



Engineering Plastics. Cost-effective, top quality compounding with Coperion's processing lines.



# Benefit from our experience and know-how. Our co-rotating twin-screw extruders ZSK are the most widely used compounding systems in the world for the production of engineering plastics.

The properties of engineering plastics make them indispensable nowadays in the construction of vehicles and machinery, power and electrical engineering, domestic installation and for sport and leisure articles. The processing ranges from coloring and alloying of base polymers right through to incorporating

organic and inorganic fillers and reinforcing materials. Our individually configurable ZSK compounding systems offer the optimum solution for all types of processing. **That's what we mean when we say "confidence through partnership".**

## MANUFACTURING HIGHLY FILLED AND REINFORCED COMPOUNDS

### Raw material addition

- Metered into the feed barrel:
  - \_ Polymers, additives and/or fillers
- Downstream feeding of components into the polymer melt:
  - \_ Fillers, additives via the first ZS-B twin-screw side-feeder
  - \_ Cut glass and reinforcing fibres, hollow glass beads, fillers via the second ZS-B
- Direct feed of glass fibre/carbon fibre rovings
- Injection of liquid components

### Process stages in the ZSK

- Melting and homogenization of the polymers and additives
- Incorporation, homogenization and dispersion of the fillers/reinforcing fibres in the polymer melt
- Venting and degassing of volatile components
- Pressure build-up for discharge

### Recipe components

- Base polymers: PE, PP, PS, ABS, POM, PBT, PET and PA
- Additives and pigments ..... 0.5-60 %
- Polymer alloys: PP + elastomer, PC + PBT, PC + ABS, PPE + PES
- Reinforcing fibres:
  - \_ Glass fibres/rovings ..... max. 50 %
  - \_ Carbon fibres/rovings ..... max. 40 %

### Powdered additives

- Talc ..... max. 75 %
- CaCO<sub>3</sub>, BaSO<sub>4</sub>, wollastonite ..... max. 80 %
- Hollow glass beads ..... max. 50 %
- Flame retardants ..... max. 60 %
- Sb<sub>2</sub>O<sub>3</sub> ..... max. 90 %
- SiO<sub>2</sub> ..... max. 50 %
- Metal compounds ..... max. 95 %
- Wood dust ..... max. 70 %

## NANOCOMPOSITES

### Raw material addition

- Metered into the feed barrel:
  - \_ Single components and/or premixed feed

### Process stages in the ZSK

- Melting and homogenization
- Dispersion of nanoclays (intercalation)
- Even distribution of the separated layers (exfoliation)
- Venting, degassing of volatile components
- Pressure build-up for discharge

### Recipe components

- Base polymers:
  - PE, PP, PA, ABS, PET, PBT, PC and EVA
- Coating silicates ..... 5 %
- Nanoscale fillers ..... 0.5-2 %
- Nanotubes ..... 5 %

## ALLOYING, COLORING, INCORPORATING POWDERED ADDITIVES

### Raw material addition

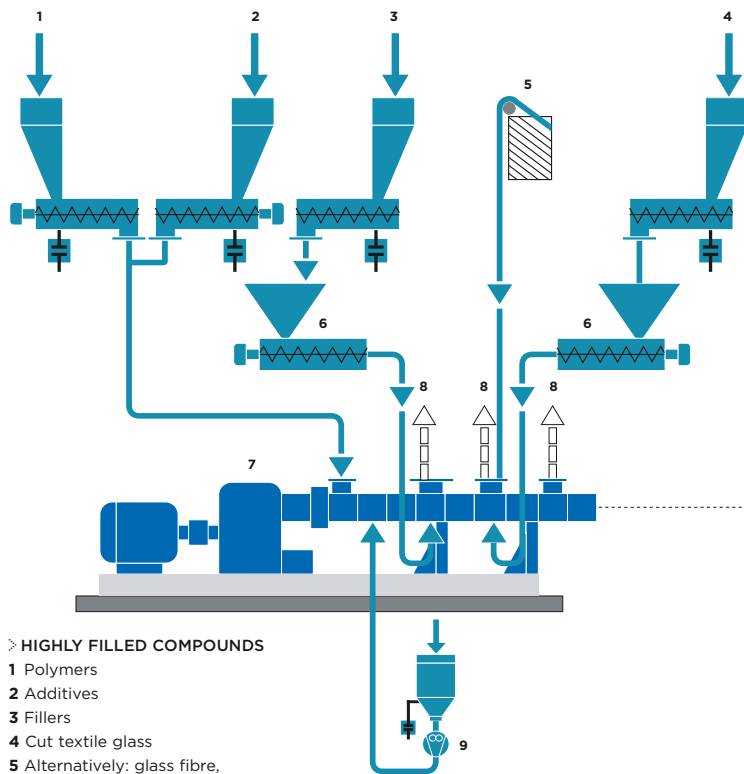
- Metered into the feed barrel:
  - \_ Single components and/or premixed feed

### Process stages in the ZSK

- Melting, homogenization and dispersion of the components
- Degassing of volatile components
- Pressure build-up for discharge

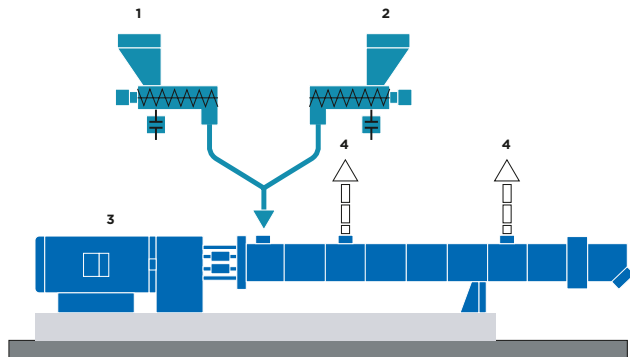
### Recipe components

- Base polymers:
  - PE, PP, PS, ABS, POM, PBT, PET, PA and fluoropolymers
- Polymer alloys:
  - PP + elastomer, PC + PET, ABS + PC, etc.
- Additives and pigments ..... 0.5-5 %
- Flame retardants ..... max. 25 %



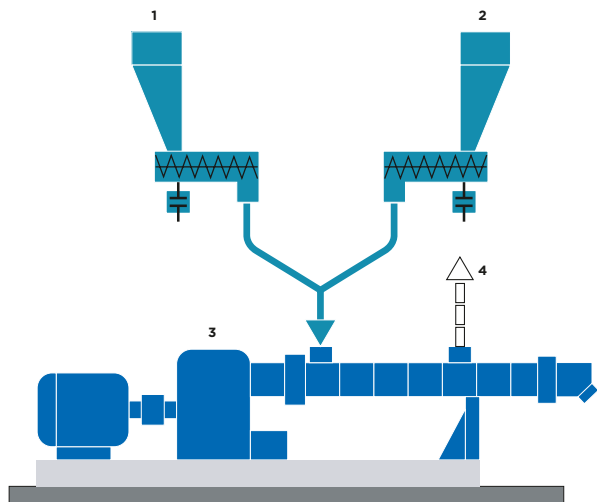
> **HIGHLY FILLED COMPOUNDS**

- 1 Polymers
- 2 Additives
- 3 Fillers
- 4 Cut textile glass
- 5 Alternatively: glass fibre, carbon fibre rovings
- 6 ZS-B twin-screw side-feeder
- 7 ZSK twin-screw compounder
- 8 Degassing
- 9 Liquid additives



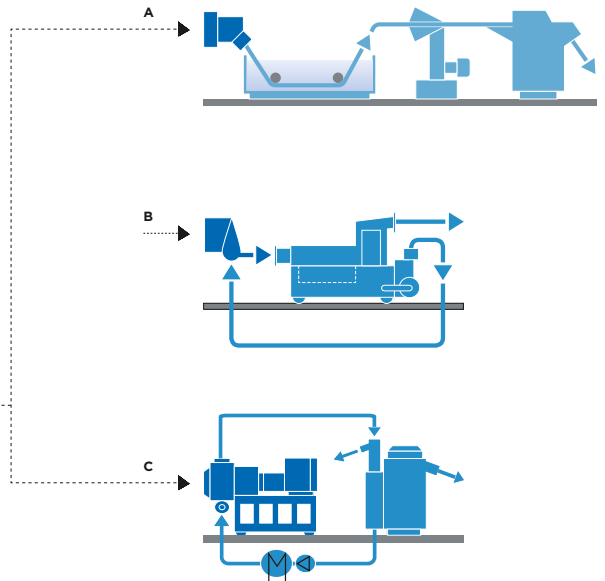
> **NANOCOMPOSITES**

- 1 Polymers
- 2 Nanofiller
- 3 ZSK twin-screw compounder
- 4 Degassing



> **ALLOYING, COLORING**

- 1 Polymer A
- 2 Polymer B or pigment mastermix
- 3 ZSK twin-screw compounder
- 4 Degassing



**DISCHARGE OPTIONS**

**A | Strand Pelletizer**

The polymer strands are solidified in the water bath, and then are surface-dried in the air-knife before being cut into pellets in the pelletizer.

**B | Water Ring Pelletizer WRG**

The polymer is extruded through a die plate, cut into pellets by the rotating knives and flung into the revolving water ring to cool off.

**C | Underwater Pelletizer UG**

The Underwater Pelletizer works along the same lines as WRG but the cutting area is completely surrounded by water, allowing pelletizing of polymers which tend to be sticky.

## DIE HEADS

The "SK" generation of die heads has proven a winner in practical applications by:

- Simple and rapid handling thanks to significant weight reduction and rapid assembly/disassembly fixtures
- Constant flow velocity across discharge section
- Flow geometry optimized by FEM calculations
- Peripheral zone heating for selective impact on edge area for larger die heads
- Minimal "dead space" upstream of ZSK screw tip

The optimized flow geometry and the easy and rapid handling are becoming more important in view of increasing batch/color changes and reduce production costs.

## ADDITIONAL SYSTEMS

### Twin-screw side-feeder ZS-B (mobile):

The ZS-B enables side-feeding of powdered and pelletized fillers and additives or cut glass fibres. It can be installed at each extruder barrel position by a special connection barrel. Captive C-washers on the barrels allow rapid fitting and removal of the ZS-B. The ZS-B standard version is mounted on a base frame with castors.

### Twin-screw side-feeder (pivoting):

The ZS-B can be mounted on an optional pivoting base frame. This is screwed directly onto the ZSK machine base and features extremely simple handling.

### Twin-screw side-degassing unit ZS-EG:

The ZS-EG enables extremely effective degassing of volatile substances from polymer melts. The modular construction with quick fasteners enables simple cleaning and rapid change-over as well as quick assembly/disassembly aided by captive C-washers. It is fitted to the side of the extruder either with mobile base frame on castors or with pivot-mounted arm. The increased process safety with the ZS-EG achieves 10-15 % higher throughput rates.

## NEW APPLICATIONS FOR ENGINEERING PLASTICS

- Gentle incorporation of micro hollow glass microspheres into PP, PA, etc.
- Manufacture of long glass fibre compounds
- Mixing wood fibres into thermoplastics
- Removing moisture from bulk materials with max. 40 % humidity
- Degassing polymer solutions with up to 80 % solvent
- Recycling PET bottles and PA carpet fibre waste etc.
- Compounding of high-temperature polymers such as PEEK
- Filtration of PC melts for optical applications

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01 | DIE HEAD (CLOSED) ZSK 70 MEGAcoupler PLUS

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02 | DIE HEAD (OPEN) ZSK 70 MEGAcoupler PLUS

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03 | TWIN-SCREW SIDE-FEEDER ZS-B (MOBILE)

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04 | TWIN-SCREW SIDE-FEEDER ZS-B (PIVOTING)

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05 | TWIN-SCREW DEGASSING UNIT ZS-EG

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>01



>02



>03



>04



>05



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