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## **INSIDE STORY: What it means *to be HFC and PBDE free.***

What does it mean to be GREEN? Ask that question to any person or organization and you will get a myriad of responses ranging from concrete initiatives to vague ideals. The purpose of this paper is to be as specific and straight forward as possible about two elements of the spray foam insulation

industry that can have an impact on the environment: blowing agents and fire retardants. While there is a sea of acronyms when dealing with building products, you do not have to be a chemist to understand this document and how it pertains to the reality of global warming and climate change.

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# The Quest for Low GWP- As Simple as H<sub>2</sub>O

## Global Warming Potential: Simplified

**Global warming potential (GWP)** is a measurement of how much a given mass of greenhouse gas is estimated to contribute to global warming relative to that of the same mass of carbon dioxide which has a GWP of 1. For example<sup>1</sup>, methane is 21 times more heat retentive than carbon dioxide, so it has a global warming potential of 21. Similarly, nitrous oxide has a global warming potential of 310.

When used in place of air-permeable insulation, spray foam insulation can reduce home heating and cooling costs by up to 50%<sup>2</sup> and lead to a reduction in related greenhouse gas emissions.

However many spray foam products employ blowing agents that can contribute to global warming. Selecting spray foam insulation that does not use a high GWP blowing agent helps build a brighter future and further reduce the environmental impact of the homes we build.

## A Green History Lesson: Chlorofluorocarbons (CFCs)

Developed in 1928 as a replacement refrigerant for ammonia<sup>3</sup>, CFCs are a family of chemical compounds containing chlorine, fluorine and carbon. CFCs gained widespread popularity after World War II and were used in aerosol-spray propellants, refrigerants, solvents, and foam-blowing agents because of their nontoxic and nonflammable properties.

However, during the 1970s studies showed that CFCs accumulated in the Earth's stratosphere and had tremendous **ozone depletion potential (ODP)**. Since stratospheric ozone shields living organisms from the harmful effects of the sun's radiation, CFCs were thus

determined to be a serious environmental threat. CFCs were phased out in the mid-90s as a result of the Montreal Protocol<sup>4</sup>.

## The Next Generation: Hydrochlorofluorocarbons (HCFCs)

By adding hydrogen to the formulation, chemists had developed a replacement that was less damaging because it allowed the CFCs to break down before reaching the ozone layer. However, HCFCs such as HCFC-141B still release chlorine that can reach the upper atmosphere and thus are considered to have high ODP. They too have been phased out.

## 3<sup>rd</sup> Generation Blowing Agents: Hydrofluorocarbons (HFCs)

With the phase outs of CFCs and HCFCs, third-generation blowing agents such as HFC-365mfc and HFC-245fa were developed and have become widely used in many polyurethane (PU) foam applications including spray. However, ODP is just one aspect of environmental concern. Climate change and global warming have become the major issues on both the public and political fronts putting great pressure on the spray foam industry to address the global warming potential (GWP) of its products.

Fortunately, alternatives to HFC-blown spray foam are readily available. To learn about the benefits of non-HFC blown products turn to page 4.

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# The ABCs of PBDEs. The Potential Dangers of this Fire Retardant

Polybrominated Diphenylethers (PBDEs) are synthetic chemicals known for their fire resistant properties. These man-made chemicals have been used in a variety of consumer and commercial products from toys and electronics to building materials including some polyurethane foam. The problem? Though these chemicals may have saved some lives, the long term hazards to our population through their widespread use may vastly outweigh their fire retardant benefits.

## Potential Dangers of PBDEs

97% of Americans have detectable levels of PBDEs in their system. It has been found in human breast milk in North America and Europe in low concentrations but the amounts have been doubling ever 4-6 years since the 1970s.

Animal studies have shown these chemicals affect neurological and reproductive behavior. Preliminary studies in humans show that these fire retardants may indeed affect human female reproduction.

In reviewing this research the EPA has determined that certain PBDEs are persistent and toxic to both humans and the environment.

PBDEs are not chemically bound to plastics, foam, fabrics, or other products in which they are used, making them more likely to leach out of these products.<sup>6</sup>

DecaBDE also can degrade to more toxic chemicals that are frequently found in the environment and are hazardous to wildlife.

## Types of Commercial PBDEs

There are three different types of commercial PBDEs:

- PentaBDE
- OctaBDE
- DecaBDE

PentaBDE and OctaBDEs are no longer produced in the United States because of the long term health and safety implications. On December 17, 2009, as the result of negotiations with EPA, the two U.S. producers of decabromodiphenyl ether (decaBDE), Albemarle Corporation and Chemtura Corporation, and the largest U.S. importer, ICL Industrial Products, Inc., announced commitments to phase out DecaBDE in the United States by December 31, 2012.

For Icynene's stance on PBDEs, turn to Page 4.

# Conclusion: Why Icynene is HFC and PBDE Free

## Benefits of a non-HFC Blowing Agent

There are several key characteristics that a blowing agent should ideally have:

- Low toxicity
- Low GWP
- Nonflammable
- Zero ODP
- Stable
- Liquid at room temperature

Icynene has undertaken a great deal of research and development to ensure their formulations function at optimal levels without the use of an HFC blowing agent. With Icynene products, water reacts with the A component and it is this reaction that creates the millions of tiny cells that form the insulation and air barrier material.

With a GWP of 1, Icynene's 100% water-blown solutions have far less environmental impact than the current HFCs used for spray foam insulation.

BLOWING AGENT	GWP
HFC-365mfc	782 (950)
HFC-245fa	1020 (950)
Water/ CO <sub>2</sub>	1

Source:  
<http://www.epa.gov/Ozone/geninfo/gwps.html>

Icynene products are a 100% water-blown and HFC-free.

## Icynene's Stance on PBDEs

The long term verdict on the effect to human health is still to be determined but the prognosis doesn't appear to be positive. It's admittedly very difficult to even determine if the spray foam product you have purchased contains these chemicals based on product literature or Material Safety Data Sheets (MSDS).



At Icynene, the safety of the customer and installer is paramount. PBDEs are not used in Icynene formulations.

This is clearly stated on the Company's Product Spec sheets. Icynene spray foams meet ASTM E84 requirements

as fire rated products without the need to employ PBDEs.

We only have one planet and we want it to remain as sustainable as possible.







ICynene provides a portfolio of innovative and responsible insulation products that contribute to a HEALTHIER, QUIETER, MORE ENERGY EFFICIENT® and sustainable building.

Be sure to visit [www.icynene.com](http://www.icynene.com)



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<sup>1</sup> <http://www.davidsuzuki.org/>

**Other Sources:**

*Health Canada:* <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/pbde-eng.php>

*The Economist:* [http://www.economist.com/science-technology/displaystory.cfm?story\\_id=15391226](http://www.economist.com/science-technology/displaystory.cfm?story_id=15391226)

*United States Environmental Protection Agency:* <http://www.epa.gov/oppt/pbde/>

*Green Living Tips:* <http://www.greenlivingtips.com/>

<http://www.c-f-c.com/supportdocs/cfcs.htm>

<http://www.chemistrydaily.com/chemistry/Hydrochlorofluorocarbon>

<http://urethanestechologyinternational.com> (low gwp blowing agents. Report by Ben Chen, Joseph Costa, Laurent Abbas, Philippe Bonnet

<http://www.appliancedesign.com> (Alternative Blowing Agents by Richard Babyak

<sup>2</sup> based on empirical field results and Icynene case studies

<sup>3</sup> <http://www.chemistrydaily.com/chemistry/CFC>

<sup>4</sup> [http://en.wikipedia.org/wiki/Montreal\\_Protocol](http://en.wikipedia.org/wiki/Montreal_Protocol)

<sup>6</sup> <http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/pbde.html>