VORAFORCE™ epoxy systems are industry leading resin transfer molding (RTM) solutions offered to meet varying application temperature requirements. They combine extended infusion times at low viscosity with ultra-fast cure capability for higher-volume production of structural components.

Meeting OEM emissions and fuel efficiency requirements is a difficult challenge when working only with materials such as steel or aluminum. Significant weight reduction is possible with low-density carbon fiber composite components that can function alongside traditional metal components in an efficient bonded hybrid construction.

VORAFORCE™ 5300 is a game-changing epoxy formulation composed of resin, hardener and internal mold release. It is designed mainly for carbon fiber composite production using high-pressure RTM or wet compression. Classed as not toxic under REACH 2015, the epoxy system is also formulated to prevent undesirable corrosion of processing equipment. VORAFORCE™ 6300 and 7100 extend those capabilities into higher temperature applications up to 200˚C.

The ultra-low processing viscosity of VORAFORCE enables short infusion times and excellent fiber wetting, allowing the production of outstanding final composite performance and substantial mass reduction compared to metal solutions. This low-viscosity advantage also reduces filling pressure and clamp force, without sacrificing flow length or fiber wetting even in parts with high fiber content.

The VORAFORCE product family is ideal for producing large composite parts with significant part consolidation potential, helping to reduce part count and therefore assembly costs. Further cost reduction is possible with the super-fast in-tool cure times of VORAFORCE 5300, suitable for high-volume part production from a single press. Depending on process needs, the versatility of VORAFORCE 5300 allows easy adjustment of injection and cure profiles, enabling molding cycle times of 30 to 180 seconds.
VORAFORCE™ ultra-fast cure composite epoxy systems—the next solution for ultra-low viscosity, excellent flow, exceptional fiber wetting and ultra-fast in-tool cure.

The VORAFORCE systems allow the production of composite parts having excellent mechanical properties, including moisture and chemical resistance complemented by a range of high glass-transition temperatures to boost stability and durability of the composite at the required service temperatures. The following properties can be achieved without a post cure:

<table>
<thead>
<tr>
<th>VORAFORCE™ (cured resin)</th>
<th>Unit</th>
<th>Test Standard</th>
<th>5300</th>
<th>6300</th>
<th>7100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elongation at Break</td>
<td>%</td>
<td>ISO 527-2</td>
<td>7</td>
<td>6.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Elastic Modulus</td>
<td>GPa</td>
<td>ISO 527-2</td>
<td>2.7</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>MPa</td>
<td>ISO 527-2</td>
<td>68</td>
<td>67</td>
<td>58</td>
</tr>
<tr>
<td>Tg Midpoint (DSC)</td>
<td>°C</td>
<td>ISO 11357-2</td>
<td>120</td>
<td>147</td>
<td>180</td>
</tr>
</tbody>
</table>

Composite Data (DowAksa cf, 50 Vol %)
- 90° Tensile Modulus (UD fabric) GPa: ISO 527-4 8.2 8.6 8.1
- 90° Tensile Strength (UD fabric) MPa: ISO 527-4 59 57 55
- 90° Elongation (UD fabric) %: ISO 527-4 1.1 1.0 1.05
- ILSS UD Fabric MPa: ISO 14130 69 67 76
- Composite Density g/cm³: 1.49 1.49 1.49

For further extended part size, it is possible to extend VORAFORCE infusion times up to several minutes via reduced tool temperatures. VORAFORCE 7100 glass-transition temperature can be further boosted to 195°C with a short post cure. Please contact Dow Automotive Systems for processing options.

ABOUT DOW AUTOMOTIVE SYSTEMS

Dow Automotive Systems, a business unit of The Dow Chemical Company, is a leading global provider of collaborative solutions and advanced materials for automotive and commercial transportation original equipment manufacturers, tier suppliers and aftermarket customers. Our materials focus includes structural, elastic and rubber-to-substrate adhesive solutions; polyurethane foams and acoustical management solutions; innovative composite solutions; and films and fluids, with an emphasis on achieving customer and corporate sustainability goals. Offices and application development centers are located around the world to ensure regionalized technical, engineering and commercial support for customers and industry groups. For additional information, visit dowautomotive.com.