Sometimes it can be difficult to identify which type of fan impeller blade material is required for a given application. Typical blade materials supplied by Fantech include GRP (Glass Reinforced Polypropylene), Aluminium, Nylon and Anti-Static Plastic.

### Blade Stresses
A rotating impeller blade will be exposed to a number of stresses. These include centrifugal and bending stresses during fan start up and running. To manually calculate stress on a blade requires knowledge of the blade profile, airflow, pressure, blade length, motor torque, speed and temperature.

To simplify this process the Fantech Product Selection Program will automatically perform blade stress calculations and will not allow any selections where the blade stress is above allowable limits.

While aluminium has the highest inherent strength of these materials, GRP blades contain fibre reinforced compounds that improve stress tolerance (even on large fans) and are cost-effective.

The easiest method to determine the appropriate blade material is to select “Any” on the Impeller Type / Material option in the selection program. The program will then automatically select the lowest cost material that can withstand the stresses that are present in the selection.

### Temperature
Typically as temperature increases the strength of most materials will decrease. GRP blades will safely handle 70 °C, while Aluminium blades will handle 110 °C. These temperature limits may be greatly exceeded (see table above) if the blades are de-rated from a stress perspective.

When selecting a fan for high temperature applications such as a smoke spill, aluminium blades are required to handle the increased temperature. During a smoke spill test, temperatures can be above 300 °C. However our tests have shown that the aluminium fan blades can withstand these temperatures for short periods of time as long as they are not highly stressed.

Under high temperatures, aluminium blades can exhibit a phenomenon called creep, where the centrifugal force causes the blades to stretch. In this instance particular attention needs to be paid to blade tip clearances to avoid blades tipping against the fan casing when a smoke spill event occurs.

<table>
<thead>
<tr>
<th>Blade Material</th>
<th>GRP</th>
<th>Aluminium</th>
<th>Nylon</th>
<th>Anti-Static</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-60°C to 110°C</td>
<td>-60°C to 250°C</td>
<td>-60°C to 110°C</td>
<td>-60°C to 70°C</td>
</tr>
<tr>
<td>Strength Rating</td>
<td>Low</td>
<td>Highest</td>
<td>Medium</td>
<td>Lowest</td>
</tr>
<tr>
<td>Corrosion Resistance</td>
<td>Very Good</td>
<td>Good</td>
<td>Very Good</td>
<td>Very Good</td>
</tr>
</tbody>
</table>

The above table summarises the properties of each material used for Fantech axial impellers. While nylon blades can be useful for particular applications, in reality their use is very narrow and therefore we will focus on the remaining 3 blade materials.

### Resonance Checks
With speed control as standard on many ventilation applications, fans are operated at many different speeds. Each fan blade material will have a natural frequency which can experience a resonance condition at a specific speed where blade vibration will substantially increase. Natural frequency is dependent on the blade stiffness and its mass. Changing blade materials can sometimes be a simple solution to avoid blade resonance problems. The Fantech selection program will also block any selections where known blade resonances exist.

### Corrosion
There is no standard solution when considering which type of blade material is suitable for corrosion resistance. Different chemicals have different effects on different materials.

GRP may have excellent corrosion resistance against Hydrochloric Acid, but can be severely affected by Chlorine. Antifreeze has a severe corrosive effect on both GRP and Nylon, while Aluminium has excellent corrosion resistance against this chemical. GRP blades have a good to excellent corrosion resistance against 78% of known chemicals. Aluminium has a good to excellent corrosion resistance against 63% of known chemicals.

“Typical axial fan blade materials supplied by Fantech include GRP, Aluminium, Nylon and Anti-Static Plastic.”

As 20 to 40% of known chemicals will cause significant corrosive effects against GRP or Aluminium, it is important to ensure blade materials are suited to the application or else suitable protective coatings are used. A corrosion engineer may be also used to give guidance on specific corrosive applications.

### Fans by Fantech
Fantech’s new Product Selection Program is full of powerful new features and is now available through your local Fantech office or agent. In each issue of TechTalk we will include tips which will hopefully save you time.

**Hints and Tips: Viewing and Testing Fan Performance**

When viewing any fan in the Selection Program, the Performance Data panel will show you the fan performance curve, your required duty point, and the point on the curve where the fan will actually perform, based on the system curve. You can change the duty point by dragging the red-cross hair, or typing new airflow and pressure values – the program will automatically recalculate the actual performance for you.