

# Freeze Drying

Atlas CONRAD™ Plants for the  
Food and Beverage Industries





# Fresh, Convenient, Value-Added

– *Freeze Drying with Unique Advantages*

## *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.

**We live in unique times. Never before has there been such variety in food. And never before has the quality of that food been under such scrutiny.**

### **Food for our times**

Food for modern families should be convenient, nutritious, delicious, and devoid of additives, preservatives, and artificial colours. Freeze drying fits the bill perfectly.

A freeze dried product retains its original nutritional value, texture, product shape, and taste. It is the fresh product with just the water removed – and nothing added.

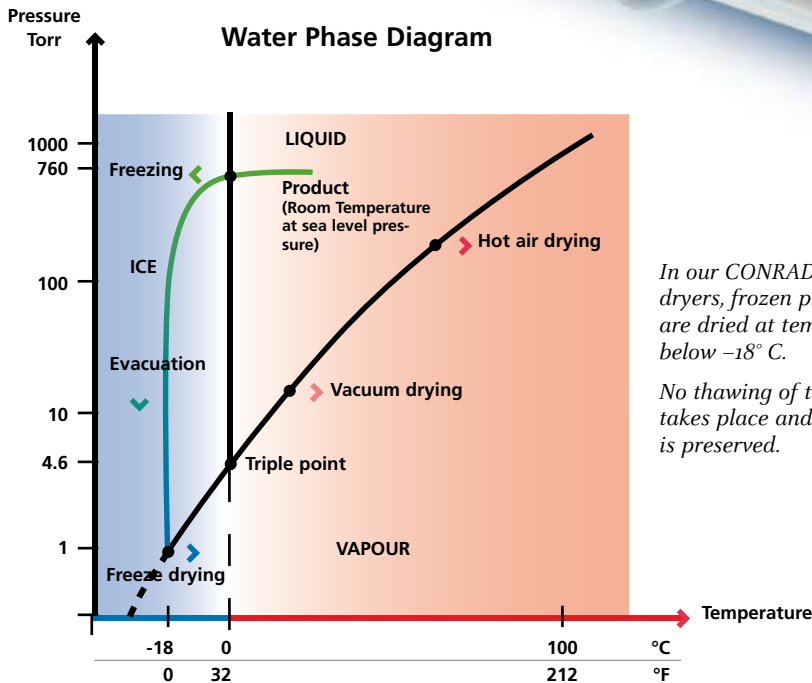
No wonder consumers prefer freeze dried products. They represent the ultimate in 21<sup>st</sup> century convenience, with none of the goodness taken out.

### **Freeze drying**

Freeze drying is the drying of an already deep-frozen product in a vacuum below the triple point. The vacuum allows the ice to turn directly into vapour without first passing through the water stage, in a sublimation process. This ensures that the product retains most of its original shape, colour, taste, and nutrients.

### **Advantages of profit**

Freeze dried products have other advantages too: they have uniform, high quality; a very long shelf life; require no refrigeration during storage;



*Finned trays provide a greater freeze drying area*

*In our CONRAD™ freeze dryers, frozen products are dried at temperatures below  $-18^{\circ}\text{C}$ .*

*No thawing of the product takes place and its quality is preserved.*



they are lightweight, making them easy and inexpensive to transport; and they reconstitute quickly and completely with the addition of water.

That is why freeze dried products are in such great demand and why the freeze drying process is able to add significant value to a wide range of food products including: vegetables; fruit and berries; meat and seafood products; prepared meals including baby food, TV dinners, camping provisions, and military rations; and beverages such as tea and coffee. Coffee is by far the biggest single freeze dried food commodity in the world today.

### Benefits of freeze drying

- Retains, to the greatest possible extent, the original shape, colour, taste, texture and nutrients
- Instant rehydration
- Lightweight for easy handling and transportation
- No refrigeration needed during transportation and storage
- Long shelf life

### Products created with freeze drying

- Coffee, tea and other extracts and liquids
- Vegetables, fruit and berries
- Meat and seafood products
- Prepared meals
- Milk products
- Dyes, pharmaceuticals, pigments and enzymes
- And many more





# CONRAD™

## Freeze Drying

### One process – a world of products

The Atlas CONRAD™ freeze drying process from GEA Niro is designed for high volume processing of high added-value products. The drying process is fundamentally the same for any type of product, but the way in which different products are prepared for drying varies considerably.



### Preparation

Products for freeze drying fall into three basic categories: liquids, Individually Quick Frozen (IQF) products and combined products. Liquids include coffee, tea, juices and other extracts. IQF products include products such as segments of, or whole fruit, berries, seafood, meat and vegetable. Combined products include soup blocks, rice dishes, baby foods, camping foods, etc.

### The challenge of liquid processing

Preparation for the freeze drying of liquids is the most complex part of the process. First, the liquids must be treated to achieve the required density and colour characteristics. The concentrate is then frozen slowly on a

CAB (Continuous Air Blast) freezer, alternatively more quickly on a Atlas Rota-freeze or in other freezing devices for obtaining a solid frozen form. The product is then granulated and sieved to produce granules of optimum size depending on requirement.

The granules are loaded onto the CONRAD™ trays to pass through the freeze dryer. Everything is weighed to ensure the correct volume on each tray for perfect freeze drying. The trays are automatically loaded using specially developed tray feeders to secure a uniform and accurate filling.

### IQF and combined products

IQF products are loaded by weight or volume directly onto the CONRAD™ trays before passing through the CONRAD™.

Combined products are normally loaded into special plastic moulds placed into the CONRAD™ trays - defining the block size of the product. Freezing takes place in a tray freezer prior to the further automatic transport into the CONRAD™.

Each product has to be prepared carefully to ensure it retains its original characteristics and to meet the requirements of the finished product.

### CONRAD™ Benefits

- Continuous production
- Economical operation
- 98% efficiency
- Low maintenance costs
- Low maintenance requirements

# The Atlas Secret



The internal vapour condenser, with built-in de-icing system, is the unique feature of all Atlas freeze dryers. The benefits: it saves space, it is more reliable, it does not cause the loss of product, and it uses less energy compared with external condenser systems.

## Space saving

The special vapour condensers are optimized and built into the side of the drying chamber.

## More reliable

The condenser system does not rely

on large external vacuum valves with pressure drops that are difficult to secure. Using the internal system, de-icing is performed under vacuum avoiding the need to seal the chamber against large pressure differentials.

## Low product loss

No product abrasion and low vapour velocities within the dryer guarantee as little as 0.1% product loss during the process.

## Low power consumption

De-icing under vacuum, rather than at atmospheric pressure, eliminates

the need to re-establish vacuum.

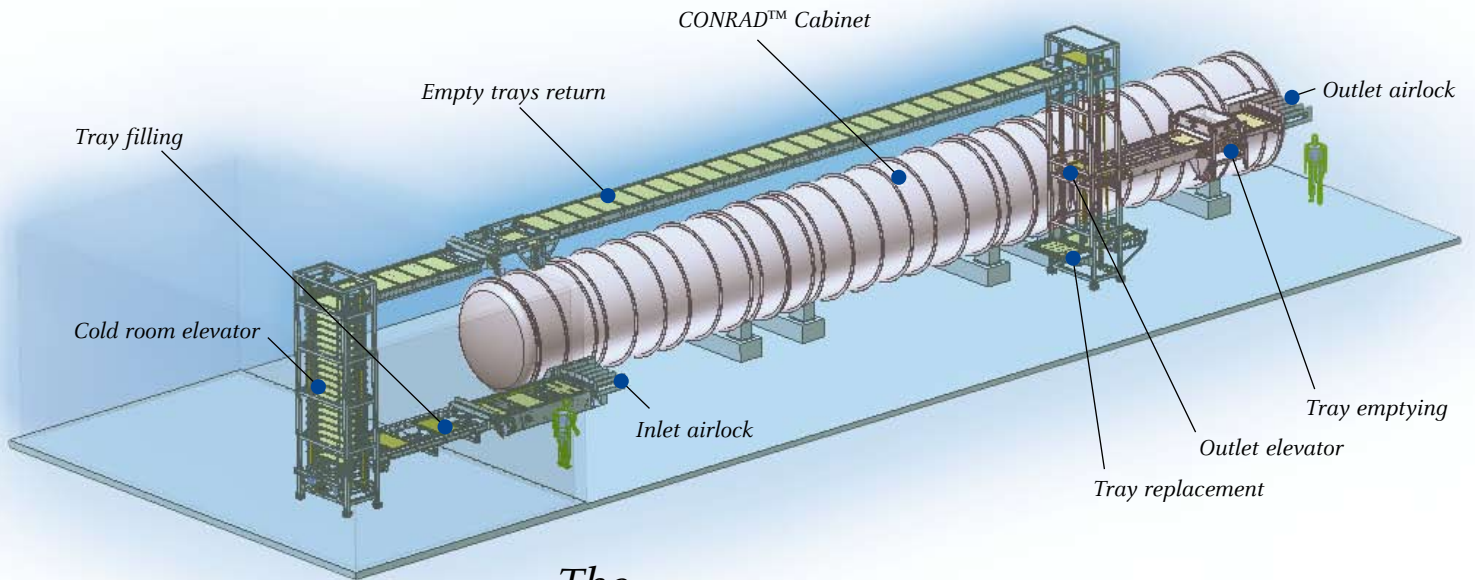
This, combined with optimal vapour flow conditions, reduces energy consumption by up to 40% compared with competing freeze drying technology.

## Design

The Atlas CONRAD™ cabinet is made in a special high quality coating and is further available in a stainless steel execution. This is all in accordance with customer requirements as well as further regulations and standards prevailing within the specific industries.

## Capacity EXAMPLES for Atlas CONRAD™ – Continuous FREEZE DRYING PLANTS

Type CONRAD™		200	300	400	500	2x500
<b>Extracts with 45% dry matter</b>						
Capacity input	kg/h	433	649	866	1,082	2,165
Capacity output	kg/h	200	300	400	500	1,000
	Output kg/24h	4,800	7,200	9,600	12,000	24,000
<b>Extracts with 25% dry matter</b>						
Capacity input	kg/h	313	469	625	781	1,563
Capacity output	kg/h	81	121	161	201	403
	Output kg/24h	1,933	2,900	3,867	4,833	9,667
<b>Solids with 15% dry matter</b>						
Capacity input	kg/h	170	256	341	426	852
Capacity output	kg/h	26	40	53	66	132
	Output kg/24h	632	948	1,264	1,580	3,161



# The CONRAD™ Process

## Freeze Drying Facts

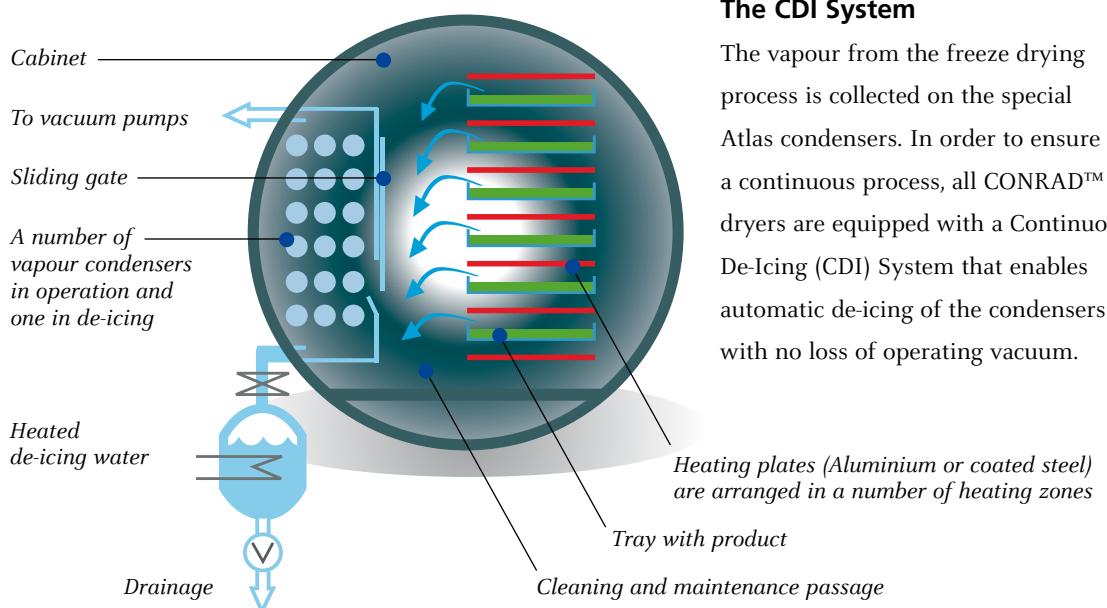
UP TO 30,000  
30 X 40 MM SOUP  
BLOCKS CAN BE  
FREEZE DRIED PER  
HOUR IN ONE SINGLE  
CONRAD 500

The CONRAD™ process is fully automatic throughout and requires only minimal staff for continuous operation. All movement and process parameters are carefully controlled, monitored and logged with the most modern PLC/PC system.

Trays with frozen product are loaded into the dryer through an efficient airlock system to an inlet elevator inside the CONRAD™ chamber.

When the elevator has a full stack of product trays, the entire stack is pushed into the first drying zone. More stacks follow and are pushed in turn through the various subsequent drying zones of the dryer - each adjusted to provide the drying characteristics required.

When trays arrive at the dryer exit elevator they are unloaded, again through an airlock, and the product emptied from the trays.



## The CDI System

The vapour from the freeze drying process is collected on the special Atlas condensers. In order to ensure a continuous process, all CONRAD™ dryers are equipped with a Continuous De-Icing (CDI) System that enables automatic de-icing of the condensers with no loss of operating vacuum.



OPEN FLAP FOR FULL PROCESS AND SYSTEM SCHEMATICS ▼

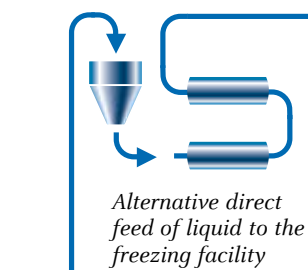
APPROX 2.2 - 2.5 KG  
OF GREEN COFFEE  
BEANS RESULT  
IN 1 KG OF  
FREEZE DRIED  
INSTANT COFFEE.

The CONRAD™

# Process at a Glance

## Preparation

*Foaming & prefreezing system to control colour, solubility and bulk density*



Fresh extract

Fines melting

Feeding with IQF products

Tray freezing of prepared food e.g. soup blocks

Preparation and filling

## Freezing and granulation

CAB (Continuous Air Blast Freezing)

*For slow freezing*

Rota Freeze

*For quick freezing*

Pre-breaking

Granulation

Oversized granulates return

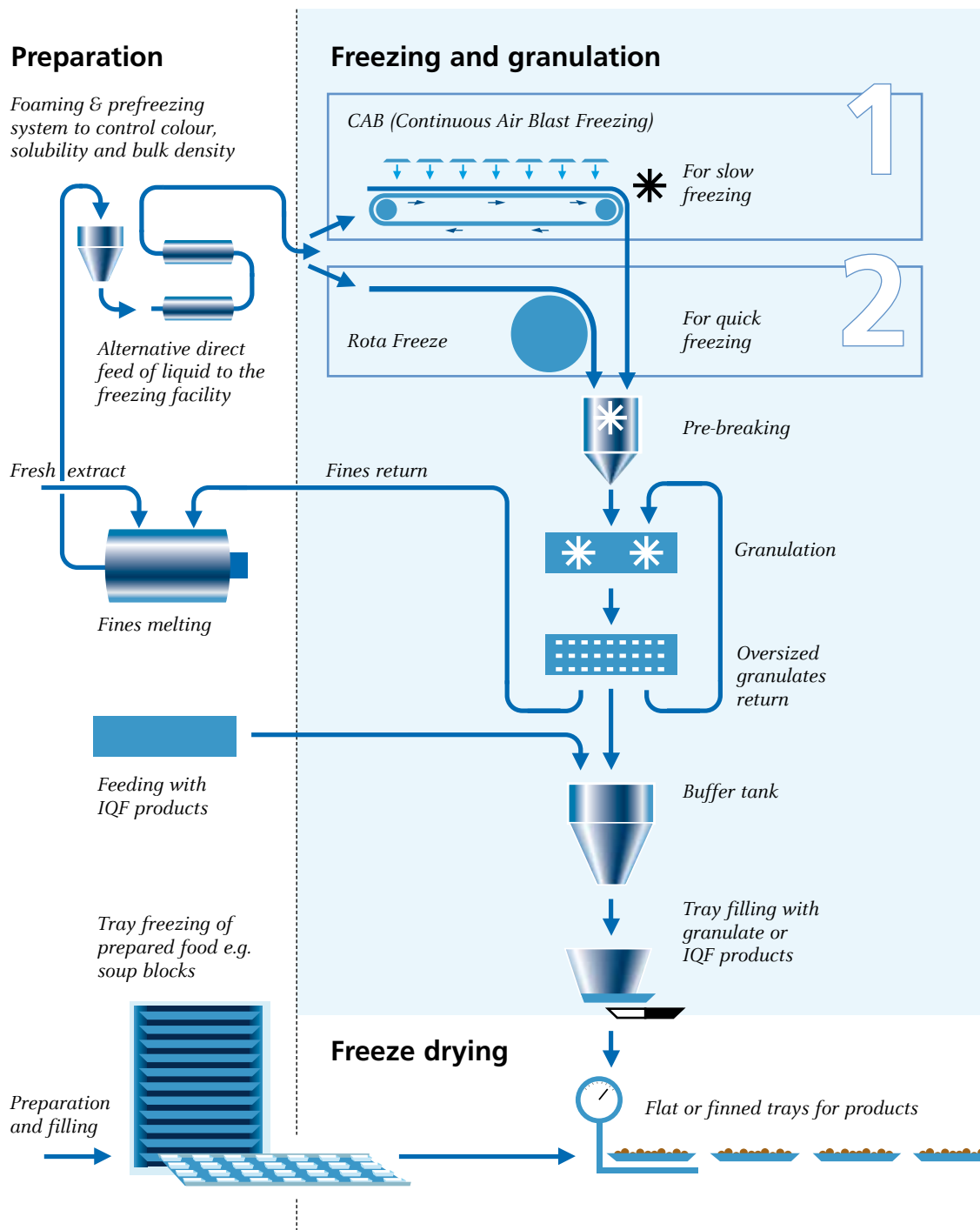
Fines return

Buffer tank

Tray filling with granulate or IQF products

## Freeze drying

Flat or finned trays for products

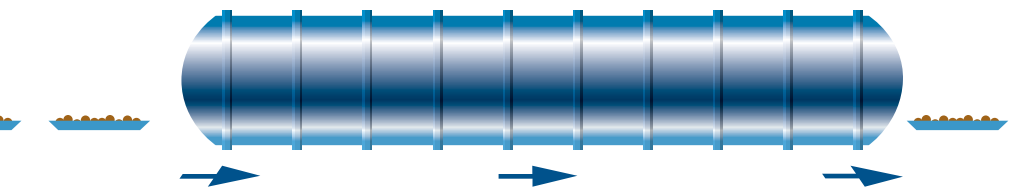
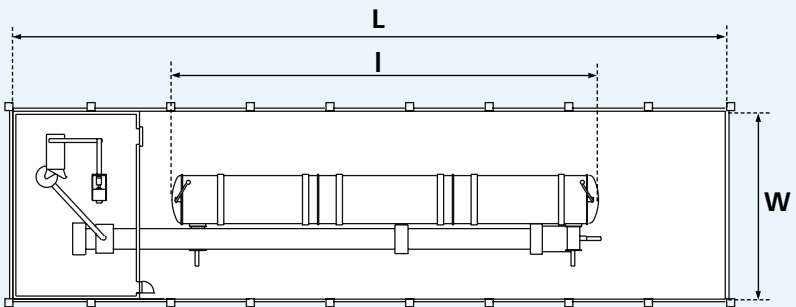
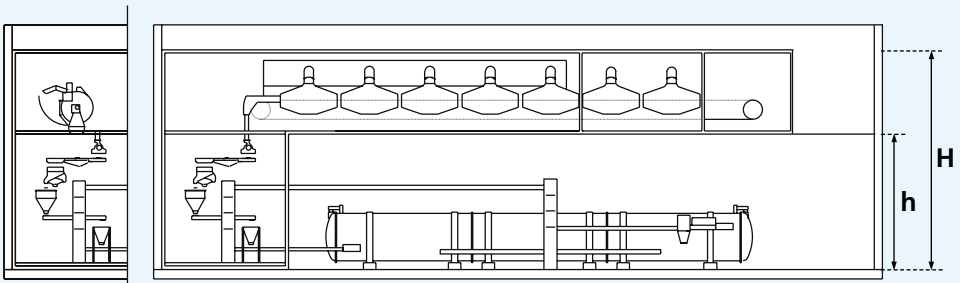




System

# Dimensions

Type CONRAD™	200	300	400	500	2x500
<b>H</b> (m)	14	14	14	14	14
<b>h</b> (m)	8	8.5	9	9	9
<b>L</b> (m)	35	40	40	45	45
<b>l</b> (m)	13	17.5	22.5	27	27
<b>W</b> (m)	12.5	12.5	12.5	12.5	23



# After Market and After Sales Service

Your Partner for Original Niro Parts and Services



## More than Just a Plant

GEA Niro has the process know-how and industry expertise to be more than just your supplier – we can become your partner. Our research facilities are at your disposal for pilot freeze-drying tests of all food and related products, and our service engineers are always on hand to support production management at start-up, train factory staff, and provide plant optimisation assistance.

## A Local Partner with a Global Presence

For every industry, in any culture, all over the World, GEA Niro makes a difference with innovative and reliable solutions. Our network of offices, subsidiary companies, and spare parts offices provide service on a global scale. For further enquiries, contact your local GEA Niro office or visit us at [www.niro.com](http://www.niro.com)





## Experience

GEA Niro has contracted and installed more than 10,000 plants worldwide

GEA Niro is a world leader in industrial drying, with spray drying, spray cooling/congealing, flash drying, freeze drying, granulation and fluid bed processing as core technologies. Having installed more than 10,000 plants around the globe, GEA Niro is known for delivering solutions that meet customers' exact requirements. The GEA Niro companies are part of the Process Engineering Division of the GEA Group.



Process Engineering

**GEA Niro**

Gladsaxevej 305 · PO Box 45 · DK-2860 Soeborg · Denmark  
Tel +45 39 54 54 54 · Fax +45 39 54 58 00  
E-mail: [food.dairy@niro.dk](mailto:food.dairy@niro.dk) · Website: [www.niro.com](http://www.niro.com)