



Infrared Drum IRD

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Kreyenborg GmbH

Screen Changers, Gear Pumps, Polymer Valves

Bruckmann & Kreyenborg Granuliertchnik

Underwater Pelletizing

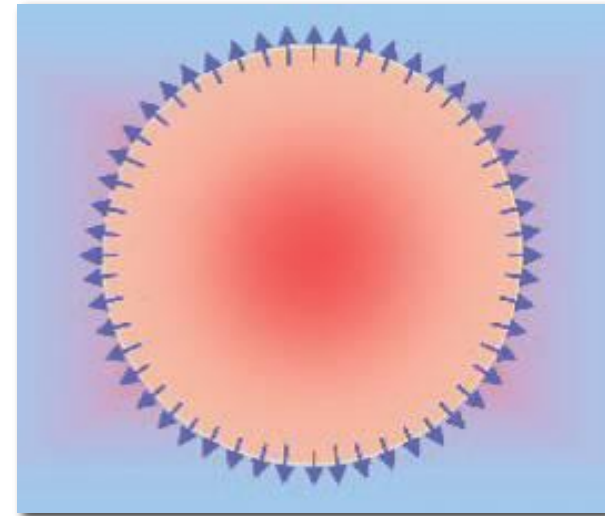
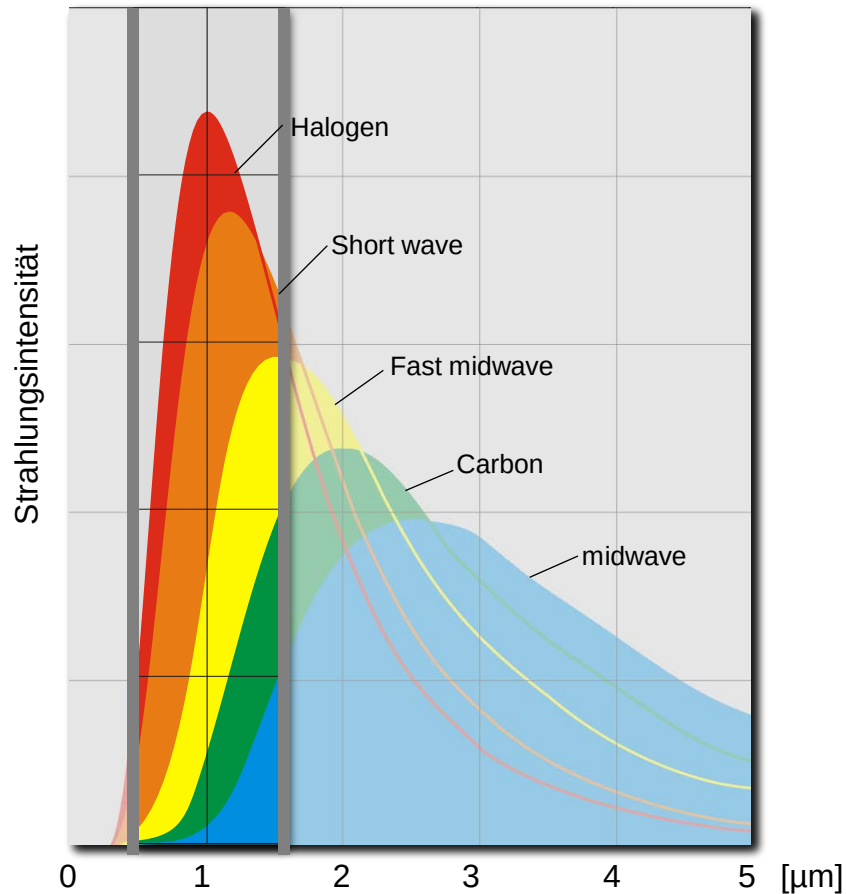
Kreyenborg Plant Technology

Infrared Dryer, Silos, Mixers, Fabrication

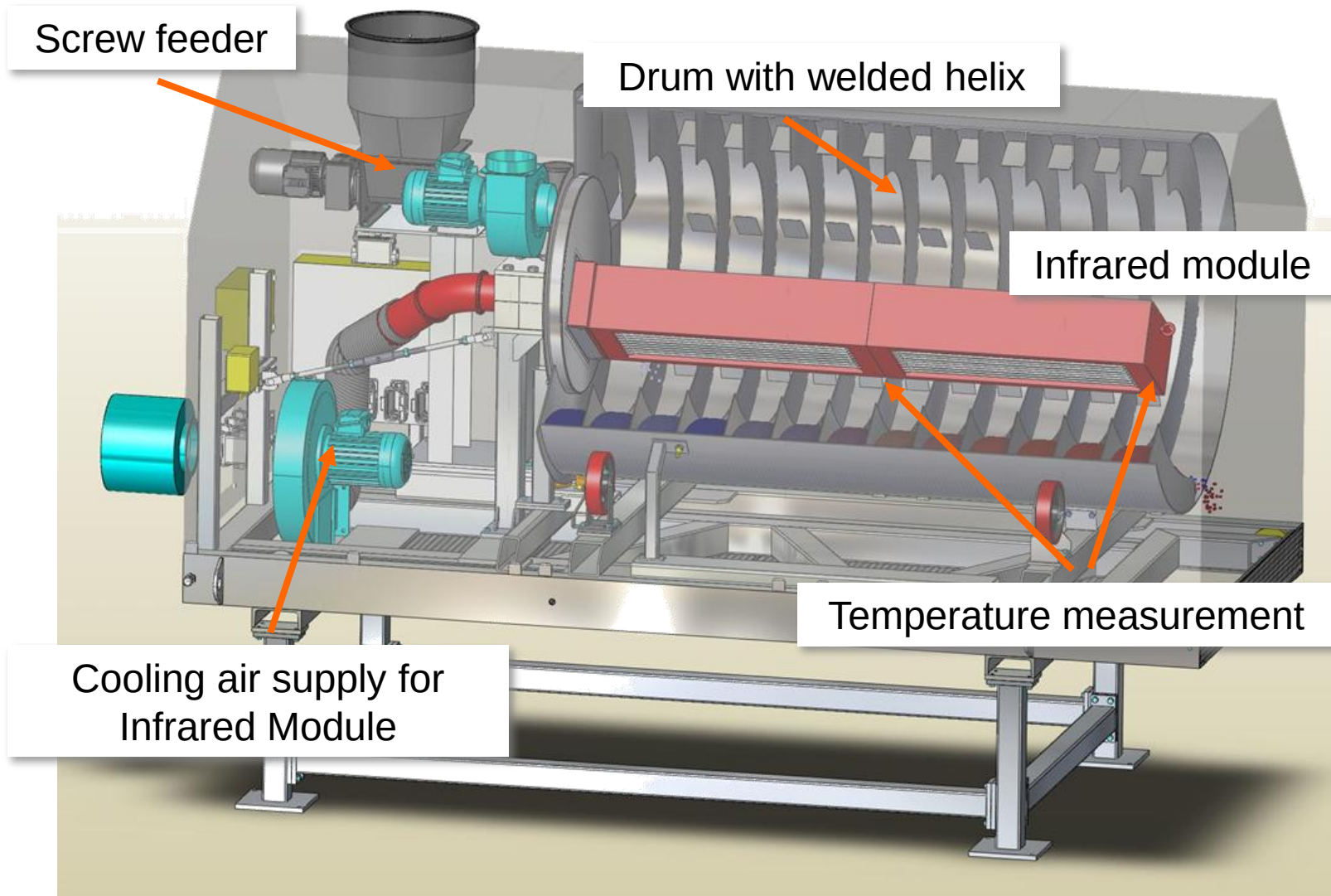
BSG Controls

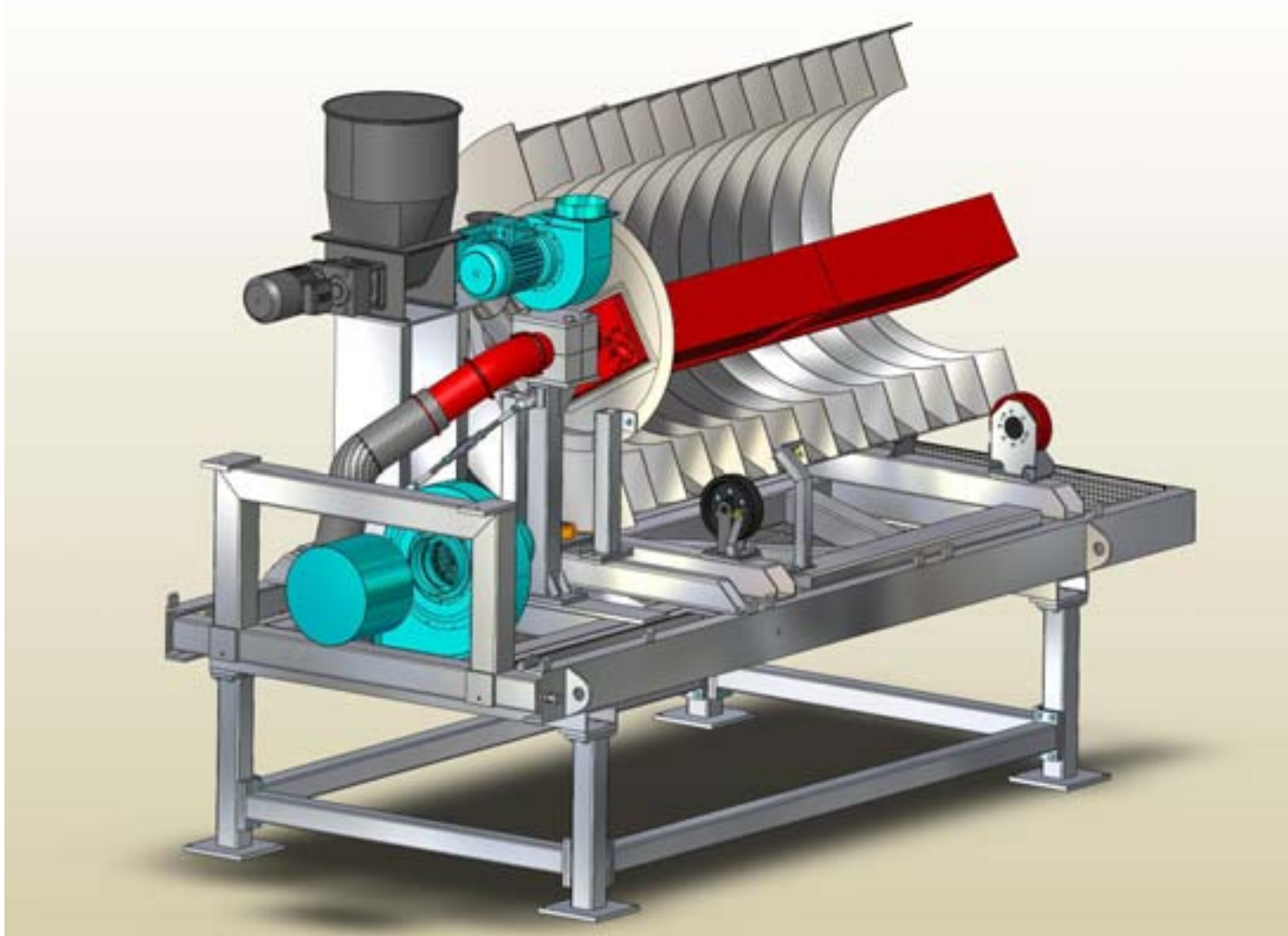
Extrusion Control Systems

- Short wave Infrared Radiation – heating from the inside



$$T_{\text{Particle}} > T_{\text{Ambient}}$$



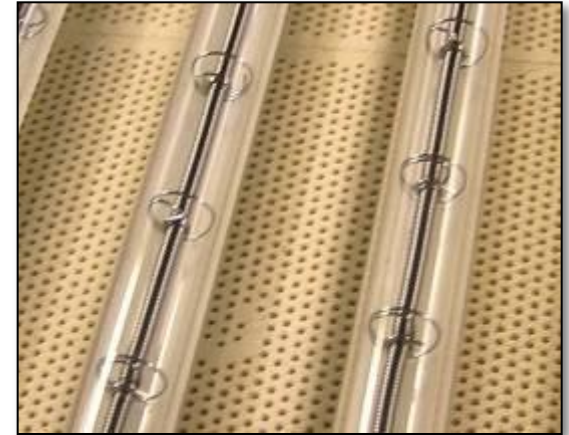
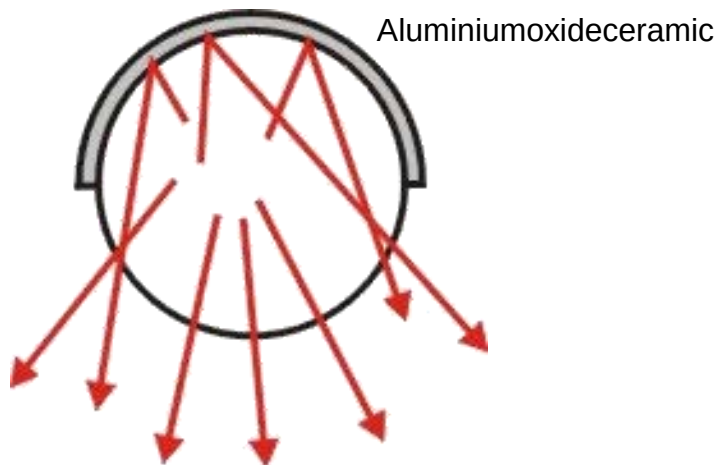


IRD – Technology / Basic design



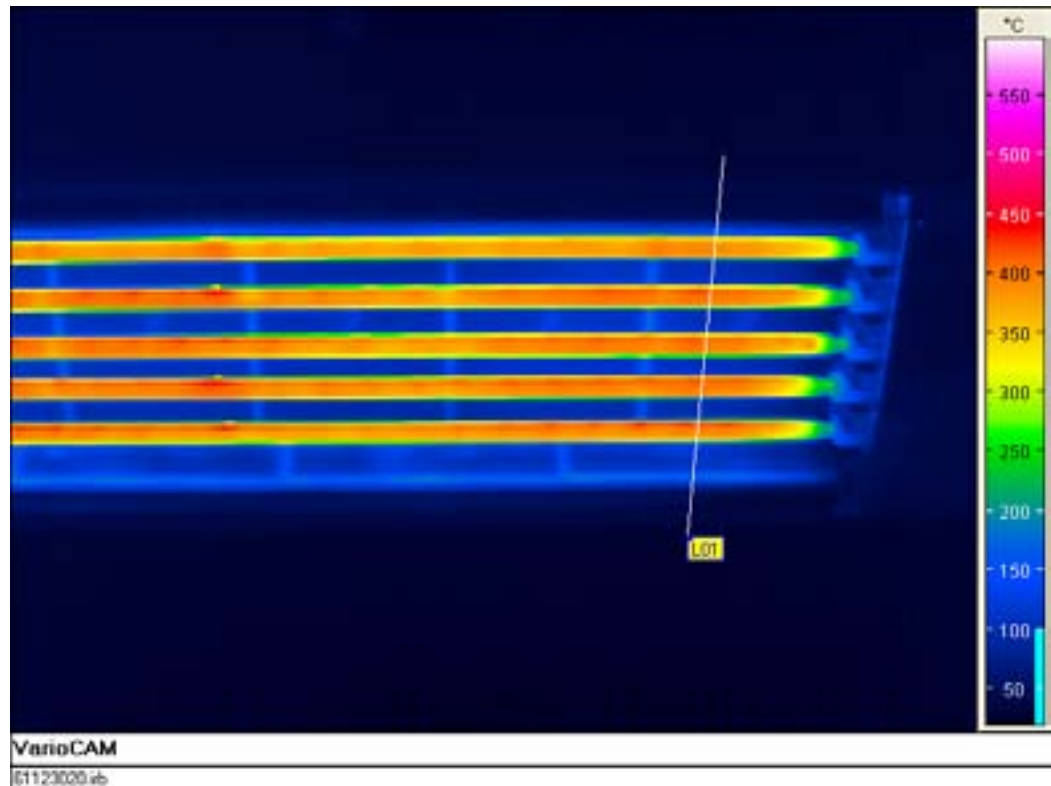
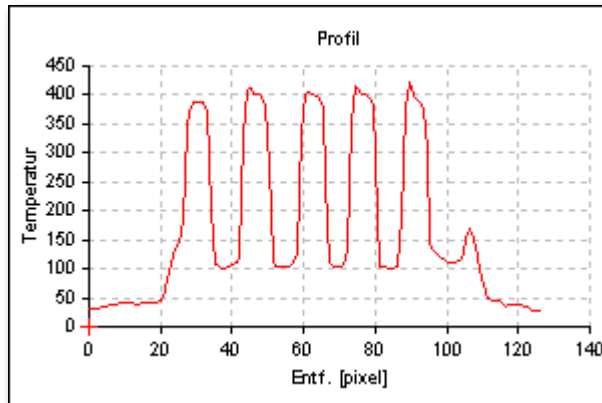
KREYENBORG Infrared Heater Modules

- ▶ Specially developed for operating in dusty conditions
- ▶ long integrity lifetime of infrared lamps
- ▶ Infrared lamps with integrated reflectors
- ▶ low spare part costs



KREYENBORG Infrared Heater Modules

- Extensive tested and simulated technology



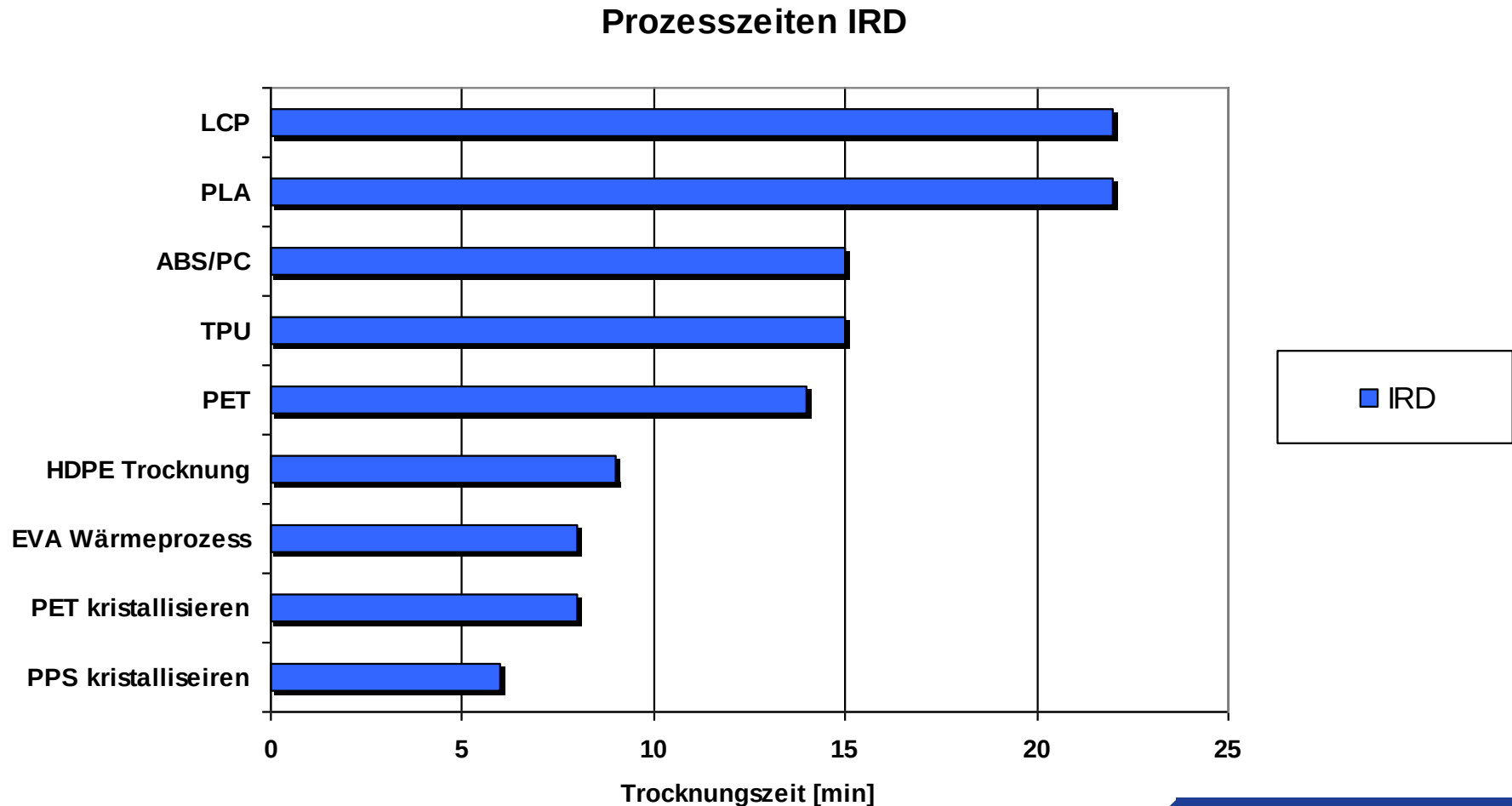
KREYENBORG Infrared Drum

- ▶ modular design specific to the application
- ▶ over 200 possible combinations of drum design combined with installed infrared power
- ▶ Throughput range from 20 kg/hr up to 5000 kg/hr (40 – 11.000 lbs/hr)



KREYENBORG Infrared Drum IRD

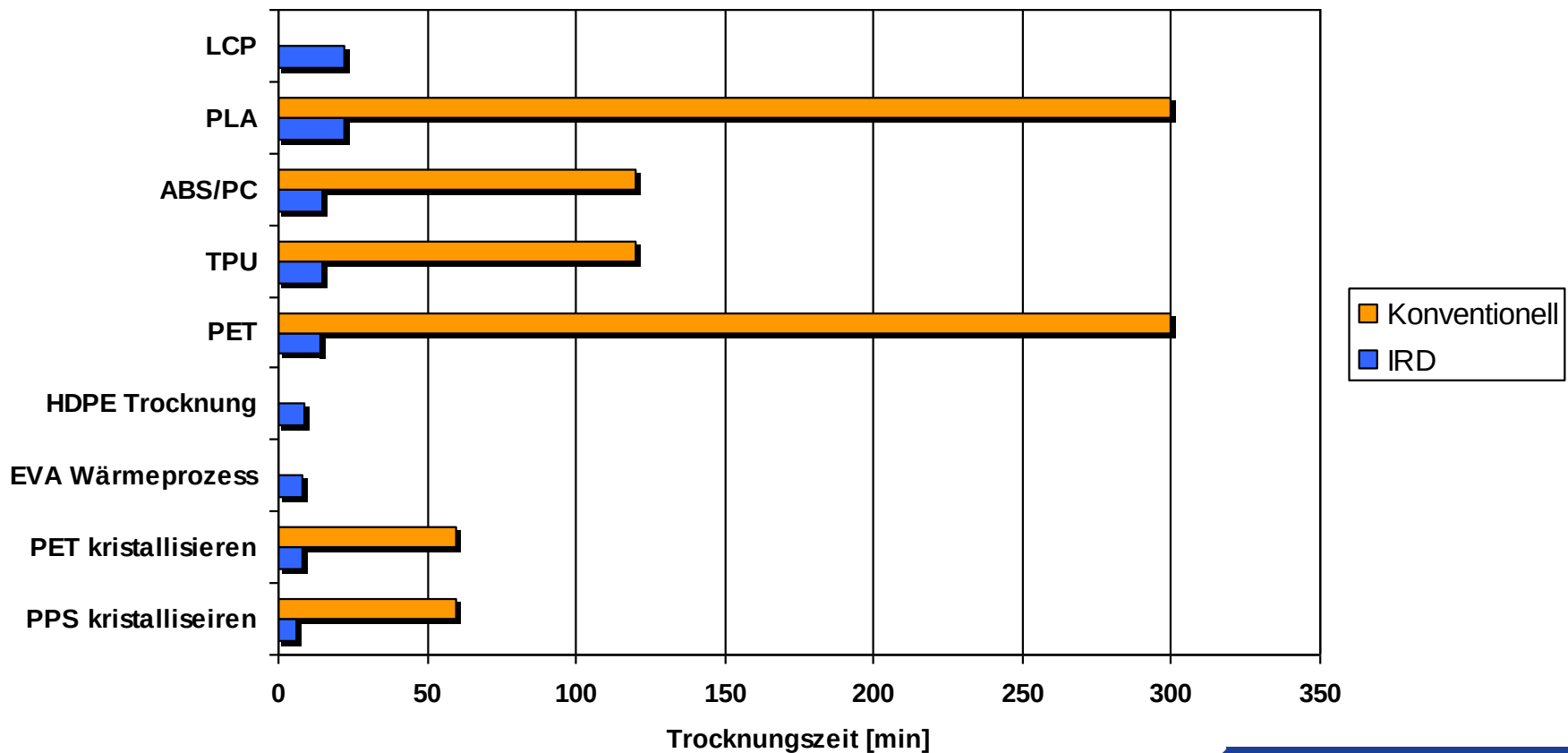
- ▶ short residence times [min]



KREYENBORG Infrared Drum IRD

- ▶ short residence times [min]

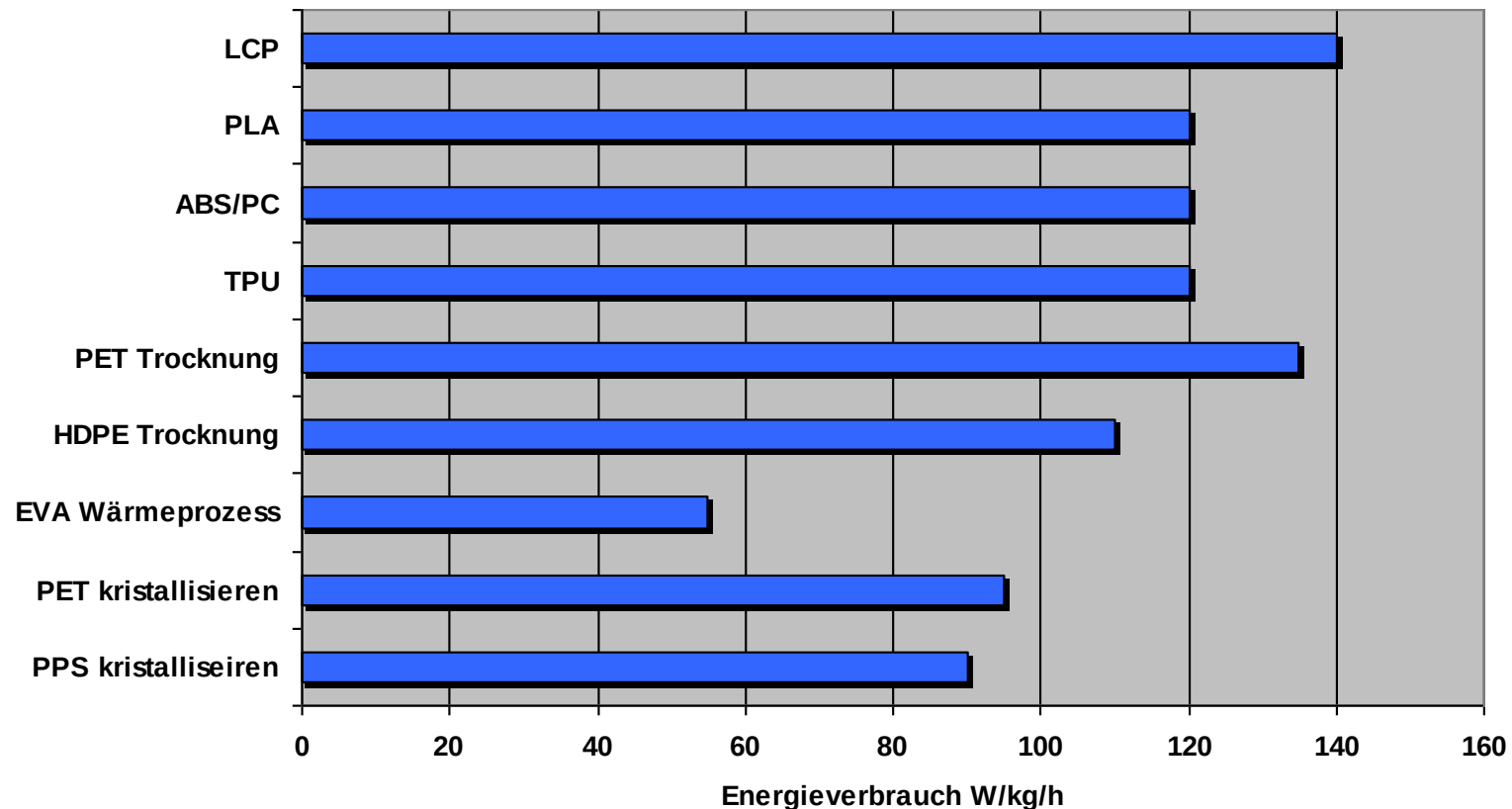
Prozesszeiten IRD - Konventionell



KREYENBORG Infrared Drum IRD

- ▶ less specific energy [W/kg/h]

Energieverbrauch IRD

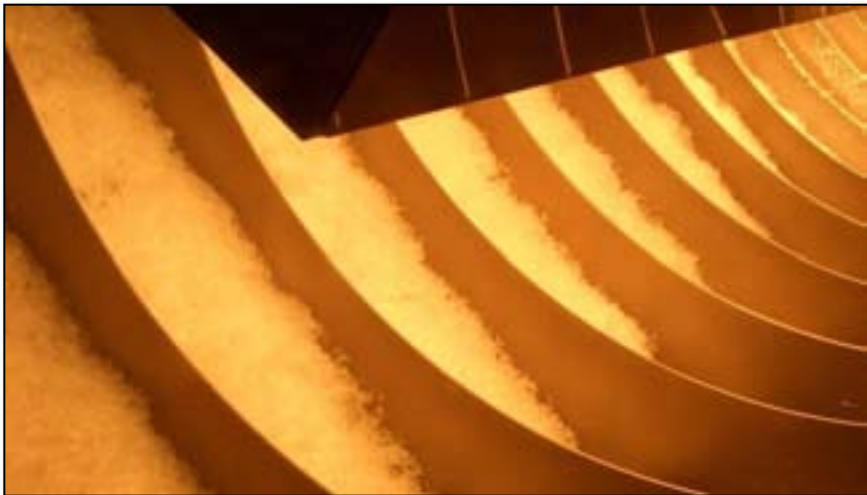


Why Crystallize and dry PLA

- ▶ Unlike many other major packaging resins (e.g., polyolefins, polystyrene, and PVC), PLA biopolymer is produced by a condensation reaction. This reaction, which also produces water, is reversible.
- ▶ Therefore, when undried PLA biopolymer is melted the resin and water chemically react. Hydrolysis occurs and key mechanical properties of the biopolymer are reduced.
- ▶ This hydrolysis reaction also changes the polymer melt viscosity and the crystallization rate, making it very difficult to process into a quality end product.

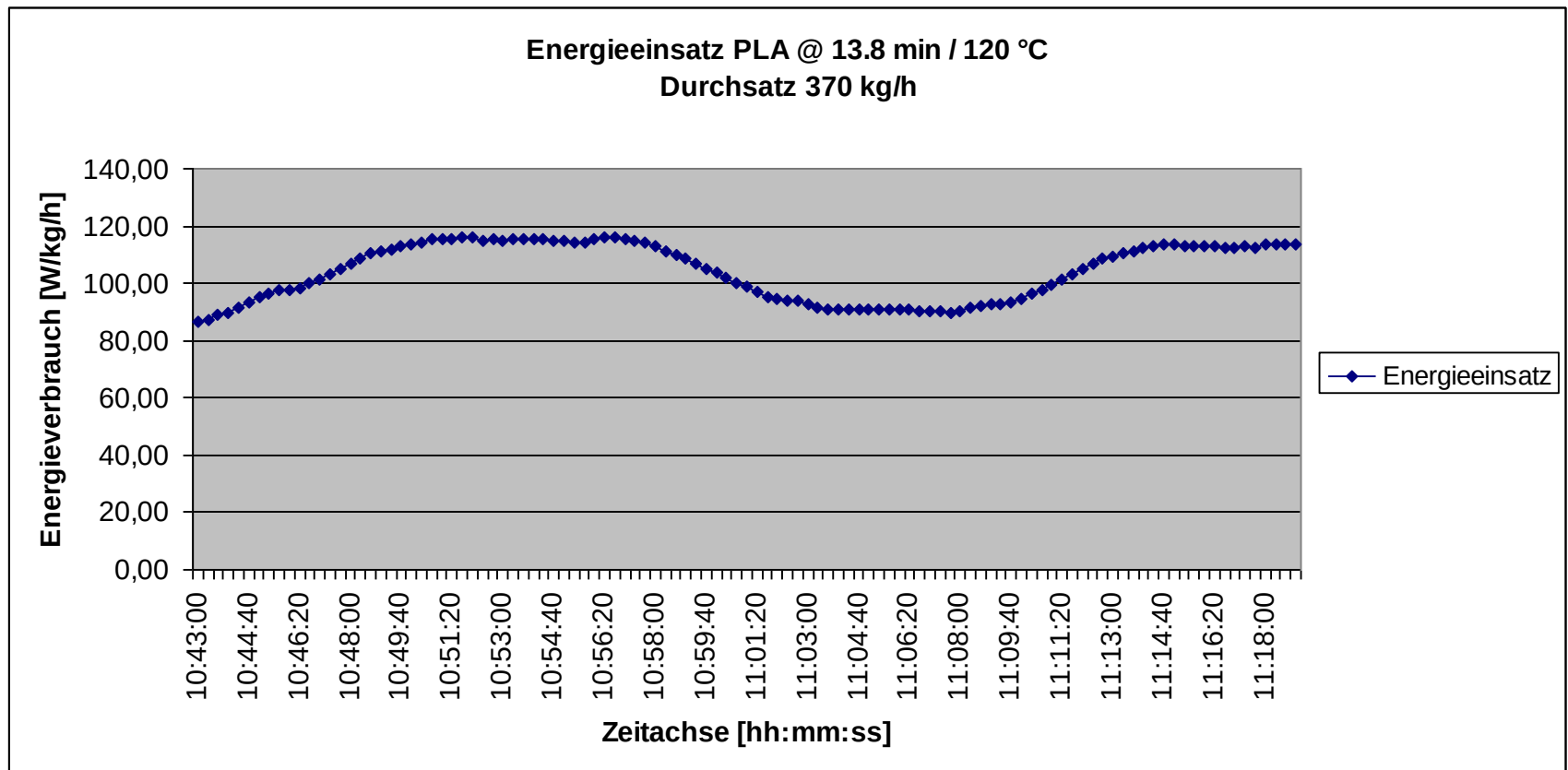
Application: Crystallization and Drying of PLA

- ▶ Difficult handling due to sticking of Flakes – good mixing necessary
- ▶ Temperature sensitive in the area of $60^{\circ}\text{C} \pm 10^{\circ}\text{C}$
- ▶ Specific material handling and temperature profiles necessary



Application: Crystallization and Drying of PLA

- ▶ Energy consumption 100 – 120 W/kg/h



Muenster Trial Facility available for customer trials



Examples of IRD in 'Real Life' applications

Infrared drying is an industrially proven process

Application: Austria – IRD B-160/270 sheet extrusion

- ▶ Crystallization and Drying of PET sheet flakes in one process
- ▶ Throughput rate up to 900 kg/hr



Application: Great Britain – IRD B-180/270-135

- ▶ 800 kg/h PET Thermoforming sheet Regrind



Application: Belgium – IRD B-180/270

- ▶ 900 kg/h PET Sheet Flakes



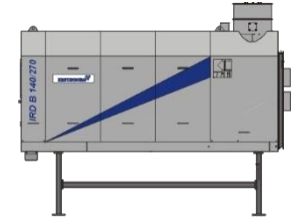
Application: Czech Republic – 4 x IRD B-180/270-135

- ▶ each 1300 kg/h PE Pellets



Application: Ireland - IRD B-120/270-90

- ▶ Crystallisation of thick PET-Regrind
- ▶ drying and crystallisation in one step
- ▶ 600 kg/h



Application: Columbia – IRD B-140/270-90

- ▶ 600 kg/h PET Bottle Flakes¹



Application: Columbia – IRD B-140/270-90

- ▶ Crystallisation and Drying of PET-Bottle Flakes
- ▶ drying and crystallisation in one step
- ▶ Upgrade of an existing desiccant dryer from 250 kg/h to 550 kg/h



Application: USA - 2 x IRD B-180/270-135

- ▶ each 800 kg/h PET and PLA Sheet Regrinds



Thank you

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