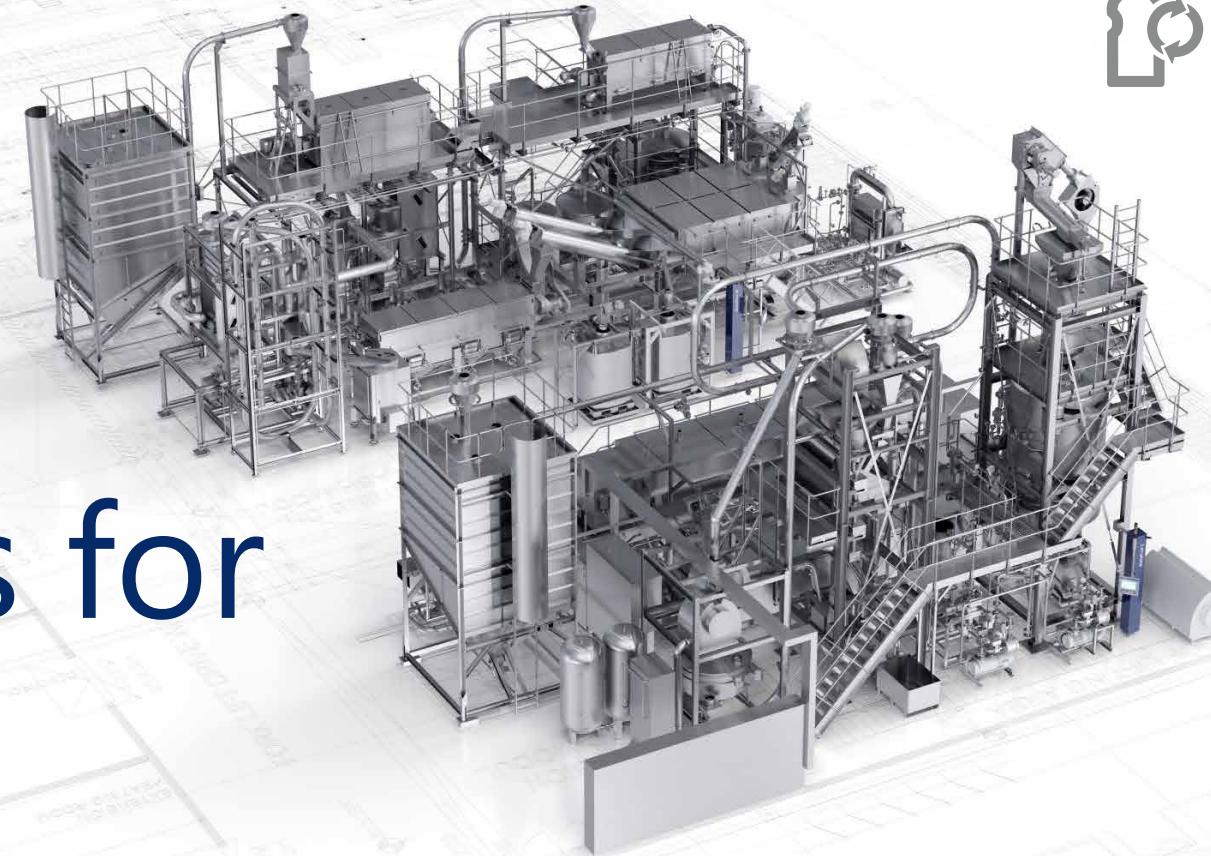




Krones solutions for PET recycling

MetaPure W and S



 KRONES

Sustainability and economic efficiency

Our contribution to circular economy

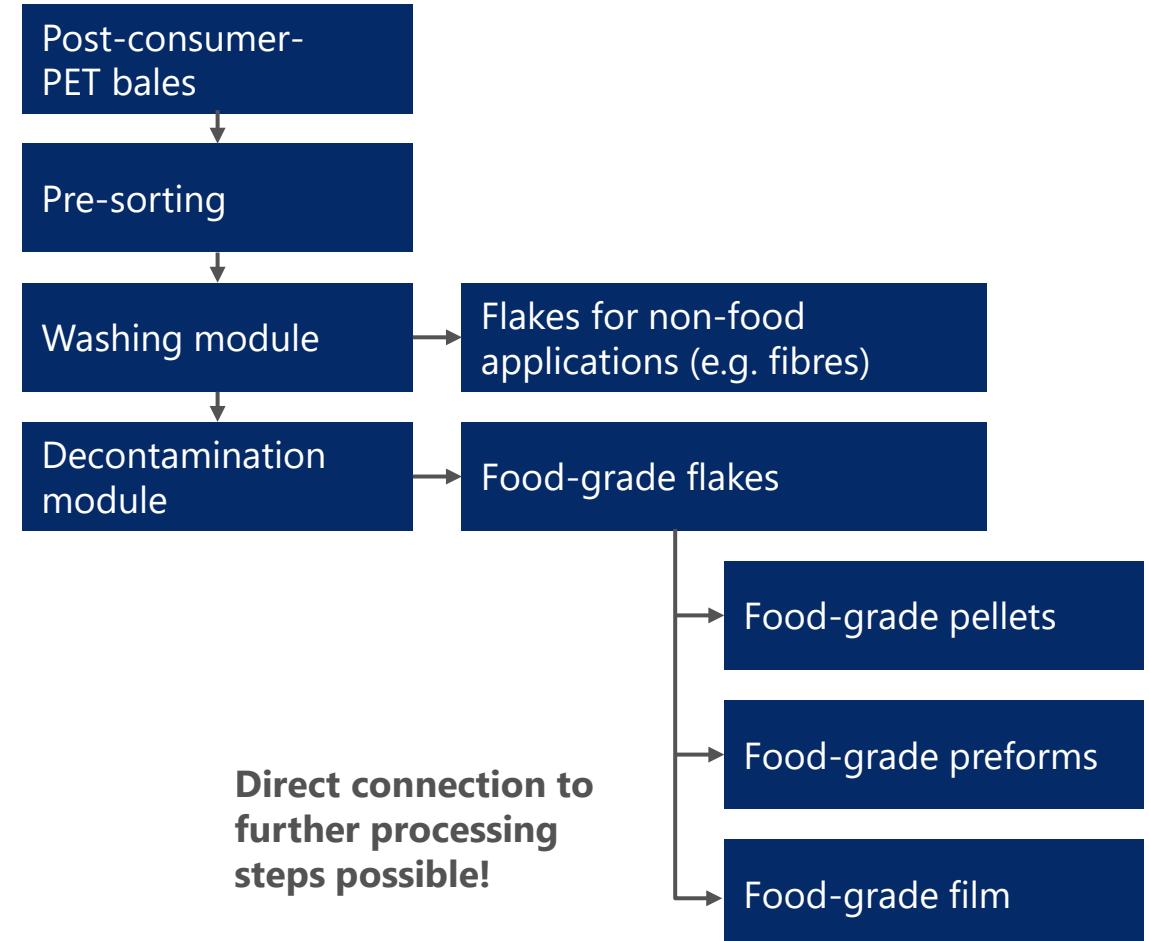


Can plastic packaging be sustainable? Yes, if its production is gentle on resources and it can be kept in a closed loop – and Krones makes both possible. From a material-saving packaging design through to low-energy container production and the recycling of used plastic materials: We give PET bottles and other packaging the chance to have a sustainable and environmentally friendly life – not only once, but multiple times.

Recycling plays a key role here. On the one hand, Krones provides its own washing and decontamination modules and, on the other, also takes on the overall responsibility for entire recycling factories.

At a glance

- Recycling of PET containers into flakes or pellets
- Energy-saving, direct further processing (optional)
- Individually adjustable intrinsic viscosity (IV)
- Production of different material qualities – up to food-grade PET standard according to FDA, EFSA and other certificates
- Available as a complete line or in the form of individual machines



Three system types for PET recycling



System type	MetaPure (complete system)	MetaPure W-PET	MetaPure S
Field of applications	Recycling of containers pressed in bales/as pressed containers <ul style="list-style-type: none">– into PET flakes or pellets for use in direct contact with foodstuffs– or inline directly into preforms or film	Recycling of containers to form PET flakes for use in non-food products or for further processing for direct contact with foodstuffs	Decontamination and SSP** of washed PET flakes to PET flakes or pellets for use in direct contact with foodstuffs
Output	1,000 kg/h to 6,000 kg/h	1,000 kg/h to 6,000 kg/h*	500 kg/h to 1,500 kg/h*
Space requirement	600 – 4,500 m ²	250 – 1,000 m ²	250 – 500 m ²

Who can use MetaPure?

- Brand bottlers
- Private label bottlers
- Converters
- Recyclers

* Several modules can be combined with each other in order to achieve higher outputs. | ** SSP = Solid State Polymerisation

The front end

Pre-sorting of the incoming material



Separation of foreign matter and impurities and sorting of the input material

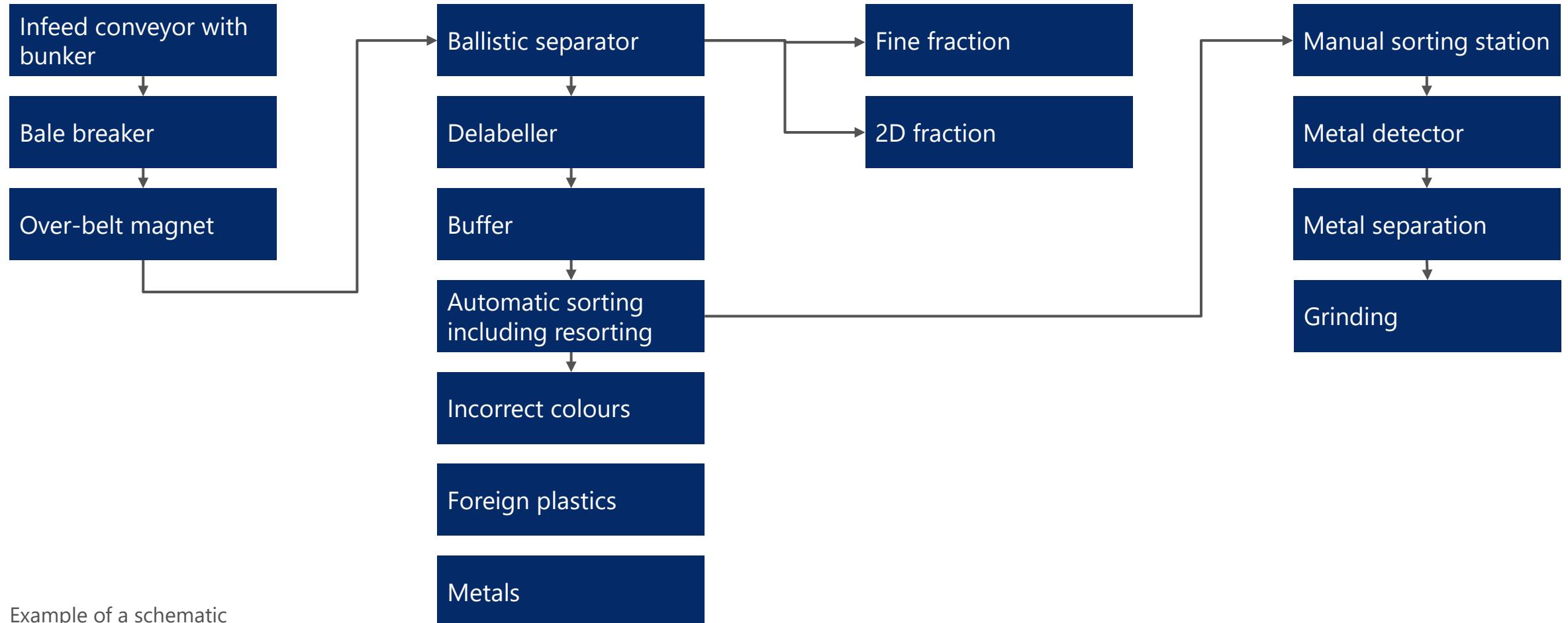
- Separation of the containers
- Removal of undesired foreign matter and impurities such as wood, sand, glass and metal, as well as coloured plastic materials and foreign polymers
- Removal of labels
- Grinding into flakes

The pre-sorting system can be individually adjusted to the quality of the infeed material, the local conditions and the required levels of purity.



The front end

Pre-sorting of the incoming material



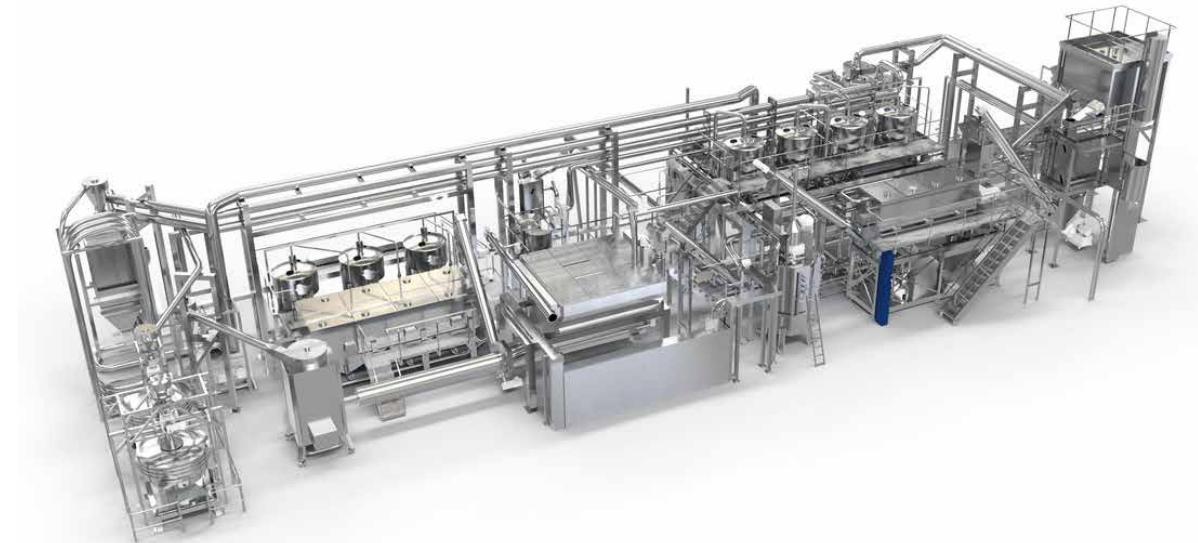
Example of a schematic representation

The MetaPure W-PET washing module



Excellent cleaning results with the Krones washing technology

- Pre-cleaning
- Caustic cleaning with caustic renewal
- Multi-stage post-washer
- Drying
- Automatic waste management system reduces the operator's work
- Separation of labels and caps using a float-sink separation system and sifter



The Krones washing process with pre-treatment, caustic cleaning and hot post-washing ensures clean flakes with the best usability for high-quality applications (fibre, film, injection moulding).

Benefits to you with the MetaPure W-PET



- **Gentle treatment** of the material as the units operate with a slow rotation
- **Reliable removal** of dirt, organic residues and adhesives using a caustic washer
- **Less cleaning and more safety** for the line operators thanks to the clean design and automatic waste management system
- Possibility to **reuse the process water** with the integrated water cascade
- **Very good washing results** achieved with a hot post-washing process
- **Reliable removal** of caps and labels so that they can be reused (optional drying, separation and sack filling)
- **Constant concentration** and **low consumption** of caustic, additives and defoamers thanks to the automatic dosing equipment
- **Robust construction** and design of many parts in **stainless steel** to protect your investment



The MetaPure S decontamination module



The way to food-grade flakes or pellets

- Drying and heating of the flakes
- Decontamination of the flakes to remove migrated substances
- Fixed-phase post-condensation (SSP) to raise the intrinsic viscosity (IV)
- Highest flexibility after SSP: three options for the end products
 - Inline direct further processing of food-grade flakes into **preforms** or **film** possible
 - Alternatively: production of **pellets** with double the safety by degassing of the melt in an additional cleaning step during extrusion

Due to the fact that flakes can be decontaminated quicker than pellets, the MetaPure S stands out thanks to its lower energy requirement and gentle material handling.



Benefits to you with the MetaPure S



- **Quick decontamination** and IV build-up in the flake
- **FDA and EFSA certificates** awarded:
Use of up to 100 percent rPET for food packaging
- **Higher yield** thanks to a vacuum reactor and heating conveyors as they generate fewer fine particles
- **Energy-saving option:** direct connection to machines for further processing (preform, film, fibre)
- **Double the safety** in the pellet process: extruder with FDA certification for extra clean pellets (optional)
- **Maintenance** of the vacuum system possible **during operation**



European Food Safety Authority

EFSA Journal 2014;12(11):3886

SCIENTIFIC OPINION

Scientific Opinion on the safety assessment of the processes "Roxane Nord" and "Stute", based on KRONES® technology used to recycle post-consumer poly(ethylene terephthalate) (PET) into food contact materials¹



Dear Drs. Frank and Weller:

No Objection Letter for Recycled Plastics #102

November 23, 2006

Robert Ward
Frank Weller
Institute of Hygiene
Lehrstuhl für Lebensmittel- und Verarbeitung
Gottschalkstr. 23
D-80534 Freising
Germany

Re: Premanufacture Consultation (PMC) 530

Dear Drs. Frank and Weller:

This is in response to your submissions, received electronically on 22 December 2005 (PMC 455), in the mail 30 January 2006 (PMC 470), and 26 July 2006 (PMC 520), requesting an initial (NOEL) or an opinion letter from the FDA confirming the capability of KRONES's secondary recycling process (called "Super Clean") to produce suitable polyethylene terephthalate (PET) for use in the manufacture of articles in contact with food under conditions of use C through G, as described in Table 2 on our website: <http://www.cfsan.fda.gov/~mols/pet-fact.html>.

We have reviewed KRONES's recycling process as well as the information obtained from surrogate testing and regulatory modeling that were submitted to demonstrate the capability of the KRONES's recycling process to remove potential contaminants from PET. Based on our review of these data, we have concluded that KRONES's recycling process, as described in the 30 January 2006 submission, would be effective in reducing potential contamination from the following sources of food and non-food PET, pursuant to the NOEL values, as directly measured or below 0.5 ppb, FDA's threshold of regulatory concern. Therefore, we have concluded that KRONES's recycling process would produce recycled PET that is of a purity suitable for use in the manufacture of articles in contact with food under conditions of use C through G, as described in Table 2 on our website: <http://www.cfsan.fda.gov/~mols/pet-fact.html>.

If you have any further questions concerning this matter, please do not hesitate to contact us.

Sincerely,

Vincent Komiprasert, Ph.D., R.H.
Consumer Safety Officer
Division of Food Contact Notifications, HHS-275
Office of Food Additive Safety
Center for Food Safety
and Applied Nutrition

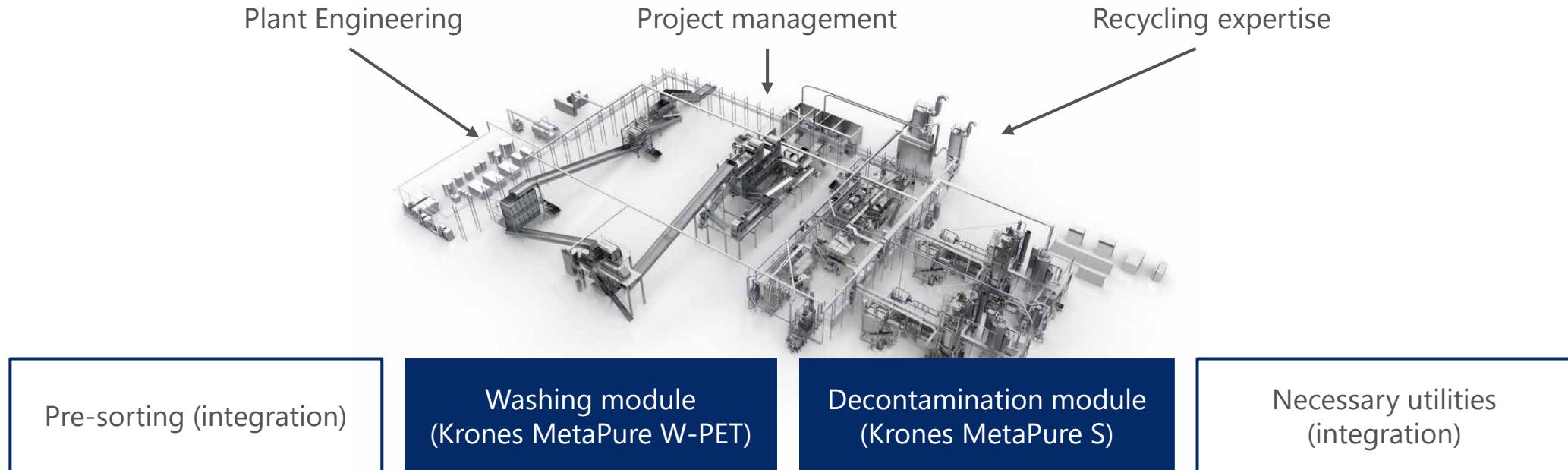


our complete-system expertise

Krones as turnkey supplier and integrator



Complete recycling plant from a single source



Benefits to you: one single contact partner and fewer interfaces

Benefits to you



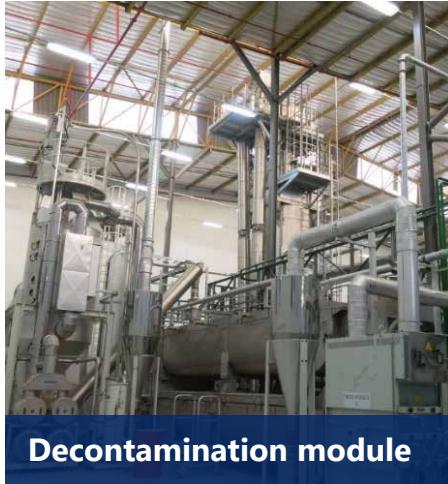
Incoming material



Front end



Washing module



Decontamination module



SSP reactor

- Krones turnkey solution: Both washing and decontamination technology from a single source
 - Washing module with a well thought-out concept and excellent washing results
 - Decontamination module with a unique set-up (treatment in solid and liquid phases)
- Proven technology for PET, also transferable to innovative PO recycling technology

Requesting a new machine

You can easily send a request for a non-binding quotation in our Krones.shop.



Everything from a single source



KIC Krones colclean optimise the PET washing process

Only if the process and processing and operating materials fit together perfectly, the result is right. This is ensured by KIC Krones additives.

Krones Lifecycle Service – Partner for Performance

It goes without saying that also after the purchase of new machines, Krones takes care of your lines: The Krones LCS experts are always there to help you reaching your goals and turn your wishes into optimal LCS solutions.



**SOLUTIONS
BEYOND
TOMORROW**

