



# NORKOOL DESITHERM™ Desiccant

## Introducing a New Premium Desiccant Designed to Fight Corrosion



Looking for a high-performance triethylene glycol (TEG) for a natural gas dehydration system? Search no further. NORKOOL DESITHERM™ TEG-based Desiccant from Dow has been specifically designed to improve the efficiency and extend the life of natural gas dehydration systems.

The newest member of our NORKOOL™ family, DESITHERM™ 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. DESITHERM™ Desiccant 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 DESITHERM™ Desiccant are heat-stable at normal dehydration operating temperatures, which not

### **NORKOOL™ Products**

NORKOOL™ Coolants

NORKOOL™ Degreaser

NORKOOL™ Cleaner

NORKOOL DESITHERM™ Desiccant

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™

### Desiccant Reduces

### Corrosion and Enhances

### Separation Performance

Today's economic environment demands products and services that will increase the longevity of equipment. DESITHERM™ Desiccant has been shown to extend the life of TEG, reduce corrosion, and extend the service life of the 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 water into a natural gas stream will inevitably bring with it soluble mineral salts, including calcium, magnesium and sodium cations; and 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. Hydrogen sulfide and carbonic acid are both very corrosive to metals. During hydration, the glycol will solubilize the components. Without inhibition, the acid gas components will attack not only the metals in the dehydration system, but also the glycol, as their low pH will accelerate glycol degradation. The dehydration inhibitor package must work to buffer the glycol and inhibit corrosion by the acid gas components.

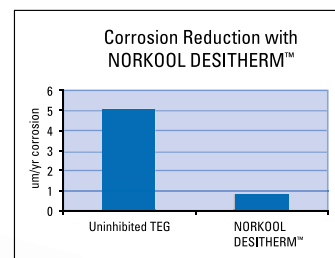
### Thermal degradation

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>

### Advantages of using DESITHERM™ Desiccant

DESITHERM™ Desiccant 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. DESITHERM™ also counteracts the scaling effects of cations found in water like calcium and magnesium. Additionally, the inhibitor in DESITHERM™ reduces the solubility of hydrocarbons in the fluid which improves separation.



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

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



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

## Using NORKOOL

### DESITHERM™ Desiccant

#### Preparation

There are several things to consider before adding DESITHERM™ Desiccant to a system:

**If the system already contains uninhibited TEG**, it may be possible to add 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 clean and 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.

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.

#### Applications for NORKOOL DESITHERM™ Desiccant

DESITHERM™ Desiccant offers excellent corrosion protection for dehydration applications, including:

- Gas Pipeline Heaters
- Gas Processing
- Waste Heat Recovery Systems
- Air Dehydration
- Natural Gas Storage
- Gas Field Gathering

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

#### Maintenance and Testing

DESITHERM™ Desiccant 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 DESITHERM™ Desiccant. Testing includes a detailed report of the fluids' current conditions from a Dow specialist, who may also recommend adding a Dow inhibitor. Please note that inhibitors should only be added 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 answer any questions.

*Dow is committed to maximizing investments. Our services and experience help maintain systems at optimum condition.*

## Typical Physical Properties<sup>2</sup> of

### NORKOOL DESITHERM™ Desiccant



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



To Learn More...

U.S., Canada, Mexico: Phone: 1-800-447-4369 Fax: 989-832-1465

Latin America: Phone: +55 11-5188-9222 Fax: +55-11-5188-9749

Europe: Phone Toll Free: +800-3-694-6367\* Phone: (+32) 3-450-2240 Fax: +32 3-450-2815

Asia-Pacific: Phone Toll Free: +800 7776-7776\* Phone: (+60) 3-7958-3392 Fax: +60 3 7958 5598

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