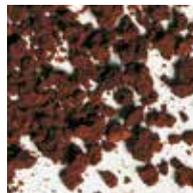
Soluble coffee consumption accounts for around 20% of global coffee consumption, a figure that has been stable for the last decade.



Powder produced on a GEA's NOZZLE TOWER™



Powder produced on GEA's FSD™



Powder produced on GEA's REWET AGGLOMERATOR™



Fluidized spray dryer - FSD™ with integrated fluid bed



VIBRO-FLUIDIZER™



REWET AGGLOMERATOR™ (RWA)

Meeting every requirement with the best in CIP and process control

Process control

Controlling and monitoring a process line is of the essence for any operator. GEA Process Engineering's proven process control system meets all requirements for safety, flexibility, and ease of use.

Using standard hardware components, the process system enables you to:

- Supervise and monitor automatic plant start up, shut down, and cleaning procedures
- Work with several product recipes in one system
- Log every process activity for real-time and historical trending

Instrument and system specifications are selected in cooperation with our customer to ensure the best hardware service during the lifetime of the plant.

CIP system

Cleaning, while necessary, can be an expensive and time-consuming part of the process. Drawing on over 80 years of experience in working with sanitary processes, GEA has developed a series of Cleaning-In-Place (CIP) systems.

With features such as retractable nozzles in the main drying chamber as well as highly efficient process water recovery, the GEA CIP system makes a significant contribution to the profitability of the entire process line.

Process control room



GEA's SANICIP™ bag filter - top view

More than just a plant...

Plant sizes

General operational data for GEA Instant Coffee (IC) plants are given in the table. Available Sizes refer to the amount of kg that is produced each hour, i.e. an IC-250 plant will produce 250 kg of instant coffee each hour.

Typical Sizes	IC-125	IC-250	IC-330	IC-500	IC-550	IC-750	IC-1000	IC-1500
Green coffee input (kg/h) 10% H ₂ O	275-375	550-750	750-1000	1100-1500	1200-1650	1636-2250	2200-3000	3300-4500
Roasted, ground coffee (kg/h) 6% H ₂ O	240-330	480-650	635-860	960-1300	1055-1430	1440-1950	1920-2600	2880-3900
*Yield % FIC™ extractor	47-53	47-53	47-53	47-53	47-53	47-53	47-53	47-53
*Yield % CARINE™ extractor	55-59,5	55-59,5	55-59,5	55-59,5	55-59,5	55-59,5	55-59,5	55-59,5
Instant coffee (kg/h) 3% H ₂ O	125	250	330	500	550	750	1000	1500
Annual production (t/year) Based on: 7500 (h/year)	940	1875	2475	3750	4125	5625	7500	11250

**Yield is a result of the type and mix of beans. Robusta will typically give a higher yield than Arabica.*

CONVENIENT COFFEE FACTS

Consumption of fresh vs. instant coffee varies: in north america, the ratio is less than 15% instant coffee to over 85% fresh. in eastern europe, it is up to 85% instant to 15% fresh, and in australasia, the share of instant in total coffee consumption varies between 30%-90%.





We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

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