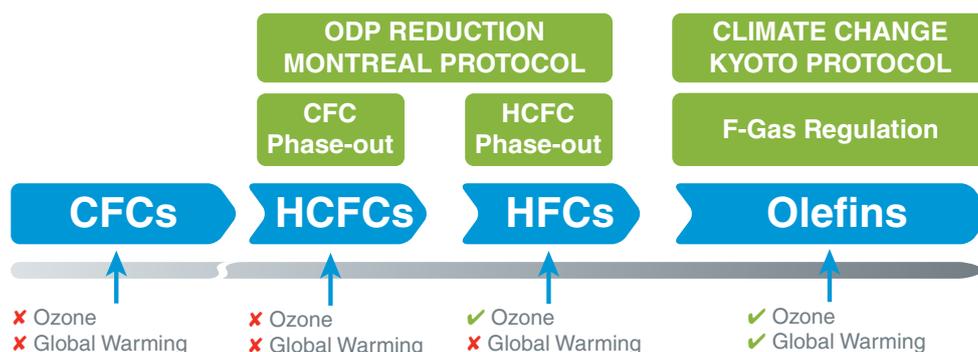


Green Pioneers initiate container trial in response to environmental challenges

The refrigerated container industry (reefer) is facing an environmental challenge resulting from the use of hydrochlorofluorocarbons (e.g., HCFC-141b) in the manufacturing process of insulation foam. HCFC-141b was a preferred blowing agent for decades in polyurethane foam insulation applications, but this material depletes the ozone layer and contributes to global warming. As a result, it was regulated under the Montreal Protocol and is being phased out. China, the production base of global reefer containers, decided to phase out HCFC-141b in the container industry by 2015. Therefore, the industry is looking for a solution that has no impact on the stratospheric ozone layer and a minimal Global Warming Potential (GWP) in compliance with Montreal and Kyoto Protocols as well as providing maximum energy efficiency.

Honeywell is the leader in the development of fluorocarbon technologies and is now leading the development of fourth generation fluorocarbon materials. In 2011, the company announced its fourth generation low-global-warming potential (LGWP) fluorocarbon blowing agent Solstice® Liquid Blowing Agent (LBA). The new blowing agent offers improved energy performance and superior environmental properties compared to existing blowing agents. Solstice LBA will be a preferred solution for the reefer container industry.



Solstice Liquid Blowing Agent

Solstice LBA, a fourth generation fluorocarbon blowing agent called a hydrofluoroolefin (HFO-1233zd) was announced by Honeywell in September 2011, and the material is commercially available.

Solstice LBA has a negligible impact on the ozone layer, and a significantly lower global warming potential (GWP) of 1. The molecule retains all other positive attributes of the HFCs: superior energy efficiency performance, very good processability to improve foam performance, non-flammability and non Volatile Organic Compound (VOC) unlike hydrocarbon



First Green Container with Solstice® LBA

blowing agents. These properties continue to differentiate fluorocarbon blowing agents as the best choice for high performance rigid foam applications where flammable blowing agents are unsafe, too costly to use or fail to provide desired energy efficiency and foam performance.

Physical Properties*

	Solstice® LBA	245fa	141b	Cyclopentane
Molecular Weight	130	134	117	70
Boiling Point	19°C (66°F)	15°C (59°F)	32°C (90°F)	49°C (120°F)
Flashpoint	None	None	None	-37°C
LFL / UFL, (Vol % in air)	None	None	7.6-17.7	1.5-8.7

Environmental Properties

	Solstice® LBA	245fa	141b	Cyclopentane
Atmospheric Life ¹	26 days	7.6 years	9.3 years	Several days
ODP ²	~0	~0	0.11	~0
GWP, 100yr	1	1030	725	11
VOC Exempt	Yes	Yes	Yes	No
Toxicity / OEL	800ppm	300ppm	500ppm	600ppm

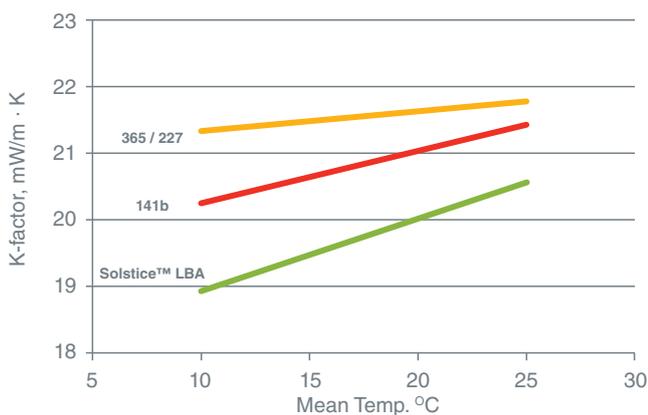
* Similarity in physical properties is only a portion of the overall mosaic of chemical properties and performance attributes that ultimately define the efficacy and overall suitability for use.
1. Anderson et al., Journal of Photochemistry and Photobiology A: Chemistry 199 (2008) 92-97. 2. No impact on ozone layer depletion, commonly referred to as zero (Analyses of tCFC's potential impact on atmospheric ozone; Wang, Olsen and Wuebbles; U of Illinois).

Solstice[®] Liquid Blowing Agent – Energy Efficient, Low GWP Foam Blowing Agent for Reefer Containers

Reefer Container Evaluation

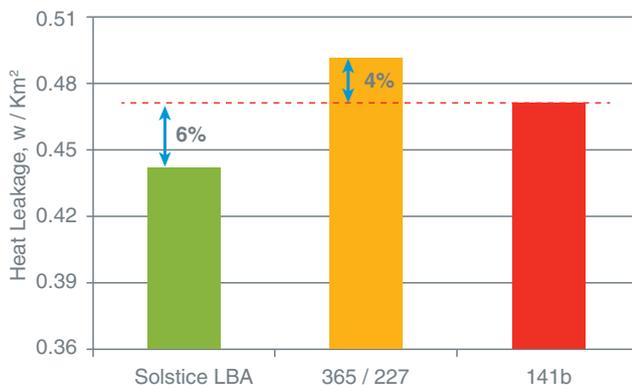
Trial Results: In September 2012, the first Solstice[®] LBA blown foam insulated reefer container was produced at Yangzhou Tonglee factory in close collaboration with the container owner Unit 45 and blowing agent supplier Honeywell. Insulated with polyurethane foam formulated with Solstice LBA, the reefer container offers both high energy efficiency and low environmental impact. Also Solstice LBA shows excellent properties in foam production process including high flowability, even density distribution, good adhesion and fewer voids. It is most impressive that the reefer container has outstanding insulation performance under standard Reversed Heat-Leakage (RHL) test which is even better than HCFC-141b.

Thermal conductivity of Polyurethane foam



Foams with Solstice LBA demonstrate the best thermal insulation value, especially at lower temperature, which is the typical reefer container working temperature.

Reversed Heat Leakage (ATP, U20)



Reefer containers RHL test result demonstrates 6% improvement of foam formulated with Solstice LBA compared to HCFC-141b.

Honeywell

430 Li Bing Road, Zhangjiang Hi-Tech Park, Shanghai,
China, 201203

Tel: +8621 2894 2872, Fax: +8621 5855 7390

Tonglee

Dev. Zone, Yangzhou, Jiangsu, China, 225102

Tel: 86-514-87585823, Fax: 86-514-87582196

Unit45

Villapark 7-8, 3051 BP, Rotterdam, The Netherlands

Tel: +31 10 2110222, Fax: +31 10 2183284

www.honeywell-solsticelba.com

Solstice Liquid Blowing Agent

High Energy Performance

- 6% lower heat-leakage than 141b (ATP, U20)
- 10% lower heat-leakage than 365/227 (ATP, U20)
- Could be even better at in-service operating temperature
- Estimated electricity consumption less 5,000kwh per container during lifetime

Best Environmental Balance

- Minimal Global Warming Potential (GWP 1)
- No impact on the stratospheric ozone layer
- VOC-exempt
- Safe: non-flammable and acceptable toxicology
- Estimated CO₂ emission reduced by 43,000kg per container

Improved foaming process during reefer container production

- Preferred substitute for 141b without sacrificing space or energy efficiency
- Commercially available

RESPONSIBLE CARE

Honeywell Performance Materials and Technologies, as a member of the American Chemistry Council, has adopted Responsible Care[®] as the foundation of health, safety, and environmental (HS&E) excellence in our business. Responsible Care is the chemical industry's global voluntary initiative under which companies, through their national associations, work together to continuously improve their health, safety and environmental performance, and to communicate with stakeholders about their products and processes.

Our commitments:

The safety of our employees

The quality of our products

Being responsible stewards for the protection of the environment, the communities in which we operate and our customers

Acknowledgements

Honeywell acknowledges the significant contributions by Unit 45 and Tonglee for their collaboration in providing the manufacturing site and reefer container, as well as Bayer Material Science in providing the polyurethane formulation utilizing Solstice LBA.

Disclaimer

Although all statements and information contained herein are believed to be accurate and reliable, they are presented without guarantee or warranty of any kind, expressed or implied. Information provided herein does not relieve the user from the responsibility of carrying out its own tests and experiments, and the user assumes all risks and liability for use of the information and results obtained. Statements or suggestions concerning the use of materials and processes are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe on any patents. The user should not assume that all toxicity data and safety measures are indicated herein or that other measures may not be required.



RESPONSIBLE CARE[®]
OUR COMMITMENT TO SUSTAINABILITY

UNIT45
INTERMODAL INNOVATORS



Honeywell

November 2013

© 2013 Honeywell International Inc.

All rights reserved.