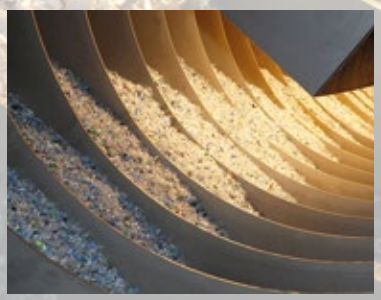
IR-CLEAN®

KREYENBORG

SUPER-CLEAN RECYCLING PROCESS.

PET DECONTAMINATION FOR DIRECT FOOD CONTACT PACKAGING.



DECONTAMINATION OF POST-CONSUMER PET FOR DIRECT FOOD CONTACT PACKAGING

PET - PROCESSING WITH IR-CLEAN.®

With the IR-CLEAN® system, KREYENBORG offers an attractive and cost-effective alternative for the direct reprocessing of PET post-consumer flakes for food packaging - without using any vacuum technology and as a retrofit solution for existing extrusion lines. The efficiency of the cleaning process has been verified by a Letter of Non-Objection from the US Food and Drug Administration (FDA). Similarly, several challenge tests have demonstrated compliance with the criteria established by the European Food Safety Authority (EFSA) for the use of recycled materials for direct food contact packaging.

High-Performance Decontamination
Efficient decontamination of recycled PET for re-use in direct food contact packaging.

FDA & EFSA Approvals
FDA Letter of Non-Objection granted, EFSA thresholds attained for up to 100% recycled material.

Continuous Process
Continuous processing from the product-feed to the extruder inlet.

Drying Up to 50 ppm
Crystallization and drying in a single process.

First-in / First-out
Rotary drum with internal helix guarantees a defined flow of materials.

No Vacuum
No maintenance-intensive and expensive vacuum system is required.

Easy Retrofitting
A problem-free upgrade of a non-EFSA or -FDA-approved extrusion line is possible.

Easy Start-Stop Process
No long pre-heating processes are necessary. System can be started directly with cold material.

Easy and Cost-Effective Maintenance
Maintenance is uncomplicated and not time-consuming.

High Energy Efficiency
High efficiency through direct heat input.

Small Footprint
Horizontal system layout does not require high plant ceilings.

FDA & EFSA APPROVALS

PER FDA DEFINITION.

IR-CLEAN® IR-CLEAN+

FDA Abbrev.	Type of Heat Treatment / Storage	Temperature Limits	Criteria Achieved
A	High temperature heat-sterilized	> 100 °C (> 212 °F)	No
B	Boiling water sterilized		No
C	**Hot filled or pasteurized**	**> 65 °C (> 150 °F)**	**Yes**
D	**Hot filled or pasteurized**	**< 65 °C (< 150 °F)**	**Yes**
E	**Room temperature filled and stored**	**No thermal treatment**	**Yes**
F	**Refrigerated storage**	**No thermal treatment**	**Yes**
G	**Frozen storage**	**No thermal treatment**	**Yes**
H	Frozen or refrigerated storage		No
I	Irradiation (Microwave)		No
J	Cooking at high temperatures	> 120 °C (> 250 °F)	No

FDA Criteria	**40 days**	**6 °C (43 °F)**

PER EFSA DEFINITION.

IR-CLEAN+

Process	Consumer	PCR Bottle Flake (%)	Virgin / Inhouse (%)
Bottle to bottle	Baby	100	0
	Toddler	100	0
	Adult	100	0
Thermoform packaging (e.g. meat trays)	All ages	100	0

EFSA criteria	**Bottle to bottle**	**365 days**	**25 °C (77 °F)**
	Thermoform packaging	**30 days**	**6 °C (43 °F)**

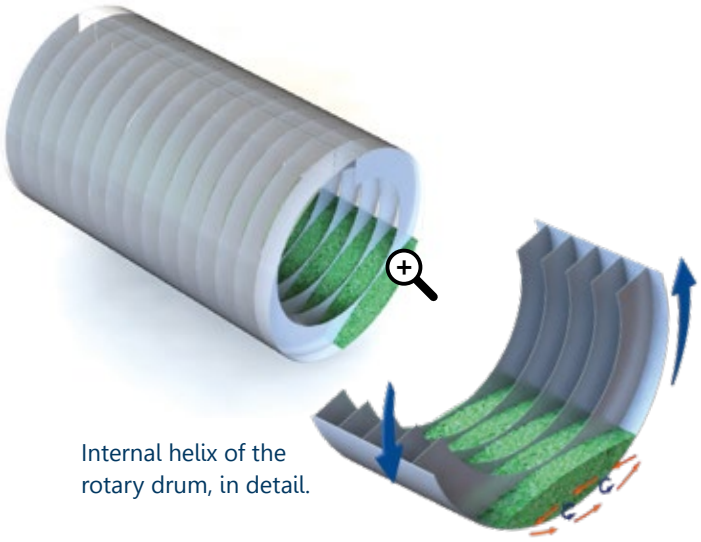
KREYENBORG

IR-CLEAN® **STEP.**

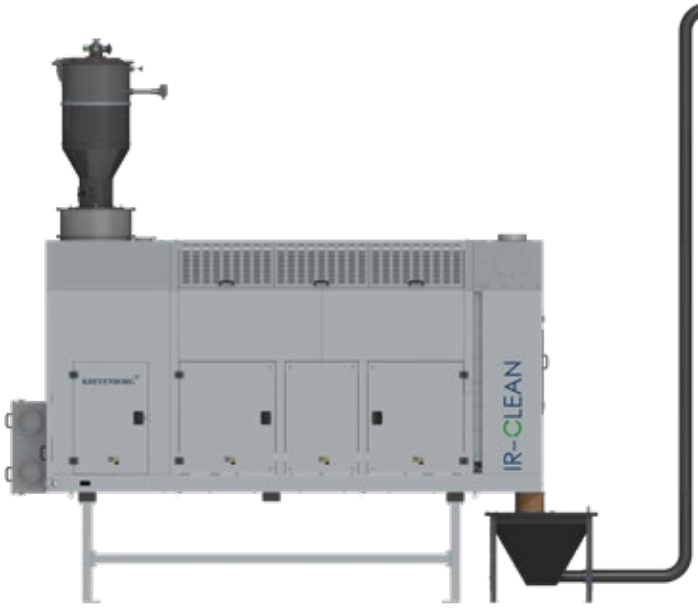
The PET recycling material is conveyed to the metering hopper of the IR-CLEAN® system and introduced into the rotary drum via a volumetric metering system. The internal helix welded into the rotary drum ensures a homogeneous mass flow with a defined residence time (the first-in / first-out principle). Due to the rotation of the rotary drum and mixing elements integrated in the coils, the material is continuously mixed with simultaneous, constant surface exchange.

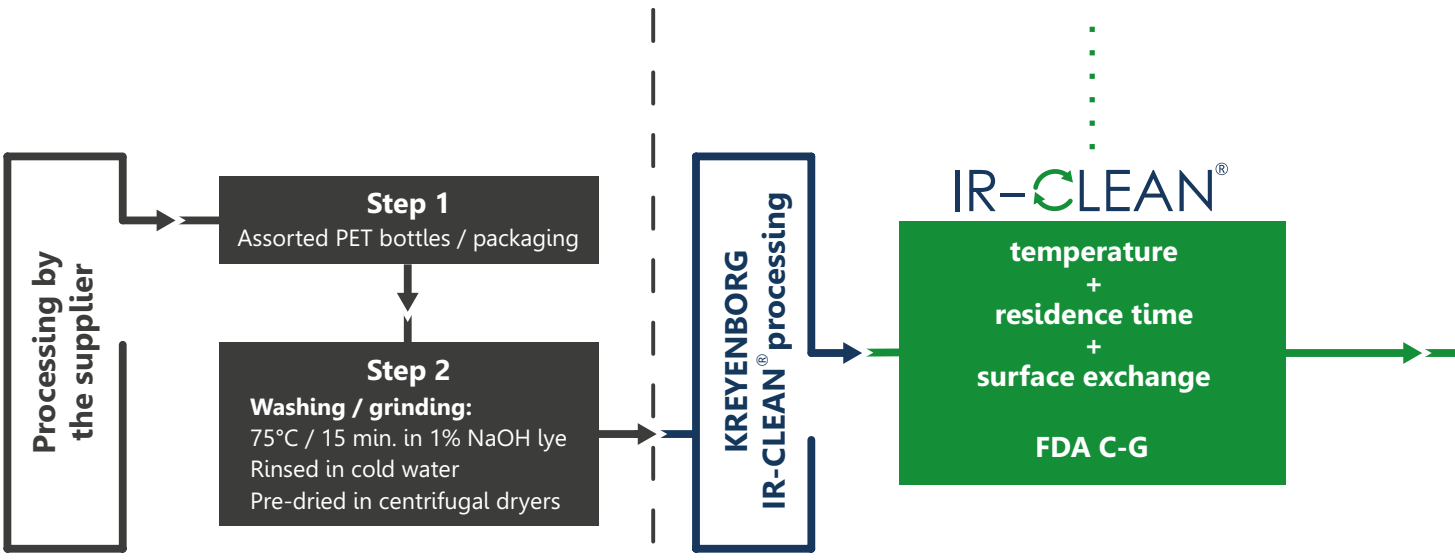
The infrared module installed above the material bed heats the material quickly and directly to a high temperature level.

The moisture-laden air is discharged from the IR-CLEAN® through a constant air stream. After minutes, rather than hours, the material exits the IR-CLEAN® and is available for the next process step.



Internal helix of the rotary drum, in detail.



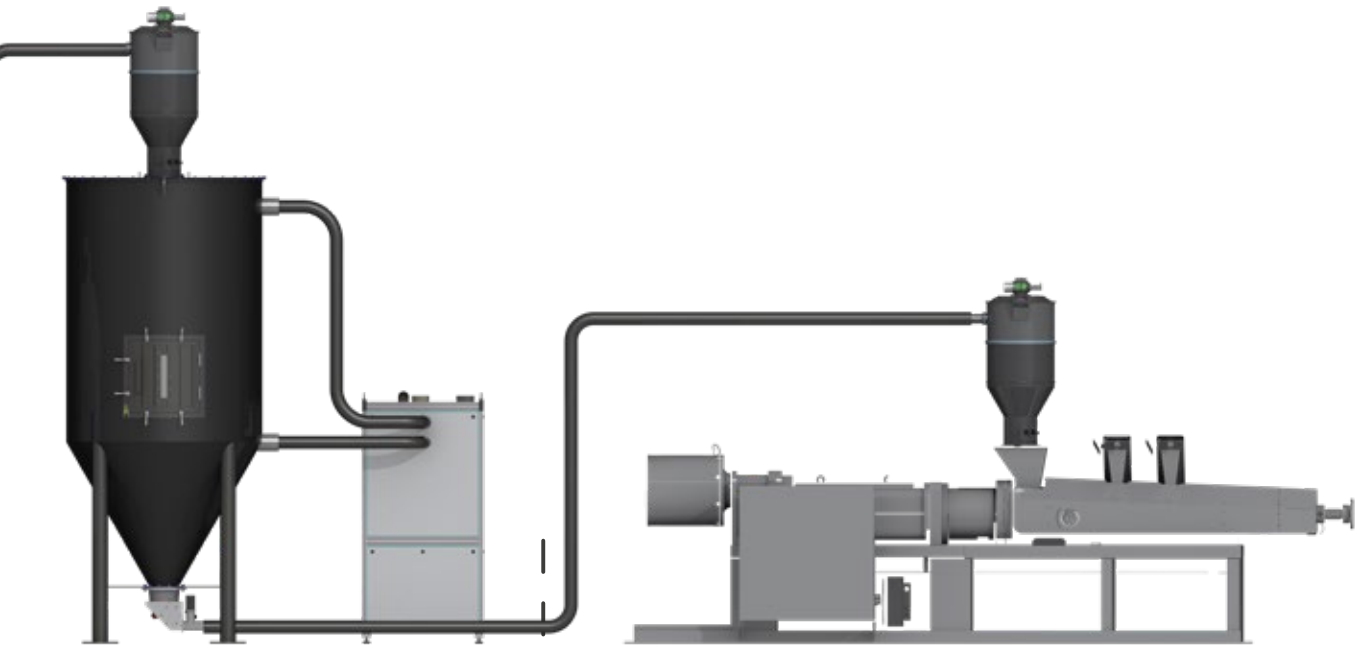


SUPER-CLEAN STEPS

IR-CLEAN+ STEP.

The combination of the IR-CLEAN® system with a finisher in the form of a desiccant dryer enables a further reduction of contamination, and has the added benefit of reduction to < 50 ppm of residual moisture.

The IR-CLEAN+ system also includes all necessary system components, including conveying equipments, filter units, de-misters and a comprehensive control package including on-going process documentation.



IR-CLEAN+

temperature
+
residence time
+
surface exchange

FDA C-G
+
EFSA
+
50 ppm moisture content

Extruder

- Single screw extruder ..... IR-CLEAN+
- Twin screw extruder ..... IR-CLEAN or IR-CLEAN+
- Multi-rotating screw extruder ..... IR-CLEAN or IR-CLEAN+
- Ring extruder ..... IR-CLEAN or IR-CLEAN+
- Planetary extruder ..... IR-CLEAN or IR-CLEAN+

KREYENBORG

SILOS

MIXER

DRYER

DOSING EQUIP.

CONVEYING EQUIP.

BIG-BAG STATIONS

TURN-KEY SOLUTIONS

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