

## **Energy Efficiency in Domestic Appliances & Lighting Conference**

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### **Advances in Environmentally Sustainable Refrigerants and Blowing Agents**

*Honeywell's new refrigerants and blowing agents meet the environmental attributes demanded by EU regulations. They are safe, non toxic and have low flammability or are not flammable. For these reasons they are suitable and safe for both domestic and commercial usage.*

Refrigerants and blowing agents of near future have to meet several attributes. They have to have certain environmental characteristics, like a global warming potential of less than 150, zero ozone layer depletion potential or photochemical ozone creation potential. Other parameters to be met are low flammability risk, low order of toxicity and no impact on human health risk.

They have to be highly energy efficient and, from a practical and regulatory point of view, they should represent a global solution. They have to conform to EU Regulation: to the F-Gas regulation and to the Mobile Air-conditioning Directive (MAC).

The results of Honeywell's multi-year development projects are two near term low global warming products: HFO-1234ze and HFO-1234yf. Former is used for stationary refrigeration, PUR foams or aerosols; the latter is suitable for mobile air conditioning and stationary refrigeration.

GWP potential of fourth generation fluorochemicals materials is less than 15, which means significant progress compared to first generation having more than 2000. Also other parameters of HFO Gases are excellent: ODP = 0, atmospheric life time maximum 18 days, GWP maximum 6 and toxicity tests brought good results.

From a flammability perspective, HFO1234yf would obtain a Class 2 flammability rating (A2 ASHRAE classification). It means that minimum energy for ignition has to be really high and flame propagation is slow.

Both HFO1234yz and HFO 1234ze(E) perform similar to current R134a, but with GWP approximately 300 times better. Similar performance was measured using the HFO Gases in beverage cooler system. All new refrigerants have lower discharge temperature than R134a, which helps reliability. For these reasons they are suitable for both domestic and commercial usage.

One of the new LGWP HFOs, HFO-1234ze, can function also as a polyurethane gaseous blowing agent. This product has been commercially available since 2008. Another blowing agent, called HBA-2, is a liquid which was launched at this year's UTECH show in Maastricht, Netherlands. Both blowing agents promise low environmental impact with high thermal insulation performance. They have a low GWP, are non-flammable and have low photochemical ozone creation potential. The performance is above average: HFO1234ze(E) as well as HBA-2 is able to outperform cyclopentane.

HFO-1234ze is commercial in EU for usage in foam industry at the moment. Commercialization in USA and Japan is in progress. HFO 1234yf is available in sample quantities and commercialization depends on regulation and industry demand. HBA-2 blowing agent's toxicity assessment is underway.