connection

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INFORMATION BULLETIN FOR HUNTSMAN POLYURETHANES RIGID FOAM CUSTOMERS

FROM THE EDITOR

We would like to take this opportunity to wish all of our customers a Happy New Year. We have decided to start the New Year by focussing on the environment. This issue of **connection** *comprises a special feature on blowing agents, and is designed to provide you with all the facts, including an overview of the legislative developments and their impact on the polyurethanes industry. For further information on this subject, please speak to your usual contact at Huntsman Polyurethanes. Regards,*

Werner Van Peteghem – Marketing Executive

BLOWING AGENTS – THE ENVIRONMENTAL ASPECT

The Challenge

Over recent years, the polyurethane industry has had to cope with various environmental issues surrounding blowing agents. Initial concerns focused on the ozone layer and subsequently moved towards global warming. This was most recently highlighted at the COP6* meeting in The Hague, where ministers and diplomats from all over the world met to accelerate international action to reduce greenhouse gas emissions. Despite the collapse of talks due to lack of agreement on some of the key outstanding issues, climate change remains a high priority. Since the 1980s, numerous measures have been implemented in order to resolve these environmental issues. In each instance, these measures have had far-reaching effects on the polyurethane industry. Most recently, the Commission has introduced tighter legislation for the use and phasing out of hydrochlorofluorocarbons (HCFCs), one of the blowing agents commonly used to manufacture polyurethane rigid foam. The new Regulation EC 2037/2000 was published on 29/09/2000 and includes reductions in the overall amounts of HCFCs available (the CAP) and significantly earlier phase-out dates for HCFCs in all use sectors, including foams.

Blowing Agents

Blowing agents are used in the production of polyurethane rigid foam where they contribute substantially to the insulation performance. As such, they play a major role in improving the energy efficiency of buildings and also reduce CO_2 emissions.

The key features and benefits of blowing agents can be summarised as follows:

- Improve insulating properties of foams
- Insulating properties last for 50 years or more because the closed-cell structure retains the blowing agent
- Low emissions of blowing agent from the foam during production and use

In line with European Regulations, Chlorofluorocarbons (CFCs) were phased out by European industry at the end of 1994 following concerns about their ozone depletion potential (ODP). CFCs were partly replaced by HCFCs as blowing agents in polyurethane. Despite their improved environmental performance, tighter restrictions were imposed on HCFCs due to concern over global warming (GWP), leading to a phase-out schedule.

The new Regulation EC 2037/2000, which entered into force on 1st October 2000, introduces tighter restrictions on ozone depleting substances. More specifically, it places further controls on HCFCs in view of the availability of alternative and substitute technologies, and introduces a series of product related bans that will completely phase out the use of HCFCs in foam blowing by 1st January 2004. The new Regulation also calls for the recovery of ozone depleting substances from foams "if practicable", and for the destruction or re-use of the recovered fluid. In addition to these issues, there is also the problem of volatile organic compounds (VOCs). A VOC is any compound of carbon excluding CO, CO_2, carbonic acid, metallic carbides or carbonates and ammonium carbonate, which participates in atmospheric photochemical reactions. In the European Union, this includes CFC, HCFC, HFC, CH_2C_{l2}, CH_4 and hydrocarbons in general. The pressure to curb VOCs is increasing and a number of directives have been introduced in order to limit the emission of VOCs into the environment.

*6th Session of the UNFCC Conference of the Parties tot the 1992 UN climate converison

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Key steps in the phase out schedule

Use Controls - HCFCs

- from 1st October 2000 a ban on HCFCs for the production of polyethylene rigid insulating foams and all integral skin foams for use in safety applications;
- **The overall availability of HCFCs in the market has been reduced by 23% on 1st January 2001 as the CAP is reduced from the previous 2.6% to 2.0%;**
- from 1st January 2002 a ban on HCFCs for the production of extruded polystyrene rigid insulating foams, except where used for insulated transport;
- from 1st January 2003 a ban on HCFCs for the production of polyurethane foams for appliances, polyurethane flexible faced laminate foams and polyurethane sandwich panels, except where these last two are used for insulated transport;
- from 1st January 2004 a ban on the production of all foams using HCFCs, including all polyisocyanurate (PIR), polyurethane spray foams and block foams plus foams used for insulated transport.

Alternative Substances

Over recent years, a range of technologies has been developed to replace HCFCs. There are three main types of alternative blowing agents:

- hydrocarbons (HCs)
- HFCs
- Water (CO_2)

Ideally, these should possess the following environmental characteristics:

- Zero ozone depletion potential (ODP)
- Low global warming potential (GWP)
- Non volatile organic compound status (VOC)

As with all substances, however, each alternative has its advantages and disadvantages. HCs, for example, have low GWP, but they are VOCs, their flammability is an issue in some applications and considerable investment costs have to be made. Liquid HFCs are expected to be very important in the future, but they will not be readily available before (until at least) 2002, due to the extensive testing and certification process for alternative substances, and their cost will limit their use. Additionally, whilst they do have good insulation value, they are powerful greenhouse gases and will be far more expensive than HCs. CO_2 as alternative has low GWP, but poorer insulation value and higher density (thus high material usage) give it an economic disadvantage.

ZERO ODP BLOWING AGENT OPTIONS

	B Pt (°C)	Thermal Conductivity (mW/mK, 10°C)	GWP (100 year ITH)
CO_2	-78	14,5	1
HC	28-50	11-14	11
HFC 134a	-27	12.4	1300
HFC 245fa	15.3	14*	820
HFC 365mfc	40.2	9**	810

* Measured at 40°C
** Measured at 24°C

Conclusion

There is no single solution to the replacement of HCFCs as blowing agents in the production of rigid insulating foam. Polyurethane remains the material of choice in this application due to its versatility, durability and high performance as an insulant. For the long term, we must remember that, whilst insulating foams significantly reduce CO_2 emissions, a switch to less efficient insulation materials would increase the burning of fossil fuels and generate increased CO_2 emissions. This could result in a whole new set of problems, and customers must decide for themselves which blowing agent best meets their requirements. Some sectors will need to use HFCs for reasons of insulating efficiency and flammability in production and use, but they must be used responsibly and this includes the eventual recovery of HFCs at end of life. The foam industry is taking pro-active measures to influence regulatory developments on alternative blowing agents and is currently engaged in consultation with other stakeholders as part of the ECCP.

Recommendations will be made on appropriate policies and measures, which will include proposals to allow the use of HFCs in insulation foams until 2020. Negotiated or voluntary agreements between government and industry will also be proposed.

Ozone Depletion Potential (ODP)	Global Warming Potential (GWP)	Volatile Organic Compound (VOC)
1987 The Montreal Protocol Measures undertaken to protect the ozone layer **1994** EC Regulation 3093/94 The European Union's legislative instrument to phase-out ODP, includes the total phase-out of CFCs **9/2000** EC Regulation 2037/2000 Introduction of reductions in the overall amounts of HCFCs available (the CAP) and significantly earlier phase-out dates for HCFCs in all use sectors **CAP Reduction** The overall availability of HCFCs in the market will be reduced by 23% on 1st January 2001 as the CAP is reduced from the previous 2.6% to 2.0% (compared to 1989 calculated levels) ⬇ Phase-out of HCFCs: • 141b, 22, 142b (Phase-out of CFCs: since 01/01/1995)	**1992** The United Nations Climate Change Convention Agreement of global strategy on climate change **1997** The Kyoto Protocol Agreement of global strategy on climate change **6/2000 - 6/2001** European Climate Change Programme (ECCP) Development of policies and measures to meet the Kyoto target of reducing greenhouse gas emissions to 8% below the 1990 level by 2008-2012 **11/2000** Sixth Session of the Conference of the Parties to the Convention (COP6) Acceleration of international action agreed under the 1997 Kyoto Protocol ⬇ Reduction of greenhouse gas emissions, including: • HFCs: 134a, 245fa, 365mfc	**1996** VOC Legislation - Directive 96/61/EC on Integrated Pollution Prevention & Control Integrated approach to ensure pollution to all media is considered (includes chemical elements & their compounds) **1998** Directive 1999/13/EC on Limitation of Emissions of VOCs To prevent or reduce the direct and indirect effects of emissions of VOCs into the environment & the potential risks to human health by providing measures & procedures **7/2000** European Pollutant Emission Register (EPER) Introduction of measures to reduce pollution; emission data to be reported and made publicly available ⬇ Prevention & reduction of VOC emissions into the environment, including: • HFCs: 134a, 245fa, 365mfc • HCs: pentanes, butanes

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