HFC-365 mfc-blown PU insulation sprays in Spain and Portugal
The Challenge

Developing insulation systems today in general is challenged by two requirements:

- Providing adequate temperatures in our living spaces to keep us healthy and comfortable
- Using natural resources efficiently and avoiding unacceptable burden to the environment.

Sound environmental data is therefore required encompassing the design and complete life cycle of insulation products to support application development and market acceptance of new products.

The Situation

In Spain and Portugal distinct climatic conditions, clear political commitments to save energy and to protect climate, water and soil as well as specific construction habits, e.g. the importance of polyurethane (PU) foam sprays for the insulation of buildings, set the framework for the development of new products.

High performance PU foam sprays need high performance blowing agents. HCFC-141b, the reference high performance blowing agent has to be withdrawn from the market because of its ozone depletion potential (ODP). Therefore the hydrofluorocarbon HFC-365mfc is currently developed to replace HCFC-141b as a blowing agent for PU foams. Unlike HCFC-141b, HFC-365mfc is not ozone depleting – but, like HCFC-141b, can be climate relevant when emitted to the air.

On the other hand HFC-365mfc-blown PU sprays present excellent insulation performance: less heating energy is needed and thus less emissions are generated – not least climate relevant CO₂.

The Approach

Recognising their joint responsibility, ATEPA (Asociación Técnica del Poliuretano Aplicado), Elastogran S.A. (BASF Group), Solvay Fluor und Derivate GmbH, the Synthesia Group and Advanced Chemicals S.L. as cooperating company have commissioned a life cycle assessment study (LCA) already at the very beginning of application development of Solvay's new blowing agent SOLKANE® 365mfc.

PU-sprays were investigated in typical applications in Spain and Portugal:

- Insulation of walls and roofs of a domestic dwelling by PU-sprays blown with water/CO₂, SOLKANE® 141b or SOLKANE® 365mfc, respectively
- Evaluated for all climatic zones in Spain and exemplifying the Portuguese situation by assessing the Lisbon area

The study was performed according to the international LCA standards of the ISO 14040 series and accompanied and checked by an external critical review panel (see certificate; “The Conclusions”).

The Results

In all five climatic zones in Spain (peninsula) represented by the cities of Almeria, Barcelona, Toledo, Madrid and Avila as well as in the exemplified Lisbon area in Portugal SOLKANE® 365mfc-blown PU-rigid sprays – as compared to water/CO₂ – can under the settings of the study more effectively

- save energy (as well as water and mineral resources – see full report) by approx. 15 % each
- reduce emissions potentially causing environmental impacts such as global warming by approx. 2 – 10 %, acid rain, nutrification of water and soil or summer smog by approx. 15 % each (see full report)
- reduce waste by approx. 15 % (see full report).

Absolute savings are all the more pronounced where insulation-demanding climatic conditions are given (see figures) or spatial or static constraints impose thin insulation layers (see full report).

It should be noted that environmental benefits of SOLKANE® 365mfc insulation systems, e.g. saving energy, are at the same time economic benefits, i.e. 15 % lower costs for heating and cooling of buildings.

The study includes sensitivity analyses and scenario calculations which show in detail the reliability and transferability of the results when altering relevant parameters such as service life of the products, blowing agent losses during the service life of products, heating/cooling technologies, or thickness of the applied insulation. Clear hints regarding the appropriate management of waste are given.
Considering the complete life cycle, SOLKANE® 365mfc-blown PU-rigid foam insulation sprays show environmental profiles which are superior to or at least competitive with water/CO₂-blown products.

Key settings: equal thickness of insulation, residential building, 50 years service life, heating mixes for Iberian peninsula, all five climatic zones in Spain represented by the cities of Avila, Madrid, Toledo*, Barcelona and Almería* and Lisbon exemplifying Portugal.

*Toledo (results between Madrid and Barcelona) and Almería (results similar to Lisbon) not shown.

Energy: total energy demand; Global Warming Potential (GWP): sum of relevant emissions multiplied by respective compound-specific GWP.

Advantages of SOLKANE® 365mfc PU sprays for other relevant environmental impact themes (acidification potential, nutrification potential, and photochemical ozone creation potential) are very similar to diagram shown for energy.

The partnership approach helped to generate unique information. The LCA methodology provides a rational information basis, comprising environmental loads and benefits of complete product systems.

Looking at the full picture, the zero-ODP compound HFC-365mfc has the potential to replace HCFC-141b and to become the future environmentally sound high performance blowing agent for high performance insulation PU foam sprays. It particularly can help to save energy (and other resources) and to reduce waste and emissions potentially causing environmental impacts like acid rain, nutrification of water and soil, summer smog and even global warming.

The Conclusions
Full report is provided on request by the project partners:

Tel. +34-91-6 31 83 14
Fax +34-91-6 31 83 14
www.buildnet.es/atepa

Elastogran

BASF Group

Tel. +34-93-6 80 61 00
Fax +34-93-6 80 62 00
www.elastogran.com

Solvay
Fluor und Derivate

Tel. +49-5 11-8 57-26 53
Fax +49-5 11-8 57-21 66
www.solvay-fluor.com

Synthesia Española

Tel. +34-93-6 82 35 41
Fax +34-93-3 25 37 00
www.synthesiaespanyola.es

Cooperating company:

Tel. +34-93-4 53 95 68
Fax +34-93-4 53 51 89