Microbial Control

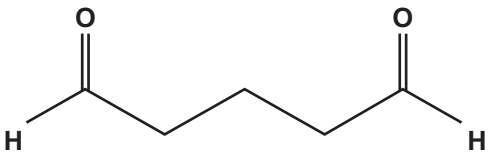
AQUCAR™ GA 24 Water Treatment Microbiocide

For use in Oilfield, Industrial Water Treatment and Pulp and Papermaking operations

General

AQUCAR™ GA 24 Water Treatment Microbiocide is part of the AQUCAR family of antimicrobials; it is a glutaraldehyde (CAS Reg. No. 111-30-8) based biocide which has found widespread use in a variety of oil, gas, industrial water treatment and papermaking operations.

Structure



Physical Properties

The following are typical properties of AQUCAR™ GA 24 Water Treatment Microbiocide; **they are not to be considered product specifications.**

Appearance:	Transparent colorless
Active, % Glutaraldehyde (w/w):	24
pH (as supplied):	3.1-4.5

AQUCAR GA 24 is an aqueous solution of glutaraldehyde containing 24% active ingredient. This broad-spectrum biocide is effective over a wide range of pH and temperature conditions and is well suited for use in the following applications.

Note: Due to differences in regional approvals do confirm with your local and regional authorities that all approvals are in place prior to using in your specific application.

Applications/ Directions for Use

Water Flood Injection Water

Glutaraldehyde 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 glutaraldehyde is non-ionic so it won't interfere with the action of demulsifiers, corrosion inhibitors, or surfactants. AQUCAR™ GA 24 Water Treatment Microbiocide is typically slug dosed into the injection water on a daily or weekly basis at 50 to 2,500 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

Glutaraldehyde 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™ GA 24 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. For a biocide to be effective

against these problematic organisms, it must be stable in the presence of sulfides or organic acids that are produced by these organisms. Glutaraldehyde, unlike some other biocides (formaldehyde and acrolein) does not react with, and is not deactivated by, H_2S or other organic acids. This ensures that all of the glutaraldehyde added is available to act as a biocide. Like its use in waterflood injection systems, glutaraldehyde is typically added in slug doses on a daily to weekly basis at concentrations of 50 to 2,500 ppm as active.

Oil and Gas Transmission lines

Biofilms are a major problem in oil and gas production systems and pipelines are often afflicted with biofilm related problems. Microbiologically influenced corrosion (MIC) is often associated with the presence of a biofilm. The control of biofilms is therefore crucial to ensuring that corrosion events, due to microorganisms, are minimized. Glutaraldehyde has been shown to penetrate a biofilm and kill the microorganisms that are contained within it. The penetrating ability of glutaraldehyde, along with its long-term stability in oilfield waters, makes it an effective product to control established biofilms in pipelines and prevents the formation of new ones.

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 serves as hosts to biofilms. This, in turn, can lead to the formation of H_2S in the gas storage facility and the corrosion of hydrocarbon storage tanks. Glutaraldehyde 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 glutaraldehyde during these injections (squeeze treatments) can help to control these microorganisms and may help reduce the occurrence of MIC in production equipment.

Paper Mills and Paper Mill Process Water Systems

Many types of microorganisms such as bacteria mold and yeast can be found in a paper mill. When uncontrolled, the growth of microorganisms can lead to serious process and quality problems, including offensive odors, corrosion of equipment, and spots and breaks in the paper. AQUCAR™ GA 24 Water Treatment Microbiocide should be added to a papermaking system at a point of uniform mixing, such as the head box, beaters, broke chest, pump, save-all tank, or white water tank.

Initial Treatment: When the system is noticeably contaminated, add 1.0 to 6.0 lbs. of AQUCAR GA 24 per dry ton of pulp or paper (0.5 to 3.0 Kg per dry metric ton) as a slug dose. Repeat until control is achieved. Heavily fouled systems should be boiled out prior to initial treatment.

Subsequent Dose: When microbial control is evident, add 0.6 to 4.0 lbs. of AQUCAR GA 24 per dry ton of pulp or paper (0.3 to 2.0 Kg per dry metric ton) as a slug dose as necessary to maintain control.

Pigments and Filler Slurries for Paper and Paperboard

AQUCAR™ GA 24 Water Treatment Microbiocide can effectively control the level of microorganisms in pigment slurries. Use from 0.21 to 1.25 lbs of AQUCAR GA 24 per 1,000 lbs dry powder (0.21 to 1.25 Kg per 1,000 Kg dry powder) to produce a concentration of 210 to 1250 ppm as product (based on slurry solids) in the mixed slurry.

Water-Based Coatings
NOTE: For use in non-food contact coatings only.

Use from 0.21 to 1.25 lbs of AQUCAR™ GA 24 Water Treatment Microbiocide per 1,000 lbs dry powder (0.21 to 1.25 Kg per 1,000 Kg dry powder) to produce a concentration of 210 to 1250 ppm as product (based on slurry solids) in the mixed slurry.

Food Additive Regulations
The product meets the requirements of the Food Additive Regulations listed below. Uses are subject to good manufacturing practices and any limitations which are part of the regulations. The information given here is for use as a general guideline. The regulations should be consulted for complete details. In some cases a product formulation may meet an FDA clearance and the use is not on the product label.

21 CFR 172.230(a)(3) Cleared for use as a cross-linking agent

21 CFR 173.320(b)(6) Chemicals for Controlling Microorganisms in Beet-Sugar Mills (max. 250 ppm active)

21 CFR 173.357(a)(2) Fixing agent in the immobilization of glucose isomerase enzyme preparations for use in manufacture of high fructose corn syrup.

21 CFR 175.105 (c)(5) Adhesives

21 CFR 176.170 (a)(5) Cleared for use as antimicrobial agent in pigment and filler slurries used in manufacture of paper and paperboard (max. 300 ppm active)

21 CFR 176.180 (b)(1) Components of Paper and Paperboard in Contact with Dry Food (max. 300 ppm active)

21 CFR 176.300 Slimicides

Efficacy of AQUCAR™ GA 24 Water Treatment Microbiocide

The efficacy of glutaraldehyde is demonstrated by the following experiments. Field isolates of seawater and produced water SRB's were grown to high levels in the laboratory and then challenged with glutaraldehyde. The following results were obtained.

Efficacy of Glutaraldehyde vs. Seawater SRB's

	Log Reduction (hours)		
Biocide (ppm a.i.)	1	2	4
GA, 24	4	4	7
GA, 50	6	7	8
GA, 100	8	8	8
Control	10^8	10^8	10^8

Efficacy of Produced Water SRB's

	Log Reduction (hours)		
Biocide (ppm a.i.)	1	2	4
GA, 24	4	6	5
GA, 50	5	6	5
GA, 100	5	8	8
Control	10^8	10^8	10^8

The experimental protocol allowed for the growth of both high populations of SRB's as well as the accumulation of bacterial metabolites such as sulfide. As these results show, glutaraldehyde was effective against these field isolates.

Increasing regulation of the discharge of chemicals into the environment requires that there be careful monitoring and control over the use of biocides. The active concentration of glutaraldehyde in AQUCAR™ GA 24 Water Treatment Microbiocide can easily be determined by a glutaraldehyde field test kit. There are several different kits that are commercially available and all allow for the rapid on-site determination of glutaraldehyde concentrations, discharge levels, half-life, and biocide/system compatibility. By regularly monitoring the active concentration of biocide in the system, the cost effectiveness of the treatment program can be maximized by accurately regulating biocide additions.

Compatibility with Water Treatment Chemicals

While glutaraldehyde is compatible with most commonly used system additives (scale and corrosion inhibitors), there are some incompatibilities that should be noted. Glutaraldehyde is incompatible with primary amines and ammonia. Secondary amines are not as problematic as primary amines, but if a secondary amine is present at high concentrations (>1,000 ppm), then care should be taken to add the glutaraldehyde at a distance from the addition point of the secondary amine. Information is available which predicts the loss of glutaraldehyde from systems that contain ammonia. This information is helpful in anticipating the expected decrease in active glutaraldehyde concentration in systems that contain ammonia. Please contact your Dow representative for copies of this data.

Glutaraldehyde is also incompatible with bisulfite-based oxygen scavengers. This interaction can most easily be managed by temporarily shutting off the bisulfite feed during the addition of glutaraldehyde. If shutting off the bisulfite feed is not an option, then it is important to realize that the ratio of reaction of glutaraldehyde with the oxygen scavenger is approximately 1:2 for Glutaraldehyde.

Application	Recommended dosage (active ingredient)	Recommended dosage (ppm product)	Purpose of Biocide
Waterfloods	50 to 2,500 ppm	208 to 10400	To prevent the introduction of harmful bacteria into the formation and to control MIC in the injection system
Drilling, Completion and Workover Fluids	25 to 500 ppm	104 to 2080	To control microbial contam ination of these fluids and prevent the introduction of bacteria into the formation
Packer Fluids	25 to 300 ppm	104 to 1250	To control microbial contamination of the fluids and prevent the introduction of bacteria into the formation
Gas Storage Wells and Systems	250 to 2,500 ppm	1040 to 10400	To control microbiological contamination of the injection water and prevent the souring of the gas
Hydrotesting	50 to 2,000 ppm	208 to 8300	To prevent the introduction of potentially harmful bacteria into the pipeline
Pipeline Pigging and Scraping Operations	500 to 5,000 ppm	2080 to 20800	To treat the inner surfaces of the pipeline in order to kill biofilm associated bacteria on freshly exposed (pigged) areas
Paper Mills and Paper Mill Process Water Systems	1.0 to 6.0 lbs. per ton (0.5 to 3.0 Kg per dry metric ton) of pulp or paper (dry basis) initially as a slug dose 0.6 to 4.0 lbs. per ton (0.3 to 2.0 Kg per dry metric ton) of pulp or paper (dry basis) subsequently as a slug dose to maintain control		To control the growth of bacteria and fungi present in papermaking systems and prevent slime formation

Dow Microbial Control Technical Laboratories, located globally, are available to assist in the determination of optimum use level required for a specific application. While AQUCAR™ GA 24 Water Treatment Microbiocide is compatible with most raw materials used in microbiologically susceptible products, Dow Microbial Control can also assist with compatibility assessments for specific applications.

Toxicology

For product safety information, refer to Safety Data Sheet (SDS).

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including Safety Data Sheets (SDS), should be consulted prior to use of Dow products. Current Safety Data Sheets are available from Dow.

For further information visit our website:
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USE BIOCIDES SAFELY. ALWAYS READ THE LABEL AND PRODUCT INFORMATION BEFORE USE.

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