**AQUCAR™ TN 50 Water Treatment Microbiocide**
Brand of TRIS(HYDROXYMETHYL)NITROMETHANE

**General**

AQUCAR™ TN 50 Water Treatment Microbiocide is an antimicrobial agent particularly suited for the control of bacteria and slimes in industrial applications.

As a biocide, it can offer the following advantages:

- Quick Kill
- Nonionic
- Low Toxicity
- No Odor

**Structure**

\[
\begin{align*}
\text{CH}_2\text{OH} & \quad \text{HOCH}_2 \quad \text{CH}_2\text{OH} \\
& \quad \text{NO}_2
\end{align*}
\]

**Physical Properties**
The following are typical properties of AQUCAR TN 50 Water Treatment Microbiocide; they are not to be considered product specifications.

- Physical state: colorless to yellow liquid
- Molecular weight of the active (calculated): 151.12
- Specific gravity: 1.22
- Bulk density: 10.15 lb/gal @ 25°C (77°F)
- pH: 2.0-4.5
- Solubility in water: 100%
- Crystallization point: 13°C (55°F)
- Flash point (closed cup): ≥200°C (392°F) – ASTM D56

Very soluble in alcohols; insoluble in hydrocarbons such as heptane, diisobutylene, kerosene, styrene, mineral oil, benzene and toluene.

**Antimicrobial Activity**

Although some antimicrobial activity is provided by AQUCAR TN 50 Water Treatment Microbiocide at a pH as low as 6, it is most effective at pH 7.5 or higher to provide continuous activity for a prolonged period.

The antimicrobial effectiveness of AQUCAR TN 50 Water Treatment Microbiocide against many organisms is indicated by the following spectrum. Repeated transfers have been made with many of these organisms without any indications of a tendency to develop resistance.

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1 Indexed by Chemical Abstracts as 2-hydroxymethyl-2-nitro-1,3-propanediol, CAS Registry No. 126-11-4.
The following information is intended only to indicate the broad-spectrum activity of the product. This information must not be interpreted as having relevance to the use pattern recommended, effective dosages, activity against specific microorganisms, or any other implications of effectiveness of formulated products.

### Antimicrobial Spectrum of AQUCAR TN 50 Water Treatment Microbiocide (as supplied)

<table>
<thead>
<tr>
<th>Organism</th>
<th>Minimum Inhibitory Concentration (MIC) at pH 7.4 (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacillus subtilis</td>
<td>250-500</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>65-125</td>
</tr>
<tr>
<td>Streptococcus faecalis</td>
<td>250-500</td>
</tr>
<tr>
<td>Micrococcus luteus</td>
<td>125-250</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>500-1000</td>
</tr>
<tr>
<td>Enterobacter aerogenes</td>
<td>65-125</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>500-1000</td>
</tr>
<tr>
<td>Salmonella typhi</td>
<td>65-125</td>
</tr>
<tr>
<td>Desulfovibrio desulfuricans</td>
<td>&lt;33</td>
</tr>
<tr>
<td>Cladosporium herbarum</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Cephalosporium sp.</td>
<td>1000-2000</td>
</tr>
<tr>
<td>Trichophyton mentagrophytes</td>
<td>250-500</td>
</tr>
<tr>
<td>Aspergillus niger</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Aureobasidium pullulans</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Fusarium moniliforme</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Saccharomyces cerevisiae</td>
<td>500-1000</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>&gt;2000</td>
</tr>
</tbody>
</table>

### Uses

**Water Flood Injection Water**

AQUCAR™ TN 50 Water Treatment Microbiocide exhibits excellent stability in oilfield injection waters, which ensures that its antimicrobial activity will not be diminished in long pipelines. Hard waters or brines do not adversely affect its biocidal efficacy, and AQUCAR TN 50 Water Treatment Microbiocide is non-ionic so it won’t interfere with the action of demulsifiers, corrosion inhibitors, or surfactants. AQUCAR TN 50 Water Treatment Microbiocide is typically slug dosed into the injection water on a daily or weekly basis at 50 to 2500 ppm active for up to 4 hours, although the exact treatment regimen will depend on the condition of the system, the amount of water being treated, etc.

**Drilling, Completion, Workover, and Fracturing Fluids**

AQUCAR TN 50 Water Treatment Microbiocide functions as a biocide over a broad pH range and its efficacy is much faster at neutral to alkaline pH’s than at acidic pH’s. Therefore, AQUCAR TN 50 Water Treatment Microbiocide is an excellent choice for use in preserving drilling muds and other oilfield fluids that are typically alkaline in pH. The combination of rapid alkaline efficacy at the typical use rates of 25 to 500 ppm as active, and proven stability and effectiveness in high salinity matrices ensures microbial protection of these important fluids.

**Produced Waters**

Most oilfield systems contain sulfate reducing bacteria (SRB’s) and acid producing bacteria (APB’s). The presence of SRB’s and APB’s presents a serious challenge for effective control of microbial contamination in a production system.
Gas Storage Wells and Hydrocarbon Storage Facilities
The water bottoms in hydrocarbon storage tanks and gas storage wells can often be contaminated with SRB’s and serve as hosts to biofilms. This, in turn, can lead to the formation of H₂S in the gas storage facility and the corrosion of hydrocarbon storage tanks. AQUCAR TN 50 Water Treatment Microbiocide preferentially partitions into the water phase in a mixed hydrocarbon/water system and so would attack any microorganisms that are present in these water bottoms.

Production Wells
The injection of scale and corrosion inhibitors into production wells can introduce microorganisms into the production equipment and the formation. The addition of AQUCAR TN 50 Water Treatment Microbiocide during these injections (squeeze treatments) can help to control these microorganisms and may help reduce the occurrence of MIC in production equipment.

Manufacturing Use in Formulated Antimicrobial Products
There is an identical manufacturing use product: AQUCAR™ TN 50 MUP Water Treatment Microbiocide. It is an excellent active ingredient for the formulation of spray fumigants and other antimicrobial products. AQUCAR TN 50 MUP Water Treatment Microbiocide slowly decomposes to release formaldehyde. Properly formulated products should be buffered to insure that this controlled release of formaldehyde does not occur until dilution by the end-user of the product. Manufacturers of such products are responsible for obtaining registration of their formulated products with EPA under provisions of the Federal Insecticide, Fungicide, and Rodenticide Act.

Environmental Effects
As an antimicrobial agent for industrial applications, AQUCAR TN 50 Water Treatment Microbiocide will not be released in harmful amounts to the environment if materials containing it are properly handled. Such materials must always be treated physically, chemically, and/or biologically in industrial treatment systems to render them harmless before disposal.

AQUCAR TN 50 Water Treatment Microbiocide provides protection from microbial contamination under alkaline conditions by decomposing to release formaldehyde. AQUCAR TN 50 Water Treatment Microbiocide in any alkaline fluid will, in time, break down (see Figure 1). Even when a fluid has been treated a number of times, AQUCAR TN 50 Water Treatment Microbiocide will not increase in concentration in the system. A study has shown that low concentrations of AQUCAR TN 50 Water Treatment Microbiocide are assimilated by sludge obtained from a municipal sewage system.
When properly handled and disposed of, AQUCAR™ TN 50 Water Treatment Microbiocide will not be released directly to the environment. Nevertheless, studies have been conducted to assess the possible effects on wildlife which might result from improper handling or accidental spills of the compound.

The 5-day dietary LC50 in mallard ducks was found to be in excess of 80,000 ppm of AQUCAR TN 50 Water Treatment Microbiocide (expressed as the 50% solution). The LC0 was in excess of 40,000 ppm. The symptoms of toxicity seen at doses of 20,000 ppm or more appeared to be reversible when the birds were fed an untreated diet for 16 days post-treatment. All birds were normal when fed 2500, 5000, or 10,000 ppm of AQUCAR TN 50 Water Treatment Microbiocide.

The 5-day dietary LC50 in bobwhite quail was found to be in excess of 5000 ppm of AQUCAR TN 50 Water Treatment Microbiocide (expressed as the 50% solution). No symptoms suggestive of toxicity were seen in birds fed 1250, 2500, or 5000 ppm of AQUCAR TN 50 Water Treatment Microbiocide.

The LC50 of AQUCAR TN 50 Water Treatment Microbiocide for rainbow trout was calculated at 410 ppm. This implies that AQUCAR TN 50 Water Treatment Microbiocide is practically nontoxic to trout.
Please refer to the product Safety Data Sheet (SDS).

Labels for AQUCAR™ TN 50 Water Treatment Microbiocide bear these caution statements:

CAUTION

Avoid contact with eyes.

Harmful if swallowed. Wash thoroughly with soap and water after handling and before eating or smoking.

Harmful if inhaled. Avoid breathing spray mist.

Remove contaminated clothing and wash before reuse.

AQUCAR TN 50 Water Treatment Microbiocide will crystallize if cooled below approximately 13°C (55°F). It is therefore recommended that storage at temperatures slightly higher than 13°C (55°F) be maintained. AQUCAR TN 50 Water Treatment Microbiocide decomposes violently at temps >100°C (212°F) and that temps >80°C (176°F) should be avoided.

During the winter months, it is highly recommended that any long distance transport of this material be limited to temperature controlled trailers with a temperature setting no lower than 16°C (60°F). This equipment is available only from refrigerated (truckload) carriers.

AQUCAR TN 50 Water Treatment Microbiocide which has become frozen may be thawed and used without any loss of potency. This is most conveniently and safely accomplished by placing the frozen material in a heated storage area and agitating the contents. If this is impractical, frozen AQUCAR TN 50 Water Treatment Microbiocide can be thawed through the use of a hot water-bath and frequent agitation of the drum to mix the contents. Care should be taken that the temperature of the polyethylene drum is not allowed to exceed 75°C (167°F).

AQUCAR TN 50 Water Treatment Microbiocide decomposes in the presence of alkaline materials, so it should be protected from vapors of ammonia and amines during handling and storage to prevent deterioration.

AQUCAR TN 50 Water Treatment Microbiocide is not classified as a hazardous material by the U.S. Department of Transportation (DOT). The bill of lading description used by DOW is:

DISINFECTANT NOI, OTHER THAN MEDICINAL OR TOILET PREPARATION. NO HAZARD CLASS LABEL OR PLACARDS REQUIRED.

AQUCAR TN 50 Water Treatment Microbiocide is packaged in closed head 55 gallon polyethylene drums containing 500 net lb.
Product Stewardship

Dow Microbial Control encourages its customers to review their applications of Dow Microbial Control products from the standpoint of human health and environmental quality. To help ensure that Dow Microbial Control products are not used in ways for which they are not intended or tested, Dow Microbial Control personnel are willing to assist customers in dealing with ecological and product safety considerations. Contact your representative if you need any assistance or information. When considering the use of any Dow product in a particular application, review the latest Safety Data Sheet and country-specific product label to ensure the intended use is within the scope of approved uses and can be accomplished safely. Before handling any of the products mentioned in the text, obtain available product safety information and take necessary steps to ensure safety of use.

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