PIMA PERFORMANCE BULLETIN

Polyiso Insulation's Low-GWP Blowing Agent Solution

Insulation and Blowing Agents

Closed-cell foam insulation products like polyiso are manufactured with captive blowing agents. The blowing agents are primarily used to increase the final product's thermal resistance or R-value. The substances are also an integral part of the manufacturing process helping to produce the ideal cell structure.

In closed-cell products, the blowing agents are retained within the cell structure to provide long-term thermal performance. And while closed-cell insulation products can exhibit an initial drop in R-value due in large part to the diffusion of air into the foam, all polyiso insulation products are tested to reflect an aged (i.e., long-term) R-value.[1] For more information on polyiso's R-value and the applicable testing requirements, visit the PIMA website.

Insulation products manufactured without captive blowing agents (e.g., expanded polystyrene, fiberglass, mineral wool) result in lower R-values per inch. Therefore, these products must be installed at greater thicknesses to equal the high R-value of polyiso insulation.

For over 20 years, the polyiso industry has utilized pentane in product formulations. These products replaced formulations using CFCs and HCFCs, which are no longer permitted for use in insulation products in major markets, including the United States and Canada.

Polyiso wall insulation on a commercial building.

Polyiso roof insulation on a commercial building.

Polyiso + Pentane = Environmental Leadership

Polyiso products are manufactured using pentane or pentane blends.[2] **Pentane is a hydrocarbon with zero ozone depletion potential**[3] **(ODP) and low global warming potential (GWP)**. GWP is a measure of a substances ability to trap heat in the atmosphere and is calculated over a specific period of time (commonly 100 years). Specifically, GWP measures how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of CO_2.[4] A substance that traps more heat will contribute more to global warming (and will be assigned a higher GWP value). Therefore, products that incorporate low-GWP blowing agents provide insulation solutions that offer reduced environmental footprints.

Notes:

1 The U.S. Federal Trade Commission's R-value Rule requires that tests performed on samples of polyiso insulation reflect the effect of aging on the product's R-value (Labeling and Advertising of Home Insulation, 16 CFR Part 460).

2 *Pentane* is used as a general term to describe the different pentane isomers or mixtures of isomers used by polyiso manufacturers. Isomers are molecules with the same molecular formula, but different bonding patterns. In terms of environmental impacts, all pentane isomers have the same GWP.

3 Ozone depletion potential, or ODP, is a relative measure of substance's contribution to the degradation of the ozone layer. For more information, visit: https://www.epa.gov/ozone-layer-protection/basic-ozone-layer-science.

4 Visit the U.S. EPA's webpage, *Understanding Global Warming Potentials*, for more information: https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.

POLYISO

Surround yourself with the best.

For over 20 years, the polyiso industry has utilized pentane in product formulations. These products replaced formulations using CFCs and HCFCs, which are no longer permitted for use in insulation products in major markets, including the United States and Canada. The transition to pentane blowing agents was preceded by years of research and development. As a result of these efforts, the polyiso industry was recognized by the U.S. Environmental Protection Agency with the Stratospheric Ozone Protection Award for leadership in the phase-out of CFCs and exceptional contributions to global environmental protection. Please refer to PIMA's Environmental Product Declarations for additional information regarding GWP and polyiso's overall environmental performance.

Comparing Polyiso to Other Insulation Products

Not all closed-cell foam insulation products are created equal when it comes to the environmental impacts of their blowing agents. **Pentane has a GWP of less than 10.**[5] Other insulation products still utilize hydrofluorocarbon (HFC) blowing agents, which can have a GWP of 1300 or higher.[6] This is more than 100 times the global warming impact of pentane used in polyiso insulation.

As a category, other closed-cell insulation products are transitioning to blowing agents with lower GWP in part as a response to international and domestic regulations. However, not all blowing agent substitutes are equivalent. In Canada, regulations prohibit the manufacture, import or sale of foam plastic insulation products that contain a blowing agent with a GWP greater than 150.[7] The U.S. Environmental Protection Agency does not enforce GWP limits for blowing agents used in foam insulation products.[8] However, several states have, or are in the process of, enacting prohibitions on the use of certain HFC blowing agents in foam insulation products manufactured or sold within their jurisdictions.[9]

Environmental Product Declarations

GWP is an important measure of a product's impact on the environment, but there is a larger story to tell for insulation products like polyiso. The polyiso insulation industry provides stakeholders with information on the environmental impacts of its products through the publication of Environmental Product Declarations (EPDs). An EPD is an internationally recognized and standardized tool that

Notes:

5 U.S. EPA assigns pentane (isopentane) a GWP value of < 10. *See* EPA SNAP approved substitute list for polyisocyanurate (available at: https://www.epa.gov/snap/substitutes-rigid-polyurethane-and-polyisocyanurate-laminated-boardstock#self). EPA estimates the GWP for isopentane based on the GWP of butane from a 2007 assessment by The Intergovernmental Panel on Climate Change, *Safeguarding the Ozone Later and the Global Climate System* (available at: https://www.ipcc.ch/report/safeguarding-the-ozone-layer-and-the-global-climate-system/).

6 For example, XPS insulation is typically manufactured with HFC-134a. This compound has a GWP of 1430. Source: The Intergovernmental Panel on Climate Change, *Fourth Assessment Report,* Chapter 2 - Changes in Atmospheric Constituents and in Radiative Force (available at: https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg1-chapter2-1.pdf).

7 Effective on January 1, 2021 for plastic foam or rigid foam products. More information is available at: https://laws-lois.justice.gc.ca/eng/regulations/SOR-2016-137/FullText.html.

8 U.S. EPA SNAP Rules 20 and 21 were partially vacated by a decision of the Court of Appeals for the District of Columbia Circuit *(Mexichem Fluor, Inc. v. EPA).* As a result, EPA has issued interim guidance to stakeholders that the Agency will not enforce certain prohibitions that limit the use of blowing agents based solely on GWP (available at: https://www.govinfo.gov/content/pkg/FR-2018-04-27/pdf/2018-08310.pdf).

9 Information on state-level activities is available via the United States Climate Alliance: http://www.usclimatealliance.org/slcpchallenge. Under certain state laws or regulations, replacement substitutes may still have a GWP of nearly 750.

reports the environmental impacts of products. EPDs report data on environmental metrics across a product's life cycle, including GWP, primary energy, resource depletion, and water use. Importantly, EPDs also provide an opportunity to disclose the environmental benefits of products. For example, the net return on environmental metrics like embodied energy, where polyiso's long-term energy savings benefits far exceed the energy used to manufacture the product.

The polyiso industry's third-party verified, ISO-compliant EPDs are available for download on the PIMA website.

About PIMA

Since 1987, PIMA has served as the voice of the North American rigid polyiso insulation industry. PIMA is a leading advocate for safe, cost-effective, sustainable, and energy-efficient construction. The Association is comprised of polyiso manufacturers and industry suppliers, and represents the public policy interests of its membership at the local, national, and international levels to advance high-performance building practices.

PIMA produces technical bulletins to address key topics related to polyiso insulation. These publications inform architects, specifiers, and contractors about the performance characteristics of polyiso insulation. Always consult individual manufacturers for product specific information, including product data sheets and installation instructions.

For more information on polyisocyanurate insulation, visit www.polyiso.org

PIMA
POLYISOCYANURATE INSULATION MANUFACTURERS ASSOCIATION

ATLAS · CARLISLE CONSTRUCTION MATERIALS · GAF · HOLCIM · IKO · JM Johns Manville · MAX · SOPREMA