

Performance additives as a response to the growing concern on volatile emissions in polyurethane applications

Over the past few years, the industry of polyurethanes, and especially the car manufacturing sector has seen growing concern and apprehension around highly volatile hydrocarbons (VOC) and semi-volatile and heavy organic compounds (SVOC/FOG) considered elements of risk for human health. This article introduces a new additive range developed by Repi which is able to minimize these emissions in polyurethane components for car interior trim and furniture applications.

Introduction

During the synthesis of polyurethane, in fact, side reactions take place which can lead to the formation and release of aldehydes, especially acetaldehyde, formaldehyde and propionaldehyde. Such organic compounds are formed in sufficient quantities to be detectable due to their smell. This is the case, for instance with interiors of cars, such as rigid and semi-rigid polyurethane parts, flexible foam seats, steering wheels, and other components. The presence of volatile aldehydes can be moreover correlated with phenomena of toxicity and the International Agency for Research on Cancer (IARC) has reported carcinogenic effects of formaldehyde in experimental studies that show a possible dose/response relationship. As a result, emission limits are becoming stricter and are pushing the polyurethane industry to look for solutions.

Currently, no real solutions exist for limiting the amount of free aldehydes in common polyurethane foams. Not only, in fact, both polyols and isocyanates, used in the production of polyurethane foams, can contain free

SenzAA Repitan additives help minimizing emissions in PU components for automotive interior trim



Source: Arteam.ro on Unsplash

aldehydes, but these can be further generated by secondary reactions in their synthesis. In this context, the selection of raw materials is crucial, tending toward components with a low content of free aldehydes as well as raw materials that empirically generate smaller quantities of free formaldehyde and free acetaldehyde during the production of polyurethane.

A new chemistry

There are as well performance additives that come in handy: aldehyde scavengers able to reduce those volatiles in polyurethanes. This

is the case of the newly developed **SenzAA Repitan** additives range by **Repi**, a series of formulations able to minimize formaldehyde, acetaldehyde and propionaldehyde, smell and VOC/FOG emissions in PU components for automotive interior trim as well as for furniture applications, where PU ether and ester foams need to meet the strict limits required by the most important players in this market.

The new chemistry of SenzAA has proven to be extremely effective in aldehydes reduction, while showing optimal antioxidant activity, without affecting the physical properties of ester and ether polyurethanes. SenzAA additives can be used as a component in the

Lucia Buffoni
l.buffoni@repi.com
Marketing Manager
Repi
www.repi.com

polyol formulation or can be fed in a separate stream directly into the mixing head.

An internal test method based on micro chamber has been set up by Repi's R&D enabling to verify effectiveness of technical solution with different polyurethane foams. The leak-proof stainless-steel chamber with PU foam is heated in an oven, at certain time and temperature condition. The air flowing through the chamber into a cartridge collects volatile aldehydes. The principle of the method is based on the specific reaction through a cartridge containing the derivatizing reagent to form stable products that are analysed for the parent aldehydes and ketones utilizing high performance liquid chromatography (HPLC) with UV detection (according to ISO 16000:2011(E)).

Figures 1-3 show the reduction performance in high resiliency molded polyurethane foam applications. Three formulations are available to offer best compatibility with customers' polyurethane systems. All versions have shown a reduction of formaldehyde above 80 % with an average dosage between 1 and 2 % on polyol (**fig. 1**). Best acetaldehyde reduction is achieved with a dosage between 2 % and 3 % on polyol, reaching a reduction above 70 % (**fig. 2**). SenzAA formulations work as well in slabstock applications, confirming the dual reducing performance of both formaldehyde and acetaldehyde (**fig. 3**).

The newly developed SenzAA technology represents Repi's first step in aldehyde scavengers and opens paths for next generations of additives that will be able to further reduce volatile emissions.

Fig. 1: ▶
Formaldehyde reduction

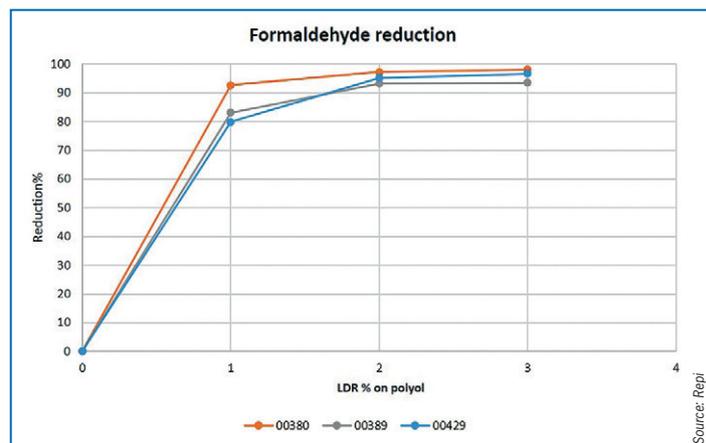


Fig. 2: ▶
Acetaldehyde reduction

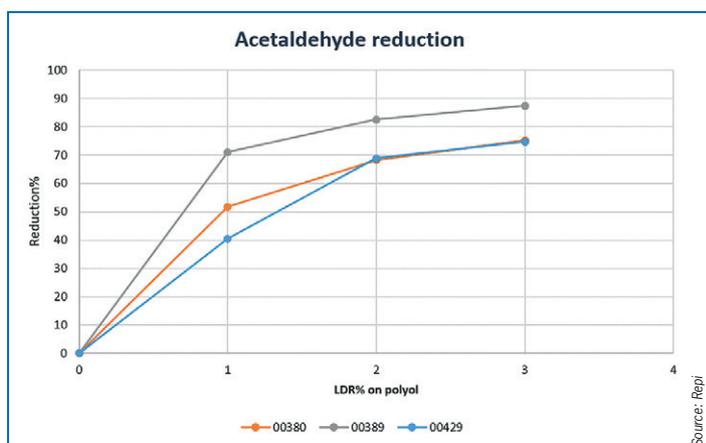


Fig. 3: ▶
Aldehydes reduction

