Cost-Effective Replacements for HCFC-141b in Panel Insulation

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>4°C</td>
<td>18.32</td>
<td>18.20</td>
<td>18.86</td>
<td>20.48</td>
<td>18.79</td>
<td>18.91</td>
<td>19.11</td>
<td>19.66</td>
</tr>
<tr>
<td>Flammability*</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.

* Flammability test methods: OSHA 29CFR1910.1200/DOT 49CFR173.120 were used for all samples except the 245fa/MF blend (95/5) which used ASTM procedure D 3278

** Like any non-azeotropic blend of a flammable and a nonflammable fluid, the blend can become flammable if the nonflammable material evaporates from the mixture

- 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
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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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