

## Information Sheet

Cardura™ E10P Glycidyl Ester

# Acid Scavenger For Ester Base Stocks – Process



### High Performance Lubricants

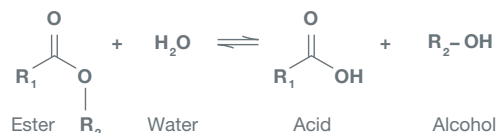
#### Synthetic ester base stocks

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

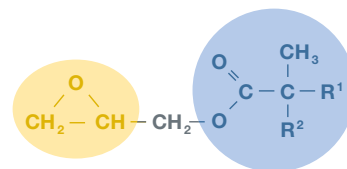
In practice, it is impossible to achieve 100% conversion of the acids during the manufacturing of ester base oil. A common method to hide the acid value of base stocks is the neutralization of the acid by the addition of a base to form a salt. This reduces the measured acid number, yet is not an effective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

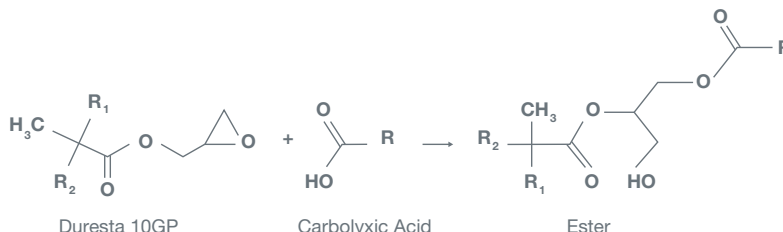
### Cardura™ E10P glycidyl ester quick facts

- 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

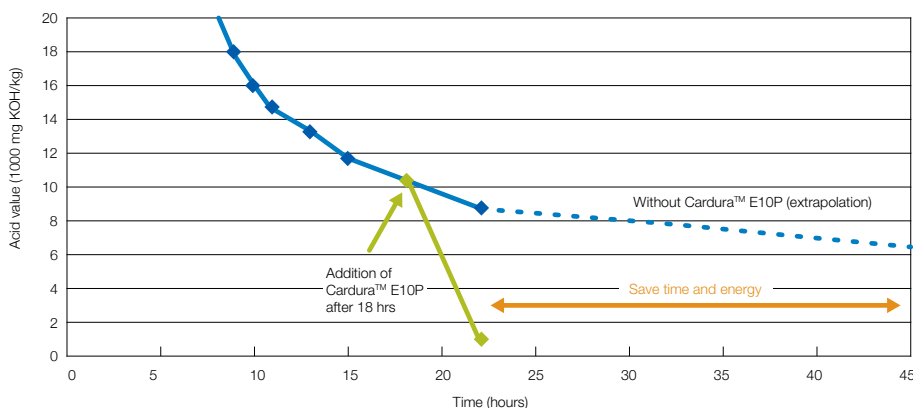
Cardura™ E10P glycidyl ester has a very high reactivity towards carboxylic acids which are therefore quickly and permanently converted into stable esters. Cardura™ E10P glycidyl ester is therefore preferably used at the end of the esterification reaction to reduce the acid number to a very low value, 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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#### 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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