

## FOOD PROCESSING TECHNOLOGIES

STERILIZATION, PASTEURIZATION, ROASTING, COATING, DRYING, STOCK PROTECTION

**KREYENBORG** designs and manufactures machinery and custom-made, turn-key solutions for bulk material handling. Throughout the food industry we specialize in solutions for sterilization, pasteurization, roasting, coating, drying and stock protection of foodstuffs. Cooling, storing, mixing, conveying and dosing are also among our core competencies.



Supplier for:  
Food industry  
Plastic industry  
Bulk material handling

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SPICES - HERBS - NUTS - SEEDS - TEAS - CEREALS - DRIED FRUITS - VEGETABLES - & MORE!





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# FROM INDIVIDUAL COMPONENTS TO A COMPLETE SYSTEM

Based on its many years of experience in plant engineering, KREYENBORG offers complete, individualized solutions for the food industry, including our FoodSafety-IRD as the core element.

Apart from the peripheral components, comprehensive support for engineering, commissioning and after-sales are provided.



## FOOD PROCESSING LINE

Bulk material  
handling

### CENTRAL CONTROL SYSTEM

The central PLC control unit facilitates control & monitoring of the entire process.

### SERVICES

- Engineering & consulting support
- Plant start-ups & staff training
- Remote-access assistance

### FOOD-LINE COMPONENTS

1		Dosing/Metering <ul style="list-style-type: none"><li>• Dosing belt</li><li>• Volumetric screw dosing</li><li>• Vibratory dosing</li></ul>	4		Conveyor belt
2		FoodSafety-IRD	5		FS-Rotary Cooler
3		Filter/Cyclone	6		Big-bag stations <ul style="list-style-type: none"><li>• Filling</li><li>• Emptying</li></ul>

FOODSAFETY-IRD'S ADVANTAGES

FOOD SAFETY  
SOLUTIONS

Multiple processes -  
one versatile machine



ADVANTAGES OF OUR SYSTEM

- |                                   |                                |
|-----------------------------------|--------------------------------|
| ✓ Continuous processing           | ✓ Multi-functional performance |
| ✓ Product always in motion        | ✓ Energy-efficient             |
| ✓ Short dwell-time                | ✓ CO <sub>2</sub> -neutral     |
| ✓ Instant production start        | ✓ CIP                          |
| ✓ No pre-heating necessary        | ✓ Ability to process a wide    |
| ✓ Fully-integrated control system | range of products              |

HANDLING THE FS-IRD

- ✓ Uncomplicated operation
- ✓ Easy cleaning
- ✓ Low maintenance costs
- ✓ Runs reliably

DESIGN

- ✓ Compact footprint
- ✓ Stainless-steel construction
- ✓ Customized
- ✓ Ergonomic

ADVANTAGES FOR YOUR PRODUCTS

- |                                      |                              |
|--------------------------------------|------------------------------|
| ✓ All-natural process                | ✓ Up to 5 temperature zones  |
| ✓ Suitable for organic food          | ✓ No dead spots              |
| ✓ Organoleptic properties preserved  | ✓ Uniform treatment          |
| ✓ 5-log reduction                    | ✓ Fast & gentle processing   |
| ✓ Various treatments all in one step | ✓ No gases or chemicals used |
| ✓ Rapid temperature adjustment       | ✓ Validated system           |



OUR SOLUTIONS




YOUR PRODUCTS		OUR PROCESSES
	Spices & herbs	Sterilization Drying
	Leaves	
	Flowers	
	Nuts	Pasteurization Roasting Coating Stock protection
	Seeds	
	Teas	Sterilization Coating Drying
	Dried fruits Dehyd. vegetables Dried mushrooms	Sterilization Coating Stock protection
	Cereals, grains & pulses	Sterilization Roasting Drying Stock protection
... and more!		




# STERILIZATION & PASTEURIZATION OF FOODSTUFFS


YOUR PRODUCTS



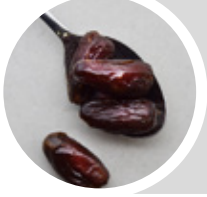
Spices  
& herbs



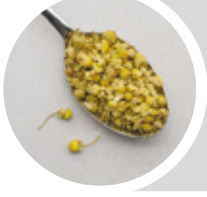
Nuts



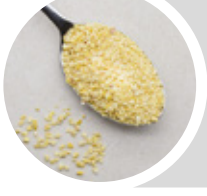
Seeds




Dried fruits



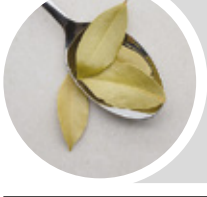
Teas



Cereals,  
grains & pulses



Dehyd. vegetables  
Dried mushrooms



Leaves

... and more!

## EFFECTIVE & SUSTAINABLE BIOBURDEN MANAGEMENT

- Validated 5-log reduction.
- Destruction of pathogens, such as Salmonella, validated by accredited labs.
- Safe reduction of TPC, yeast, mold, E. coli, coliform, ...
- Optional: spore reduction solution (e.g. highly contaminated black pepper).
- Reliable kill step has been verified in more than 8,000 individual analyses, which have been carried out by accredited labs.



## FOOD SAFETY WITH THE FS-IRD

Food safety has assumed a prominent role in recent years. Whether you are a producer, processor or trader, no one can any longer afford to bring unsafe food onto the market or to exceed admissible limit values. More & more producers have therefore opted to use the continuous FoodSafety-IRD.



## ADVANTAGES FOR YOUR PRODUCTS

- ✓ No condensate forms on the product, which could damage its sensory properties.
- ✓ Color, taste, volatile oils, odor as well as valuable substances and vitamins are protected.
- ✓ Natural - no gases, chemicals or additives used.
- ✓ Applicable to organic food.
- ✓ Products are continuously mixed. No dead spots. Every particle receives the same treatment in duration and temperature.
- ✓ Processing within minutes. Fast heating of the product ensures short dwell-time.
- ✓ Precise management of the residual moisture content throughout the process.



Protection of  
organoleptic  
properties




No dead  
spots




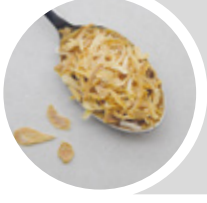
Validated  
system

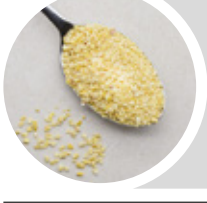
# ROASTING

YOUR PRODUCTS

Nuts

Seeds

Onions

Cereals,  
grains & pulses

... and more!

ADVANTAGES OF OUR FS-IRD

☒ Complete access to machine interior

☒ CIP

☒ No CO2 emission

☒ No pre-heating of the system necessary

☒ Stainless-steel construction

ACHIEVING PERFECT ROASTING

4 independent temperature zones.

The product temperature is measured during the process continuously and the light intensity is regulated automatically as needed.

Adjustable drum speed for gentle roasting.

Spiral inside the drum reduces mechanical stress and crushing of sensitive beans and other products significantly.

PRODUCT SHAPES & SIZES

All kinds of nuts, kernels, onions, cereals, grains, pulses, ...

whole, blanched, sliced, slivered, diced, in-shell, kibbled.

ADVANTAGES FOR YOUR PRODUCTS

☒ Absolute uniform roasting

☒ Perfect for fragile nuts such as cashews, sliced almonds, ...

☒ Adjustable roasting levels with a wide range of taste & color

☒ Reduced acrylamide levels due to our unique technology

☒ Prolonged shelf-life




TWO STEPS IN ONE

During the roasting process, the product can also be pasteurized.


# COATING

YOUR PRODUCTS


Nuts  
+ SALT

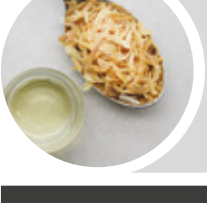
Nuts  
+ SUGAR

Nuts  
+ SPICES

Seeds  
+ SALT

Puffed rice  
+ SUGAR

Apple pieces  
+ FLAVOR

Onions  
+ OIL

... and more!

COATING OPTIONS

KREYENBORG offers two coating methods:

1.

Combination of coating during the pasteurization, sterilization or roasting process in the FS-IRD.

2.

Coating in separate coating drum. We can design application solutions for various products and recipes.



ADVANTAGES FOR YOUR PRODUCTS

☒ Liquid & dry seasonings applied with one coating system

☒ Sprayable, water-soluble additives such as salt, flavors, color, ...

☒ Other sprayable additives

☒ Products are continuously mixed. Uniform coverage of the product. No dead spots. Every particle receives the same treatment.

☒ Maximized seasoning-coverage & minimized waste in the process area

ADVANTAGES OF OUR FS-IRD

☒ Designed for flexibility & hygiene


☒ Fully adjustable

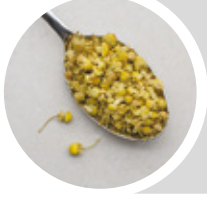
☒ Complete access to the machine interior


☒ CIP


DRYING

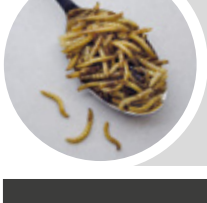
YOUR PRODUCTS

Spices & herbs

Teas

Cereals, grains & pulses

Pet food

Alternative protein sources

... and more!

ADVANTAGES OF OUR SYSTEM

✓

FS-IRD keeps the product in motion and mixes it thoroughly and continuously. The risk of cluster formation is thereby excluded and the final product will be dried uniformly.

✓

The infrared light heats and dries the product within minutes and not hours. The product temperature is measured during the process continuously and light intensity is regulated automatically as needed.

✓

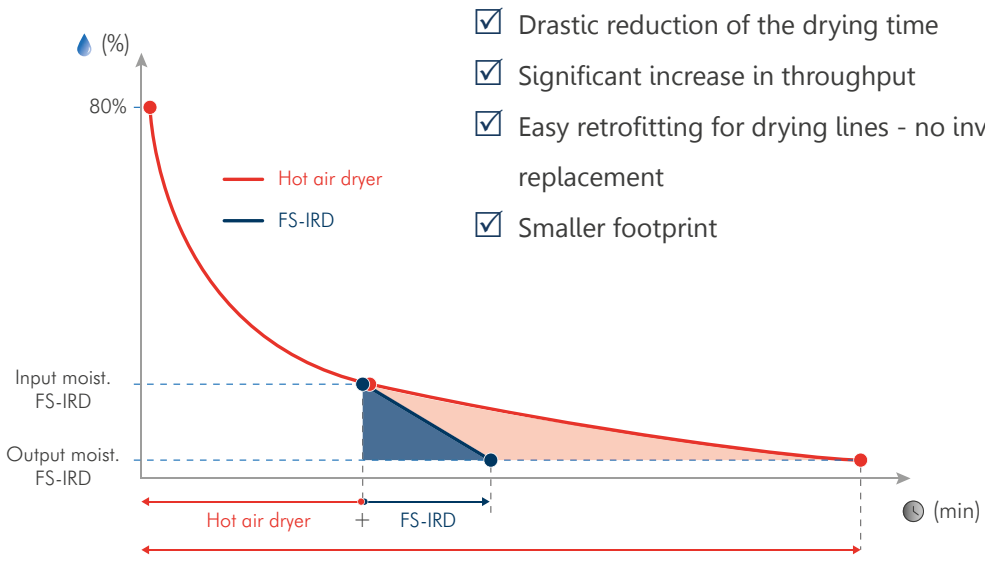
4 to 5 temperature zones can be regulated independently.

EXAMPLE: PRODUCTION LINE FOR EXTRUDED PRODUCTS



BOOSTER EFFECT: SHORTER DRYING TIMES

The economical drying process with the FS-IRD starts with an input moisture level around 25% and the final product can be dried to less than 1%.



- ✓

Drastic reduction of the drying time
- ✓


Significant increase in throughput
- ✓


Easy retrofitting for drying lines - no investing in expensive replacement
- ✓

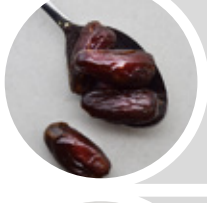
Smaller footprint

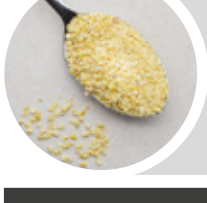
STOCK PROTECTION

YOUR PRODUCTS

Nuts

Seeds

Dried fruits

Cereals, grains & pulses

... and more!

DESTROYING INSECTS, LARVAE & EGGS

**Ensuring sterility, shelf-life & quality.** Two critical steps in processing cereals, nuts, seeds and dried fruits are:

- disinsectization to guarantee sterility, and shelf-life of food
- processing for a high-quality, healthy and unique product.

**Disinsectization process safeguarded with the FS-IRD.** Without any addition of chemicals, but simply with the application of infrared light, destruction of pests and reliable protection of the supply stock is ensured.

COMBINING TWO STEPS IN ONE

During the pasteurization process, the destruction of insects, larvae & eggs is ensured.

ADVANTAGES OF OUR FS-IRD

✓

Short dwell-time

✓

No gases or chemicals used

✓

Automatic regulation of light intensity

✓

Multi-functional performance

ADVANTAGES FOR YOUR PRODUCTS

✓

Safe killing of insects & eggs

✓

Uniform treatment

✓

Ensured protection of supply stock

✓

High-quality product

✓

Pasteurization & stock protection in one step



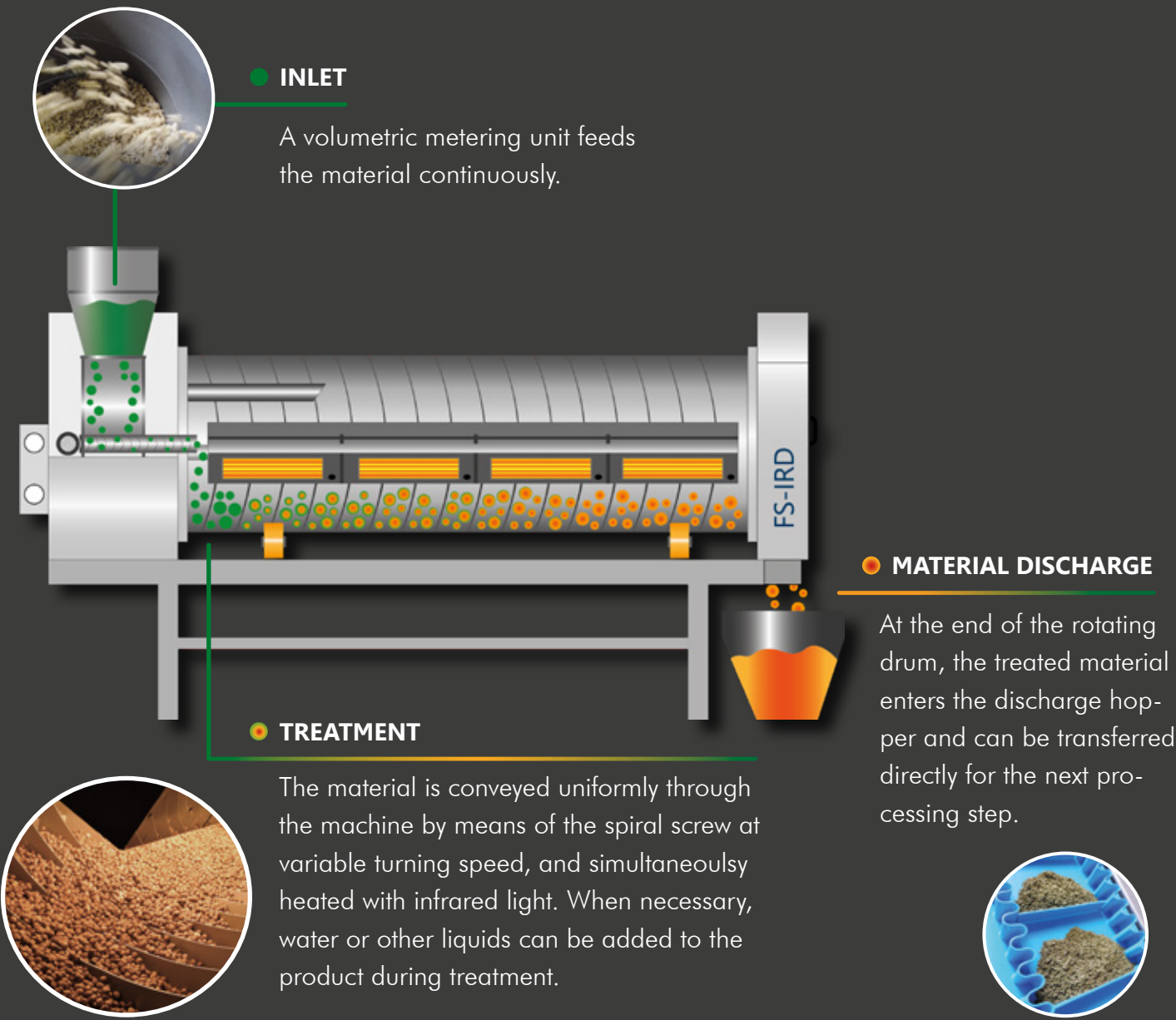
Killing of insects assured



No gases or chemicals



# THE FS-IRD PROCESS



## FULLY AUTOMATIC CONTROL CONCEPT



- Innovative, automated system easy to operate
- Different modes available to cover common applications
- Recipe management for various products
- Control of each IR module
- Up to 5 temperature zones available

# TECHNOLOGY IN LIGHT

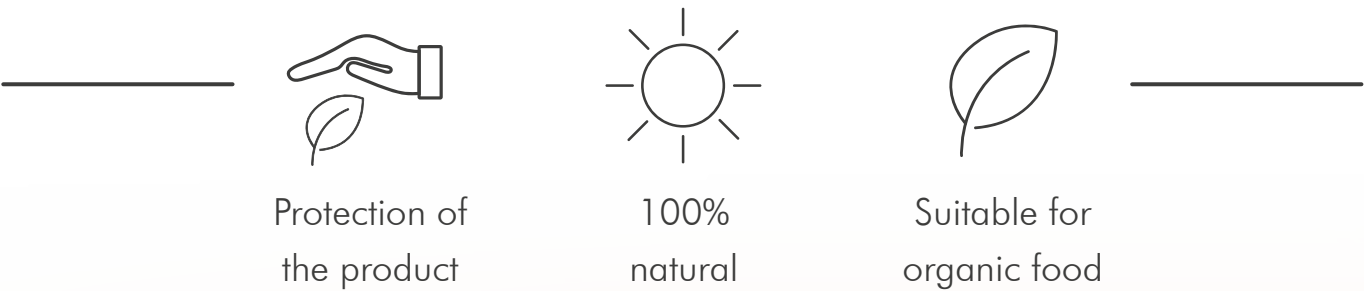
## ADVANTAGES OF IR LIGHT TREATMENT

- ✓ 100% natural - part of the sunlight spectrum
- ✓ Applicable to organic processing
- ✓ Food particles heated rapidly
- ✓ Uniform temperature distribution
- ✓ Protection of product surface
- ✓ No waste of time, saves energy
- ✓ Quick heating means short exposure time of product

## HOW IR LIGHT WORKS IN THE PRODUCT

**Heated from the core outward.** Energy is introduced directly into the product core, heating the material from the inside out.

**Air circulation.** Additional air circulation inside the dryer removes the evaporated moisture from the material.



# FOODSAFETY - ROTARY COOLER

Every natural product requires a cooling step after thermal treatment and before packaging or warehousing. The FS-RC has been designed for food applications that have very high food safety and hygiene requirements.

- Suitable for sensitive products such as nuts, grains, seeds, mixtures, etc.
- The product is mixed and conveyed with a slow, gentle, rotary movement, so the mechanical stress on the product is rendered insignificant.
- A cooling inflow of air, precisely directed at the product, can be adjusted in both temperature and intensity, while heated air is exhausted.
- Optionally, this cooling process can also be used to enable the introduction of salt, flavors, dyes, etc., for coating.

## COOLING SYSTEM



- 1 FS-RC
- 2 Heat exchanger
- 3 Conveyor belts
- 4 Cyclone

### COOLING SYSTEM

Cooling solutions after thermal treatment are important to prevent the recurring formation of germs.



BULK HANDLING SOLUTIONS

ADDITIONAL  
EQUIPMENT

OUR EQUIPMENT	DESCRIPTION
	<div>Dosing belt</div> <ul style="list-style-type: none"><li>• Easy-loading station</li><li>• Protective product-handling (i.e. nuts)</li><li>• Consistent dosing</li></ul>
	<div>Conveyor belts</div> <ul style="list-style-type: none"><li>• Products gently conveyed from one processing station to the next</li><li>• Easy to clean</li></ul>
	<div>FS-IR-BATCH</div> <ul style="list-style-type: none"><li>• For treatment of small &amp; medium-size batches</li><li>• Recommended for many processes</li><li>• Long dwell-times possible</li></ul>
	<div>FS-IRD-LAB</div> <ul style="list-style-type: none"><li>• For in-house development of products &amp; processes</li></ul>
	<div>Mixer</div> <ul style="list-style-type: none"><li>• For product homogenization</li></ul>
	<div>Filter/Cyclone</div> <ul style="list-style-type: none"><li>• Cleaning of exhaust</li><li>• Additional filter available</li></ul>
	<div>Big-bag stations</div> <ul style="list-style-type: none"><li>• Filling station</li><li>• Emptying station</li></ul>

WE PROVIDE SOLUTIONS!

DEMO &  
TEST CENTER

Didn't find your product? We are ready for new challenges & we're looking forward to developing new processes with you!



Book a trial using your products!

For trials, please contact us at:  
food@kreyenborg.com  
+49 2597 93997 0



At our food test facility in Germany we can perform **continuous** and **batch** trials and we provide the following services and processes:

- Sterilization
- Pasteurization
- Roasting
- Coating
- Drying
- Stock protection
- Developing new applications
- Storage
- Mixing
- Conveying
- Dosing

AVAILABLE IN OUR TRIAL CENTER	
<input checked="" type="checkbox"/>	FS-IRD, FS-IRD-LAB, FS-IR-BATCH
<input checked="" type="checkbox"/>	Coater
<input checked="" type="checkbox"/>	Dosing and conveyor belts
<input checked="" type="checkbox"/>	Dosing equipment, conveying screws
<input checked="" type="checkbox"/>	Filter/Cyclone
<input checked="" type="checkbox"/>	Mixer
<input checked="" type="checkbox"/>	Analytical equipment

