EXPERT IN
REACTIVE THERMOPLASTIC PULTRUSION
Company
Core Business and competences
Reactive Thermoplastic Pultrusion Technologies
Advantages of Thermoplastic Composites
Applications
CQFD Composites, facts

- Founded in 2006
- R&D process development since 2007
- Commercial approach initiated in 2010
- Team of 8 persons
- R&D work place of 800 m²
- 4 advanced pultrusion lines dedicated to R&D pultrusion work
- Based in Wittenheim (France) - 20 mm from Bâle-Mulhouse airport
CQFD Composites, **Core Business:**

- Development of innovative composite thermoplastic profiles
- Industrialization of products and processes.
- Production
- Technologies transfer

CQFD Composites, **competences:**

- Development of composites profiles
- Expertise in thermoplastic composites
- Design of pultrusion tools and machineries
- Polymer chemistry and interface
- R&D project management
Reactive Thermoplastic Pultrusion

Step 1
Proprietary formulation of low viscosity monomers combining catalyst, activator, additives and suitable fibers are introduced under pressure into a pultrusion die.

Step 2
The thermoplastic polymer is synthesized «in situ» among the fibers during the shaping step of the profile, under pressure and heat.
### Key Advantages of Pultruded Thermoplastic Composites

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
<td>Ultimate mechanics, shapable profiles, compatible for overmoulding</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>Low cost raw materials, one step transformation, straight or curved</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>2.5x less energy consumption, recyclable, styrene free</td>
</tr>
<tr>
<td><strong>Time to Market</strong></td>
<td>Mature technology, available for mass production, available for technology transfer</td>
</tr>
</tbody>
</table>

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**STRAIGHT**

**SHAPED**

**CURVED**
Never-achieved fiber content

85 \%_wfibers!
Reactive Structural Thermoplastic Pultrusion by CQFD

Traditional Thermoset composite profile

CQFD Thermoplastic composite profiles

SEM pictures obtained on composite profiles after breaking

High adhesion quality
Reduction of composite transformation steps

Monomers → Polymers → Filament, Granules, Powder → Composite

Actual techniques

Optimized cost

Reactive Structural Thermoplastic Pultrusion by CQFD
Reactive Structural Thermoplastic Pultrusion by CQFD

Raw materials
- Lower cost first transformation matrix
- Lower cost large tow fibers

Transformation
- Low pressure
- Low temperature
- On line chemistry
- Multi cavities die
THICK structural profiles
INSERTS reinforcements (extrusion & injection)
ULTRA HIGH MODULUS
PRECISE profiles (connexion / assembly)
COMBINAISON of fibers for mechanical /cost optimisation
CO_EXTRUDED profiles (surface functionalities /welding)
Reactive Structural Thermoplastic Pultrusion by CQFD

Key markets

- **Automobile**
  - Structural and semi structural parts

- **Construction**
  - Windows, and others structural profiles
Automotive: ULTIMATE MECHANICS

From DESIGN...

.... to REALITY
## Alternative to aluminum in building applications

<table>
<thead>
<tr>
<th>Property</th>
<th>ALU</th>
<th>CQFD UD GLASS</th>
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</thead>
<tbody>
<tr>
<td>Density</td>
<td>2.7</td>
<td>2.0</td>
</tr>
<tr>
<td>Rigidity</td>
<td>70</td>
<td>55-65</td>
</tr>
<tr>
<td>Resistance</td>
<td>250</td>
<td>1500</td>
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<tr>
<td>Spe. Rigidity</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>Conductivity</td>
<td>220</td>
<td>0.5</td>
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<tr>
<td>Dilatation</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>Gpa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mpa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W/m.K</td>
<td></td>
<td>10^{-6} m/m.K°</td>
</tr>
</tbody>
</table>

Building: ULTIMATE WEATHER
CQFD composites commits to his customers to:

- Think about a performing innovative product solution
- Identify the most efficient process
- Propose an industrial scenario in line with the customer expectations:
  - Production by CQFD Composites
  - Joint-Venture
  - Technology/Know-How transfer to the customer
Thank you for your attention