

# NORKOOL™ Cleaner, Degreaser, and Inhibitor 244

System maintenance solutions

**DOW**

®



# Maintaining your system, new or old

Chemical cleaning compounds play a vital role in keeping industrial heating and cooling equipment operating efficiently. Of particular importance is the removal of foulants such as corrosion scales, water-derived mineral deposits, grease and oil-based foulants. The presence of dirt and scales is also common. Cleaning new systems is just as important as cleaning old ones since new systems may be coated with oil or a protective film.

Whether new or old, heat transfer systems that utilize water or water-containing fluids as coolants are likely to accumulate rust, mineral scales and oily contaminants during construction and operation. These scales and contaminants can drastically reduce the heat transfer efficiency of the system because of the low thermal conductivities of the scales and oils compared to the high thermal conductivities of the bare metals.

Even the slightest buildup of rust or other scales can cause a dramatic reduction in heat transfer efficiency. For example, a one-inch-thick piece of steel coated with just 1/16-inch of rust has the same heat transfer characteristics as a four-inch-thick piece of steel. In fact, the thermal conductivity of the scale is in the same range as insulating materials such as firebrick. To make sure the performance of the system meets design specifications, these insulating contaminants must be removed prior to installation of an industrial heat transfer fluid.

However, to ensure optimal system performance, the cleaned metal surface should be immediately protected by a passivating agent to prevent corrosion from flash rusting prior to introducing the new heat transfer agent. Failure to do so will seriously compromise system performance even before it is put into service.

## Dow's three-part solution

Dow offers a three-part solution to remove foulants and help protect a newly cleaned system and coolant.

In combination, NORKOOL Cleaner and Degreaser enable descaling and degreasing in a single step. The two products offer a broad spectrum of foulant-removing capabilities, and the wetting characteristics of NORKOOL Degreaser can even significantly increase the scale-removal rate of NORKOOL Cleaner, helping lower overall application time. Using NORKOOL Inhibitor 244 in addition prevents premature depletion of the new coolant and provides an important buffering action in the clean system.

NORKOOL™ Cleaner, Degreaser and Inhibitor 244 offer a number of additional advantages:

**Easy to use** – There is no need for the neutralizing or exhaustive clean-water rinses associated with acid cleaners. In many instances, no auxiliary equipment is required to apply NORKOOL™ products. Ease of handling permits more jobs to be done on site.

**Save time, money and downtime** – On-site use by your personnel, or a qualified cleaning service, eliminates the cost of dismantling equipment, sending it off-site for cleaning services and reassembling. Users are able to realize substantial savings in maintenance time and money, as well as in equipment downtime.

**Cleaner system** – NORKOOL Cleaner can remove scales that conventional mineral and organic acids remove, plus more! Laboratory testing and customer use verify that our cleaner removes up to three times more rust and other corrosion and mineral scales than some available mineral-acid cleaners.

**Non-acidic, non-alkaline and non-corrosive** – NORKOOL Cleaner, NORKOOL Degreaser, and NORKOOL Inhibitor 244 have a negligible effect on gaskets, seals and other non-metallics. While they are generally non-corrosive to metallics, they are an excellent choice in applications where it is critical to minimize changes in dimensions or tolerances of system components.

**Improved safety** – The near-neutral pH of NORKOOL Cleaner and NORKOOL Degreaser means that they are much safer to handle than conventional cleaners.

**Biodegradable** – NORKOOL Cleaner, NORKOOL Degreaser, and NORKOOL Inhibitor 244 contain no heavy metals. They are biodegradable and exhibit little impact on the environment when disposed of properly.

# Applications

## Natural gas processing equipment

NORKOOL™ Cleaner and NORKOOL™ Degreaser are ideal products in a wide variety of natural gas applications. For example, natural gas processing equipment, such as triethylene glycol dehydrators, are susceptible to corrosion from gas contaminants and improper fluid maintenance, as well as to scale formation resulting from brackish water intrusions. NORKOOL Cleaner offers an easy-to-use and effective alternative to equipment disassembly and mechanical cleaning to remove these deposits. In addition, sludge can be removed with a water solution of NORKOOL Cleaner instead of highly flammable or caustic materials.

## Gas compressor engines

NORKOOL Cleaner and NORKOOL Degreaser are used extensively by operators of gas compressor engines to remove scale, sludge and oil from cooling systems. Cooling systems can be simultaneously descaled and degreased. When used properly, these products will not harm gaskets and O-rings and will not attack mineral-filled water pump shaft seeds. NORKOOL Cleaner helps prevent cooling system overheating, power cylinder head cracking due to water passage scaling and partially clogged coolant flow passages in ignition cells.

# Product descriptions

## NORKOOL Cleaner

NORKOOL Cleaner, which for optimal results should be used in conjunction with NORKOOL Degreaser, effectively removes such foulants as corrosion scales and water-derived mineral deposits. While it does not contain mineral acid, it is as effective as mineral acids and removes some scales unaffected by acids. The cleaner has also proved to be highly effective in removing scales resulting from atmospheric and non-aqueous corrosion.

NORKOOL Cleaner is a water-based product in which the principal active ingredients are ammonia-neutralized chelating and sequestering agents. These convert water-insoluble chemical compounds — containing such elements as calcium, magnesium, iron, aluminum, zinc, lead and copper — into water-soluble compounds at neutral or near-neutral pH. Therefore, the product is highly effective in removing corrosion such as rust, as well as lime and other mineral scales. Other important cleaner ingredients include a green dye to help make the cleaner readily distinguishable and corrosion inhibitors to protect the bare metal once the corrosion products or mineral scale have been removed.

## Indirect heaters/line heaters

Maintenance of gas transmission pipeline heaters should not be neglected. Due to evaporation of water, the heater becomes underfilled, and the glycol portion of the heat transfer fluid becomes over-concentrated. As a result, to maintain gas temperatures, the heater is frequently over-fired, resulting in both oxidation and coking of the glycol. The heat transfer fluid can become corrosive and the tubes and shell fouled with coke and corrosion scale. Ultimately, the heater fails to heat sufficiently and requires extensive maintenance. Cleaning with NORKOOL Cleaner is an excellent alternative to labor-intensive equipment disassembly and mechanical cleaning. The cleaner also helps to eliminate similar problems in other types of indirect heaters, such as vaporizers, wellhead heaters or oil pipeline heaters.

## Cogeneration engines

NORKOOL Cleaner effectively removes scale, sludge and oil from reciprocating engine cogeneration cooling and heat recovery systems. Proper use of NORKOOL Cleaner has helped to prevent such problems as power cylinder head cracking and loss of heat transfer efficiency.

## NORKOOL Degreaser

NORKOOL Degreaser, a companion product used with NORKOOL Cleaner, is the ideal choice for chemical cleaning of hydrocarbon foulants such as oils, greases, waxes, gums, tars and coke. NORKOOL Degreaser contains a complex mixture of nonionic and anionic surface-active compounds dispersed in water. It is effective and easy to use. And, unlike other degreasers, it is not formulated with volatile organic solvents, halogenated solvents, or inorganic phosphates that may necessitate workplace exposure monitoring and controls, as well as additional disposal requirements.

## NORKOOL™ Inhibitor 244

NORKOOL Inhibitor 244 protects against flash rusting. In a freshly cleaned system that is not protected, there is a tendency for the bare metal surface to flash rust on exposure to oxygen. The new coolant will act as a solvent, pulling the rust off into the liquid coolant. This results in several undesirable effects:

- Initiation of scale build-up that may lead to cracked heads and loss of heat transfer.
- Precipitation of inhibitors that can lead to severe corrosion.
- Erosion corrosion resulting in excessive metal wear.

By passivating the metal surface, NORKOOL Inhibitor 244 prevents flash rusting and prepares the surface for the new inhibitor package. It also buffers the system for the new coolant.

# Performance of NORKOOL™ Cleaner

Field experience and laboratory evaluations show that NORKOOL™ Cleaner can dissolve a wide range of mineral and corrosion scales, as listed in Table 1. This list includes most scales from typical cooling systems. In scales containing two or more of the minerals, NORKOOL Cleaner will tend to preferentially dissolve the minerals listed highest in the table. Repeated cleaner applications will aid in the removal of the secondary scales.

**Table 1:** Scales removed by NORKOOL Cleaner

| Scale  | Scale classification | Relative descaling effectiveness of NORKOOL Cleaner |
|--|----------------------|---|
| Rust (Fe <sub>2</sub> O <sub>3</sub> )       | Corrosion            | Excellent   |
| Lime (CaCO <sub>3</sub> )                    | Mineral              | Excellent   |
| Magnesium Hydroxide                          | Mineral              | Excellent   |
| Cupric Oxide                                 | Corrosion            | Excellent   |
| Solder Bloom (lead corrosion)                | Corrosion            | Excellent   |
| Black Rust (Fe <sub>3</sub> O <sub>4</sub> ) | Corrosion            | Very good   |
| Cuprous Oxide                                | Corrosion            | Very good   |
| Aluminum Oxide                               | Corrosion            | Good  |
| Ferric Hydroxide                             | Corrosion/mineral    | Fair  |
| Ferrous Hydroxide                            | Corrosion/mineral    | Fair  |
| Zinc Phosphate                               | Corrosion            | Fair  |
| Aluminum Phosphate                           | Corrosion            | Fair  |
| Calcium Phosphates                           | Mineral              | Slight to fair                                      |
| Calcium Sulfates                             | Mineral              | Slight  |
| Magnesium Silicate                           | Mineral              | <sup>(1)</sup>                                      |

<sup>(1)</sup>Relative position in table unknown; however, it has been shown to be dissolved by NORKOOL Cleaner.

# A note about product safety

When considering the use of any Dow products in a particular application, you should review the latest Safety Data Sheets from Dow and ensure that they are intended for safe use. For other products mentioned in the text, you should obtain the current Material Safety Data Sheet and other available product safety information when reviewing and take necessary steps to ensure safety of use before handling.

No chemical should be used as or in a food, drug, medical device or cosmetic, or in a product or process in which it may contact a food, drug, medical device or cosmetic until the user has determined the suitability and legality of the use. Since government regulations and use conditions are subject to change, it is the user's responsibility to determine that this information is appropriate and suitable under current, applicable laws and regulations.

Dow requests that the customer read, understand and comply with the information contained in this publication and the current Safety Data Sheet(s). The customer should furnish the information in this publication to its employees, contractors and customers, or any other users of the product(s), and request that they do the same.

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