Fachverlag für die Polymerindustrie

FreeFoam – a novel PU foam manufacturing process with reduced toxic isocyanate content

Polyurethane is one of the most versatile materials ever created. It is used in cars, under carpets, as packaging material, and as cushioning material in almost all furniture and bedding. The European PU foam sector comprises of 50 000 companies that employ over 1.6 million people.

Polyurethane foam technology consists on foam building by reacting two chemicals, isocyanate and polyol, in the presence of other additives such as blowing agents, catalysts, and fire retardants. The manufacture of polyurethane foam requires a certain amount of free isocyanate in order to fully react the polyurethane mixture. Isocyanate component represents a potential risk to workers during manufacture of the PU foams. Isocyanate is included in the 2003 European schedule of occupational diseases, and it has been established that 10 – 20 % of asthma cases recorded in EU are due to isocyanates.

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The aim of the research project **FreeFoam** is to evaluate a new technique that could reduce the exposure of workers to isocyanates during foam manufacturing through lowering the concentration of free isocyanate and reducing their emission to the atmosphere. This EU-funded project is proposing to develop and evaluate a unique, homogeneous reactive mixture for polyurethane foaming purposes where reactants are physically separated using functionalised microcapsules of isocyanate conveniently dispersed in the polyol component.

The reactive system will allow an increase in the mixture reactivity due to the increased compatibility and homogeneity between isocyanate and polyol components, while decreasing the exposure of workers to harmful emissions by lowering the residual monomer content in the foam, thus avoiding the emissions and migration of such components from the foams.

In addition, this technique will create a decrease in the volume of waste generated due to bad cell homogeneity and low product density as consequence of bad mixing process. The expected results include:

- New method for isocyanate encapsulation
- New PU foam formulation based on polyols and microencapsulated isocyanate
- New foaming method for PU foam manufacture

FreeFoam brings together a consortium of nine organisations to deliver the project led by **CETEM** (Science & Technology – Spain) and includes **Inspiralia** (Research – Spain), **PolymerExpert** (Research & Development – France), **Tagra** (Research & Development – Israel), **Plama-pur** (Flexible PU producer – Slovenia), **Cosmetic Valley** (Research & Development – France), **Lesarki grozd** (Wood Industry Cluster – Slovenia), **ZCHFP** (Chemical & Pharmaceutical Association – Slovakia), and the **British Furniture Manufacturers' Association (BFM),** United Kingdom.

Having commenced in May 2013 the project has a planned duration of three years. Further information can be found at **www.freefoam-project.eu**