



COST-EFFECTIVE,
HIGHLY-EFFICIENT

Biocide Performance for Smaller System Cooling Towers

SUMP BUDDY™
Antimicrobial Time-Release Tablets



SUMP BUDDY WT ANTIMICROBIAL TIME-RELEASE TABLETS



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Effective, Environmentally Sound Solutions to Biocide Treatments

SUMP BUDDY* WT Antimicrobial Time-Release¹ tablets make microbial control in smaller cooling towers easier and more reliable than ever. The active ingredient in this product is 2,2-dibromo-3-nitrilopropionamide (DBNPA), a biocide used for many years in larger recirculating and once-through cooling towers.

This antimicrobial comes in a 200-gram cylindrical tablet containing 40% active DBNPA. The SUMP BUDDY WT Time-Release tablet releases DBNPA into water by dissolving at a controlled rate over a three-week period. This makes DBNPA practical for smaller systems. SUMP BUDDY WT Time-Release tablets actually yield antimicrobial performance and handling properties far superior to the liquid form of DBNPA used in larger systems.

*Trademark of The Dow Chemical Company.
¹EPA registration No. 464-624

Reliability and Performance for Smaller Systems

SUMP BUDDY WT Time-Release tablets provide great performance formerly impractical in smaller systems

DBNPA combines quick kill with rapid degradation. In larger systems using the right metering equipment, these two properties make it easy to achieve forceful microbial control while meeting strict discharge regulations.

But if you are trying to set up and manage treatment programs for dozens of small towers at different locations, safe manual handling of biocides can be a costly obstacle. Obviously, the preferred route to microbial control would involve as little contact with biocides as possible.

Simple, continuous delivery

SUMP BUDDY WT Time-Release tablets incorporate solid DBNPA in a water-soluble matrix that releases the biocide by dissolving at a controlled rate. When suspended in its bag, each tablet takes about three weeks to dissolve. Dissolution is a reliable, continuous process that automatically maintains an effective biocide level.

No system modifications, no pump concerns

Unlike other solid-form biocide products, SUMP BUDDY WT Time-Release tablets don't require the costly addition of sidestream flow or bypass feed systems. The tablets release biocide continuously without the need for high-velocity water overflow.

Also, the elegant simplicity of SUMP BUDDY WT Time-Release tablets offers assured biocide delivery. There are no pumps or other complex mechanical equipment to monitor and maintain.

Dramatically reduce handling hazards

SUMP BUDDY WT Time-Release tablets are solid and won't dust like free-flowing powders. They also won't splash, spill or leak like liquids. Plus, the controlled-release form only requires handling once every three weeks. In the event of a spill, the solid product form makes cleanup much easier and less hazardous than with liquids or powders. As an added safety feature, each tablet comes wrapped in a protective, water-soluble film. The polyvinyl alcohol film dissolves in water in approximately five

minutes. Although goggles and gloves should be worn while handling SUMP BUDDY WT Time-Release tablets, these safety features significantly reduce handling hazards associated with liquids and powders.

Convenience and economy that can increase profit

Because SUMP BUDDY WT Time-Release tablets last approximately three weeks, treatment and monitoring times are greatly reduced. Once a dosage level is established, there is little chance of overdosing the system and wasting biocide. Simply place the correct number of tablets in the bag once every three weeks.

SUMP BUDDY WT Time-Release tablets come packaged 25 tablets per container – enough to treat a typical 1,000 gallon (3,790 liter) system for one year. The container can easily be transported by hand to virtually any location. No drum handling, measuring or metering equipment are necessary.



Compatible with most treatment programs at any pH

DBNPA, the active ingredient in SUMP BUDDY WT Time-Release tablets, is compatible with other treatment chemicals. It won't react with charged substances like many common scale inhibitors, dispersants, or corrosion inhibitors.

It's easy to maintain reliable microbial control in systems running at acidic, neutral or alkaline pH

when using SUMP BUDDY WT Time-Release tablets. Even in non-pH-controlled towers operating between pH 8 and 9, you can count on dependable performance.

The best environmental profile available

In aqueous environments, DBNPA, the active ingredient in SUMP BUDDY WT Time-Release tablets, degrades quickly. At neutral pH, its half-life is approximately nine hours. The continuous release of biocide

from the tablet maintains effective control in the tower, while the biocide in the blowdown discharge quickly degrades – making it easy to meet strict environmental regulations regarding tower discharge.

Superior performance compared to liquid DBNPA biocides

While adding convenience and minimizing handling problems, SUMP BUDDY WT Time-Release tablets perform much better than intermittent, slug-dose treatment with liquid DBNPA.

Lab testing shows DBNPA is actually a very effective biocide, even at levels below 1 ppm, as long as a continuous level of the biocide is maintained. SUMP BUDDY WT Time-Release tablets are formulated to do just that. Each tablet maintains active DBNPA levels in 500-1,000 gallons (1,895-3,790 liters) of water – even at pH 9. The full-scale system trials described on the next page demonstrate the effectiveness of this approach in a typical small system.

Test Results Prove High Performance

In cooling tower tests, the continuous-release delivery of SUMP BUDDY WT Time-Release tablets performed 10 times better than liquid DBNPA, while using less biocides.

Trials conducted using SUMP BUDDY WT Time-Release tablets in a typical 1,500 gallon tower

Three trials were conducted in a 1,500 gallon (5,678 liter) system. Operating flow rate was 750 gpm, with a variable percent of total flow going over the tower. The tower typically operated at eight cycles of concentration, with make-up water added at 2,500-4,500 gpd. Temperature drop across the tower averaged 10°F (-12°C). System pH was 8.8; hardness averaged 800 ppm.

Comparing intermittent and continuous treatment

First, a reference trial was conducted with intermittent liquid DBNPA treatment. Two trials with SUMP BUDDY WT Time-Release tablets followed, and are briefly described here.

DBNPA liquid trial

Liquid DBNPA treatment consisted of 3 ppm slug-doses of active biocide administered once daily for 29 days (May 6th through June 3rd).

Tablet trial #1

Three SUMP BUDDY WT Time-Release tablets were used to maintain a continuous 30 ppb level of active biocide for an 11-day period (August 12th through August 22nd).

Tablet trial #2

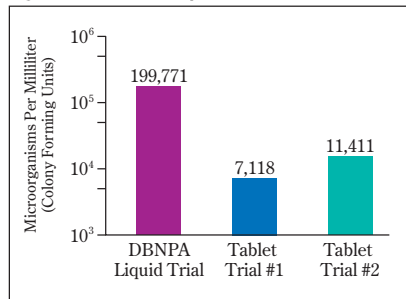
Three SUMP BUDDY WT Time-Release tablets were used to maintain a continuous 30 ppb level of active biocide for a 27-day period (September 3rd through September 29th).

In all three trials, water samples were taken daily and serially diluted. Triplicate inoculations of these samples were plated and incubated for a total of 72 hours. Plate counts were made at 24, 48 and 72 hours. Plate counts read at 24 hours were considered indicative of biocide performance against fast-growing microorganisms. The 48-hour and 72-hour plate counts were considered representative of the combined fast-growing and slow-growing microorganisms.

The results are clear

As shown in Figures 1, 2 and 3, SUMP BUDDY WT Time-Release tablets provided performance far superior to intermittent DBNPA treatment against both fast-growing and slower-growing microorganisms. In general, treatment with the tablet product kept microbial populations a full order of magnitude lower than liquid DBNPA treatment. Most importantly, SUMP BUDDY WT Time-Release tablets performed best against the fastest growing organisms – those most likely to cause problems in operating systems.

Figure 1 – 24-hour plate counts†



Tests show effectiveness against algae

In the laboratory, SUMP BUDDY WT Time-Release tablets were also evaluated against *Selenastrum capricornutum*, a common green algae.

Four 29-gallon aquariums were treated with the equivalent of zero, one, two or five tablets of SUMP BUDDY WT Time-Release tablets per 500 gallons (1,895 liters) of water. The water was treated with various salts and nutrients to simulate cooling tower water and provide a good medium for algae growth. Each aquarium was dosed with 250 ml of

a five-day culture of *Selenastrum* prior to the addition of the tablets. Visual observations were made daily to determine algae growth.

Table 1 shows results obtained for these tests at the end of the second week.

Table 1 – Performance of SUMP BUDDY WT Time-Release tablets against *Selenastrum capricornutum* algae

0 Tablets/500 Gallons (Control)	+++
1 Tablets/500 Gallons	+
2 Tablets/500 Gallons	-
5 Tablets/500 Gallons	-

+++ = Significant Growth
 + = Moderate Growth
 - = No Growth

Figure 2 – 48-hour plate counts†

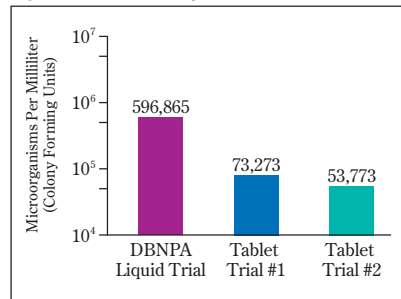
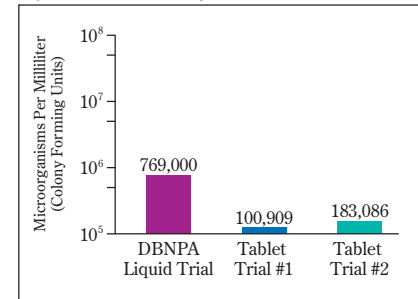


Figure 3 – 72-hour plate counts†



†Average microbial population in 1,500-gallon system during three trials.

Determining Dosage Levels

The continuous-release form of SUMP BUDDY WT Time-Release tablets greatly simplifies dosage calculations, biocide handling, and system monitoring. Although not all-inclusive, the guidelines presented here provide an overview of these procedures.

Rule of thumb: one tablet per 500-1,000 gallons

In most small-to-medium sized systems using 500-1,000 gallons (1,895-3,790 liters) of water, one SUMP BUDDY WT Time-Release tablet will provide sufficient active biocide on a continuous basis for three weeks.

This rule of thumb takes into account average water turnover rates, as well as the continuous degradation of the active DBNPA ingredient during residence in systems.

Labeling for this product permits use rates as high as two tablets per 500 gallons if conditions in the tower require more biocide.

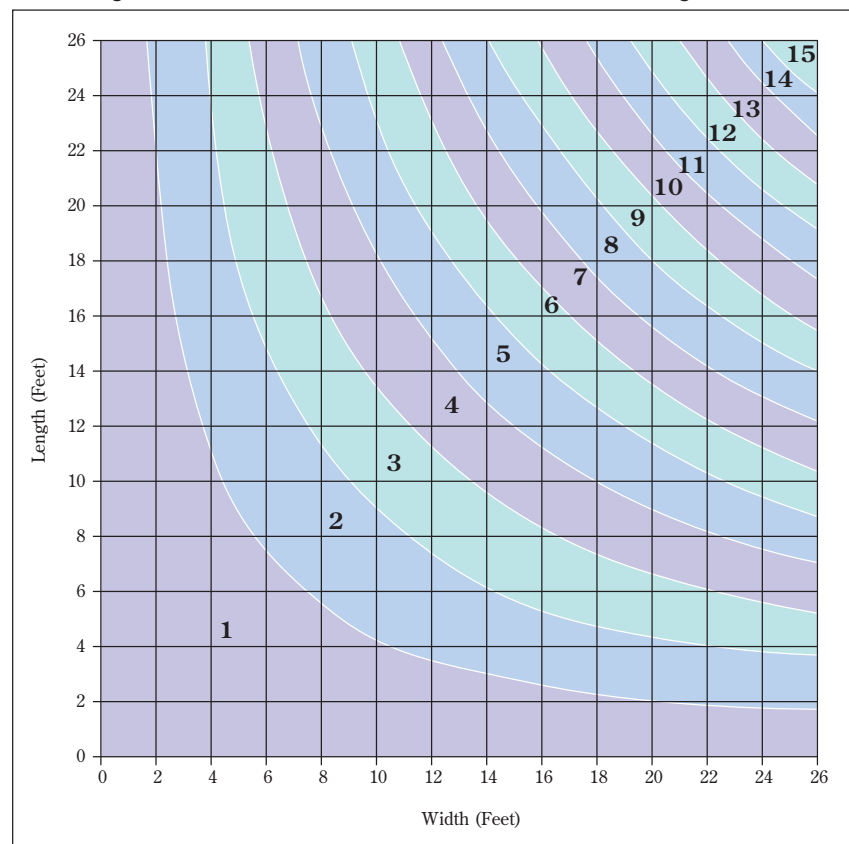
Estimating system volume

When the volume of a system is unknown, you can approximate it from the area of the tower basin. The following formula assumes that water in the tower base is one foot deep, and that one-third of the total system volume lies outside the basin.

Gallons in system = square feet of water in basin x 11.

Figure 4 is based on this formula and provides a quick way of determining the tablet dosage for a system by simply measuring the length and width of the basin.

Figure 4 – Suggested number of SUMP BUDDY WT Time-Release tablets for treatment of a cooling tower with one foot of water in a basin with the following dimensions.¹



¹Note: If the water depth is more or less than one foot, the number of tablets should be adjusted proportionately.

Example: If the tower is 14 feet long and eight feet wide, use three tablets every three weeks.

Tablet placement precautions

Use the bag provided, or a similar receptacle made of nylon or plastic. Suspend this in the tower basin in a manner that avoids direct contact with basin sidewalls or floor. Note that DBNPA at-use concentrations do NOT contribute appreciably to the corrosivity of tower water.

- Avoid incomplete immersion
- Do not allow contact with basin walls or floor
- Avoid areas of high velocity water flow
- Avoid sunlight

Monitoring tablets in use

SUMP BUDDY WT Time-Release tablets release active DBNPA by gradual dissolution and erosion of the outer tablet surface. The outer dissolving layer remains thin; DBNPA in the core remains dry.

During the first few days in a system, the appearance of a tablet will not change dramatically. Within one week, the sharp edges will lose definition, then round off and appear translucent. This marshmallow-like

appearance will then remain essentially the same and the tablet will decrease in size until completely dissolved. During initial location trials, monitor tablet dissolution to verify that it follows the typical three-week schedule.

Dissolution rates vary with water flow rates

Figure 5 shows average tablet dissolution profiles obtained in a study that modeled water flow rates bracketing the range typical of bypass feeders. Two tablets were studied at each flow rate and the results were averaged.

The data indicate initial weight gains as the tablets hydrated, followed

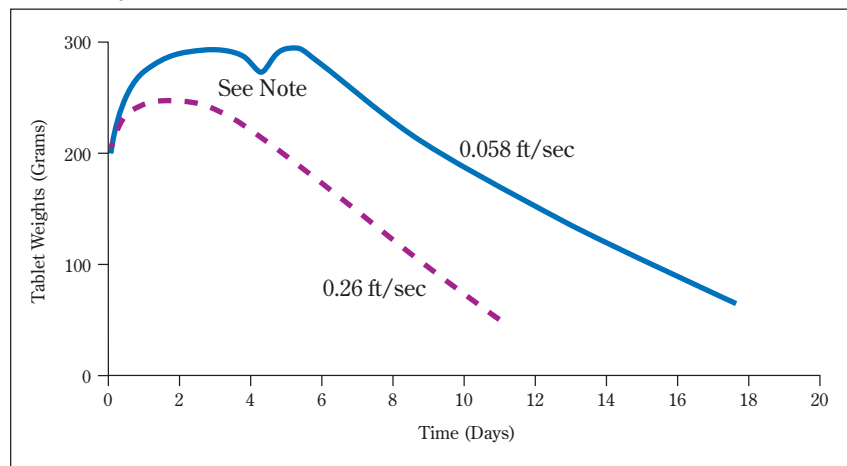
by uniform dissolution. The expected tablet lifetime was calculated at 21 days at a flow rate of 0.058 ft/sec, and 13 days at 0.26 ft/sec.

Compatibility cautions

Previous tests have shown that DBNPA, the active ingredient in SUMP BUDDY WT Time-Release tablets, is compatible with cooling tower water and various components of most water treatment programs.

However, mercaptobenzothiazoles and their sodium salts will rapidly degrade DBNPA, as will strong reducing agents such as oxygen scavengers or hydrogen sulfide.

Figure 5 – Average tablet dissolution profiles at two water flow rates (Water temperature: $31 \pm 2^\circ\text{C}$ [$89 \pm 5.7^\circ\text{F}$])



Note: in the study at 0.058 ft/sec, the experiment was shut down for a weekend; the tablets were allowed to dry and lost weight. The tablets quickly rehydrated when the experiment was restarted. Note that this upset had very little effect on dissolution rate.

Safe Handling Guidelines

The active ingredient in SUMP BUDDY WT Time-Release tablets, DBNPA, is potentially damaging to the eyes and prolonged contact can cause a chemical burn to the skin. Although the tablets are packaged to help reduce direct contact, wear goggles and gloves when handling the product.

When transporting SUMP BUDDY WT Time-Release tablets, they should remain sealed in their original plastic container.

Leave the polyvinyl alcohol film wrapper on the tablets when handling. The film is water soluble, and will dissolve approximately five minutes after the tablet is placed in water.

Loading and placing the bag

When adding tablets to the bag, slowly lift the bag from the water, allowing the water to drain without dripping or splashing. Leave the polyvinyl alcohol film wrappers on the tablets when placing them into the bag. Then, gently lower the bag into the water.

The bag must be placed where the water depth is great enough to assure full immersion, and allow free and complete water circulation

around the tablets. A good approach is to suspend the bag from a horizontal brace or bar that is readily accessible, yet clear of surrounding objects.

Do not allow the bag to rest on the floor or against the walls of the tower basin, as this may restrict water circulation around the tablets or cause corrosion.

To avoid accelerated tablet erosion, keep the bag out of high velocity areas. Because the active biocide is photodegradable, be sure the bag is kept out of sunlight.

Avoid contact with metal surfaces

Studies have shown that DBNPA, when present in concentrated form, is corrosive to most metals. These include common construction materials used for cooling towers such as aluminum and mild steel, as well as some metals generally more resistant to corrosion, such as stainless steel.

The surface of a dissolving SUMP BUDDY WT Time-Release tablet may contain a relatively high concentration of DBNPA. For this reason, we recommend that these tablets not be placed in direct contact with metal surfaces.



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For more information about
SUMP BUDDY WT Antimicrobial Time-Release tablets, call:

In the United States and Canada:
1-800-447-4369; Fax 1-517-832-1465

In Europe:
++31-20-691-6268; Fax: +31-20-691-6418

In Asia-Pacific:
+852-2879-7260; Fax: +852-2827-5881

In Other Global Areas:
1-517-832-1556; Fax: 1-517-832-1465

The Dow Chemical Company, Midland, Michigan 48674

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