Nutrition & Biosciences

DUPONT

Microbial Control
Technical Data Sheet

BIOBAN™ BP-PLUS Preservative

For The Treatment Of Industrial Process Systems

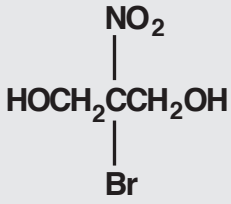
General

BIOBAN™ BP-PLUS Preservative is a broad-spectrum bactericide used to control microbial growth and its associated problems in industrial process systems such as cooling water, oil production and transport, pulp and paper production, and in watercontaining systems including adhesives, printing inks and fountain solutions, starch, pigment and extender slurries, and paints, latex and antifoam emulsion systems.

When BIOBAN™ BP-PLUS Preservative preservative is used in industrial process or as a preservative in watercontaining systems, it provides the following benefits:

- Efficacy against Pseudomonas
- Control of slime-forming bacteria
- Control of anaerobic organisms responsible for microbial-induced corrosion
- Control of Legionella pneumophilia
- Application approvals in numerous international markets

Structure



Physical properties

The following are typical properties of BIOBAN™ BP-PLUS Preservative; preservative **they are not to be considered product specifications.**

BIOBAN™ BP-PLUS Preservative

Appearance	Free Flowing Powder
Purity, % by wt. (min.)	99
Water Content, % by wt. (max.)	0.5
Melting Point	~130°C/266°F
Bulk Density, g/cm^3	1.2
pH of 1% Solution @ 20°C	5-7
Vapor Pressure	nil
Flash Point:	Does not have a flash point as measured by SETAFLASH Closed Cup
Solubility	highly soluble in water and lower alcohols. Generally soluble in glycols and other polyols. Insoluble in aliphatic hydrocarbons.

Antimicrobial Activity

BIOBAN™ BP-PLUS Preservative is effective against a broad array of organisms as Activity determined by agar dilution. The minimum inhibitory concentrations (MIC) listed below illustrate its effectiveness. These data are intended only as an indication of the broad spectrum of activity of BIOBAN™ BP-PLUS Preservative and should not be interpreted as having relevance to the effectiveness or dosage against specific microorganisms in formulated products.

Organism	MIC (ppm)
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

BIOBAN™ BP-PLUS Preservative , in contrast to the majority of other antibacterial agents, is markedl inhibitory to *Pseudomonas aeruginosa*. This organism is difficult to control with most antimicrobial agents and can develop resistance to preservatives. To date, no strains of microorganisms with acquired resistance to BIOBAN™ BP-PLUS Preservative have been reported.

Formulating Considerations

The active ingredient in BIOBAN™ BP-PLUS Preservative, bronopol, is compatible with a range of materials used in water treatment, pulp and paper and other process applications. The materials include compounds such as scale inhibitors, pitch stabilizers, sizing agents, retention aids, flocculants and other biocides. However, strong reducing agents such as bisulfite (>50 ppm), oxidizing agents such as free residual chlorine (>5 ppm) and secondary amines should be avoided. It is also recommended that BIOBAN™ BP-PLUS Preservative not be subjected to temperatures greater than 40°C/104°F in order to avoid its decomposition. For formulations that will be repeatedly exposed to microbial challenges during storage and use (user opening and closing product container) the optimum pH range of use is below 8; however, products that are greater than pH 8 can still be preserved with BIOBAN™ BP-PLUS Preservative. Testing should be performed to confirm that BIOBAN™ BP-PLUS Preservative meets the preservation requirements outlined for the product.

BIOBAN™ BP-PLUS Preservative 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 are often more cost effective. Multiple biocide combinations help prevent the establishment of populations of organisms resistant to a single biocide. BIOBAN™ BP-PLUS Preservative can be used 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-PLUS Preservative.

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-PLUS Preservative demonstrates excellent efficacy against *Pseudomonas*, a weakness of isothiazolinone chemistry.
- BIOBAN™ BP-PLUS Preservative is more effective in the presence of reducing agents as compared to isothiazolinones. In addition, BIOBAN™ BP-PLUS Preservative can improve the stability of CMIT/MIT in the presence of reducing agents.

Applications	Purpose	Suggested Concentrations of BIOBAN™ BP-PLUS Preservative	How to Apply
Pulp and Paper	To control slime-forming bacteria in process water and bulk pulp.	10-250 ppm of BIOBAN™ BP-PLUS preservative for process water. 50-250 ppm of BIOBAN™ BP-PLUS Preservative for bulk pulp.	Add to the hydropulper, machine chest or stock chest.
Water Treatment	To control slime-forming bacteria in recirculating water cooling towers, evaporative condensers, industrial process water, and air scrubber, air conditioner and humidifier systems.	25-100 ppm of BIOBAN™ BP-PLUS Preservative.	Add directly into the sump or basin at any point where there is adequate agitation to ensure dissolution.
Absorbent Clays, Corn Cobs, & Ground Wood	To inhibit the growth of odor-causing bacteria.	25-200 ppm of BIOBAN™ BP-PLUS Preservative.	Impregnate directly into clay, cob, or wood in a prepared solution.
Adhesives	For preservation of water-based adhesives including dextrin, clay and polyvinyl acetate containing systems.	100-5000 ppm of BIOBAN™ BP-PLUS Preservative.	Add to the final formulation.
Starch and Pigment Slurries	To control bacteria in aqueous starch suspensions and pigment slurries.	100-500 ppm of BIOBAN™ BP-PLUS Preservative.	Add close to the end of the manufacturing process.
Paints, Latex and Antifoam Emulsions	For in-can preservation and to prevent bacterial spoilage during storage of latex emulsion concentrates and latex emulsion-based paints. Also, for the preservation of silicone and other antifoam emulsion systems.	100-500 ppm of BIOBAN™ BP-PLUS Preservative.	Add as a final step before packing into bulk or sales packs.
Inks and Fountain Solutions	To inhibit bacterial growth during the storage and use of water-based printing inks and fountain solutions.	For in-can applications dose 100 500 ppm of BIOBAN™ BP-PLUS Preservative. In fountain reservoir applications use 25-100 ppm of BIOBAN™ BP-PLUS Preservative.	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	To control aerobic and anaerobic bacteria in oil and gas-related production.	25-200 ppm of BIOBAN™ BP-PLUS Preservative in oil flooding/ injection water, enhanced oil recovery fluids, produced water, drilling fluids, workover fluids and completion fluids, well squeeze and fracturing fluids.	Add at any convenient point, in the process.
Oil and Gas Transportation and Storage	For protection against bacterial growth and microbial-induced corrosion in pipelines and water bottoms in tanks.	25-200 ppm of BIOBAN™ BP-PLUS Preservative for pipeline maintenance. 50-100 ppm in water bottoms of tanks.	Add directly to the water phase.
Raw Materials	To control bacteria in raw materials.	100-500 ppm BIOBAN™ BP-PLUS Preservative based on the final formulation volume.	May be added at any time, but ideally as a final step.
Surfactants	To control bacteria in industrial surfactants.	100-500 ppm BIOBAN™ BP-PLUS Preservative based on the final formulation volume.	May be added at any time, but ideally as a final step.
Consumer, Household and Institutional	To control bacteria in consumer, household and institutional products.	100-500 ppm BIOBAN™ BP-PLUS Preservative based on the final formulation volume.	May be added at any time, but ideally as a final step.
Agricultural Pesticide Concentrates	To control bacteria in water-based agricultural pesticide concentrates.	100-500 ppm BIOBAN™ BP-PLUS Preservative based on the final formulation volume.	May be added at any time, but ideally as a final step.
Chemical Toilets Deodorants	To control odor causing bacteria in chemical toilet application.	100-500 ppm of BIOBAN™ BP-PLUS Preservative.	Incorporate into the deodorant concentrate.

Uses

BIOBAN™ BP-PLUS Preservative may be used in the following end-use applications.

Pulp and Paper
BIOBAN™ BP-PLUS Preservative may be used for the control of slime-forming bacteria in paper mill process water and bulk pulp. It can be added into the hydropulper, machine chest or stock check. The correct dose of active ingredient for these applications is 10-250 ppm BIOBAN™ BP-PLUS Preservative in paper mill process water and 50-250 ppm BIOBAN™ BP-PLUS Preservative in bulk pulp.

Water Treatment
BIOBAN™ BP-PLUS Preservative may be used to control slime-forming bacteria in recirculating water cooling towers, evaporative condensers, industrial process water, and air scrubber, air conditioner and humidifier systems. BIOBAN™ BP-PLUS Preservative may be dosed directly into the sump or basin at any point where there is adequate agitation to ensure dissolution. The correct dose range of active ingredient is 25-100 ppm BIOBAN™ BP-PLUS Preservative.

Absorbent Clays, Corn Cobs and Ground Wood
BIOBAN™ BP-PLUS Preservative may be used in absorbent clays, corn cobs and ground wood to inhibit the growth of odor-causing bacteria. The suggested application rate of BIOBAN™ BP-PLUS Preservative in clay, corn cob, and ground wood applications, is 25-200 ppm impregnated on the materials generally in a prepared solution.

Adhesives
BIOBAN™ BP-PLUS Preservative is effective and compatible in most water-based adhesive formulations including dextrin, clay and polyvinyl acetate containing systems. A typical treatment level of 100-5000 ppm is recommended.

Starch and Pigment Slurries
BIOBAN™ BP-PLUS Preservative is useful for the control of bacterial growth in aqueous system such as starch suspensions and pigment slurries. Add BIOBAN™ BP-PLUS Preservative at, or close to, the end of the manufacturing process, either as a solid or pre-dispersed in a quantity of the process water. BIOBAN™ BP-PLUS Preservative should be dosed at 100-500 ppm.

Paints, Latex, and Antifoam Emulsion Systems
BIOBAN™ BP-PLUS Preservative provides in-can preservation and prevents bacterial spoilage during shelf-life storage of styrene-acrylic, polyvinyl acetate and other latex emulsion concentrates and latex emulsion based paints. It is also effective for the preservation of silicone and other antifoam emulsion systems. BIOBAN™ BP-PLUS Preservative can be added at any convenient point during the manufacturing process. Ideally, it should be added as a final step just prior to packing the product into bulk or sales packs. BIOBAN™ BP-PLUS Preservative should be dosed at 100-500 ppm.

Water-Based Printing Inks and Fountain Solutions
BIOBAN™ BP-PLUS Preservative can inhibit the growth of spoilage bacteria during the storage and use of water-based printing inks and fountain solutions. For in-can preservation of inks, BIOBAN™ BP-PLUS Preservative should be added as a final step and should be dosed at 100-500 ppm. To control bacterial spoilage during the use of fountain solutions, BIOBAN™ BP-PLUS Preservative should be shock dosed at a suitable point in the fountain reservoir where there is adequate flow or agitation to insure quick dissolution. BIOBAN™ BP-PLUS Preservative may be shock dosed once or twice weekly as a normal routine. Where conditions indicate, more frequent shock dosing may be required. In fountain solutions, BIOBAN™ BP-PLUS Preservative should be shock dosed at 25-100 ppm.

Oil Production
BIOBAN™ BP-PLUS Preservative may be used to control aerobic and anaerobic bacteria, especially sulfate-reducing bacteria, in oil and gas-related production. BIOBAN™ BP-PLUS Preservative may be dosed at any convenient point in the process. The dose rate for oil flooding/injection waters, enhanced oil recovery fluids, produced water, drilling fluids, fracturing fluids and workover and completion fluids is 50-100 ppm BIOBAN™ BP-PLUS Preservative. The dose rate of active ingredient for well squeeze fluids and fracturing fluids is 25-200 ppm.

Oil and Gas Transportation and Storage
BIOBAN™ BP-PLUS Preservative may be used to control aerobic and anaerobic bacteria that contribute to corrosion in pipeline maintenance and water bottoms in oil or transportation tanks. The dose range for water bottom in oil or transportation tanks is 50-100 ppm in the aqueous phase. For pipeline maintenance the dose range is 25-200 ppm.

Additional Applications
Contact your DuPont Technical Representative for more information.

Storage and Handling

At normal use rates BIOBAN™ BP-PLUS Preservative is compatible with a wide range of metals. However, the solid or its concentrated solutions can be corrosive to some metals if left in contact for prolonged periods. Care must be taken, therefore, to wipe up and/or wash down all spills where these may lead to prolonged contact with metals.

Store the product in its original container, tightly closed in a safe place away from foodstuffs. Wash out the empty container thoroughly and dispose of safely.

Minor spillages may be flushed away with plenty of water. Major spillages must be treated with a suitable absorbent carrier which may then be swept up and contained for disposal in accordance with local requirements.

Shipping and Packaging

BIOBAN™ BP-PLUS Preservative is classified as a Class 4.1 hazardous material in the U.S. Department of Transportation regulations and in the international regulations for air and open transport.

Product Stewardship

When considering the use of any DuPont product in a particular application, review the latest Safety Data Sheet (SDS) and country-specific product label to ensure the intended use is within the scope of approved uses. DuPont 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 DuPont products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

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

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