



Freeze Drying

RAY™ plants for the
food and beverage industries



engineering for
a better world

gea.com

Superior quality – unique advantages...

The RAY™ freeze drying plants from GEA offer substantial benefits to nearly every area of food processing, such as fish, fruits, coffee and herbs.

The Atlas RAY™ freeze drying technology simply gives you the highest quality in the market. Frozen products are dried under vacuum, ensuring that the inherent solvents in the product (i.e. water) are removed as vapor. This preserves the overall product structure and size, as well as all nutrients, flavors, and colors.

Meeting market demands

Today, customers request food that is easy to prepare and keeps well without being spoiled while retaining the characteristics of fresh food. Freeze drying allows manufacturers to meet these demands by preserving the natural look and consistency of the product as well as all its flavors, proteins, and vitamins.

Unique advantages

As one of the most experienced designers and manufacturers of freeze drying plants in the world, GEA combines unique technology with reliable plant operation. While providing the superior product quality you need in order to stay ahead of

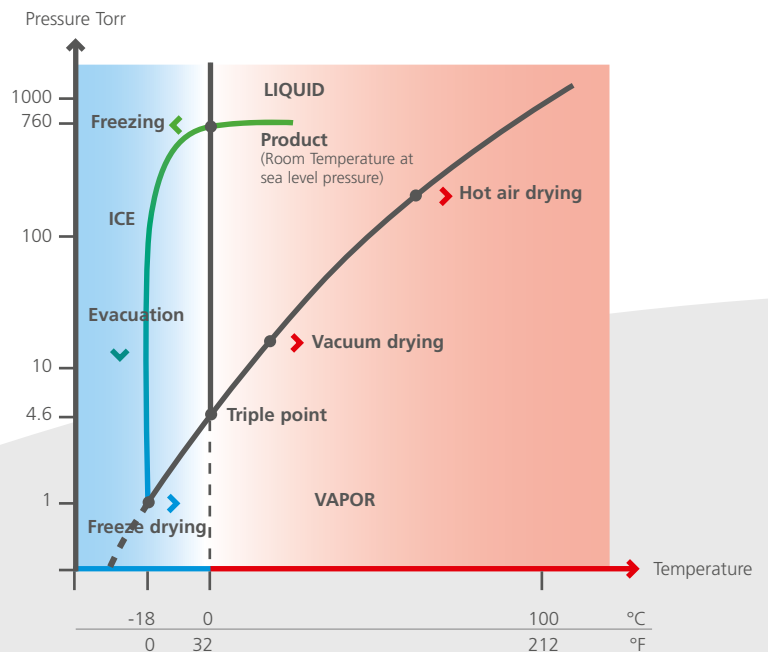
your competitors, our Atlas RAY™ technology gives you unique economical and technical advantages:

- The freeze drying process results in stable products with a long shelf life.
- Freeze dried products are durable at a wide range of temperatures, eliminating the need for complicated cold chain distribution systems.
- The low weight and easy handling of freeze dried products reduce shipping costs dramatically.

On top of that, Atlas RAY™ freeze drying plants are designed to:

- Eliminate product loss
- Reduce energy costs
- Maximize plant reliability and ease of use.

Water phase diagram



In our RAY™ freeze dryers, frozen products are dried at temperatures below -18° C. No thawing of the product takes place and its quality is preserved.



Advanced simplicity – complete plants with the RAY™ concept

Advanced simplicity is the best way to describe the RAY™ concept from GEA.

GEA offers a full range of plant services worldwide – from turnkey solutions to that vital piece of equipment that will make your freeze drying process profitable.

Service beyond delivery

In addition to actual plant delivery, GEA has the experience and market know-how to support you in your product research and feasibility studies.

The Atlas RAY™ concept is the result of many years of plant and process development based on research and collaboration with our customers in all parts of the world. The result is a freeze drying process – as shown in the diagram – that is second to none.



The full range

The Atlas RAY™ plant is capable of handling most freeze drying operations. GEA has the perfect freeze drying solutions with the CONRAD™ plant for continuous operation and the RAY™-S dryer for sterile processes. Call your local agent for details. See the full range on pages 6-7.



RAY™ 125-S plants for sanitary applications.

Monitor the entire process on-site or from a central control room.



RAY™ 8 plant for various products/test.



RAY™ 125 plant for vegetable, fish and meat applications.

FREEZE DRYING FACTS

3,000 kg of frozen strawberries will result in 300 kg freeze dried berries. The same amount of chicken will give 1,000 kg of dried product.

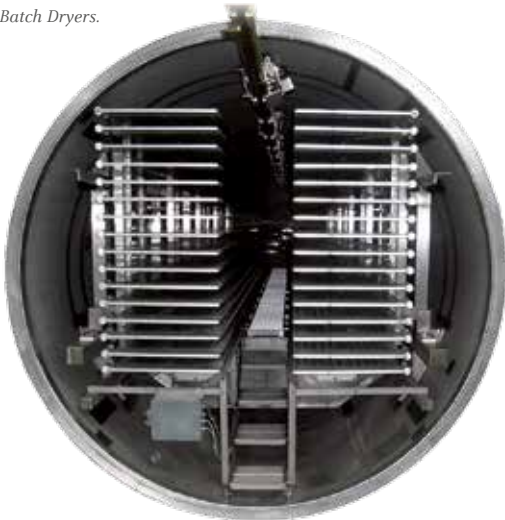
RAY™ batch dryers

Refined efficiency

We have refined the freeze drying process to a point where we are able to supply the most efficient and economical freeze drying plant designs in the market. The advantages of selecting our equipment include:

- Negligible power loss (less than 0.1%)
- Low energy consumption
- Compact design
- Simple and reliable operation
- Uniform drying
- High sublimation capacity

*Modular and efficient:
The Atlas RAY™
Batch Dryers.*

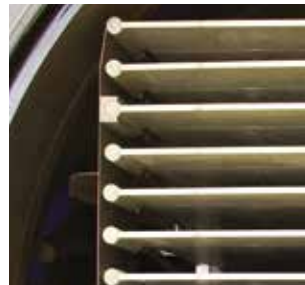


Modular design

The Atlas RAY™ freeze dryers from GEA are designed as modular systems, with cabinet, heating plates, and vapor condensers built as individual units.

The modular design offers a number of advantages during installation and operation:

- Shorter interval between order and commercial production thanks to quick installation.
- Local subcontracting becomes a viable option for dryer assembly.
- Easy access for cleaning and maintenance.



Heating plate module

Twin stacks of heating plates designed for RADIANT drying. The heating plates are made of anodized aluminium.



Vapor condenser module

Built-in condenser with GEA's unique automatic de-icing system. The condenser is made of stainless steel.



Cabinet module

Cylindrical vessel with door at one end for loading and unloading. All connections with auxiliary systems are located at the rear end.

FREEZE DRYING FACTS

During re-hydration in warm water, up to 90% of the removed water will be absorbed again.

RAY™

A water-flushing de-icing system is used for the smaller RAY™ (2, 8, 16, 30, 45, 50) cabinets. At the end of every freeze drying cycle, the condenser is flushed with pre-heated water. Ice in the condenser melts within 10 minutes, whereupon the water is drained. This method is ideal for smaller systems, ensuring:

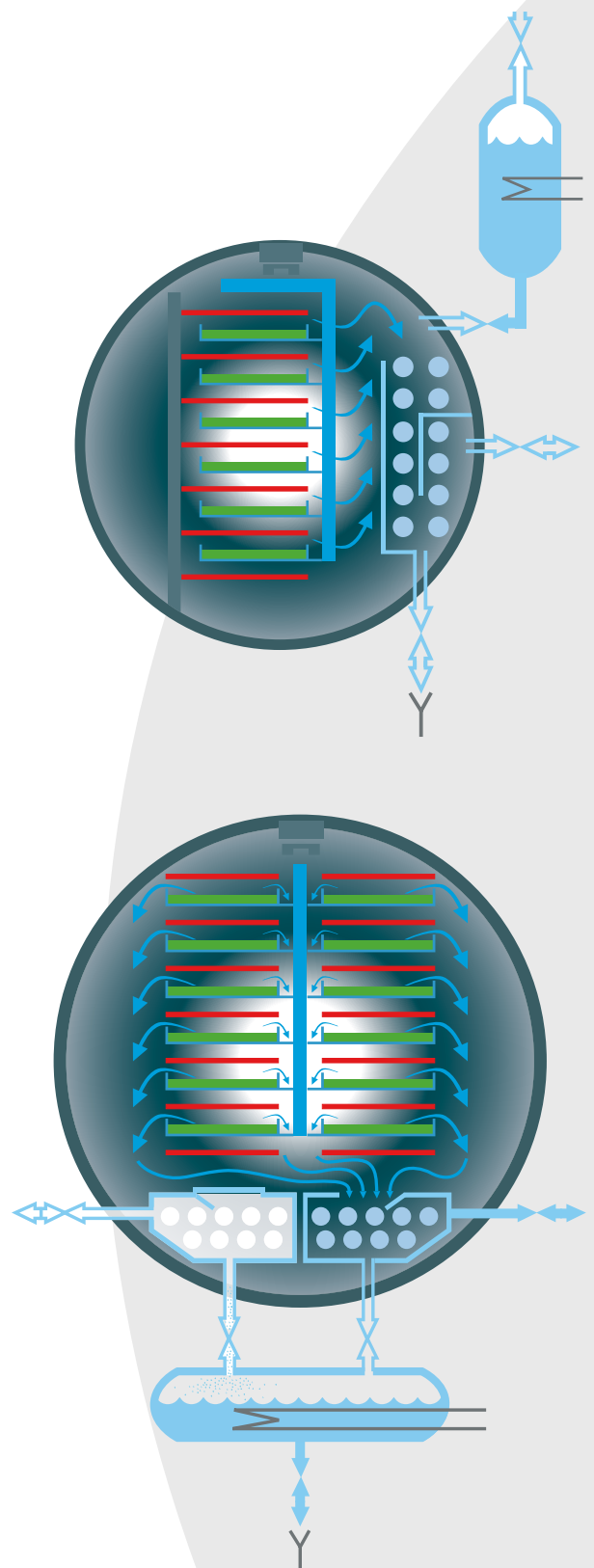
- Minimum investment cost.
- Simple operation.

RAY™ with CDI

The larger RAY™ (75, 100, 125, 150) cabinets incorporate the Continuous De-Icing System (CDI). During de-icing, vapor at 25° C from the de-icing vessel condenses on the cold condenser surface, thus melting the ice. In order to restore the condenser to operating condition, the condenser chamber is closed off from the de-icing vessel. The condenser is cooled to operating temperature, resulting in the condensation of any remaining vapor.

As the vapor condenses, the pressure in the condenser decreases until operating vacuum is achieved eliminating any loss of operating vacuum at switch-over between vapor condenser chambers. The CDI system is fully automatic. It ensures:

- An ice layer on the condenser coils of max. 5 mm (1/5"), resulting in a negligible temperature drop over the ice and low energy consumption in the refrigeration plant.
- Constant condenser capacity.
- High freeze drying capacity per square meter of tray surface.
- Short time from one charge to another.
- Higher overall profitability in your large-scale freeze drying process.



The full range

1 Tunnel freezing/frost storage

One 8-hour preparation shift provides sufficient product for 24 hours of freeze drying. Freezing is by the “first in/first out” principle.

2 Transport by overhead rail

Trolleys carry the product trays from freezing, through freeze drying, to emptying. A simple, hygienic, and safe system.

3 RAY™ freeze dryer

Fully automatic control of the drying cycle for each batch. Just close the door and press the button.

4 Heat supply system

Drying is carefully controlled throughout the temperature range – from below freezing temperature (brine) or room temperature (cooling water) up to 130°C – to ensure perfect product quality.

5 Vacuum system

Process vacuum is typically achieved in less than 10-12 minutes depending on RAY™ type. If you have products with special requirements, this time can be reduced.

6 De-Icing

Type CDI

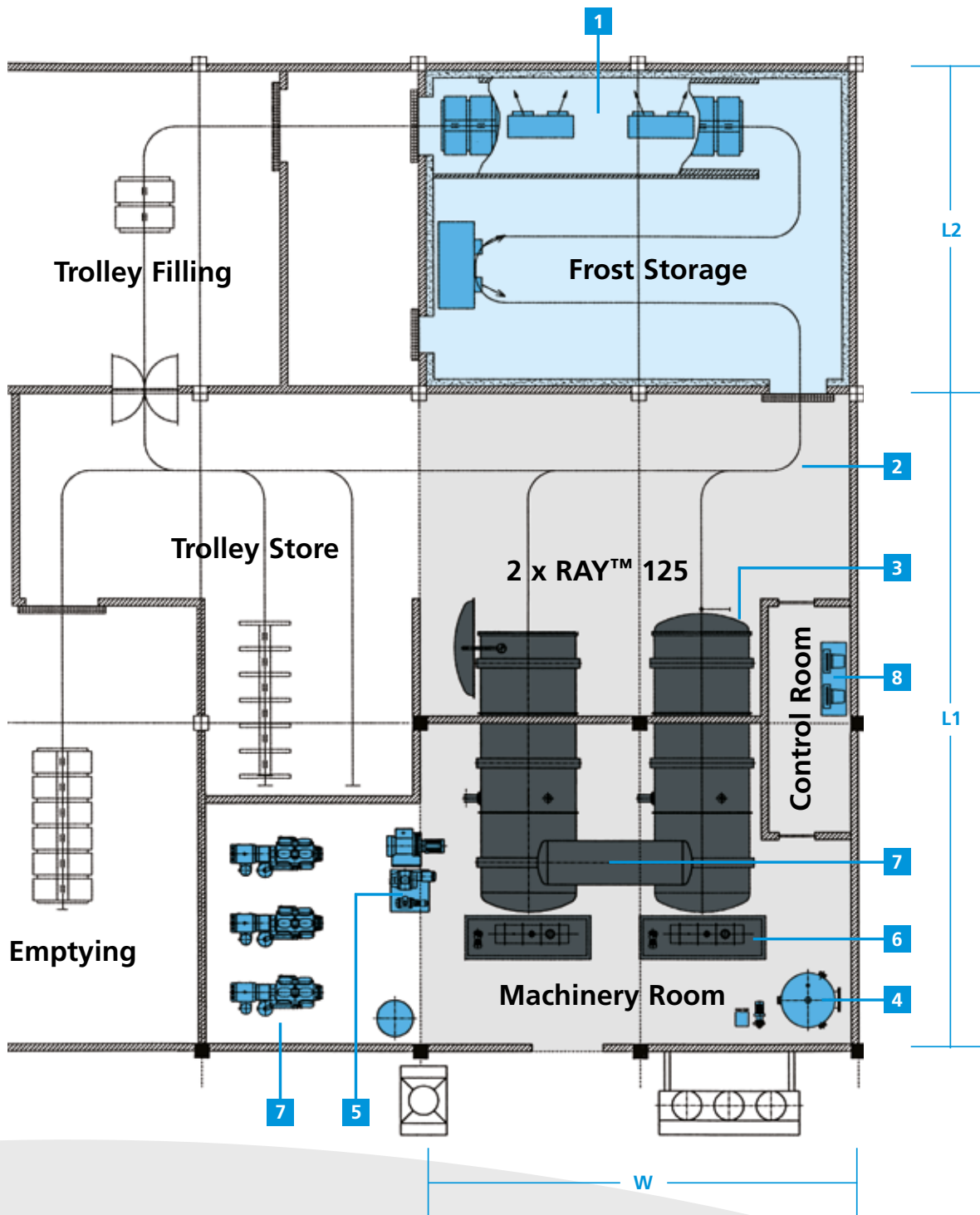
7 Refrigeration system

Incorporates highly efficient refrigeration compressors with automatic capacity control.

8 PC/PLC control system

The control system ensures optimal operating conditions throughout the plant – freezing, drying and associated heating, vacuum and refrigeration systems. Remote control via modem supplied as option.

Typical capacities	RAY™									
	2	8	16	30	45	50	75	100	125	
Effective tray area (m ²)	1.5	7.6	15	26	39	45	68	91	114	
Max. sublimation capacity (kg H ₂ O/hour)	3	17	34	60	85	105	170	230	280	
Typical input capacity solids 15% (kg/24 hours)	39	190	380	650	975	1125	1780	2375	2965	
Output capacity (kg/24 hours)	6	28	56	100	150	175	275	370	460	
Building requirement per cabinet (based on two or more units)										
Freeze drying, WxL1 (m ²)		36	48	60	60	72	96	108	120	
Freezing+cold storage, WxL2 (m ²)		N/A	12	24	24	36	48	60	80	



FREEZE DRYING FACTS

Efficient and gentle: Freeze drying removes only water and preserves all nutrients, flavors and other product properties.

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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