

EXTRUSION DAYS BATCH-TO-CONTI

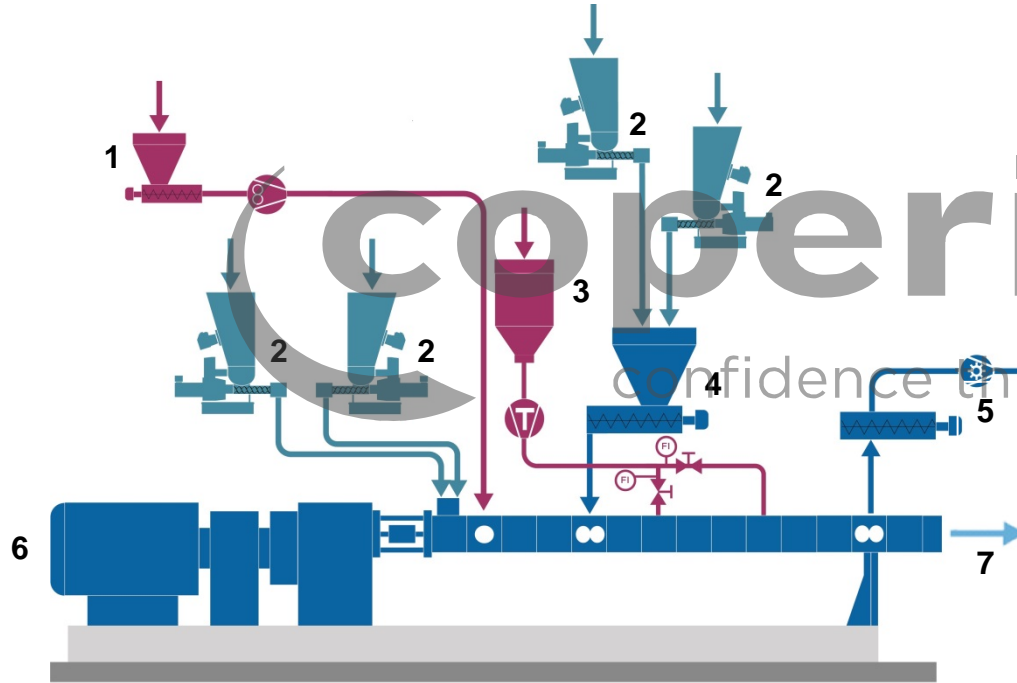


Continuous Extrusion – Technical and Process Advantages

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Process Technology Compounding & Extrusion



Continuous Extrusion – Process Example (HMPSA / Hot Melt Pressure Sensitive Adhesives)

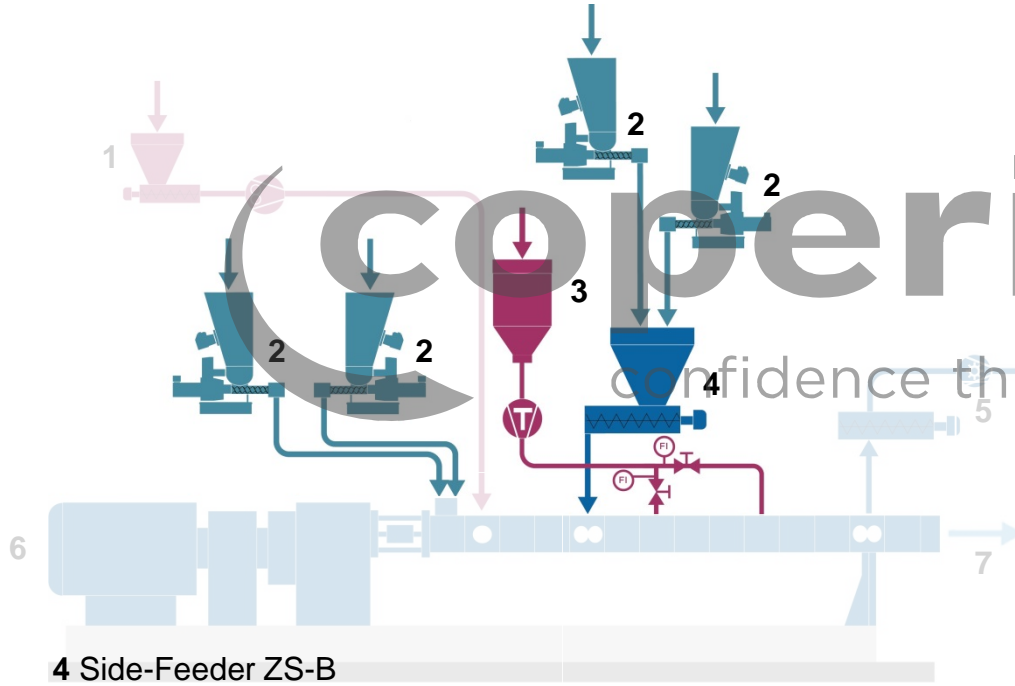


- 1 Feeder for e.g. rubber bale
- 2 Solid feeder
- 3 Liquid feeder
- 4 Side-Feeder ZS-B
- 5 Vacuum unit ZS-EG
- 6 Extruder ZSK
- 7 Discharge equipment
 - Drum filler or
 - Underwater pelletizer or
 - Filling system for e.g. for cartridges



Continuous Extrusion – Dosing Equipment

Gravimetric Loss-in-Weight Feeder



4 Side-Feeder ZS-B



2 Solid feeders (powder/pellets)

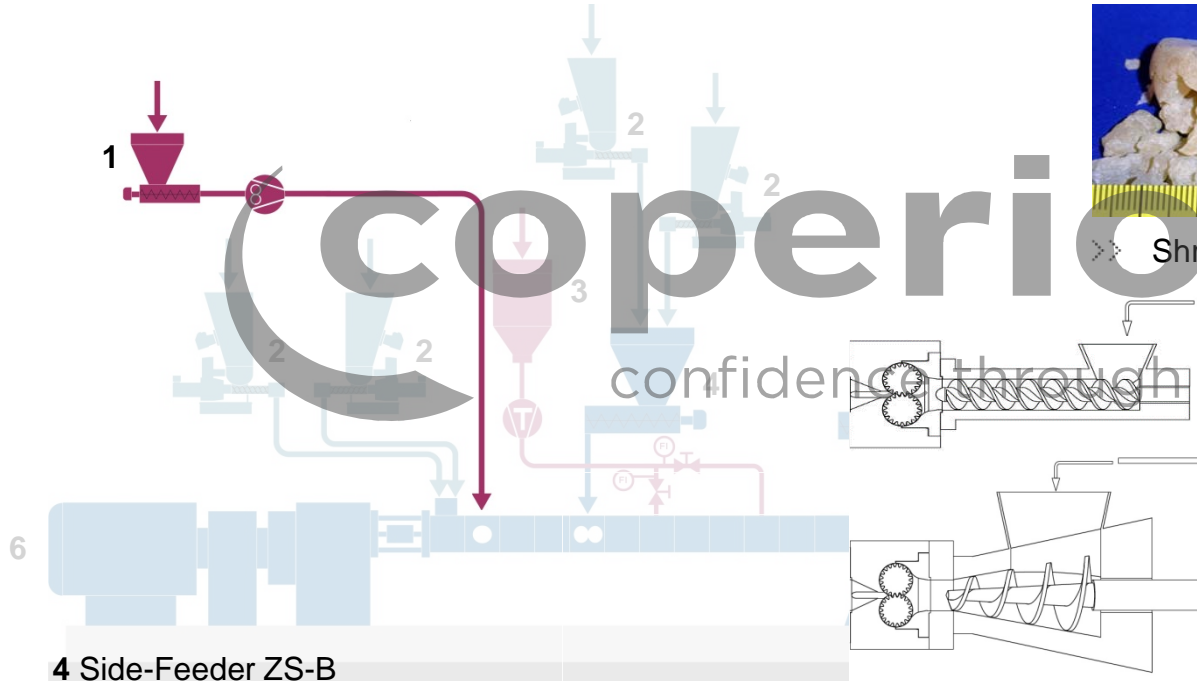


3 (Heatable) Liquid feeders



Continuous Extrusion – Dosing Equipment

Continuous Dosing of Non-Free-Flowing Materials



Shredded rubber



Rubber bale

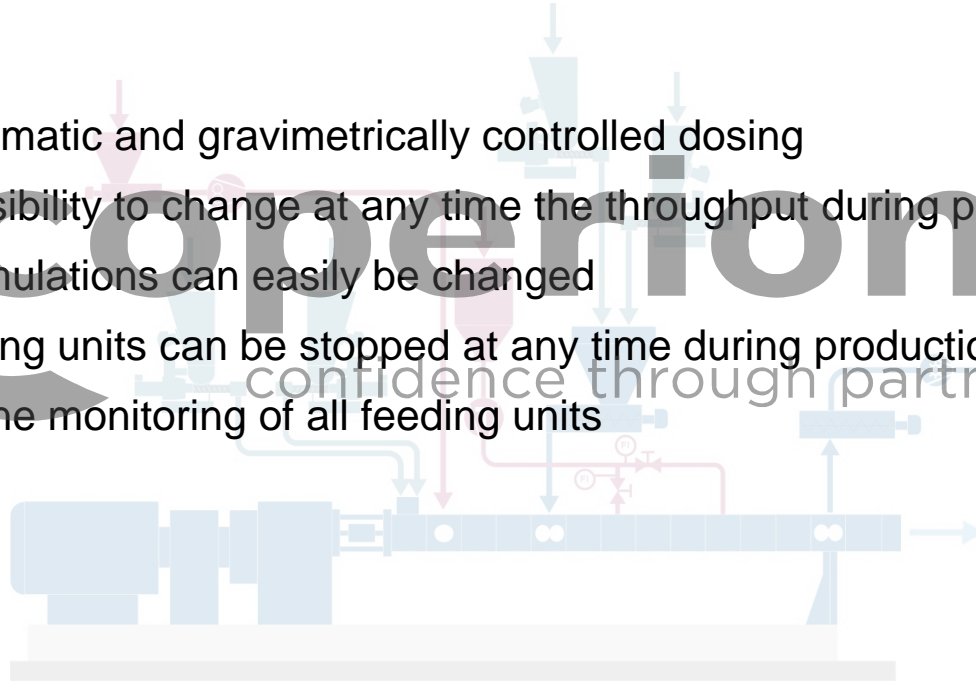


Source: UTH GmbH

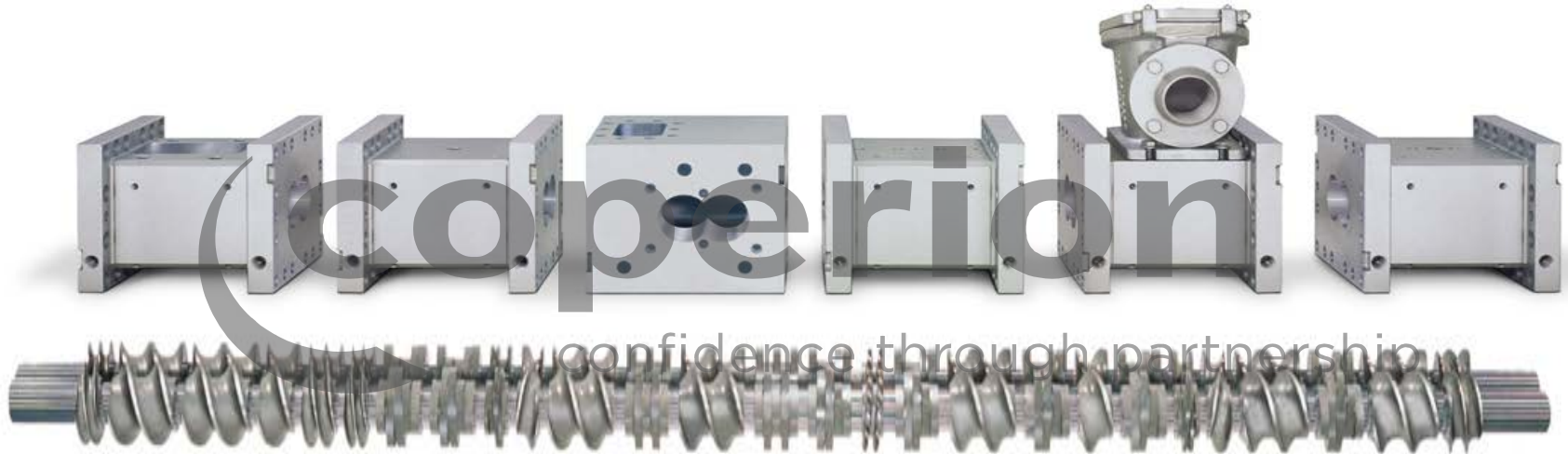
Continuous Extrusion – Dosing Equipment Advantages



- Automatic and gravimetrically controlled dosing
- Possibility to change at any time the throughput during production
- Formulations can easily be changed
- Dosing units can be stopped at any time during production
- Online monitoring of all feeding units

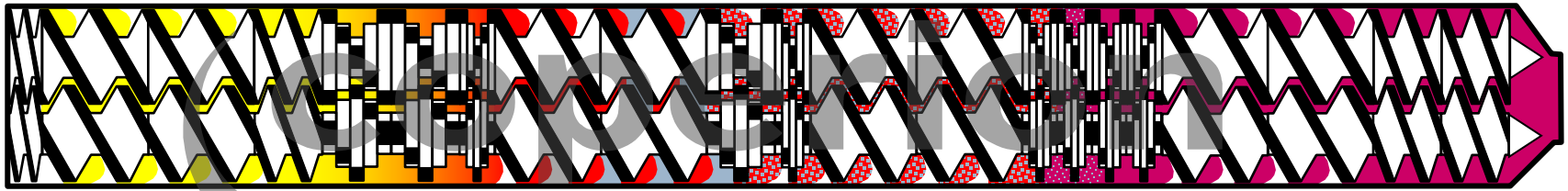


Continuous Extrusion – Process Section Variability



- Single barrels which together form an individual process section
- Each barrel is coolable and heatable
- Variable process length

Continuous Extrusion – Process Section Variability

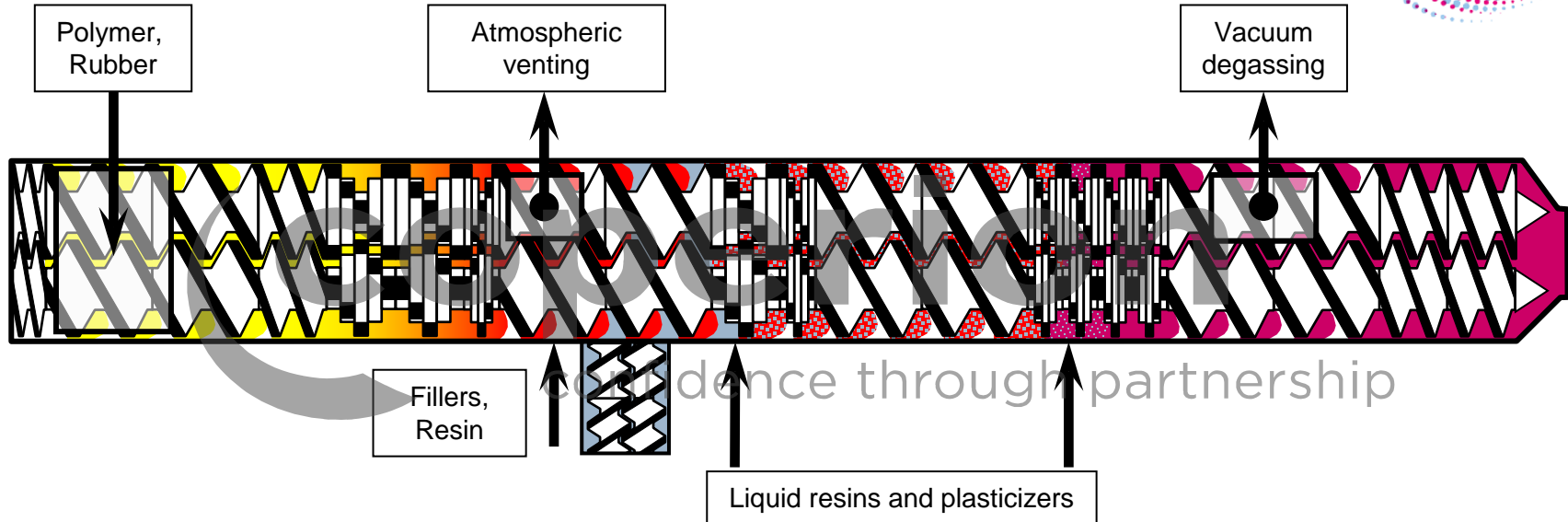


- Screws in modular design with single elements threaded on a shaft
- Variable screw length



Continuous Extrusion – Process Section

Process Example for HMPSA

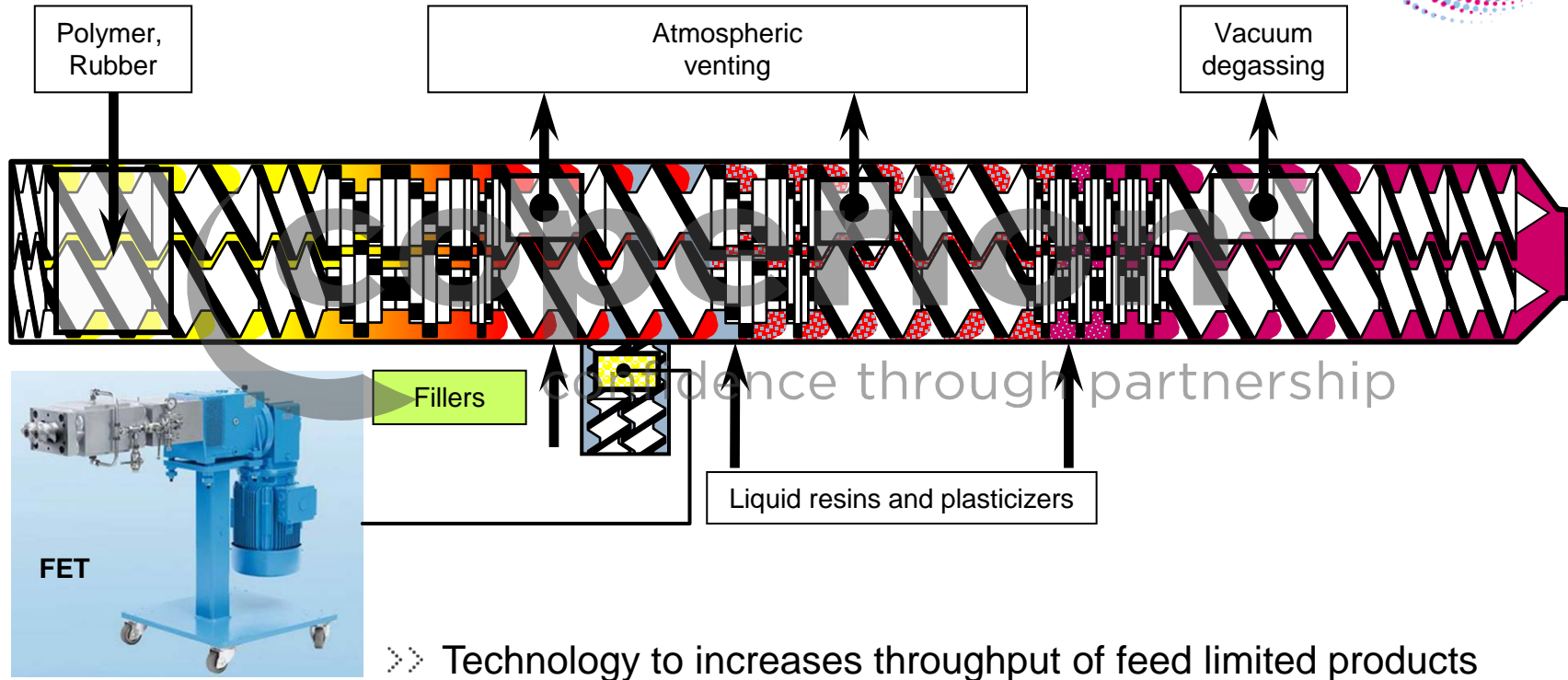


Feeding	Melting, Mastication	Conveying, Side feeding	Mixing Kneading	Conveying	Homogenization	Degassing	Metering, Discharge
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>> Various process steps within a short time

Continuous Extrusion – Process Section

Feed Enhancement Technologie - FET

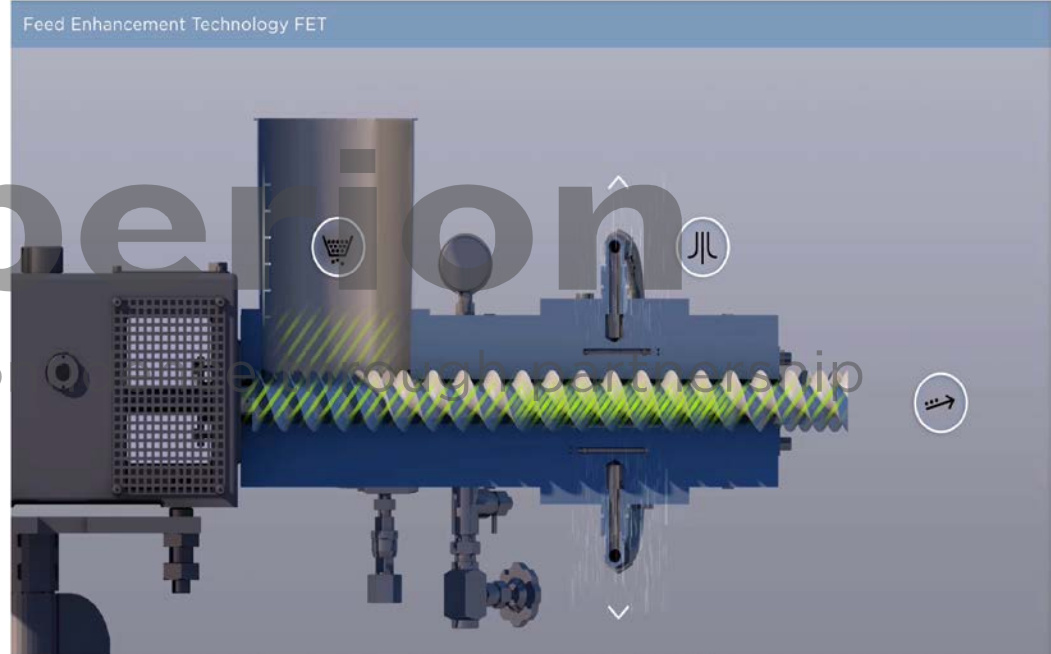
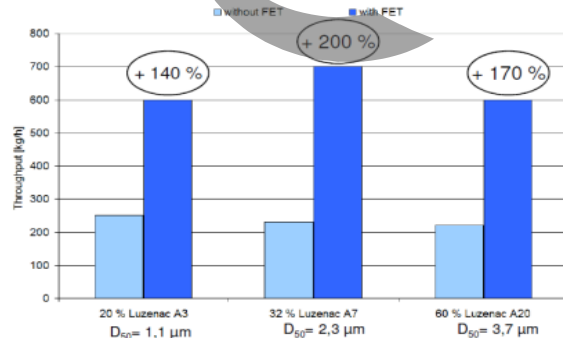


Continuous Extrusion – Process Section

Feed Enhancement Technologie - FET

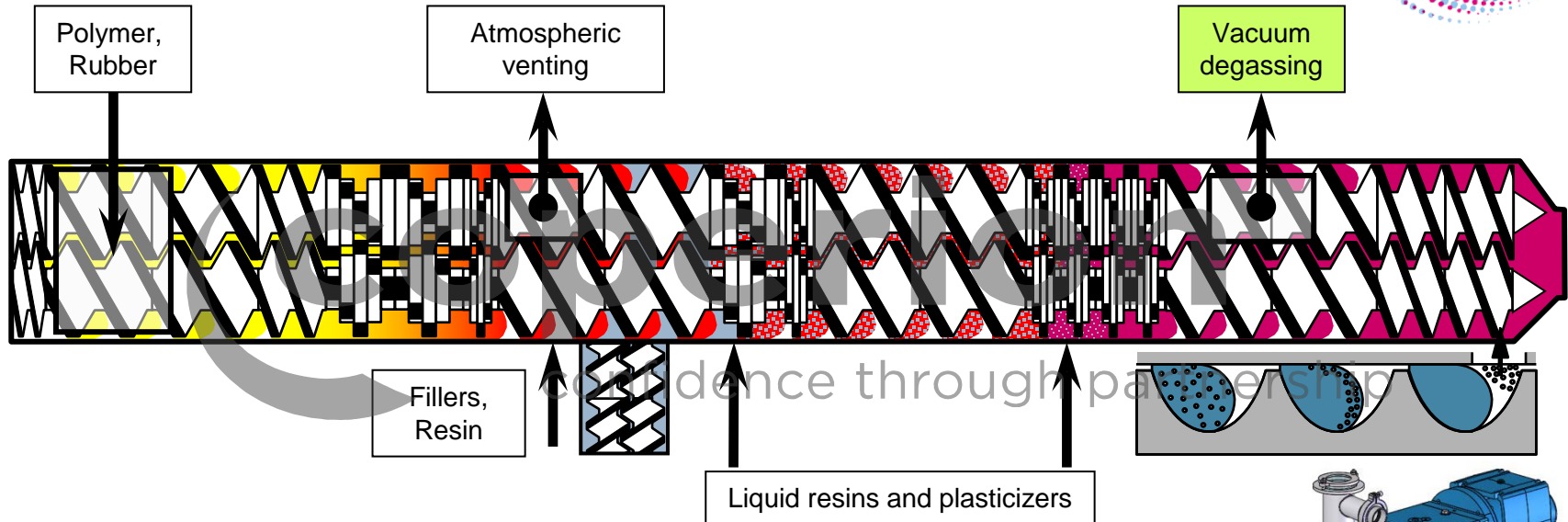


- Invented and patented by Coperion
- Solids conveying is improved by applying vacuum in the feed zone to a wall section which is porous and permeable to gas
- Increased efficiency

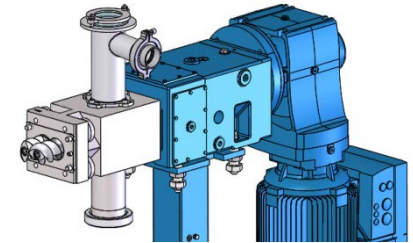


Continuous Extrusion – Process Section

Degassing

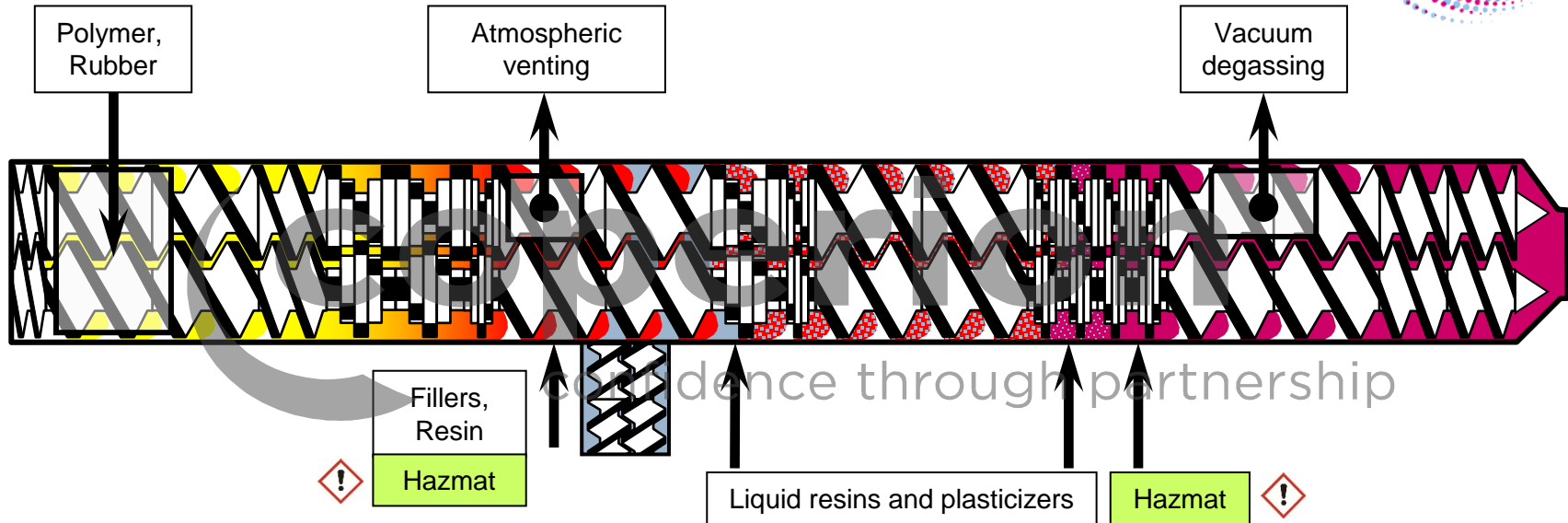


- Vacuum down to 1 mbar absolute
- Good degassing by intensive mixing and renewal of the melt surface
- Degassing through a top opening or a side degassing ZS-EG



Continuous Extrusion – Process Section

Hazardous material and product



>> Significantly reduced risk due to a very small volume in the extruder

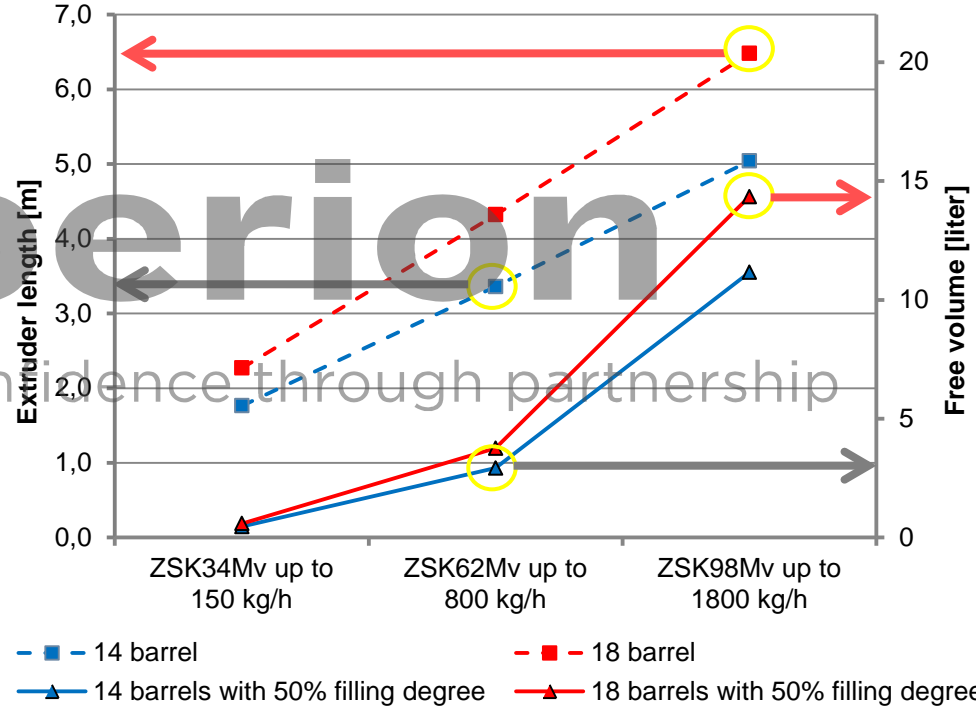
Continuous Extrusion – Process Section

Inner Volume



- ›› Inner volume is very small compare to batch kneader
- ›› Only a small portion of material mix are treated continuously
- ›› Scrap rate very low
- ›› The residence time (seconds) is defined by the machine size (length), screw design, product and the operating conditions

Extruder length & free volume

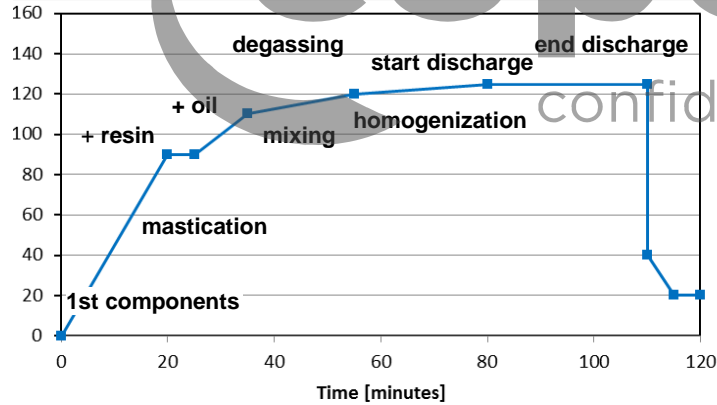


Continuous Extrusion – Process Section

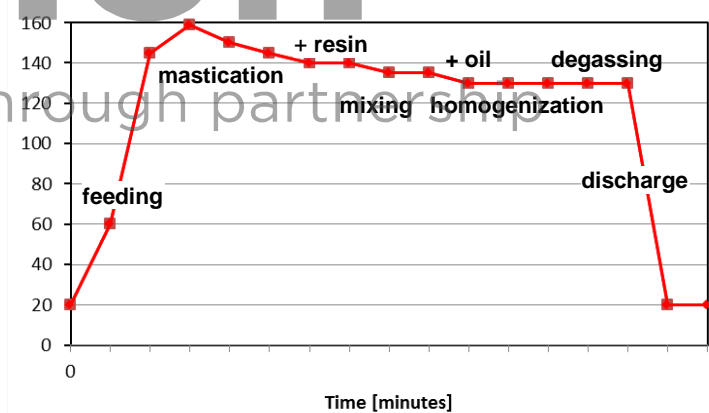
Kneading Time, Temperature Peaks and Residence Time

- » Negligible thermal degradation due to short dwell time
- » The material treatment (shear rate) is higher, but shorter
- » Higher temperatures for very short time
- » Very short residence time

Batch (Universal Kneader)



Continuous (Twin Screw Extruder)



Continuous Extrusion – Process Section

Kneading Time, Temperature Peaks and Residence Time

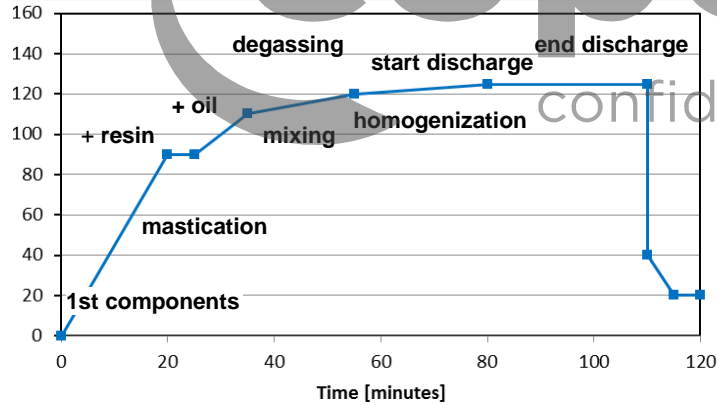
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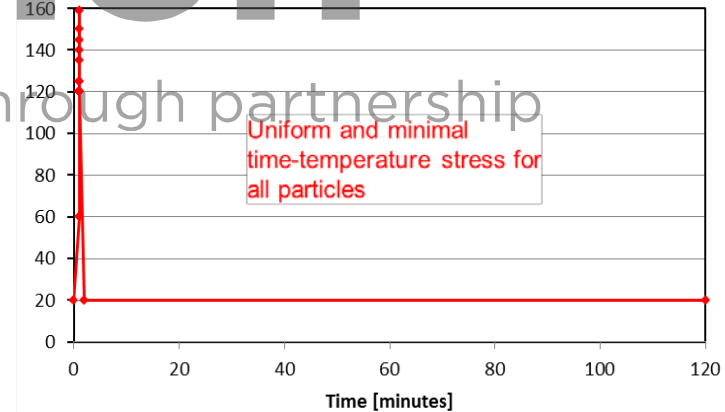
vs.



Batch (Universal Kneader)



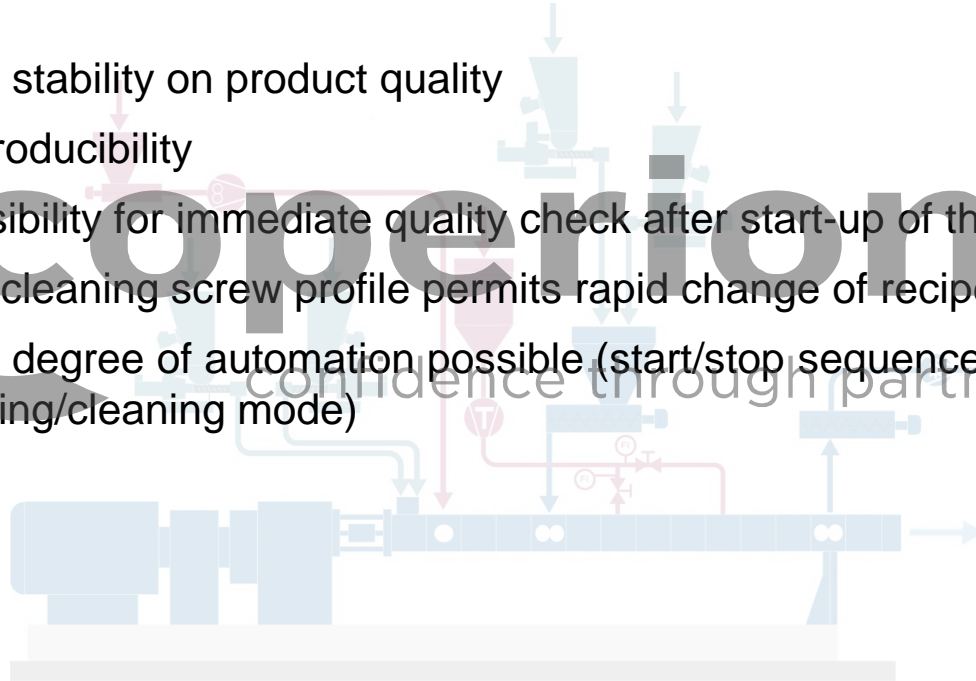
Continuous (Twin-screw Extruder)



Continuous Extrusion – Process Advantages



- High stability on product quality
- Reproducibility
- Possibility for immediate quality check after start-up of the line
- Self-cleaning screw profile permits rapid change of recipe
- High degree of automation possible (start/stop sequence, ramp up, purging/cleaning mode)



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