

Waterfront

www.wateradditives.com

Product Information

Belclene® 499 Multifunctional Deposit Control Agent for Industrial Water General Product Information

Belclene 499 is a new proprietary, multifunctional, organic polymer for deposit control in industrial water treatment.

Belclene 499 represents improved cost effectiveness for BioLab Water Additives' POCA chemistry (available previously as Belclene 494), allowing the unique combination of polymer and phosphonate within the same molecule to be more fully exploited by the formulation specialist.

Belclene 499 can replace existing copolymers in formulations allowing the formulator to reduce or eliminate other formulation components.

Features

Belclene 499 offers:

- Effective calcium carbonate scale control
- Effective calcium phosphate scale control
- Iron oxide and particle dispersancy
- Corrosion inhibition properties
- Halogen stability
- Low phosphorus content

Benefits

- **Reduced raw materials costs.**
Cost effective replacement of two or more formulation components.
- **Less time spent on making formulated products more time to focus on customers.**
Greater simplicity of formulations and shorter processing times.

- **Fewer effluent compliance issues.**

Eliminate heavy metals such as zinc or molybdate or lower the phosphorus content of your formulation

- **Better control of system performance and peace of mind.**

Formulations can be designed for a range of scaling indices and the broad range activity of Belclene 499 enables formulations to cope with swings or upsets in cooling tower operating conditions

- **Versatility in formulation choice tailored to customer needs.**

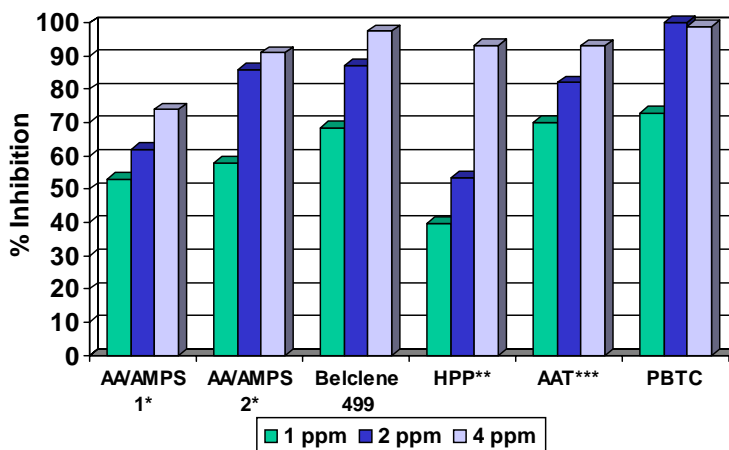
Belclene 499 can be used in all-organic, phosphate and low level zinc formulations, giving scale control, dispersancy and corrosion inhibition from a single product.

Applications

Belclene 499 is designed for use in open evaporative cooling systems. Due to its polymer/phosphonate characteristics and halogen stability, Belclene 499 performs many functions in a water treatment formulation.

Calcium carbonate inhibition from carboxylate and phosphonate functionalities

Calcium Carbonate Threshold Test



Test conditions:

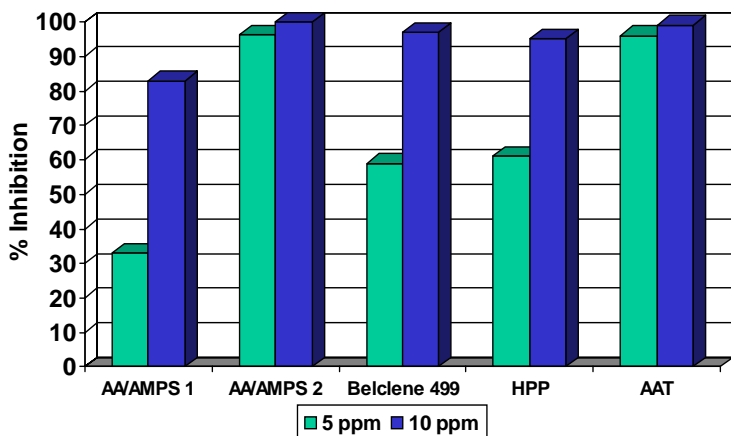
Ca²⁺: 375 ppm as CaCO₃, CO₃²⁻: 85 ppm as CaCO₃,
HCO₃⁻: 220 ppm as CaCO₃, Mg²⁺: 185 ppm as CaCO₃
pH 8.2, 70°C, 30 minutes, LSI = 2.4
Dosed as solids

Key :

- * AA/AMPS polymers
- ** "High Performance Polymer"
- *** Acrylic acid terpolymer

Calcium phosphate inhibition from sulphonic acid functionality

Calcium Phosphate Threshold Test

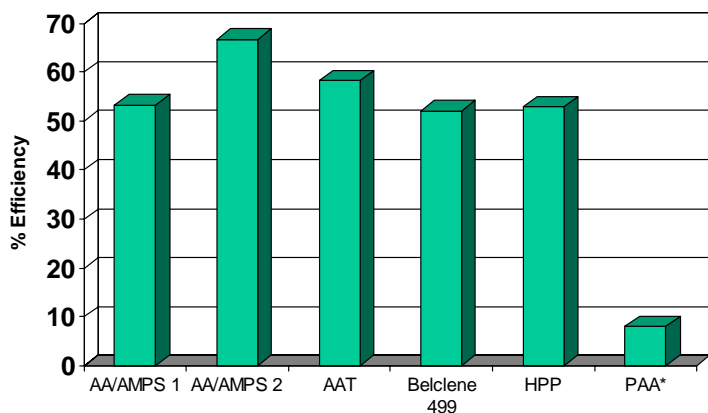


Test conditions:

Ca²⁺: 250 ppm as CaCO₃, PO₄³⁻: 10 ppm
pH 8.5, 70°C, 24 hours
Dosed as solids

Efficient particle dispersancy from the presence of sulphonic acid functionality

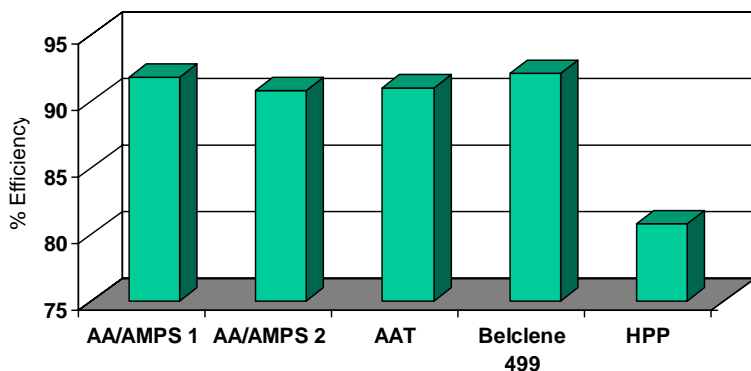
(i) Kaolin Dispersancy



Test conditions:

0.1% Kaolin, ambient temp., pH 8.0, 4 hours
Ca²⁺: 200 ppm as CaCO₃
HCO₃⁻: 100 ppm as CaCO₃
Dose: 10 ppm solids

(ii) Iron Oxide Dispersancy

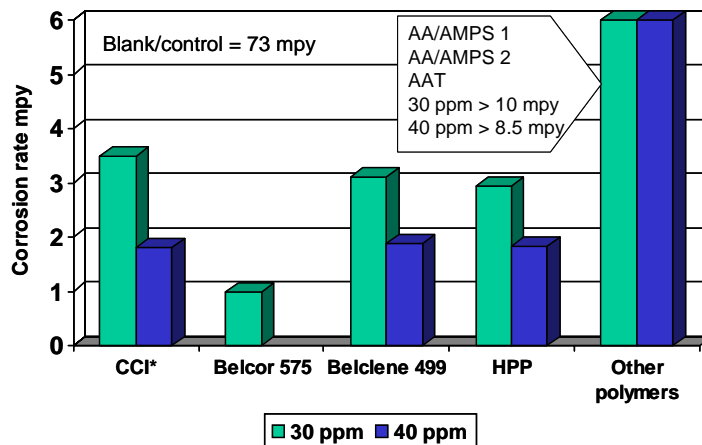


Test conditions:

Fe³⁺: 75 ppm, pH 8.5, ambient temp., Time = 30 minutes
Ca²⁺ 100 ppm as CaCO₃, HCO₃⁻ 60ppm as CaCO₃
Dose: 10 ppm solids

Corrosion inhibition from phosphonate functionality

Corrosion Inhibition



Test conditions:

Conditions: Ca²⁺:150 ppm as CaCO₃
TH: 225 ppm as CaCO₃, TA: 350 ppm as CaCO₃
Cl⁻: 200 ppm, SO₄²⁻: 200 ppm, pH 8.1, LSI = 0.9
Dosed as solids

Key: * CCI – competitive organic corrosion inhibitor

Belclene 499 Pilot Cooling Tower Test

Belclene 499 can be used to replace several components in a formulation and still retain system performance as the following test (using a pilot cooling tower) in a long half life system clearly shows.

Formulation 2 and the water chemistry were used in the main cooling system of a large power station. Formulation 1, containing Belclene 499, was designed to replace 3 components from Formulation 2 in a cost effective manner.

Test conditions

Formulation 1		Formulation 2	
Component	Dose (ppm solids)	Component	Dose (ppm solids)
Belclene 200	3	Belclene 200	2
Belclene 499	3	PBTC	2
Total solids	6	AA/AMPS	3.6
		PAA	2.4
		Total solids	10

Water chemistry:

Component	ppm
Calcium	332 (as CaCO ₃)
Magnesium	67 (as CaCO ₃)
Bicarbonate	358 (as CaCO ₃)
T. Alk	375 (as CaCO ₃)
Sulphate	160
Chloride	344
Sodium	211
TDS	1322

pH	8.8
LSI	2.12
RSI	4.56
Larson –Skold index	1.67

Test Parameters:

Half life	61 hours
Heat exchangers	Stainless Steel
BTU's	10,000
Time	14 days
Bulk Temp	40°C/104°F
Flow rate	1 m s ⁻¹ / 3ft s ⁻¹

Results

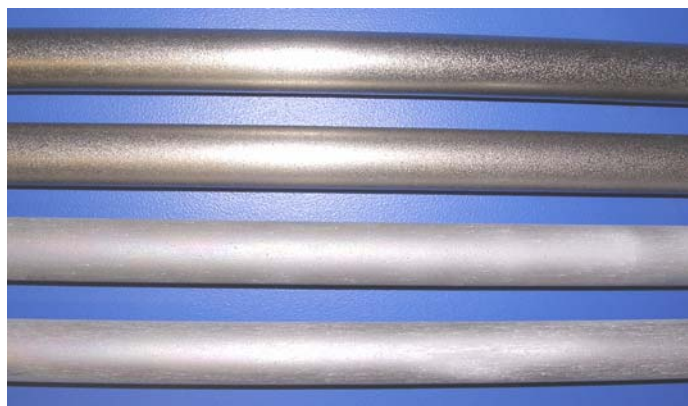
Both formulations gave good performance but heat exchangers for Formulation 1 were clean and those treated with Formulation 2 showed deposit build up, as the following table and photographs demonstrate.

Fouling rates:

Fouling Rate - average from two heat exchangers (mg/cm ² /day)	
Formulation 1	0.0063
Formulation 2	0.0296

Rating (mg/cm ² /day)	
<0.11	Good
0.12-0.19	Moderate
0.20 -0.26	Poor
>0.27	Unacceptable

Top: Clean heat exchangers after 14 days test with Formulation 1 (3 ppm Belclene 499 / 3 ppm Belclene 200)



Bottom: Heat exchangers with deposit build up after 14 days test with Formulation 2 (2 ppm Belclene 200 / 2 ppm PBTC / 3.6 ppm AA/AMPS and 2.4 ppm PAA)

This pilot cooling tower test clearly shows how the carboxylate and phosphonate functionalities Belclene 499 can give effective calcium carbonate control. Further, from the formulator's point of view, Belclene 499 can be used to replace two or more components in a formulation without compromising performance or system control. In addition to excellent system control, use of Belclene 499 reduces time and cost to formulate.

Further benefits of Belclene 499

- 10% higher solids content than many competitive polymers
- Low phosphorus content compared to phosphonates

	% "P" as product	% "PO ₄ ³⁻ " as product
HEDP	18	55
PBTC	6	11
Belclene 499	0.6	1.9

- 5% Belclene 499 as product in a formulation dosed at 100 ppm adds only 0.1 ppm as PO₄³⁻

Typical Physical Properties

Appearance	Clear pale yellow liquid
Solids content	50% (w/w)
Specific gravity (20/20)	1.25
pH (neat at 20°C)	<2
Viscosity at 25°C	100 mm ² /s
Do not store below 10°C	

Regulatory Registrations

Belclene 499 is listed on the following inventories:

Australia AICS- in progress

Canada DSL

Europe - exempt

USA TSCA

Logistics

Classification Hazardous for transportation
Irritant for supply

Packaging Net weight 250 kg (551lb)
HDPE drum

Details on safety and handling are available in the material safety data sheet on this product.

Conclusion

Belclene 499 is a true multifunctional additive. By replacing an existing copolymer in your formulation you can reduce or eliminate other components and maintain performance. The results for the formulator are:

- Reduced raw materials costs
- Less effort expended on making formulated products
- More time to focus on customers
- Fewer effluent compliance issues
- Versatility of formulation choice tailored to customer needs – more choice from just one additive
- Better system control and peace of mind

Patents

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