**Honeywell, Blowing Agent Technology Leader for 70+ Years**

Honeywell has been at the forefront of blowing agent technology for decades, first offering chlorofluorocarbons like CFC-11, followed by HCFC-141b.

Honeywell’s Enovate® 245fa (HFC-245fa), part of the third-generation hydrofluorocarbons (HFCs), has long been considered a standard in the foam insulation industry. It has a global-warming-potential (GWP) of 858.

In 2014, Honeywell introduced Solstice® Liquid Blowing Agent (HFO-1233zd(E)), based on hydrofluoro-olefin (HFO) technology, which retained all the positive attributes of Enovate 245fa, but boasts a GWP of 1, which is 99.9 percent lower than HFCs and equal to carbon dioxide.

**Cost-Effective Solutions, Available Today, Offer Equal or Better Performance**

Honeywell has tested the following blowing agents for panel foam insulation to replace HCFC-141b. Review the information below to evaluate the results and find the solution that best matches your requirements.

### Thermal Conductivity of Foam with Various Blowing Agents

<table>
<thead>
<tr>
<th></th>
<th>HCFC-141b</th>
<th>Solstice® LBA</th>
<th>Enovate® 245fa</th>
<th>Cyclopentane (CP)</th>
<th>65/35 LBA/CP</th>
<th>85/15 LBA/n-pentane</th>
<th>95/5 245fa/methyl formate (MF)</th>
<th>60/40 245fa/CP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>λ (mW/mK)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4°C</td>
<td>18.32</td>
<td>18.20</td>
<td>18.86</td>
<td>20.48</td>
<td>18.79</td>
<td>19.11</td>
<td>19.11</td>
<td>19.66</td>
</tr>
<tr>
<td><strong>Flammability</strong>*</td>
<td>Nonflammable</td>
<td>Nonflammable</td>
<td>Nonflammable</td>
<td>Flammable</td>
<td>Flammable</td>
<td>Flammable</td>
<td>Nonflammable**</td>
<td>Flammable</td>
</tr>
</tbody>
</table>

* Based on generic formulations. Results will vary by formulation. Note: Blend ratios are shown as weight percent.

**Global Environmental Treaty Mandates Product Phaseout**

As defined by the Montreal Protocol, Article V countries are being required to phase out their use of HCFC blowing agents, such as HCFC-141b.

In October 2016, delegates to the Montreal Protocol agreed in Kigali, Rwanda to an historic amendment that adds high-GWP HFCs to the Protocol and establishes schedules for their phase down in developed and developing countries.

- 65/35 weight % LBA/CP has similar performance to Solstice LBA
- At room temperature, 60/40 weight % Enovate 245fa/CP performs almost as well as neat Enovate 245fa
- Dimensional stability is comparable or better than HCFC-141b for all samples at -29°C, 90°C and 70°C/95% relative humidity
- The table above is not intended to be a comprehensive list. Other co-blowing agent options are available such as methylal, isopentane, and pentane mixtures
Honeywell Technical Services Helps You Develop Optimized Solutions

Our technical service experts, located around the world, provide consulting services that can help you optimize your formulation and recommend materials that can further improve your foam performance.

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