



Getting Low Free Polyurethane - Prepolymers by Vacuum Distillation

Case Study

KEY FACTS

- Best practice method for achieving low free polyurethane-prepolymers
- TDI and MDI levels < 0.1 % can be achieved
- Reducing regulatory restrictions and meeting standards like:
 - GHS
 - California Proposition 65
 - EU Directive 2004/42/EC
 - OSHA
 - MAK



Application

Polyurethane-prepolymers are used to make a variety of materials and products, including foams, glues and hot melts, gaskets, coatings and solid rubber.

Prepolymers are made by reacting polyols with isocyanates. Isocyanates are a group of highly reactive chemicals characterised by the presence of an isocyanate group ($-N=C=O$). Some isocyanates such as toluene diisocyanate (TDI), are considered highly hazardous and toxic. After reaction, the isocyanate levels in the product are excessive. To achieve a safe and competitive product that meets international regulations, this excess must be removed.



Challenges

Meeting the stringent limits for some types of isocyanates is challenging. Distillation processes implemented to meet these stringent regulations must be designed to handle product characteristics such as high reactivity, temperature sensitivity and possible high viscosity.





Solution

Vacuum distillation is proven technology for managing the thermal sensitivity of polyurethane-prepolymers by lowering boiling points and shortening residence times.

Sophisticated thin film and short path distillation equipment can reduce TDI/HDI, MDI and other free isocyanates to less than 0.1 %. Depending on the exact product, application, and requirements, multi-stage distillation processes may be required.

Overcoming the challenge of the high viscosity of some polyurethane-prepolymers combined with their temperature sensitivity require sophisticated temperature management throughout the distillation process from feed to discharge.

For more than 25 years UIC and VTA have been designing and supplying industrial scale plants for the distillation of free isocyanates for the world's major manufacturers. Plants with a thermal surface area up to 25 m², commissioned more than 20 years ago, are still in operation. Since then, UIC and VTA have served various customer requests for the removal of free isocyanates. With our in-depth knowledge of all modern applications, latest standards, new challenges and latest customer preferences we are happy to serve as an experienced partner in developing process solutions for free isocyanate removal needs.

UIC and VTA experts draw on more than 70 years of experience to provide customised plants of all sizes for any distillation need. We work with our customers throughout the entire process, supported by two state-of-the-art technology centers. This includes determining the perfect distillation technology and parameters for each individual request, conducting laboratory and pilot plant testing, designing, constructing, and commissioning industrial-scale distillation plants, as well as providing after-sales support.

We can also provide contract distillation for a wide range of polyurethane-prepolymer batch sizes.

Let us face your next distillation challenge together!



VTA and UIC are the partners for demanding process solutions of high-end thermal separation tasks. The distillation specialists offer small, standardized laboratory units up to tailor-made, skid-mounted industrial size facilities. Testing, engineering and manufacturing is performed in-house at the headquarters in Germany. VTA and UIC offer contract distillation on different toll processing plants. VTA and UIC are offering wiped and short path distillation equipment and process development for various industrial sectors with high boiling and thermal sensitive products.

Technologies

- Thin Film / Wiped Film Distillation
- Short Path Distillation
- Horizontal Thin Film Distillation
- Thin Film Drying
- Fractionation



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