Technology Overview Extrusion

International Conference
CHALLENGES IN EXTRUSION OF POLYMERS
June 11th 2014, Leoben
Mr. Luigi Traniello
Agenda

General Information about KraussMaffei Technologies GmbH

Latest experiences and developments KraussMaffei Berstorff – Extrusion Munich
High problem-solving expertise for numerous industries
Technology³ expertise as a unique selling proposition

Product brands
- NETSTAL
- KraussMaffei
- KraussMaffei Berstorff

Lines of business
- Injection Molding Machinery
- Injection Molding Machinery and Reaction Process Machinery
- Extrusion Technology

Customer industries
- Automotive
- Construction
- Chemicals
- Electronics/Electrical Engineering
- Consumer Goods
- Medicine
- White Goods
- Packaging
## Agenda

<table>
<thead>
<tr>
<th>General Information about KraussMaffei Technologies GmbH</th>
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<td><strong>Latest experiences and developments KraussMaffei Berstorff – Extrusion Munich</strong></td>
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</table>
Product Portfolio KraussMaffei Berstorff Munich
Applications

Pipe  Profile  Sheet  Pelletizing
Product Portfolio KraussMaffei Berstorff Munich
Pipe

- Single screw extruder, 36D series
- New single screw extruder, 41D series
- Twin screw extruder, 32D & 36D series for pipe application
- XS-extruder for basic, eclectic and flexible applications
- Pipe heads (PO & PVC)
- QuickSwitch System for continuous dimension change for PO
- Complete extrusion lines for pipe application
- Downstream equipment and peripheral units
Extrusion technology – Pipe
Single screw extruder for PO materials

Single screw extruder KME

- 36 L/D technology
- 6 extruder sizes
- Output rates up to 2000 kg/h
- Co-extruder
Pipe Extrusion-Products
Upcoming new technologies

Technical data and dimensions

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<thead>
<tr>
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<tbody>
<tr>
<td>Output rate, max. [kg/h] HDPE</td>
<td>270-300</td>
<td>450-500</td>
<td>640-700</td>
<td>850-950</td>
<td>1000-1200</td>
<td>1300-1500</td>
<td>1800-2000</td>
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<td>Number of heating/cooling zones</td>
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<td>5/5</td>
<td>5/5</td>
<td>5/5</td>
<td>5/5</td>
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<tr>
<td>Screw length [L/D]</td>
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<td>Screw diameter [mm]</td>
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<td>75</td>
<td>90</td>
<td>105</td>
<td>125</td>
<td>150</td>
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<td>Extrusion height [mm]</td>
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<td>1150</td>
<td>1150</td>
<td>1400</td>
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<table>
<thead>
<tr>
<th>Technical data 41 L/D KME</th>
<th>45-41 B/R</th>
<th>60-41 B/R</th>
<th>75-41 B/R</th>
<th>90-41 B/R</th>
<th>105-41 B/R</th>
<th>125-41 B/R</th>
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<tr>
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<td>550</td>
<td>850</td>
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<td>1500</td>
<td>1800</td>
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<tr>
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<td>500</td>
<td>750</td>
<td>1150</td>
<td>1400</td>
<td>1700</td>
<td>2100</td>
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<td>Number of heating/cooling zones</td>
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<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Screw length [L/D]</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
</tr>
<tr>
<td>Screw diameter [mm]</td>
<td>45</td>
<td>60</td>
<td>75</td>
<td>90</td>
<td>105</td>
<td>125</td>
</tr>
<tr>
<td>Extrusion height [mm]</td>
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<td></td>
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KraussMaffei Berstorff Munich
Pipe Extrusion – QuickSwitch

Diameter Ranges PO:
• 25 – 63 mm
• 70 – 160 mm (alternatively: 63 – 140 mm)
• 160 – 250 mm
• 250 – 450 mm

➢ 1 Layer, 2 layer or 3 layer
➢ Adapter for outside layer
➢ Adapter for stripes

Inline-Dimension-Changes – without stopping the production – just at the touch of a button
QuickSwitch
QuickSwitch – An innovative pipe extrusion system

Cutting Unit  Spray Bath  Vacuum Tank
Haul Off       Sealing     Calibration
Extruder

Pipe Head  Line Control System

QuickSwitch covers the whole extrusion line
Extrusion Technology – Highlights
IPC – Internal Pipe Cooling

Functional Principe
Extrusion Technology – Highlights
IPC – Internal Pipe Cooling

- Collector ring channel
- Distribution pipes
- Air flow
- Central intake pipe
- Non central air extraction
Extrusion technology – Pipe
Twin screw extruder for PVC

Flexible pipe extrusion with the 36 L/D series

- extended processing unit
- New design of the screw geometry
- Higher flexibility in the use of different PVC dry-blend
- outstanding product quality through homogenous melt and a wider processing window

Extruder KMD 90-36/R
Extrusion technology – Pipe
Pipe heads for PO

Spiral distributor pipe heads KM-RKW

- Diameter range 10 up to 2500 mm
- 1, 2 or 3 spirals
- Outer layer adapter
- Flexible system for feeding of the layers
- Intelligent solution for stripe adapter
Pipe Extrusion-Products
Upcoming new technologies
# Pipe Extrusion-Products

## Upcoming new technologies

<table>
<thead>
<tr>
<th>Technical data and dimensions</th>
<th>KME 20-25 D/C</th>
<th>KME 30-25 D/C</th>
<th>KME 30-30 B/C</th>
<th>KME 38-30 B/R</th>
<th>KME 45 XS</th>
<th>KME 45-30 B/C</th>
<th>KME 60 XS</th>
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<tr>
<td>Output rate, max. [kg/h] HDPE</td>
<td>4.5</td>
<td>16</td>
<td>50</td>
<td>120-130</td>
<td>75</td>
<td>200-240</td>
<td>130</td>
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<tr>
<td>Output rate, max. [kg/h] PP [PP-H; PP-B]</td>
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<td>40</td>
<td>110</td>
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<td>140-170</td>
<td>85</td>
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<td>Number of heating/cooling zones</td>
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<td>3/0</td>
<td>4</td>
<td>4/4</td>
<td>4/4</td>
<td>4/4</td>
<td>5/5</td>
</tr>
<tr>
<td>Screw length [L/D]</td>
<td>25</td>
<td>25</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>30</td>
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<tr>
<td>Crooked bush</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Screw diameter [mm]</td>
<td>20</td>
<td>30</td>
<td>30</td>
<td>38</td>
<td>45</td>
<td>45</td>
<td>60</td>
</tr>
<tr>
<td>Extrusion height [mm]</td>
<td>920-1520</td>
<td>920-1510</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
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## Dimensions [mm]

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<th>KME 45-30 B/C</th>
<th>KME 60 XS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length, including adapter</td>
<td>1350</td>
<td>1400</td>
<td></td>
<td>2650</td>
<td>2250</td>
<td>2750</td>
<td>2751</td>
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<tr>
<td>Width, incl. control cabinet</td>
<td>1020</td>
<td>1020</td>
<td></td>
<td>1000</td>
<td>1000</td>
<td>1150</td>
<td>1140</td>
</tr>
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</table>
Extrusion technology – Pipe
Pipe heads for PVC

Spider type pipe head KM-RK
- Single and double strand
- Single and multi-layer
- Diameter range 16 up to 800 mm
Extrusion technology – Pipe
Polyurethane insulated pipe

⇒ Protection of Environmental Impact, Heat and Coldness

- Long-distance-heating pipes
- Warm water supply
- Climate- and cooling technique
- Frost proof installation of pipes
- Pipes for geothermic
- Swimming pools, ...

Jacket pipe from PE-HD
Polyurethane insulation

Inner pipe
- PE-HD
- PE-Xb
Extrusion technology – Pipe
Filled material
Product Portfolio KraussMaffei Berstorff Munich
Profile

- Single screw extruder, 36D series
- Twin screw extruder, 32D series
- XS-extruder for basic applications in the lower price segment
- Conical Twin Screw Extruder
- Complete extrusion lines for profile application
- Downstream equipment and peripheral units
Extrusion Technology – Highlights
Special solutions for dual strand extrusion

Tandem layout with co-extruder
Dual strand with color layer

Basic extruder with piggy-back
Core technology for dual strand extrusion, the core of the profile is made out of regrind material.
Co-extrusion

- KMB – the market leader in co-extrusion solutions

Market requirements

- Re-window commitments of the profile suppliers
  - 100% of the PVC windows have to be returned into the material circuit

- Constant pressure on profile/material costs
  - Use of internal recycled material
  - Use of re-window-material
  - Use of downgraded core formulations
Co-extrusion

- KMB – the market leader in co-extrusion solutions

Standardized – but tailor-made!

- Output rates: up to 800 kg/h PVC

- More than 100 systems sold during the last 3 years
  - Single strand
  - Dual strand
  - Different coex-systems
    - Core-, layer-, mixed technology
Co-extrusion

- KMB – the market leader in co-extrusion solutions

Solutions for every tool technology

- Core technology
- Layer technology
- Mixed technology
Natural Fibre / WPC

Market development

- KMB concentrates on special materials and applications
  - KET
    - Innovative natural fibre/plastic-waste recycling product
    - Totally new developed and designed for the high end Chinese window market
Extrusion technology – Profile
WPC – Wood Plastic Compound

- Pelletizing
- Profile Extrusion
- Counter Rotating Extruder
- Direct Extrusion
- Co-Rotating Extruder
- Masterbatch
- Agglomeration
- PVC
- PO
- Wood
- Additives

KraussMaffei
Berstorff
Product Portfolio KraussMaffei Berstorff Munich
Sheet & Board

- Single screw extruder, 36D series
- Twin screw extruder, 32D series
- Complete extrusion lines for sheet application
- Downstream equipment and peripheral units
Extrusion Technology – Sheet
Materials & Dimensions

- PVC formulations, new materials or filled with calcium carbonate
- PVC formulations, foamed
- Polyolefin, e.g. HDPE, MDPE; PP

- PVC free foam: 1 – 30 mm
- PVC Coex (ABA): 2 – 12 mm
- PVC compact: 1 – 30 mm
- PO compact: 1 – 45 mm

- Working width of the lines: min. 1200 – max. 2500 mm
Extrusion technology – Sheet/Board

Material

- PVC (rigid, soft)
  - Twin Screw Extruder for rigid - and soft PVC
  - KMD

- POLYOLEFINE PE, PP
  - Single Screw Extruder with grooved bush in the intake section
  - KME / B

- TECHNICAL THERMOPLASTICS PS, ABS, PMMA....
  - Single Screw Extruder with grooved bush in the intake section and degassing
  - KME / BV
Extrusion technology – Sheet/Board

PVC Sheet

Twin Screw Extruder 32 L/D
- Highest output
- Best melt homogeneity
- Wide Production Range
- Easy to handle due to the
  modern C5 Control System
- Excellent price-/performance-ratio

Multi component gravimetric dosing unit for Dosing of:
- Dry-blend (New material)
- Recycled Material
- Chemical Blowing Agent
- Master batch for Colouring
Extrusion technology – Sheet/Board
PVC Sheet

Pre-cooling Unit
for fast Cooling of the Surface
• 2, 4 or 6 pair of rolls, according to output
• Electrical adjustment of gap with a precision of 0,01mm
• Unit horizontal moveable

3 Rolls PVC Polishing Roll Stack
• Width 2400mm, diameter of rolls 400mm - 600mm - 600mm
• Gap adjustment of the rolls with 0,01 mm precision
• Electrical gab regulation
• Precision of temperature over the roll width +/-1 C
Sheet Line

Extruder for tests:
- KMD 90-32/WPC
- improved degasing for processing of composites

Sheet die for test:
- Width: 1100 mm
- Thickness: 4,0 mm
Sheet Line

- Polishing roll stack
  - Roll diameter: 400/400/400 mm
  - Roll width: 1800 mm
  - Roll tempering system: pressure water
  - Center roll: matt
  - Adjustment: hydraulic; gap adjustment during production possible
Extrusion technology – Sheet/Board
PO Sheet

Extrusion components
- Gravimetric or dosing new material, regrind and blowing agent incl. dynamic mixer
- KME 150–36/PL
- Screen changer
- Special sheet die for foamed PO sheets (shown a die with width 2500mm)

Vertical polishing roll stack
- Diameter of rolls 400-600-600 mm
- Precision of temperature ± 1°C over the roll width
- Regulation of the roll gap during production
Thank you for your attention!