



Polyolefins. Compounding at the highest technical level  
with the ZSK MEGAcompounder.

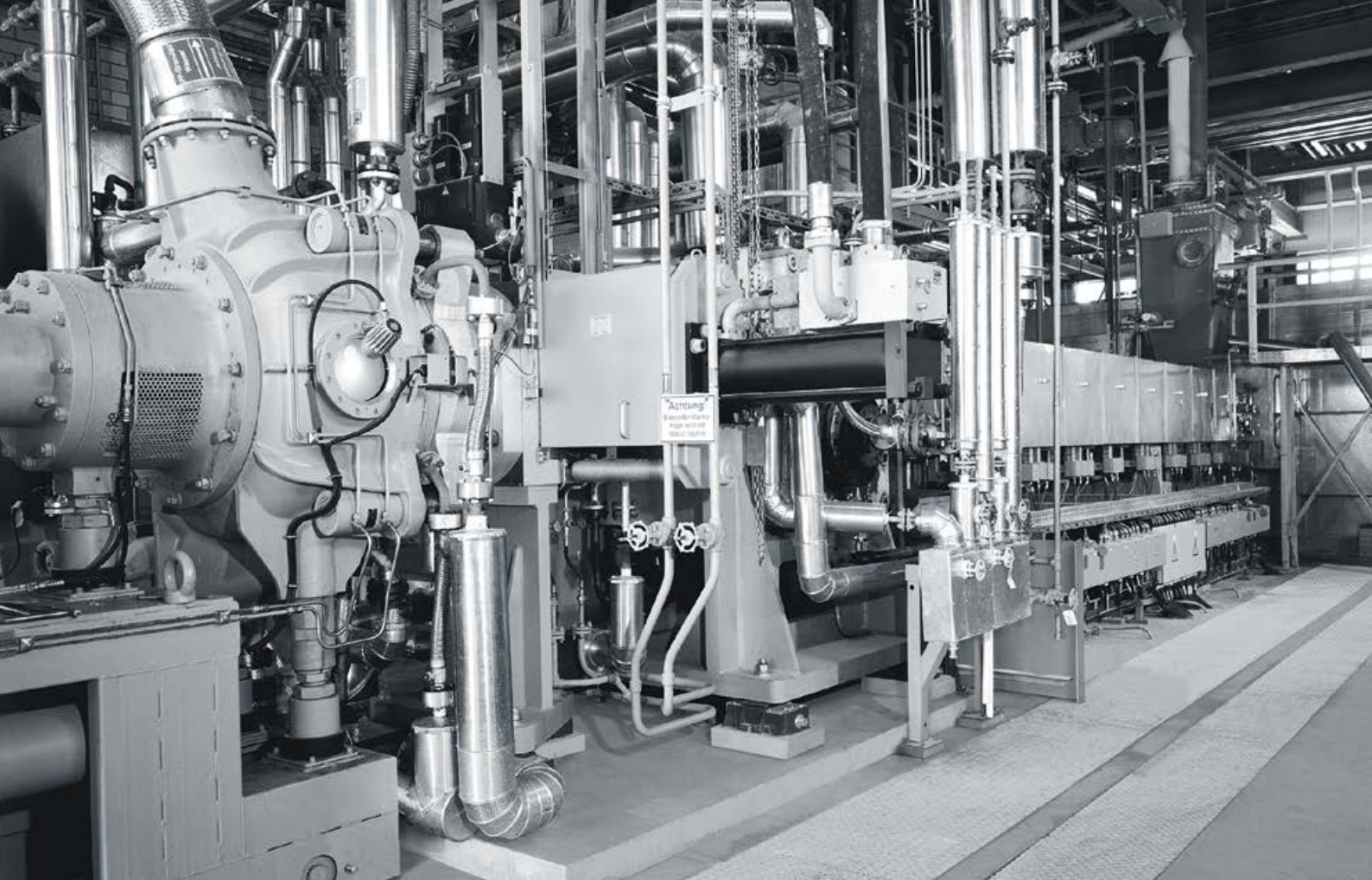
»» Why you can rely on our process expertise for the optimal processing systems for polyolefins. As the pioneer in the development of the closely inter-meshing, co-rotating twin screw extruder we have a unique know-how and an extraordinary wealth of experience in providing high-performance compounding systems for the polyolefin industry. We adapt every process step from compounding and devolatilization to pelletizing and materials handling exactly to your application so that you benefit from maximum throughput rates with the highest product quality.

The ZSK MEGAcoupler co-rotating twin screw extruder from Coperion is a superior product at the highest technical level for the processing of polyolefins. It combines the total results of 60 years of system and processing competence. Its modular design principle allows optimal adaptation to every process. Whether it is a matter of continuously stabilizing, homogenizing and pelletizing LLDPE, HDPE or PP powder or

concentrating a melt solution – with our many years of know-how we configure the ZSK MEGAcoupler and the system auxiliary equipment to your individual process requirements. You achieve maximum throughput rates with the greatest possible cost effectiveness and the highest product quality with our systems. **That's what we mean when we say "confidence through partnership".**

#### Production capacities

|       |                                        |
|-------|----------------------------------------|
| PP    | Throughput rates up to approx. 100 t/h |
| LLDPE | Throughput rates up to approx. 125 t/h |
| HDPE  | Throughput rates up to approx. 125 t/h |
| LDPE  | Throughput rates up to approx. 80 t/h  |



› Perfect processing of polyolefins. With high-performance compounding systems from Coperion.

### ZSK MEGAcoupler

The ZSK MEGAcoupler from Coperion is seen as a milestone in the development of high-performance compounding systems. The extremely high productivity of this twin screw extruder is the result of more than 60 years of continuous

research and development work. The current ZSK MEGAcoupler series stands out with a specific torque of 12.5 Nm/cm<sup>3</sup>. This brings polyolefin processing to the throughput rate of 100 t/h and beyond.

| ZSK    | Torque per shaft [Nm] | Specific torque Md/a <sup>3</sup> [Nm/cm <sup>3</sup> ] | Max. screw speed [min <sup>-1</sup> ] | Max. drive power N [kW] | Screw diameter [mm] |
|--------|-----------------------|---------------------------------------------------------|---------------------------------------|-------------------------|---------------------|
| 177 Mc | 39,000                | 12.5                                                    | 550                                   | 4,500                   | 177                 |
| 250 Mc | 107,000               | 12.5                                                    | 500                                   | 11,200                  | 248                 |
| 320 Mc | 222,000               | 12.5                                                    | 400                                   | 18,600                  | 315                 |
| 350 Mc | 311,000               | 12.5                                                    | 350                                   | 22,800                  | 352                 |
| 380 Mc | 394,000               | 12.5                                                    | 320                                   | 26,400                  | 380                 |
| 420 Mc | 394,000               | Increased drive power upon request                      |                                       |                         | 420                 |

| ZSK process section | Possible gearboxes [max. Nm] |         |         |         |         |
|---------------------|------------------------------|---------|---------|---------|---------|
| 177 Mc              | 39,000                       |         |         |         |         |
| 250 Mc              | 39,000                       | 107,000 |         |         |         |
| 320 Mc              |                              | 107,000 | 222,000 |         |         |
| 350 Mc              |                              | 107,000 | 222,000 | 311,000 |         |
| 380 Mc              |                              |         | 222,000 | 311,000 | 394,000 |
| 420 Mc              |                              |         |         | 311,000 | 394,000 |

### SWZ screen pack changer

The SWZ screen pack changer from Coperion ensures maximum productivity in the production of polyolefins. It is designed especially for the melt filtration in high-performance compounding systems. The screen packs can be changed during operation without interrupting or reducing the production.



| SWZ screen pack changer                            | 1,900 | 2,700 | 5,000 | 7,000 | 9,000 | 14,000 | 17,000 | 21,000 |
|----------------------------------------------------|-------|-------|-------|-------|-------|--------|--------|--------|
| Total filter area [cm <sup>2</sup> ]               | 1,900 | 2,700 | 5,000 | 7,000 | 9,000 | 14,000 | 17,000 | 21,000 |
| Permissible melt pressure upstream of screen [bar] | 350   | 350   | 350   | 350   | 350   | 350    | 350    | 350    |
| Max. throughput rate* [t/h]                        | 15    | 20    | 30    | 40    | 50    | 65     | 80     | 125    |

\* depending on the product and mesh size

### UG underwater pelletizer

The UG underwater pelletizer from Coperion is suitable for pelletizing most thermoplastics. Its optimized flow channels ensure a gentle pressure build-up before pelletizing. It achieves maximum throughput rates with the large number of bores per die plate size. The UG underwater pelletizer is an integral part of all polyolefin compounding systems.



| UG underwater pelletizer                               | 300   | 400   | 500 | 525 | 550 | 700 | 725 | 750 | 750 W | 925 | 1.000 | 1.250 |
|--------------------------------------------------------|-------|-------|-----|-----|-----|-----|-----|-----|-------|-----|-------|-------|
| Max. permissible pressure of the heating medium* [bar] | 50    | 65    | 65  | 65  | 65  | 65  | 65  | 65  | 65    | 65  | 65    | 65    |
| Max. knife speed [min <sup>-1</sup> ]                  | 1,200 | 1,000 | 800 | 800 | 800 | 600 | 600 | 600 | 600   | 400 | 400   | 400   |
| Drive power/min. installed motor power [kW]            | 20    | 40    | 70  | 100 | 110 | 120 | 180 | 220 | 250   | 250 | 280   | 320   |
| Max. throughput rate PE [t/h]**                        | 7     | 22    | 35  |     | 55  |     |     | 70  | 85    |     | 95    | 125   |
| Max. throughput rate PP [t/h]**                        | 12    | 25    | 36  | 45  |     | 58  | 65  | 75  | -     | 90  | 100   |       |

\* heating medium oil or steam

\*\* small UG sizes are used for PP, PE and many other applications

### WRG waterring pelletizer

In waterring pelletizers the cooling and transport medium, water, does not come into contact with the die plate. The rotating knives cut the melt strands and fling the still hot pellets in melt form into the circulating waterring. The water flow then transports the pellets out of the pelletizer hood.



| WRG waterring pelletizer                               | 280 | 300 | 320 | 400 |
|--------------------------------------------------------|-----|-----|-----|-----|
| Max. permissible pressure of the heating medium* [bar] | 32  | 32  | 32  | 40  |
| Drive power/min. installed motor power [kW]            | 7.5 | 9.2 | 17  | 30  |
| Pelletizing water flow [m <sup>3</sup> /h]             | 90  | 90  | 120 | 200 |
| Max. throughput rate** [t/h]                           | 3   | 4,5 | 7   | 12  |

\* heating medium oil or steam

\*\* throughput rates related to pelletizable plastics, e.g. polyethylene, styrene polymers and very hard TPUs

### MP melt pump

Use of a melt pump is necessary in individual cases for processing and pelletizing polyolefins. It ensures the necessary pressure build-up for the melt filtration and pelletizing at a very low introduction of energy. The melt pumps from Coperion are adapted individually to the project requirements as well as the ZSK MEGAcoupler. For commissioning and maintenance overhauls the ZSK Mc can be operated without MP.



| MP melt pump          |                                   | 280     | 360       | 450       | 500         | 560         |
|-----------------------|-----------------------------------|---------|-----------|-----------|-------------|-------------|
| Throughput rate [t/h] |                                   | 8-20    | 15-40     | 30-70     | 35-85       | 50-110      |
| Weight [t]            |                                   | 5       | 9         | 18        | 25          | 34          |
| Drives                | Single- and twin shaft drive [kW] | 250-500 | 500-1,000 | 900-1,800 | 1,100-2,200 | 1,500-3,000 |
| Cooling               | Shaft cooling                     | ✓       | ✓         | ✓         | ✓           | ✓           |
|                       | Shaft-bearing cooling             | ✓       | ✓         | ✓         | ✓           | ✓           |

### Extruder drive concepts

Coperion offers most innovative drive concepts that can be adapted to all local power supply conditions. Huge motor power requirements can be split into two smaller motor sizes with flexibility in power layout. Highest energy efficiency is achieved with a fixed speed primary drive motor and a variable speed secondary drive motor to allow the optimum extruder rpm for different polymers and rates.

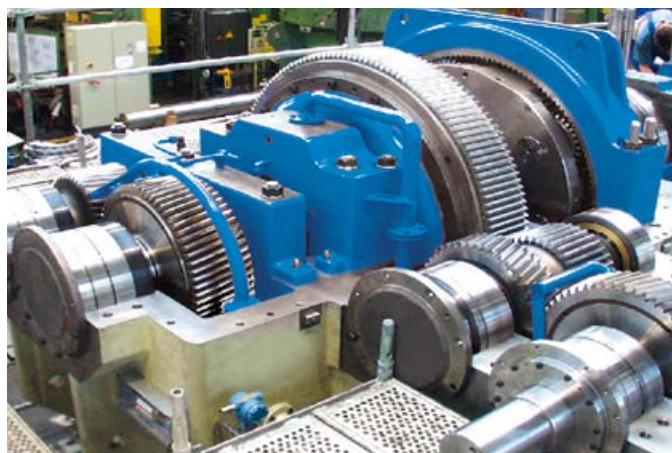
#### Motor options

Single fixed speed

Two fixed speed (for two screw rpm)

Fixed speed + variable speed (for variable operation window)

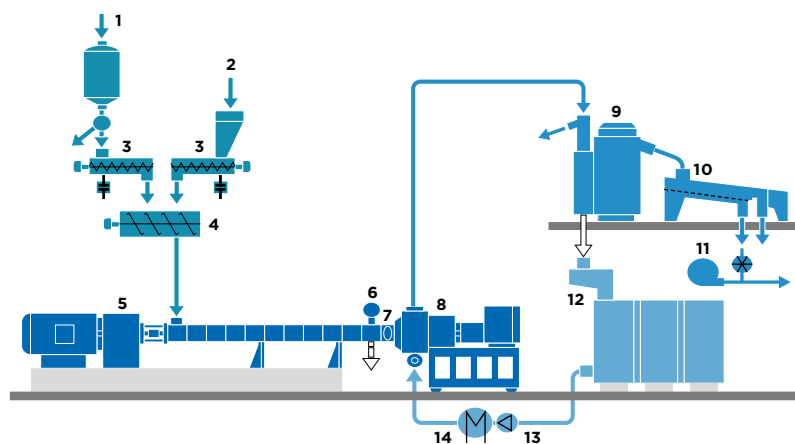
Variable speed (for full variable screw speed)



## COMPOUNDING AND PELLETIZING OF POLYOLEFIN POWDERS

### Advantages of the ZSK MEGAcompounder

- Good intake and conveying properties
- Gentle and stable melting of the powder (even at reduced throughput rate)
- Good homogenization of additives in the polymer melt
- Effective pressure build-up with low energy input

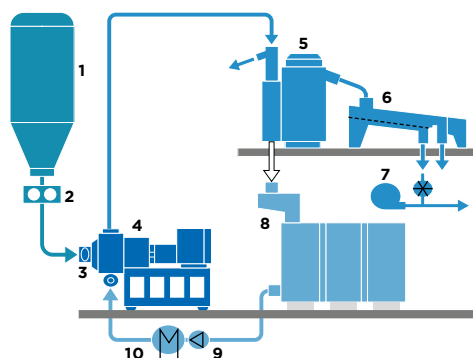


- 1 HDPE, LLDPE or PP
- 2 Additives/additive premix
- 3 Weigh feeder
- 4 Continuous mixing and conveying screw (optional)
- 5 ZSK twin screw extruder
- 6 Throttle start-up valve
- 7 SWZ screen pack changer
- 8 UG underwater pelletizer
- 9 Pellet dryer
- 10 Classifying screen
- 11 Pneumatic conveyor
- 12 Pellet water tank
- 13 Pump
- 14 Heat exchanger

## PELLETIZING OF POLYMER MELTS AND ELASTOMERS

Coperion has many years of experience in the pelletizing of standard plastics (PS, LLDPE, elastomers) which are discharged from the polymerization reactor as volatile free melt and do not require additional devolatilization,

homogenisation or compounding. The polymer melt is discharged from the reactor through a gear pump and fed into a SWZ screen pack changer or directly into a UG underwater pelletizer.

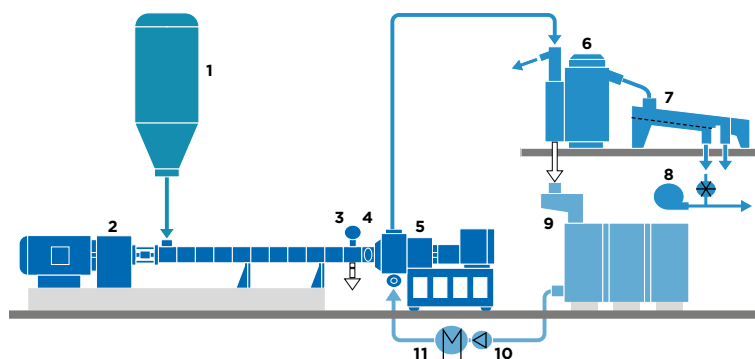


- 1 Reactor
- 2 ZSK or gear pump
- 3 SWZ screen pack changer
- 4 UG underwater pelletizer
- 5 Pellet dryer
- 6 Classifying screen
- 7 Pneumatic conveyor
- 8 Pellet water tank
- 9 Pump
- 10 Heat exchanger

## DISCHARGE OF LDPE/EVA FROM LPS

A large feed opening of the ZSK extruder will ensure proper intake of the melts from the LPS and this will allow to operate the LPS at low pressure to have reduced equilibrium residual volatile levels. The ZSK self-wiping profile and building block principle will provide excellent mixing capabilities for additive

incorporation without hang-up on the screw flights. A lateral extruder will generate the additive batch and pressurize this into the main ZSK extruder. Screening, if required, and pelletizing is performed with an underwater pelletizer, capable of pelletizing both high and low viscosity melts into homogeneous pellets.

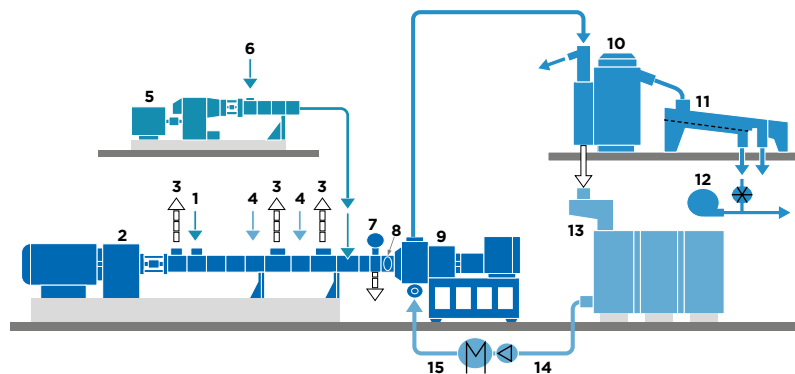


- 1 LPS low pressure separator
- 2 ZSK twin screw extruder
- 3 Throttle start-up valve
- 4 SWZ Screen pack charger
- 5 UG underwater pelletizer
- 6 Pellet dryer
- 7 Classifying screen
- 8 Pneumatic conveyor
- 9 Pellet water tank
- 10 Pump
- 11 Heat exchanger

## DEVOLATILIZATION OF POLYMER AND RUBBER SOLUTIONS

### Advantages of the ZSK MEGAcompounder

- › Large degassing surfaces due to the axially open screw profile
- › Degassing in several vacuum stages separated by melt seals in the screws
- › High material degassing coefficient due to high screw speed, but simultaneous gentle treatment of the material
- › Addition of stripping media with homogeneous incorporation into the melt
- › Pulsation-free material feeding and conveying, even with partially filled screws
- › Reliable removal of vapor streams



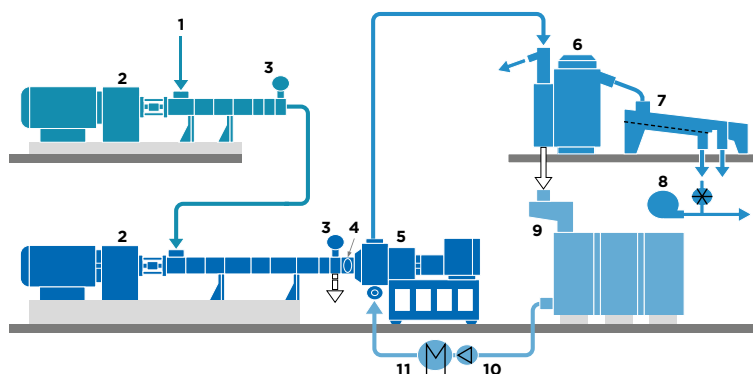
- 1 Feeding solution
- 2 ZSK twin screw extruder
- 3 Degassing
- 4 Stripping medium
- 5 ZSK twin screw extruder
- 6 Feeding of additive mix
- 7 Throttle start-up valve
- 8 SWZ screen pack changer
- 9 UG underwater pelletizer
- 10 Pellet dryer
- 11 Classifying screen
- 12 Pneumatic conveyor
- 13 Pellet water tank
- 14 Pump
- 15 Heat exchanger

## PROCESSING OF BIMODAL POLYETHYLENE

Bimodal polyethylene requires high demands on the homogenization due to the wide molecular weight distribution. The long chained molecules which are responsible for the strength in the end product must be worked into the short chained molecule matrix during compounding. This process has a decisive influence on the post processing of the product. The ZSK extruder with an extended process section (larger l/d) will process such material successfully and achieve the homogenisation of the longer chain molecules in the matrix. For higher capacities and

wider molecular weight distribution products Coperion has developed the ZSK NT which consists of two ZSK MEGAcompounders especially for this process task.

In the first ZSK MEGAcompounder the polymer is melted at a high screw speed. In the second stage the different viscosities are homogenized at low speed. The ZSK NT technology achieves top class homogeneity of the bimodal polyethylene and promises to supply high product qualities for future products with an even wider molecular weight distribution.



- 1 Product feeding
- 2 ZSK twin screw extruder
- 3 Throttle start-up valve
- 4 SWZ screen pack changer
- 5 UG underwater pelletizer
- 6 Pellet dryer
- 7 Classifying screen
- 8 Pneumatic conveyor
- 9 Pellet water tank
- 10 Pump
- 11 Heat exchanger

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