

Information Sheet

Cardura™ E10P Glycidyl Ester

Acid Scavenger For Ester Base Stocks – Process



High Performance Lubricants

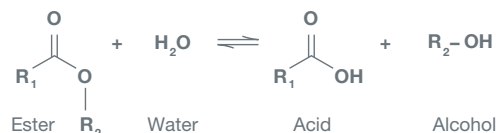
Synthetic ester base stocks

Synthetic ester base stocks are highly versatile base oils from Group V used for a wide range of high performance lubricant applications, such as refrigeration, air-conditioning, aviation turbines, automotive production and gear oils. They are predominantly made by esterification; the reaction of mono or poly alcohols with carboxylic acids.

Hydrolysis

The issue with hydrolysis

The reverse of the esterification reaction called hydrolysis is the degradation of the ester in presence of water to generate acids and alcohols. It results in a loss of the lubricating properties.



For high quality, ester based, lubricants this degradation is extremely slow. However, lower quality esters, with a high acid number, tend to hydrolyze fast. Traces of unconverted acids in the product catalyze the hydrolysis leading to the formation of more acids which, further stimulates an auto-accelerating reaction. The degradation of the oil then accelerates in a snowball-like effect. In addition to the acid value the rate of hydrolysis may be further accelerated by several factors such as:

- Water concentration in the oil
- Oil temperature (higher temperatures speed up the hydrolysis reaction)
- Presence of catalyst remaining from the synthesis of the oil
- Nature of additives, some of which support hydrolysis
- Presence of impurities such as copper

Effective Hydrolysis Reduction

Reduced acid number

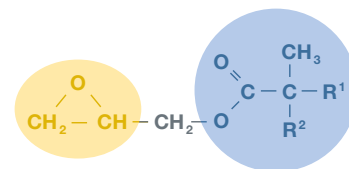
In practice, it is impossible to achieve 100% conversion of the acids during the manufacturing of ester base oil. A common method to hide the acid value of base stocks is the neutralization of the acid by the addition of a base to form a salt. This reduces the measured acid number, yet is not an effective way to prevent hydrolysis because the formed salt also catalyzes hydrolysis.

Cardura™ E10P glycidyl ester acts as an acid scavenger and enables base stock producers to truly reduce the initial acid concentration by a chemical reaction. Cardura™ E10P acid scavenger effectively reduces the hydrolysis rate and the snowball effect.

Cardura™ E10P Glycidyl Ester

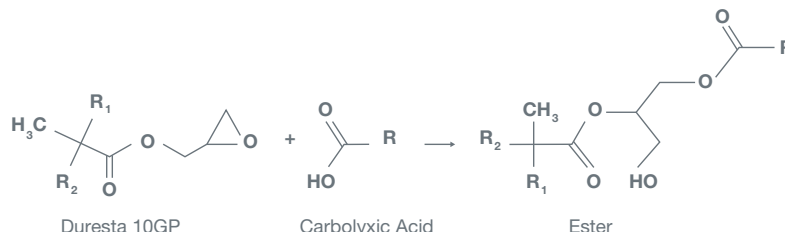
Cardura™ E10P glycidyl ester quick facts

- Epoxy equivalent weight: approx. 241 g/Eq-g
- Boiling range: 251 – 278 °C (5 – 95%)
- Viscosity (23 °C): 7.1 mPas
- High flame/flash point



Control of the Acid Number With Cardura™ E10P

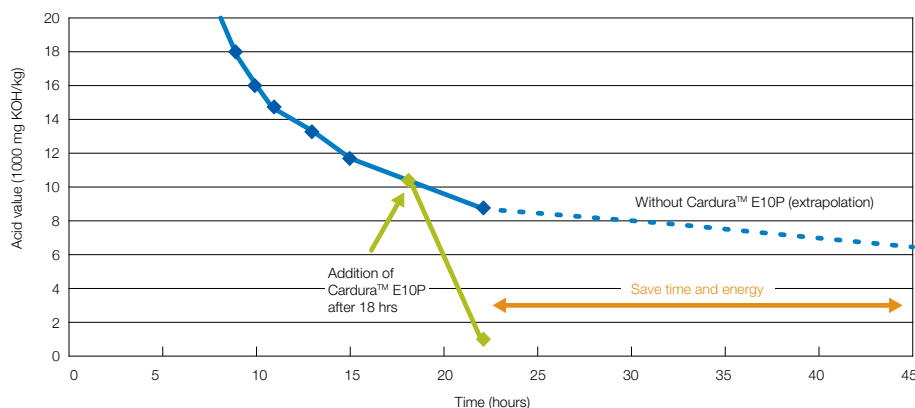
Cardura™ E10P glycidyl ester has a very high reactivity towards carboxylic acids which are therefore quickly and permanently converted into stable esters. Cardura™ E10P glycidyl ester is therefore preferably used at the end of the esterification reaction to reduce the acid number to a very low value, typically below 1000 mgKOH/kg. It is effective from 150 °C, with an optimum reaction temperature between 170 °C and 220 °C depending on the desired reaction time and the possible presence of catalyst.



Reduction of Ester Cooking Time With Cardura™ E10P Acid Scavenger

Ester based stocks are usually cooked under vacuum at elevated temperatures, 200 to 240 °C for 8 to 48 hours. The lengthiest processes are required to achieve the lowest acid values. Cardura™ E10P acid scavenger is also reducing these cooking times. This improves significantly the reactors throughput and reduces energy consumption.

Example of reduction of the cooking time with Cardura™ E10P acid scavenger.
(Synthesis of a TMP tri oleate in an atmospheric reactor at 220 °C without catalyst)



Summary

Cardura™ E10P glycidyl ester enables efficient synthetic ester base stock production

- Reach very low acid values
- Reduce base stock processing time and energy consumption

Enabling high performance lubricants

- Reduce additives
- Provide high performance and high stability
- Minimize corrosion
- Increase lubricant life and enhance protection of lubricated parts

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E-mail: service@hexion.com or enter a request on our website www.hexion.com under “contact us”



World Headquarters

180 East Broad Street
Columbus, OH 43215-3799

U.S., Canada and Latin America

+1 888 443 9466 / +1 614 986 2497

Europe, Middle East, Africa and India

+31 10 3136 500

China and Other Asia Pacific Countries

+86 21 3161 6680

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