# BIOBAN BP-10/30

Liquid Preservatives For Treatment Of Industrial Process Systems And Product Preservation Applications

## General

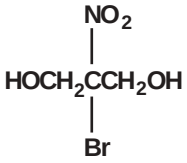
BIOBAN™ BP liquid preservatives contain the active ingredient 2-bromo-2-nitro-1,3-propanediol (bronopol) and are used for controlling bacterial growth in industrial process systems such as industrial process waters, recirculating water, cooling towers and evaporative condensers, oil production and transport, and pulp and paper production. In addition, BIOBAN BP liquid preservatives are effective for the preservation of adhesives, starch, pigment and extender slurries, printing inks, fountain solutions, paints, latex and antifoam emulsion systems.

BIOBAN BP liquid preservatives are EPA-registered and possess numerous global application approvals. They are available in 10% (BIOBAN BP-10) and 30% (BIOBAN BP-30) active solutions in water and propylene glycol.

BIOBAN BP liquid preservatives provide the following benefits when used in industrial process systems and other water-containing systems:

- Broad-spectrum bacterial efficacy
- Control of *Pseudomonas* sp.
- Control of *Legionella pneumophila*
- Control of slime-forming bacteria
- Control of anaerobic bacteria responsible for microbiologically-induced corrosion
- Especially effective in combination with other biocides

## Structure




## Physical Properties

The following are typical properties of BIOBAN BP liquid preservatives; they are not to be considered product specifications.

### BIOBAN BP-10

**EPA Reg. No. 464-680**
**CAS Reg. No. 52-51-7**
**EINECS No. 2001430**

| | |
|---|---|
| Appearance | Pale yellow to colorless liquid |
| Active, % by wt. | 9.5-10.5 |
| Propylene Glycol, % by wt. | ~10 |
| Water, % by wt. | ~80 |
| pH (as is) | 2.0-6.0 |
| Density @ 20°C | 1.04-1.07 |
| Flash Point | Does not have a flash point as measured by SETAFLASH Closed Cup |
| Freeze Point | -8°C to -18°C/17.6°F to -0.4°F |
| Solubility in water | Miscible |

## BIOBAN BP-30

**EPA Reg. No. 464-685**
**CAS Reg. No. 52-51-7**
**EINECS No. 2001430**

| | |
|---|---|
| Appearance | Pale yellow to colorless liquid |
| Active, % by wt. | 29.1-30.9 |
| Propylene Glycol, % by wt. | ~60 |
| Water, % by wt. | ~10 |
| pH (as is) | 4.5 Max. |
| Density @ 20°C | 1.19-1.21 |
| Flash Point | Does not have a flash point as measured by SETAFLASH Closed Cup |
| Freeze Point | -25°C/-13°F |
| Solubility in water | Miscible |

## FDA Clearances

| | |
|---|---|
| 21CFR175.105 | Component of adhesives |
| 21CFR176.170 | Components of paper and paperboard in contact with aqueous and fatty foods |
| 21CFR176.180 | Components of paper and paperboard in contact with dry food |
| 21CFR176.300 | Slimicide for use in manufacture of paper and paperboard intended to contact food |

## Antimicrobial Activity

BIOBAN BP liquid preservatives are effective against a broad array of bacteria as illustrated by the minimum inhibitory concentrations (MIC) listed below. These data are intended only as an indication of the broad spectrum of activity of BIOBAN BP liquid preservatives and should not be interpreted as having relevance to the effectiveness or dosage against specific bacteria in formulated products or process systems.

| Organism | MIC (ppm active ingredient) |
|---|---|
| *Escherichia coli* | 12.5-50 |
| *Pseudomonas aeruginosa* | 12.5-50 |
| *Pseudomonas putida* | 25 |
| *Pseudomonas cepacia* | 25 |
| *Pseudomonas stutzeri* | 25 |
| *Pseudomonas fluorescens* | 25 |
| *Klebsiella pneumoniae* | 25 |
| *Enterobacter aerogenes* | 25 |
| *Staphylococcus aureus* | 12.5-30 |
| *Staphylococcus epidermidis* | 50 |
| *Legionella pneumophilia serotype* | 25-50 |
| *Desulfovibrio* sp* | 0.39-12.5 |

*BIOBAN BP-10 and BP-30 demonstrate effectiveness against *Desulfovibrio* sp.

BIOBAN BP liquid preservatives, in contrast to the majority of other antibacterial agents, are particularly effective in controlling *Pseudomonas aeruginosa.* These organisms are difficult to control with most antimicrobial agents and can develop resistance to preservatives. BIOBAN BP liquid preservatives are also very effective at controlling the anaerobic sulfate-reducing bacteria (SRB) that are responsible for causing microbiologically influenced corrosion as well as generating gases such as $H_2S$. BIOBAN BP liquid preservatives exhibit limited fungal efficacy at typical use levels.

In order to obtain the full benefits of BIOBAN BP liquid preservatives, avoid use in systems containing reducing agents or secondary amines. In neutral to alkaline systems bronopol can slowly decompose to release nitrite ions. In the presence of secondary amines these nitrite ions have the potential to form nitrosamines. Bronopol itself is not a nitrosating agent. It is also recommended that BIOBAN BP liquid preservatives should not be subjected to temperatures greater than 40°C to avoid decomposition. For formulations that will be repeatedly exposed to microbial challenges during use and storage (user opening and

closing product container) the optimum pH range for use of these preservatives is below 8; however, products that are greater than pH 8 can still be preserved with BIOBAN BP liquid preservatives. Testing should be performed to confirm that preservation meets the requirements outlined for the product.

## Formulating Considerations

The active ingredient in BIOBAN BP liquid preservatives, bronopol, is compatible with a range of materials used in water treatment, pulp and paper and other process applications. Compatible materials include compounds such as scale inhibitors, pitch stabilizers, sizing agents, retention aids, flocculants and other biocides. However, strong reducing agents such as bisulfite (>50ppm) and oxidizing agents such as free residual chlorine (>5ppm) should be avoided. BIOBAN BP liquid preservatives maintain their antimicrobial activity over a wide pH range despite some decrease in chemical stability as conditions become more alkaline (pH < 8.5).

BIOBAN BP liquid preservatives can be used alone or in combination with other biocides. The use of multiple preservatives provides additional protection against bacterial and fungal spoilage. In addition, combination systems can be more cost effective. Multiple biocide combinations help prevent the establishment of populations of organisms resistant to a single biocide.

BIOBAN BP liquid preservatives can be used in combination with a wide variety of biocides. The most popular combinations are those with 5 chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one (CMIT/MIT) or 1,2-benzisothiazolin-3-one (BIT). The dosage levels of CMIT/MIT, typically 25-30 ppm active ingredient for preservation applications, can be reduced to 7.5 to 15 ppm active ingredient when combined with 100-200 ppm (active ingredient) BIOBAN BP liquid preservatives.

The benefits of the combination of these two actives are as follows:

- Synergistic activity has been reported between bronopol and isothiazolinones in both the USA and Japan.
- *Pseudomonas* efficacy – BIOBAN BP liquid preservatives have extremely good efficacy against *Pseudomonas,* a weakness of isothiazolinone chemistry.
- BIOBAN BP liquid preservatives can improve the stability of CMIT/MIT in the presence of reducing agents.

| Applications | Recommended Product | Purpose | Suggested Concentrations of BIOBAN BP Liquid Preservatives | How to Apply |
|---|---|---|---|---|
| **Pulp and Paper** | BIOBAN BP-10, BIOBAN BP-30 | To control slime-forming bacteria in process water and bulk pulp. | 10-250 ppm of BIOBAN BP-10 or BP-30 as active ingredient for process water. 50-200 ppm of BIOBAN BP-10 or BP-30 for bulk pulp. | Add to the hydropulper, machine chest or stock chest. |
| **Water Treatment** | BIOBAN BP-10, BIOBAN BP-30 | To control slime-forming bacteria and algae in recirculating water cooling towers, evaporative condensers, industrial process water, and air scrubber, air conditioner and humidifier systems. | 25-100 ppm of BIOBAN BP-10 or BP-30 as active ingredient. | Add directly into the sump or basin at any point where there is adequate agitation to ensure dissolution. |
| **Absorbent Clays, Corn Cobs, & Ground Wood** | BIOBAN BP-30 | To inhibit the growth of odor-causing bacteria in absorbent clays. | 25-200 ppm of BIOBAN BP-30 Preservative as active ingredient. | Impregnate into the absorbent material. |
| **Adhesives** | BIOBAN BP-10, BIOBAN BP-30 | For the preservation of water-based adhesives. | 100-500 ppm of BIOBAN BP-10 and BP-30 as active ingredient. | Added in the final manufacturing step. |
| **Starch and Pigment Slurries** | BIOBAN BP-10, BIOBAN BP-30 | To control bacteria in aqueous starch suspensions, mineral and pigment slurries. | 100-500 ppm of BIOBAN BP-10 or BP-30 Preservatives as active ingredient. | Add directly to the process water or close to the end of the manufacturing process. |
| **Paints, Latex and Antifoam Emulsions** | BIOBAN BP-10, BIOBAN BP-30 | For in-can preservation of latex emulsion concentrates and paints. Also, for silicone and other antifoam emulsion systems. | 100-500 ppm of BIOBAN BP-10 or BP-30 Preservatives as active ingredient. | Add as a final step before packing into bulk or sales packs. |
| **Inks and Fountain Solutions** | BIOBAN BP-10, BIOBAN BP-30 | To inhibit bacterial growth during the storage and use of water-based printing inks and fountain solutions. | 100-500 ppm of BIOBAN BP-10 or BP-30 as active ingredient. For in-can preservation 20-100 ppm BIOBAN BP-10 or BP-30 as active ingredient when used to treat in-use fountain solutions. | For in-can preservation, add as a final step. During use, shock dose in the fountain reservoir where there is adequate flow or agitation. |
| **Oil and Gas Fluids** | BIOBAN BP-10, BIOBAN BP-30 | To control aerobic and anaerobic, especially sulfate-reducing bacteria in oil and gas-related production. | 50-100 ppm of BIOBAN BP-10 or BP-30. Well squeeze fluids should be dosed at 25-200 ppm active ingredient. | Add at any convenient point. |
| **Oil Process Water** | BIOBAN BP-10, BIOBAN BP-30 | To inhibit the growth of slime-forming bacteria and sulfate-reducing bacteria in oil and gas well injection and formation waters. | 25-200 ppm of BIOBAN BP-10 or BP-30 as active ingredient. | Slug dose at any time into the process waters. |
| **Oil and Gas Transportation and Storage** | BIOBAN BP-10, BIOBAN BP-30 | For protection against microbial-induced corrosion in pipelines and water bottoms in tanks. | 25-200 ppm of BIOBAN BP-10 or BP-30 as active ingredient. | Add directly into the water bottom, pipeline or hydrocarbon phase. |

## Uses

BIOBAN BP liquid preservatives are registered for the following end-use applications.

## Pulp and Paper

BIOBAN BP-10 and BP-30 liquid preservatives can be used to control microbiological growth in paper and paperboard manufacturing processes such as paper mill process water, bulk pulp, and starch, pigment, and extender slurries used in paper coating applications. BIOBAN BP liquid preservatives have FDA clearances for use as a paper slimicide (21 CFR 176.300), as a component of paper and paperboard in contact with aqueous and fatty foods (21 CFR 176.170), and as a component of paper and paperboard in contact with dry foods (21 CFR 176.180).

### Paper Process Waters

In paper process waters BIOBAN BP-10 and BP-30 liquid preservatives can be used to control slime-forming bacteria in paper or paperboard process water systems. BIOBAN BP

liquid preservatives should be dosed at a convenient point early in the process system. Dosing points may include the machine chest, headbox or white water loop. BIOBAN BP liquid preservatives should be slug-dosed several times daily in quantities sufficient to meet the required dose based on the daily production of finished product. Dose between 10-250 ppm of BIOBAN BP-10 or BP-30 on an active basis.

**Bulk Pulp**

To preserve bulk quantities of pulp in paper and paperboard manufacturing systems or to prevent foul odors and deterioration of pulp stock when stored for significant periods of time, add BIOBAN BP-10 and BP-30 liquid preservatives directly into the hydropulper, machine chest or stock chest. A single slug dose will provide microbiological control for up to three days or longer depending on the degree of contamination of the stock. In highly contaminated pulps, repeat dosing may be required every 1-7 days. The recommended dosage rate for BIOBAN BP-10 and BP-30 is 50-200 ppm active ingredient.

## Water Treatment

**Industrial Recirculating Water Cooling Towers and Evaporative Condensers**

For control of slime-forming bacteria and algae in recirculating water cooling towers and evaporative condensers, dose BIOBAN BP-10 or BP-30 liquid preservatives directly into the sump or basin at any point where there is adequate agitation to ensure rapid dispersal throughout the system. BIOBAN BP-10 and BP-30 should be dosed 25-100 ppm active ingredient.

**Industrial Process Water**

BIOBAN BP-10 and BP-30 liquid preservatives may be used to effectively control bacterial and algal growth in industrial process water including closed-circuit machine cooling and stored water (non-potable) as well as to reduce the biofouling of pipework, heat exchangers, condenser tubes and to minimize microbiologically-influenced corrosion. Dosing should be carried out in the sump/tank of the process water system where a slug dose is preferred. BIOBAN BP liquid preservatives can also be used as an intermittent flush treatment during regular maintenance cleaning of water tanks (non-potable) or equipment. In open systems, slug dosing of BIOBAN BP liquid preservatives should be carried out on a once-a-week to once-a-month basis, depending on the degree of contamination. In closed-circuit systems, with minimal loss of BIOBAN BP-10 and BP-30, less frequent dosing (1-2 times/month) should be adequate. The recommended dose rate for BIOBAN BP-10 and BP-30 is 10-100 ppm active ingredient.

## Absorbent Clays, Corn Cobs and Ground Wood

BIOBAN BP-30 may be used in absorbent clays, corn cobs and ground wood to inhibit the growth of odor-causing bacteria. BIOBAN BP-30 may be impregnated into the absorbent material at an application rate of 25-200 ppm active ingredient.

## Adhesives

BIOBAN BP-10 and BP-30 liquid preservatives can be used to control microbial contamination in water-based, adhesive formulations. BIOBAN BP liquid preservatives have FDA approval for indirect food contact use in adhesives. Typical treatment levels for BIOBAN BP-10 and BP-30 liquid preservatives is 100-500 ppm active ingredient.

## Starch and Pigment Slurries

BIOBAN BP-10 and BP-30 liquid preservatives are useful for the control of bacterial growth in aqueous systems such as starch suspensions and pigment slurries during manufacture, storage and distribution. BIOBAN BP liquid preservatives should be added near or at the end of the manufacturing process. If the manufacturing process involves a heating stage, it should be added after the product has cooled below 40°C/104°F. BIOBAN BP-10 and BP-30 should be dosed at 100-500 ppm active ingredient.

## Paints, Latex and Antifoam Emulsion Systems

BIOBAN BP-10 and BP-30 liquid preservatives may be used to provide in-can preservation and to prevent bacterial spoilage during manufacture and bulk storage of acrylic, styrene-acrylic, polyvinyl acetate, and other latex emulsion-based paints. They are also effective for the preservation of silicone and other antifoam emulsion systems. In addition, BIOBAN BP liquid preservatives may be added as a final step just prior to packing the product into bulk or sales packs. If a heating stage is involved in the manufacturing process, BIOBAN BP liquid preservatives should be added after the product has cooled below 40°C/104°F. BIOBAN BP-10 and BP-30 liquid preservatives should be dosed at 100-500 ppm active ingredient.

## Water-Based Printing Inks and Fountain Solutions

BIOBAN BP-10 and BP-30 liquid preservatives can inhibit the growth of spoilage bacteria during the storage and use of water-based printing inks and fountain solutions. For in-can preservation, BIOBAN BP liquid preservatives should be added as a final step. To control bacterial spoilage during the use of fountain solutions, BIOBAN BP liquid preservatives should be shock-dosed at a suitable point in the fountain reservoir where there is adequate flow or turbulence to insure quick dissolution. BIOBAN BP liquid preservatives may be shock-dosed once or twice weekly as a normal routine. Where conditions indicate, more frequent shock dosing may be required. As an in-can preservative, BIOBAN BP liquid preservatives should be dosed at 100-500 ppm active ingredient. For in-use fountain solutions, BIOBAN BP-10 and BP-30 should be shock-dosed at 20-100 ppm active ingredient.

## Oil Field and Fuel Applications

### Oil and Gas Fluids

BIOBAN BP-10 and BP-30 liquid preservatives can be used to control microbiological contamination and degradation of a variety of gels and fluids caused by cellulolytic, slime-forming and sulfate-reducing bacteria. The types of fluids to be preserved include fracturing, enhanced oil recovery, injection, well squeeze, drilling, workover and completion. BIOBAN liquid preservatives may be pre-mixed or added directly to the fluids and should be added at a dosage rate of 50-100 ppm active ingredient. Well squeeze fluids may require dosages ranging from 25-200 ppm active ingredient.

### Oil Process Water

BIOBAN BP-10 and BP-30 liquid preservatives can be used to inhibit the growth of slime-forming bacteria or corrosion inducing sulfate-reducing bacteria in oil and gas well injection and formation waters. BIOBAN BP liquid preservatives should be injected as a slug-dose at any point, and should be added at 25-200 ppm active ingredient.

### Oil and Gas Transportation and Storage

BIOBAN BP-10 and BP-30 liquid preservatives can be used to control bacterial contamination in water bottoms in crude and refined hydrocarbon storage tanks, piping and transportation systems. Add BIOBAN liquid preservatives directly into the water bottom or pipeline, or it may be added to the hydrocarbon phase. Treatment rates for BIOBAN liquid preservatives vary from once daily for pipeline maintenance to once every 1-2 months for storage and transportation systems. Addition to the hydrocarbon phase will result in longer protection by gradual diffusion of the active ingredient into the water phase. BIOBAN BP-10 and BP-30 should be applied to reach a target dosage of 25-200 ppm active ingredient.

## Toxicity

The oral toxicity of BIOBAN BP-10 and BP-30 liquid preservatives can be estimated as 800 mg/kg and about 2400 mg/kg respectively. Both concentrations are toxicity category III under current EPA regulations, i.e., harmful if swallowed. In animal tests, this toxicity is evidenced by gastrointestinal irritation with ulceration at high concentrations.

Dermally, limit tests with rabbits (2000 mg/kg) did not result in deaths or signs of systemic toxicity. However, even BIOBAN BP-10 which contains 10% of bronopol is moderately irritating to the skin, as are solutions up to 40%. Based on eye irritation studies all liquid solutions of bronopol should be considered to be corrosive to the eye. Because literature references on bronopol indicate some instances of positive reactions, solutions also may cause dermal sensitization in certain individuals.

## Environmental Effects

No direct testing of BIOBAN BP-10 and BP-30 liquid preservatives was conducted. The active ingredient is toxic to aquatic species so neither product should be allowed to enter lakes, ponds, streams, estuaries, oceans or other public waters.

## First Aid

**If in eyes,** hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes. Get medical attention

**If on skin,** wash with plenty of soap and water. Get medical attention.

**If swallowed,** call a doctor or get medical attention. Do not induce vomiting or give anything by mouth to an unconscious person. Drink promptly a large quantity of milk, egg whites, gelatin solution, or if these are not available, drink large quantities of water. Avoid alcohol.

**If inhaled,** remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

**NOTE TO PHYSICIAN**
Probable mucosal damage may contraindicate the use of gastric lavage.

## Precautionary Labeling

Labels for BIOBAN BP-10 and BP-30 liquid preservatives bear these caution statements:

DANGER!

KEEP OUT OF REACH OF CHILDREN!

CORROSIVE: CAUSES IRREVERSIBLE EYE DAMAGE AND SKIN BURNS.

HARMFUL IF SWALLOWED, ABSORBED THROUGH SKIN, OR INHALED.

Do not get in eyes, on skin, or on clothing.

Wear goggles or face shield, protective clothing, and rubber gloves when handling.

Wash thoroughly with soap and water after handling, and before eating, drinking, or using tobacco.

Remove contaminated clothing and wash before reuse.

Do not breathe vapor or spray mist.

Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

## Storage and Handling

Persons handling BIOBAN BP-10 and BP-30 liquid preservatives should wear rubber gloves and apron and safety glasses or chemical goggles to prevent contact with eyes or skin.

Because of their very low vapor pressure, these products do not present an inhalation hazard. Wash thoroughly after handling.

Store BIOBAN BP liquid preservatives in their original containers in cool locations away from food or feed. They can be corrosive to metals on prolonged contact, so wash away any spills from metal surfaces.

Spills should be contained and/or absorbed in suitable inert materials such as sawdust. Small spills or residues may be flushed to sewers, which lead to treatment systems.

## Shipping and Packaging

BIOBAN BP-10 and BP-30 liquid preservatives are classified as Class 8 Packing Group III corrosive liquids in the U.S. Department of Transportation regulations and in the international regulations for air and ocean transport because of their corrosive effects on aluminum.

The bill of lading description used by DOW is:

DISINFECTANT, LIQUID, CORROSIVE, N.O.S (2-BROMO-2-NITROPROPANE-1,3-DIOL SOLUTION) 8, UN1903,III. IN CASE OF EMERGENCY USE DOW GUIDE 5 ATTACHED. DISINFECTANT NOI, OTHER THAN MEDICINAL OR TOILET PREPARATIONS. NMFC ITEM 57100 SUB 3 CLASS 60. TRADE NAME = BIOBAN (BP-10 and BP-30).

**BP-10**

| Shipping Container | Net Wt. | Gross Wt. |
|---|---|---|
| 55-gallon HDPE drum | 475 lb | 497 lb |
| 1000 liter IBC* | 2,204 lb | 2,486 lb |

**BP-30**

| Shipping Container | Net Wt. | Gross Wt. |
|---|---|---|
| 55-gallon HDPE drum | 500 lb | 522 lb |
| 1000 liter IBC* | 2,645 lb | 2,777 lb |

*Intermediate bulk container (tote tank) with HDPE bottle and steel cage and pallet.

## Product Stewardship

Dow encourages its customers to review their applications of Dow products from the standpoint of human health and environmental safety. To help ensure that Dow products are not used in ways for which they are not intended or tested, Dow personnel are willing to assist customers in dealing with ecological and product safety considerations. Dow literature, including Safety Data Sheets, should be consulted prior to use of Dow products. Contact your Dow representative if you need any assistance or information.

**For further information visit our website: www.dowbiocides.com or call…**

| | |
|---|---|
| United States and Canada: | 1-800-447-4369 (phone)<br>1-989-832-1560 (phone)<br>1-989-832-1465 (fax) |
| Europe: | 800-3-694-6367 (phone)<br>32-3-450-2240 (phone)<br>32-3-450-2815 (fax) |
| Pacific: | 603-7958-3392 (phone)<br>603-7958-5598 (fax) |
| Latin America: | 55-11-5188-9555 (phone)<br>55-11-5188-9937 (fax) |
| Other Global Areas: | 1-989-832-1560 (phone)<br>1-989-832-1465 (fax) |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