Dieffenbacher Fiberpress
A New Generation of Composite Compression Molding
Dieffenbacher - Company Overview

Dieffenbacher Canada

Dieffenbacher Germany

Dieffenbacher Czech Republic

Dieffenbacher China
Dieffenbacher - Business Unit Composites

Wet molding line for the production of hybrid parts

LFT-Directline

Preform Center

HP-RTM production line
Dieffenbacher - Composite Portfolio

Compression Molding Technology CM

Thermo-set

- SMC
- Hybrid
- D-SMC
- Wet-molding
- HP-RTM

Thermo-plast

- LFT-D
- LWRT
- GMT
- Tailored LFT-D
- Tape Placement
- Tape Consolidation
# General Process Overview

<table>
<thead>
<tr>
<th><strong>Thermoset</strong></th>
<th><strong>Thermoplastic</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SMC / D-SMC / HP-RTM / Wet-molding</td>
<td>LFT / LFT-D / GMT</td>
</tr>
</tbody>
</table>

**Hardening Principle:**
- "Chemical reaction"
- "Freeze"

- **Thermoset**
  - Lower internal mold pressure: 40 - 100 bar
  - Pressure built up time approx.: 1 s
  - Lower pressing speeds
  - Cycle times approx.: 60 – 180 sec
  - Long pressing time in the lower dead point
  - Class-A parts
  - IMC surface possible

- **Thermoplastic**
  - High internal mold pressure: 150–250 bar
  - Pressure built up time: ≤ 0.5 s
  - High press velocities
  - Short cycle times: 20 – 50 sec
  - Visible parts
  - High accuracy of parallelism between ram and table are necessary especially for:
    - thin parts
    - large parts

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Roof of the Roding Roadster R1

Underbody Shield
**Press Technology - Press Series Matching all Demands**

<table>
<thead>
<tr>
<th>Fiberpress</th>
<th>CompressPlus (DCP)</th>
<th>CompressEco (DCE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short stroke press</td>
<td>Short stroke press</td>
<td>Long stroke press</td>
</tr>
<tr>
<td>Press forces 10.000 kN up to 50.000 kN</td>
<td>Press forces 25.000 kN to 43.000 kN</td>
<td>Press forces 10.000 kN up to 30.000 kN</td>
</tr>
<tr>
<td>Cycle times ≥ 20 s</td>
<td>Cycle times ≥ 20 s</td>
<td>Cycle times ≥ 90 s</td>
</tr>
<tr>
<td>Column guides / roller guide</td>
<td>Roller guide to fold away</td>
<td>Roller guide to fold away</td>
</tr>
<tr>
<td>With active parallel leveling system</td>
<td>With active parallel leveling system</td>
<td>With active parallel leveling system</td>
</tr>
<tr>
<td>Energy efficient</td>
<td>Short pressure build up time</td>
<td>Energy efficient</td>
</tr>
<tr>
<td></td>
<td>Energy efficient</td>
<td></td>
</tr>
</tbody>
</table>

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*Dieffenbacher Fiberpress – ACCE 2019*
Dieffebacher Fiberpress

The Fiberpress was designed based on the experience gained over the last decade delivering column guided short stroke presses. This new press:

- Has a simplified machine design
- More robust controls against eccentric loads
- Is lighter for reduced transport cost
- More energy efficient saving electrical cost
- All at a more economical price point

“The advantages of the compact Fiberpress have convinced us. Dieffenbacher has managed to keep its promise within an ambitious project planning and delivery time. The forward-looking, partnership-based and reliable cooperation with Dieffenbacher has always been an essential factor for us when deciding for a state-of-the-art SMC production line.”

Josef Muxeneder, Head of Industrial Engineering at Fritzmeier Composite GmbH & Co. KG
Dieffenbacher Fiberpress Design

- Column press design with four grounded columns and locking system
- Lower bed in welded design
- Without upper press crown
- With a compression stroke table for the working stroke
- Ram guiding designed as roller guides
- Working cylinders in single acting design
- 5 Cylinder design for optimized deflection line control
- Ram locking in raster design
Intelligent cylinder arrangement
→ equal bending line of the ram and table.
→ equal bending of the mold
→ consistent part thickness and quality
Dieffenbacher Fiberpress Design

Parallelism Control

Parallelism control has 2 capabilities:

1. **Parallel Closing/Opening**: consistent part thickness and low wear of mold and press
2. **Programmable Tiltage**: flow front control for processes like in mold coating (IMC)

### Parallelism of Ram and Table

<table>
<thead>
<tr>
<th>Pressing speed</th>
<th>Max. Parallelism deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm/s</td>
<td>0.08 mm</td>
</tr>
<tr>
<td>5 mm/s</td>
<td>0.11 mm</td>
</tr>
<tr>
<td>10 mm/s</td>
<td>0.15 mm</td>
</tr>
<tr>
<td>20 mm/s</td>
<td>0.25 mm</td>
</tr>
<tr>
<td>40 mm/s</td>
<td>0.4 mm</td>
</tr>
</tbody>
</table>

**Programmable tiltage max. 0.5 mm/m**
Fiberpress vs. Conventional Press – Machine Height

- Looking at example of a 2500T press.
  - A Conventional Press (image right) has a height of 9.1m = 30 feet
  - While the Fiberpress (image left) has a height of 5.8m = 18 feet
- With this overall building height can be reduced saving costs.
Fiberpress vs. Conventional Press – Transport

- The heaviest components of a Conventional Press is the monolithic frame and ram.
- With the new Fiberpress the design consists of a lower press crown, columns, and a locking ram. The heavy frame component is broken up, resulting transport cost saving.
Fiberpress vs. Conventional Press – Energy Consumption

- Short stroke concept
  - Reduced oil volume
  - Downsize pump requirements

2500T Example
- 8 hour shift
- 3 shifts per day
- 261 working days per year
- 90% utilization
- $0.0762/kWh (Michigan Industry Average)
- 30s cycle time = ~$30,000 USD yearly savings
- Significant savings considering complete press hall

Fiberpress

Conventional Press

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Fiberpress vs. Conventional Press – Power Consumption

<table>
<thead>
<tr>
<th>Cycle Time [s]</th>
<th>Fiberpress</th>
<th>Conventional Press</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>$9,729</td>
<td>$29,188</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Fiberpress vs. Conventional Press – ACCE 2019
New Visualization Software - Main page

- Process overview with a direct status display of the main parameters
- Live display of the cycle progress
- Symbols instead of text
New Visualization Software - Customization

- Process-specific and freely configurable
- User-specific configurable
- Free phase selection
New Visualization Software - Datasets

- Save datasets for specific process configurations and molds
New Visualization Software – Eccentricity Monitoring

- Live display of the off-center force application point
Dieffenbacher Fiberpress – Production Example
Thank you very much for your attention!