

# Bardac<sup>®</sup> LF 18-50 WT

## The Cost Effective Solution for Outstanding Algae Control



## Description

Bardac® LF 18-50 WT prevents algae growth at low concentrations and regains control of systems where algae have become established. Bardac® LF 18-50 WT is EPA registered for use in both recirculating cooling water systems and decorative fountains.

Algae growth can be difficult to control cost effectively when using oxidizing biocides alone. At typical cooling water treatment concentrations, active bromine and chlorine levels that are sufficient to control bacteria are generally not effective at controlling algae. Bardac® LF 18-50 WT is a unique quaternary-based algaecide with two very important differences from traditional alkyl dimethyl benzyl ammonium chloride (ADBAC) and polymeric quaternaries (quats). Traditional and polymeric quat-based algaecides are known to be incompatible with anionic scale and corrosion inhibitors. However, Bardac® LF 18-50 WT can be applied with confidence to water systems that use these compounds. Because of its unique chemical structure, Bardac® LF 18-50 WT demonstrates minimal interaction with anionic treatment chemicals while retaining the outstanding algaecidal performance of traditional ADBAC quats. In addition, compared to ADBAC quats, Bardac® LF 18-50 WT is low foaming. The use of ADBAC algaecides is often limited because of the problems associated with the high foam levels that they can create. Bardac® LF 18-50 WT exhibits low levels of fast breaking foam, which allows for application in dynamic systems with high recirculation rates.

## Product Benefits

- Outstanding Algae Control at Low Cost
- Compatible with Anionics
- Broad Spectrum Efficacy
- Low Foam
- Easy to Use

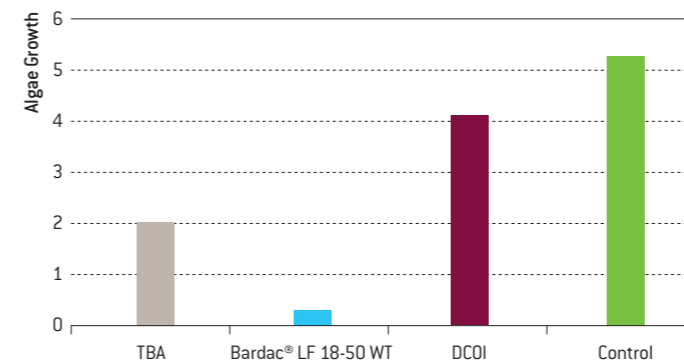
## Outstanding Algae Control at Low Cost

Preventing or eliminating algae growth at cost effective treatment levels is critical to achieve sustainable, economic treatment of water systems. Bardac® LF 18-50 WT provides excellent performance at low dosage levels and offers outstanding cost performance compared with other specialty algaecides. Laboratory tests on two common strains of algae found in cooling systems (*C. pyrenoidosa* and *S. obliquus*) demonstrate Bardac® LF 18-50 WT cost performance advantages over two competitive specialty algaecides.

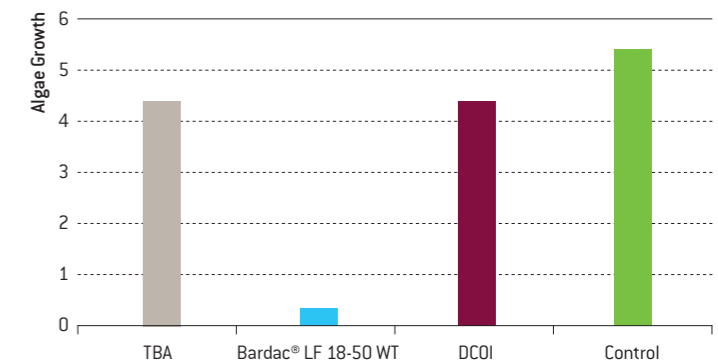
### Cooling Water Algaecides

	Terbutylazine (TBA)	Dichloro-n-octyl-isothiazoline (DCOI)	Quaternary ammonium compounds			
			Bardac® LF 18-50 WT	Bellacide® 350	Polyquat	ADBAC
Activity	4.00%	4.25%	50%	50%	60%	50%
Water soluble	No	Yes	Yes	Yes	Yes	Yes
Not dermal sensitizer	Yes	No	Yes	Yes	Yes	Yes
Anionic Compatible	Yes	Yes	Yes	No	No	No

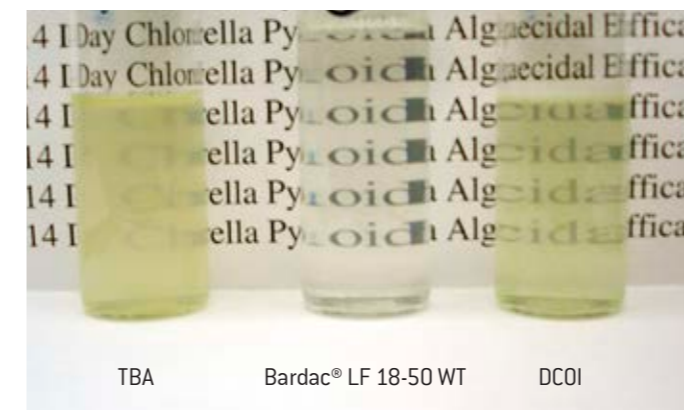
### Chlorella Pyrenoidosa Performance Comparison



### Scenedesmus Obliquus Performance Comparison



Comparative algaecidal efficacy testing was conducted at equivalent cost dosages comparing 13 ppm of 50% active Bardac® LF 18-50 WT, 25 ppm of 4.47% active Terbutylazine (TBA) and 12 ppm of 4.25% active Dichloro-n-octyl-isothiazoline (DCOI). Results were scored on a 0 to 5 scale with 0 = No Growth and 5 = Heavy Growth. Day 14 results are presented for both algae types.



### General Algistatic and Algicidal Performance

Bardac® LF 18-50 WT is algistatic and algicidal at low concentrations. Determinations were performed using the Fitzgerald Method (Applied Microbiology, Vol. 7; 1959, pp 205-211). This procedure calls for incubation for 28 days (@ 23°C) under continuous light.

Test Organism	ppm active Bardac® LF 18-50 WT	
	Stasis	Kill
Chlorella pyrenoidosa #2005 #2005 (Wisconsin Strain)	0.5	1.0
Phormidium inundatum #1093 (Black Algae)	0.5	1.25

### Label Use Levels (ppm as products) – As an Algicide

Bardac® LF 18-50 WT and the lower concentration product, Bardac® LF 18 – 10 WT, can be applied across a broad range of dosages to optimize cost performance for each individual water system.

	Bardac® LF 18-50 WT	Bardac® LF 18-10 WT
<b>Recirculating Cooling Towers</b>		
Initial Dosage	10 – 120 ppm	50 – 600 ppm
Maintenance Dosage	10 – 40 ppm	50 – 200 ppm
<b>Decorative Fountains</b>		
Initial Dosage	10 – 120 ppm	50 – 600 ppm
Maintenance Dosage	10 – 40 ppm	50 – 200 ppm

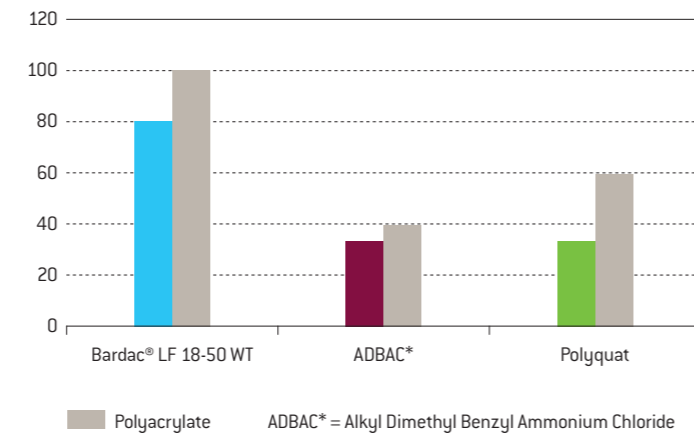
## Compatible with Anionics

Bardac® LF 18-50 WT is compatible with typical anionic corrosion and scale control treatment chemicals, such as polyacrylates and phosphonates. This compatibility allows for the cost-effective control of algae without increasing the stress on corrosion and scale inhibition treatment programs. Using a recirculating water test apparatus, 15 ppm active of each quaternary was added along with 10 ppm of a tagged sulfonated polyacrylate to a simple synthetic cooling water. After 15 minutes, both the quaternary and polyacrylate levels were measured and expressed as a percent residual. Only Bardac® LF 18-50 WT showed complete recovery of polyacrylate and at least 75% recovery of algicide.

### Test Conditions

- Quaternary (15 ppm active)
- Acrylate = 10 ppm active Optidose® 2000
- Total Hardness 600 ppm as CaCO<sub>3</sub>
- Total Alkalinity 200 ppm as CaCO<sub>3</sub>
- Temperature = 22°C
- pH = 9.0
- Flow rate 1.5 GPM (~4 cycles/min)
- 15 minute test (60 cycles)

### Scale Dispersant Compatibility (% residual)



### Scale Dispersant Performance

A separate test was performed to demonstrate that, in addition to being chemically compatible with polyacrylate scale dispersants, Bardac® LF 18-50 WT does not impact the performance of anionic scale inhibitors. Utilizing a dynamic recirculating apparatus similar to the scale dispersant compatibility test, 30 ppm of active quaternary from Bardac® LF 18-50 WT and an industry standard ADBAC quat were separately added to 10 ppm of a polyacrylate scale dispersant under the “stressed” conditions described as follows.

After recirculating in the system for 60 minutes, the treated waters were allowed to stand for 1 week at 50°C. The water samples were then filtered to remove precipitated scale and re-analyzed to measure soluble hardness ion recovery. The water sample treated with Bardac LF 18 and polyacrylate retained the same level of residual total hardness as the water sample treated with polyacrylate alone. The antiscalant performance of the polyacrylate treatment was not reduced or negatively impacted by the addition of Bardac® LF 18-50 WT.

### Dynamic Scale Inhibition: Test Conditions

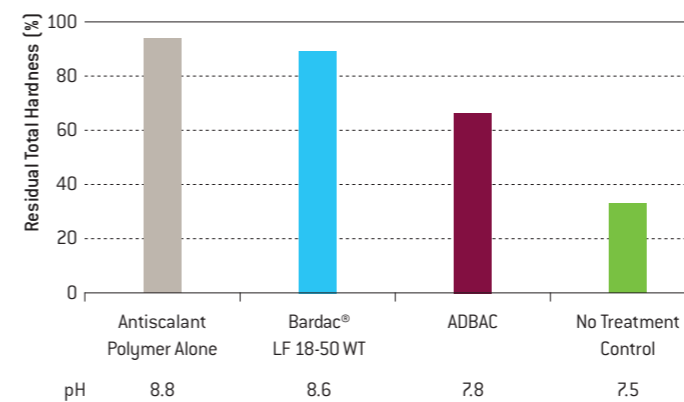
#### Step 1: Foam Stress Test in Synthetic Cooling Water

- Quaternary (30 ppm active)
- Total Hardness 600 ppm as CaCO<sub>3</sub>
- Total Alkalinity 200 ppm as CaCO<sub>3</sub>
- T= 22°C
- pH= 9.0
- Flow rate 1.5 GPM (~4 cycles/min)
- 60 minute (~240 cycles)

#### Step 2: Hardness Stress Test

- T= 50°C
- Filter size = 0.2 µm
- 1 week
- RSI = 3.5
- LSI = +2.6

### Dynamic Scale Inhibition: Results



## Broad Spectrum Efficacy

In addition to its use as an algicide, Bardac® LF 18-50 WT has the flexibility to be employed as a general microbiocide. It controls bacterial slimes found in industrial and commercial recirculating cooling systems and decorative fountains. Because of its surfactancy properties Bardac® LF 18-50 WT also aids in cleaning and loosening of slime deposits from surfaces.

Test Organism	Minimum Inhibitory Concentration (ppm active Bardac® LF 18-50 WT)
Staphylococcus aureus <sup>1</sup>	2.0
Escherichia coli <sup>1</sup>	40.0
Pseudomonas fluorescens <sup>2</sup>	17.5
Bacillus cereus <sup>2</sup>	7.5
Desulfuivibrio desulfuricans <sup>2</sup>	17.5

<sup>1</sup> Broth Dilution Test, 18 hour immersion @ 37°C)

<sup>2</sup> API-38 Test Procedure, 30°C incubation for 96 hours for Bacillus cereus and Pseudomonas fluorescens and 30 days for Desulfuivibrio desulfuricans.

## Low Foam

Because Bardac® LF 18-50 WT is low foaming, common problems associated with other algicides, such as heavy, stable foam, are avoided. Thus, the potential to cavitate recirculation pumps, create persistent, localized foam that impairs system operation, and produce the drift of foam to sensitive surfaces is minimized.

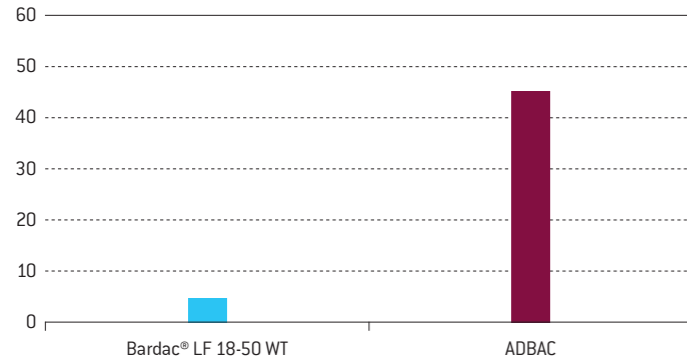
### Foam Generation

Using a recirculating water test apparatus, 30 ppm active of each quaternary was added to a synthetic cooling water solution. After 15 minutes, equilibrium foam levels were measured. Bardac® LF 18-50 WT produced a foam level below 3 centimeters compared to 45 centimeters for the ADBAC algicide.

### Test Conditions

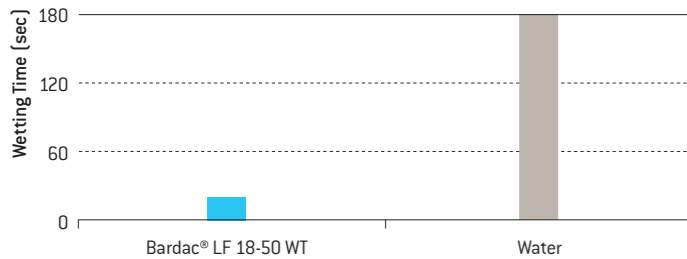
- Quaternary (30 ppm active)
- Total Hardness 280 ppm as CaCO<sub>3</sub>
- Total Alkalinity 164 ppm as CaCO<sub>3</sub>
- T= 22°C
- pH= 7.3
- Flow rate 1.5 GPM (~4 cycles/min)
- 15 minute test run

### Foam Generation (cm @ 30 ppm Active)



In addition to its surface active behavior as it relates to low foam, Bardac® LF 18-50 WT is also an excellent wetting agent. This surface wetting performance is demonstrated in the Draves Wetting Test results shown below.

### Bardac® LF 18-50 WT – Draves Wetting Results



## Easy to Use

Bardac® LF 18 requires no special feeders or addition techniques. It is available as a 50% end use concentration for medium to large systems, and as a 10% end use concentration for better control in small systems.

#### The products are named:

- Bardac® LF 18-50 WT
- Bardac® LF 18-10 WT

Both products are 100% water miscible, low viscosity liquids, which are pumpable over a broad temperature range using standard metering pumps.

## Product Composition and Typical Properties

	Bardac® LF 18-50 WT	Bardac® LF 18-10 WT
EPA Registration Number	6836-60	6836-61
<b>Active Ingredients</b>		
Diocetyl dimethyl ammonium chloride % CAS No. 5538-94-3	50	10
<b>Inert Ingredients</b>		
Water %	44	89
Glycerin %	6	1
<b>Typical Properties</b>		
Appearance	Clear to yellow	
pH (10% solution)	6.5 – 9.0	
Flash Point (Setaflash °F)	> 200	
Color (APHA)	50 to 150	
Specific Gravity @ 25°C	0.96	0.99
Density (lbs./gallon)	8.0	8.3
Viscosity cps @ 25°C	30	7.5
Viscosity cps @ -5°C	105	12.5
Freeze Point °C	-12	-8
Solubility	soluble in all proportions in water, lower alcohols and glycols	

## Field Monitoring Method

Bardac® LF 18-50 WT does not interact with anionic compounds like traditional quaternary algecides. Therefore, Bardac® LF 18-50 WT can not be accurately measured using standard quaternary analytical methods. A method using cetyl trimethyl ammonium bromide (CTAB) as a titrant must be used. Hach Method 8337 or equivalent is recommended for measuring Bardac® LF 18-50 WT under both field and laboratory conditions. To convert from ppm CTAB to ppm Bardac® LF 18-50 WT when using Hach Method 8337, multiply the CTAB reading by 0.86 to correct for differences in molecular weight.

## Environmental Fate and Biodegradability

The environmental fate of Bardac® LF 18-50 WT is significantly affected by its surroundings. Quaternary algaecides, such as Bardac® LF 18-50 WT, have a strong tendency to adsorb onto dissolved and suspended organic solids such as algae and bacteria, adhere to cooling tower surfaces and complex with strongly anionic compounds. This tendency, along with its low dosage requirements and the high dilution of blowdown streams into waste water treatment systems, has the effect of reducing any residual concentration of Bardac® LF 18 that may be discharged from the treated system. In addition, published studies have concluded that quaternary algaecides are readily and ultimately biodegradable. Please refer to the Bardac® LF 18-50 WT MSDS for specific details.

## Product Safety and Handling

Please refer to the product MSDS for safety and handling procedures and guidelines.

## Bardac® LF 18-50 WT Global Registrations

Country	Database	Comments
USA	TSCA EPA	Listed on database Registered by EPA and in 48 states and in the District of Columbia
European Union	EINECS BPD	Listed on database Not supported for sale as a registered pesticide.
Canada	DSL NDSL PMRA	Listed on database Not listed Not supported for sale as a registered pesticide.
Mexico	CICOPLAFEST	Allowed for sale by Lonza Inc. No registration currently required. The customer may have to register final formulation if it contains other actives.
Venezuela	Environment Agency	Allowed for sale by Lonza Inc. No registration currently required. The customer may have to register final formulation if it contains other actives.
Australia	AICS APVMA	CAS 5538-94-3 is listed on the NICNAS AICS database. Not registered for sale as a pesticide.
Korea	ECL	Listed on database
Japan	MITI/ENCS	Listed on database
China	IECSC	Listed on database
Philippines	PICCS	Listed on database



Lonza Inc.  
90 Boroline Road  
Allendale, NJ 07401  
Tel: +1 201 316 9200  
contact.allendale@lonza.com

---

The information contained herein is believed to be correct and corresponds to the latest state of scientific and technical knowledge. However, no warranty is made, either expressed or implied, regarding its accuracy or the results to be obtained from the use of such information, and no warranty is expressed or implied concerning the use of these products. The buyer assumes all risks of use and/or handling. No statement is intended or should be construed as a recommendation to infringe any existing patent. Some products may not be available in all markets or for every type of application. Any user must make his own determination and satisfy himself that the products supplied by Lonza Group Ltd and the information and recommendations given by Lonza Group Ltd are (i) suitable for intended process or purpose, (ii) in compliance with environmental, health and safety regulations, and (iii) will not infringe any third party's intellectual property rights.