Honeywell | Blowing Agents

Solstice® Liquid Blowing Agent (LBA)
Blowing Agent for Sustainable Building

Solstice® LBA :
an HFO Blowing Agent with Ultra-Low GWP of 1 and Improved Performance, Exceeding Flon Phasedown Target

2005

Kyoto Protocol (1997) went into force
- Advancement of Energy-Saving Rulings
- HFC (alternative flon) added to phasedown substance

2013 H25

Revision to *Act on the Rational Use of Energy*:
- 2013 (H25) Revised Energy Efficiency Standard Introduced

Building material Top Runner Listing started
- Insulation Material (Glasswool, Rockwool, and XPS)

2014 H26

Eco-Town Act
Low-Carbon
Building Incentive Introduced

2015 H27

- primary energy consumption method applied to all new & renovated buildings

***Act on Rational Use and Proper Management of Fluorocarbons* (New Flon Act)**
Sets HFC phasedown target of ccSPF to GWP 100 by 2020.
- JUFA's Guidance to apply Pink Color to Non-flon foams
- Solstice LBA is confirmed as Non-Flon
- Solstice LBA-blown foam used at more than 80 building projects
- JIS A 9526:2015 added a new class for HFO-blown foams

2016 H28

April: *Act for the Improvement of the Energy Saving Performance of Buildings* (Building Energy Saving Act) enacted
- Takes over H25 Energy-Saving Act (above)
- Building Energy Consumption Performance Standard (H28 Energy-Efficiency Standard) Introduced, sets 10% improvement to primary energy consumption by H25 standard. Outer shell insulation remains the same as H25 standard.
- Exceptional floor area ratio
- Proper display of energy-saving capability of the building

March
J-CHIF's "Excellent Insulation" certification added ccSPF

Fall (planned)
New "quasi"-Top Runner product category for rigid urethane foam
- Includes spray foam
- Required to have thermal conductivity (Lambda) 0.026 mW/mK and lower

Update:
Solstice LBA-blown foam used at more than 120 building projects

2017 H29

- April (Planned)
  Mandatory for certain new and renovating buildings over 2,000m^2 to meet the Energy Efficiency Standard and obtain building permission
- Top-Runner Housing certification starts

2020

All New Buildings & Houses to meet the Energy Efficiency Standard
TARGET ZEB of all newly-built Public Buildings
TARGET ZEH of standard newly-built Houses

TARGET YEAR
GWP 100 for all residential-use blown foams

2030

TARGET ZEB of average newly-built buildings
TARGET ZEH of average newly-built Houses

Thermal Performance ✔

Lambda of Solstice LBA-blown foam is 0.026 mW/mK,
25% higher than Water/CO_2
2-4% better than HFC-245fa

CASBEE ☆☆☆☆☆

Solstice LBA-blown insulation is able to score 5-star in Avoidance of Flon and Halon

Green Purchase Listed ✔

Solstice LBA-blown Urethane Foam products

Why HFC is not good?

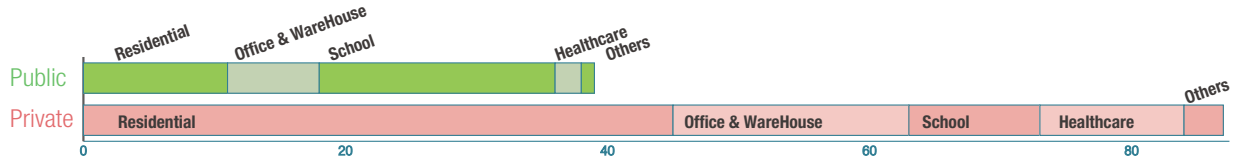
Although non ozone-depleting, HFC (alternative flon) has strong global warming effect. GWP of commonly-used blowing agents are HFC-245fa (1030*), HFC-365mfc (795*), meaning they have 1030 times or 795 times the global warming effect than CO_2, which GWP is 1.

What is HFO?

HFO (HydrofluoroOlefin) has been developed as an alternative to HFC, features ultra-low GWP and non ozone depleting. Honeywell's Solstice LBA is HFO-1233zd(E), with GWP of 1*, Non ozone-depleting, Non-flammable (ASTM E-681), and Non-flon.

Solstice LBA is Around You, Adopted at about 130 Buildings and More Nationwide

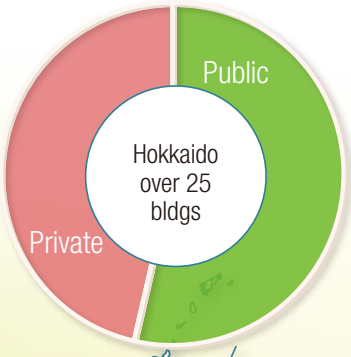
In few years after introduction, Solstice® LBA is quickly adopted at many types of public and private buildings, from apartments, office buildings, to schools and hospitals, adding about 50 buildings to the previous survey in August, 2015. Adoption is accelerating in Hokkaido and cold climate area for Solstice LBA's excellent water & vapor resistant and thermal properties.

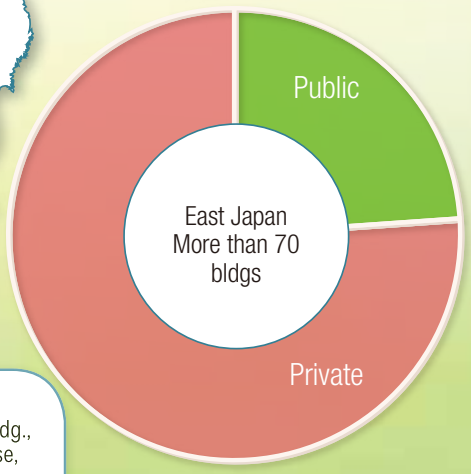


Stats:
More than 80 Building Architect Offices
More than 50 Contractors incl. Super GCs.

Hokkaido

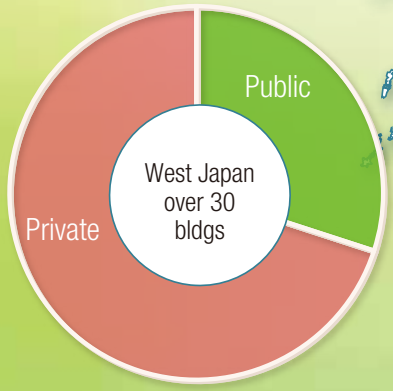
Notable that Public sector has more cases than Private. Most applied at School/Educational Institutions, followed by Office/ Warehouse, Healthcare Facilities, and Apartments. Others include recreational facilities.





East Japan

Most applied at residential bldg., followed by Office/Warehouse, School/ Educational Institution, and Hospitals/ Elderly Care. Others include Hotels, etc



West Japan

Most applied at residential bldg., followed by School/ Educational Institution, and Hospitals/ Elderly Care Houses.

Source: survey by Honeywell
As of April, 2016. "Buildings" exclude detached houses.

*GWPs used in the Phasedown targets are of AR4 of IPCC's Assessment Report (AR). Each version presents different GWPs on the same substance reflecting actual global warming effect. AR4 is the previous version and applied at phasedown target. AR5 is applied to HFOs including Solstice LBA, as they were not evaluated in AR4. AR5 GWPs of HFC-245fa and HFC-365mfc are 858 and 804 respectively.

Solstice® LBA

HFO-1233zd (E)

Atmospheric Life	26 Days (HFCs are 7-8 years)
ODP	~0
GWP	1 (=CO_2)
Flammable	No
Exposure Limit (OEL)	800ppm

Building Applications:

- ccSPF: Building Roofing and Wall, Commercial Refrigerators/Freezers, etc.
- Sandwich Panel: Prefabricated housing unit, Cold Storage, Containers, etc.
- Rigid Polyurethane Foam Board: Floor, Cold Storage, etc.

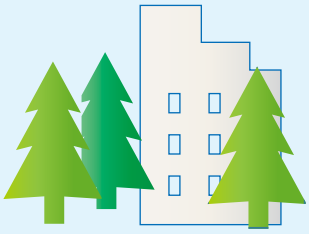
Required Foam Thickness

Mostly the same as HFC, 25% thinner than Water/CO_2

Designated as Non-flon

Rigid Urethane foam products using Solstice LBA are "S Class (Non-Flon)".

CO_2 emission and Energy saving by using Solstice LBA-blown foam



Model Apmt. Building with 30 rooms,
Foam application area 2,000m^2
30mm spray foam insulation thickness

HFC-blown 287.8MT vs. Solstice LBA-blown 0.3MT
= saves 287.5MT of CO_2

equivalent to CO_2 emissions:

from **82** households
- average annual CO_2 emission from energy sources [1]

absorbed by **20,535** ceder trees
in 5.2 times the Tokyo Dome area of forest for one year [2]

[1] reference: *Ministry of Env. Survey on CO_2 emission from Households (Preliminary Result), March 2016*
[2] annual CO_2 absorption by one ceder tree about 14kg by the Forestry Agency, Tokyo Dome 46,755m^2

JIS Standard

In December 2015, JIS added New classes of 1H and 2H to HFO-Blown Urethane Insulation Foam to spray-applied rigid polyurethane foam for thermal insulation (JIS A 9526:2015). Thermal property of 1H and 2H are 0.026 mW/mK and lower.

JIS A 9526:2015

Class	Code	Description
Class A, 1H	NF1H	Closed cell foam using HFO blowing agent, for applications require medium strength such as wall, and ceiling (indoor)
Class A, 2H	NF2H	Closed cell foam using HFO blowing agent, for applications require high strength such as refrigerated warehouse.

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