

The DOW logo is a red diamond shape with the word "DOW" in white, bold, sans-serif capital letters. A registered trademark symbol (®) is located to the right of the diamond.

**DOW**®

# **NORKOOL DESITHERM™**

## **Specialty Dehydration Fluid**

### **Designed to fight corrosion**



NORKOOL DESITHERM Specialty Dehydration Fluid from Dow is an innovative, inhibited TEG-based desiccant that reduces corrosion rates, counteracts scaling effects and improves water-hydrocarbon separation, making it better equipped to handle the unique challenges in natural gas dehydration systems.

TEG — with no additives — is often used to remove the water from natural gas. However, the extreme temperatures this process requires result in the formation of organic acids, such as glycolic, formic and acetic acids, in a process known as glycol degradation. This process forces the system's pH down to an unstable level, causing the pure TEG to become corrosive and leaving the system unprotected.

Fortunately, Dow now offers a solution to help solve this common problem. NORKOOL DESITHERM features a complete inhibitor package that buffers the system's pH and reduces glycol degradation, protecting the entire gas dehydration system against rapid corrosion. The inhibitors contained in NORKOOL DESITHERM are heat-stable at normal dehydration operating temperatures, which not only reduces corrosion in the system, but also extends the life of the TEG overall. Stabilizing the system's pH minimizes the formation and build-up of degradation acids, extending the life of the desiccating fluid and protecting the metal components of the system against corrosion. Additionally, adding these beneficial inhibitors does not affect the removal of water from natural gas.

## **NORKOOL DESITHERM™ Specialty Dehydration Fluid *reduces corrosion and enhances separation performance.***

Today's economic environment demands products and services that will increase the longevity of equipment. NORKOOL DESITHERM has been shown to extend the life of TEG, reduce corrosion and extend the service life of gas dehydration systems.

### **Drawbacks of pure TEG gas dehydration systems**

Inherently, glycols have a low corrosive nature with most metals. However, during the dehydration process, the glycol dehydration fluid becomes dramatically more corrosive.

#### **Absorption of water**

Water is inherently more corrosive than glycol, and, therefore, aqueous glycol solutions must be inhibited against corrosion. Without inhibition, the water component will corrode ferrous metal surfaces in the dehydration unit.

#### **Salt contaminants**

The intrusion of produced water into a natural gas stream will inevitably bring with it soluble mineral salts, including calcium, magnesium and sodium cations as well as chloride, sulfate and carbonate anions. The calcium and magnesium cations cause scaling, which can be exacerbated by the use of some inorganic corrosion inhibitors in the glycol. The chloride, sulfate and carbonate anions that intrude are inherently corrosive. Non-scaling inhibitors must be utilized to counteract the effects of these corrosive anions.

#### **Acid gas absorption**

Acid gas contains carbon dioxide and hydrogen sulfide. In the presence of water, the carbon dioxide will react to form carbonic acid. Under acidic conditions hydrogen sulfide and carbonic acid are both very corrosive to ferrous metals since the corrosion products are soluble in the glycol dehydration fluid. Without proper pH control, the acid gas components will not only attack the metals in the dehydration system, but also accelerate glycol degradation into lower glycol components. The dehydration inhibitor package must work to buffer the glycol and inhibit corrosion by the acid gas components.

#### **Thermal degradation**

Glycol degradation occurs when the glycol is exposed to high temperatures, particularly in the presence of oxygen or oxidizing agents. During the dehydration process, repeated regeneration of the glycol will result in gradual degradation of the fluid. This degradation results in the formation of organic acids, specifically, glycolic, formic and acetic acids. As degradation progresses, the pH of the fluid decreases, eventually becoming acidic. Buffering of the glycol is required to counteract degradation, thus preventing the fluid from becoming acidic and retarding the corrosion process<sup>1</sup>.

NORKOOL DESITHERM is designed to combat the corrosive environment typical in glycol-based dehydration systems.



<sup>1</sup>Information taken from "Buffering and Inhibition of Glycol in Gas Dehydration Applications: An Alternative to Amines," by Barbara A. Stefl and Sidney F. Bosen, presented to the NACE International conference, 1995.

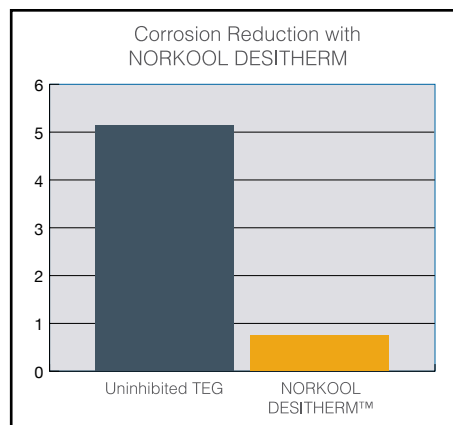
# Advantages of using NORKOOL DESITHERM™

NORKOOL DESITHERM offers excellent corrosion protection for dehydration applications, including:

- Gas pipeline heaters
- Gas processing
- Waste heat recovery systems
- Air dehydration
- Natural gas storage

NORKOOL DESITHERM contains a formulated inhibitor that is specifically designed to act as a buffer to help retain the alkalinity of the glycol, thus keeping corrosion rates low. The technology also counteracts the scaling effects of cations found in water like calcium and magnesium. Additionally, the inhibitor in Dow's product reduces the solubility of hydrocarbons in the fluid, which improves separation.

When added to existing TEG dehydration systems, NORKOOL DESITHERM decreases the corrosion rate by a factor of six or greater.



## Preparation

There are several things to consider before adding NORKOOL DESITHERM to a system: If the system already contains uninhibited TEG, it may be possible to add NORKOOL DESITHERM to help protect it against corrosion. A Dow representative can help evaluate a system's needs by conducting tests to determine the current condition of the fluid.

If the system is new, some preparation is recommended. Debris, grease and other particulates left in the system after construction can result in poor dehydration. First flush, then clean, the system, leaving the metal surface ready for the initial fill. Dow offers various levels of assistance in system preparation, from providing products like NORKOOL™ Cleaner and NORKOOL™ Degreaser, to providing complete turnkey cleaning services.

## Typical physical properties<sup>2</sup>

Triethylene Glycol, V%	> 96.7
Color	Water white to straw
Clarity	Clear
Odor	Mild
Additive package, V%	> 2.7
pH, 50:50 @ 77 °F	8.0 - 10.5
Reserve alkalinity, 0.1N HCl Titration	4.2 - 4.4
Freeze point, °F	15
Specific gravity @ 77 °F	1.1283 - 1.1295
Boiling pt @ 760 mmHg, °F	415
Vapor pressure, mmHg @ 77 °F	> 0.01
Vapor pressure, mmHg @ 380 – 400 °F	400 - 600
Vapor density (air = 1)	5.0 - 5.2
Flash pt, °F, CC, ASTM D-93	350 - 351
Auto-ignition, °F	650 - 660
Solubility in water, %	100
Flammable limit in air, V%	Lower 0.9
Flammable limit in air, V%	Upper 9.2

<sup>2</sup>Typical properties, not to be construed as sales specifications

NORKOOL Cleaner and NORKOOL Degreaser are specially formulated products developed specifically for use in natural gas equipment including dehydration units, engine-cooling systems and line heaters. A solution of 10% NORKOOL Cleaner and 2% NORKOOL Degreaser will remove scale, rust and contaminants from the system, leaving the metal surface clean. Unlike harsh acid cleanings, these products will not damage the metal or gasket components in the system.

A Dow representative can assist with determining the best preparation options for a system.



## Maintenance and testing

NORKOOL DESITHERM™ comes with a complimentary testing program to help maintain fluids at peak operating condition. Dow recognizes the high cost of downtime, so data and technical expertise are provided to help keep systems running smoothly.

Dow offers testing twice annually, though sample kits are always available upon request. Each sample goes directly to the lab, where Dow performs a series of tests to evaluate the fluid's current condition. A Dow specialist will review each report and make recommendations for maintaining the integrity of the fluid. The final report will be sent by e-mail, and a Dow representative will be available to review the results and answer any questions.

Dow also offers testing for customers interested in converting their current fluid to NORKOOL DESITHERM. Testing includes a detailed report of the fluid's current condition from a Dow specialist, who may also recommend adding a Dow inhibitor. Please note that inhibitors should be added only as specified by the report. Incorrectly adding inhibitors can result in precipitation, leaving the system unprotected from corrosion. Under-inhibiting can also result in inadequate inhibition. Please consult a Dow representative to request a test kit or information on sampling procedures, or to receive answers to any questions



### A note about product safety

Dow encourages its customers and potential users to review their applications from the standpoint of human health and environmental aspects. To help ensure that Dow products are not used in ways for which they are not intended or tested, Dow personnel will assist customers in dealing with environmental and product safety considerations. Dow literature, including Safety Data Sheets, should be consulted by customers and potential users prior to use..

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