



## Aquatreat® AR-888

在高LSI条件下, Aquatreat AR-888是一种出色的“无磷”碳酸钙水垢抑制剂。与竞争产品相比,毒性极低。由于其优化的分子量, Aquatreat AR-888无需在配方中添加其他分散剂。

### 优势

- 高LSI下的高效无磷碳酸钙阻垢剂
- 减少聚合物用量以节省成本并减少制剂毒性
- 无需添加额外的分散剂降低配方成本
- 与竞品马来酸均聚物相比
  - 极低的毒性
  - 硫酸钙抑制性能更强
  - 更好的耐铁性
  - 更易调配配方
  - 相同的漂白稳定性

### 应用Applications

- 冷却塔
- 采矿
- 油田

### 碳酸钙垢抑制

Aquatreat AR-888利用了所有三种聚合物阻垢功能机制(阈值抑制,分散和晶体修饰) 以提供无与伦比的性能。

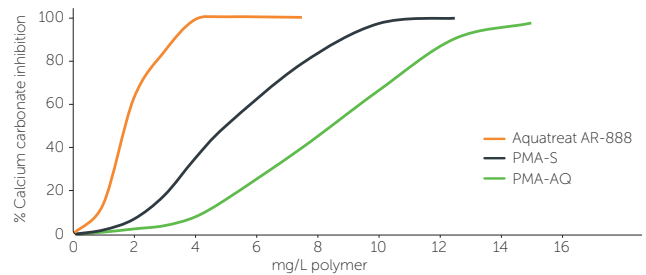
#### 阈值抑制 Threshold inhibition

在静态碳酸钙测试中(图1), Aquatreat AR-888在4 ppm的剂量下可提供90%的最小可接受抑制水平。竞品溶剂马来酸均聚物需要两倍的剂量, 而竞品马来酸水溶液需要三倍的剂量才能达到相同的90%抑制率。

#### Calcium carbonate static test conditions

Ca	300 mg/L as CaCO <sub>3</sub> (120 mg/L as Ca)
Mg	147.6mg/L Mg as CaCO <sub>3</sub> (36 mg/L as Mg)
Bicarbonate	350 mg/L as CaCO <sub>3</sub> (427 mg/L as HCO <sub>3</sub> <sup>-</sup> )
Carbonate	80 mg/L as CaCO <sub>3</sub> (48 mg/L as CO <sub>3</sub> <sup>2-</sup> )
pH	8.7-8.9
Temperature	50°C
Time elapsed	17 hours

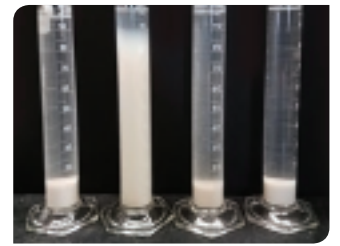
Figure 1: Static test



### 分散

分散是重要的控制机制, 使垢悬浮于水中, 避免沉积于装置表面

Aquatreat AR-888分子量设计为具有最佳分散能力。图片右图显示了与马来酸均聚物相比, Aquatreat AR-888具有更好的粘土悬浮性。



Control Aquatreat PMA-AQ PMA-S  
(No polymer) AR-888

### 晶体修饰

Aquatreat AR-888吸附在形成的碳酸钙晶体表面, 使正在生长的晶体变形。改性晶体彼此之间以及与表面的粘附可能性较小, 因此传热表面保持清洁和高效。如下图所示, Aquatreat AR-888的晶体生长改性性能优于溶剂PMA和PMA水溶液。Aquatreat AR-888完全扭曲了晶体结构, 使其难以自行构建, 因此不太可能粘附在表面上。



Aqueous maleic



Solvent maleic



Aquatreat AR-888

## Additional testing

### Conditions for dynamic testing per cycle of concentration

Ca	100.0 mg/L Ca as CaCO <sub>3</sub> (40 mg/L as Ca)
Mg	49.2mg/L Mg as CaCO <sub>3</sub> (12 mg/L as Mg)
Bicarbonate	74 mg/L as CaCO <sub>3</sub> (90 mg/L as HCO <sub>3</sub> <sup>-</sup> )
Carbonate	447 mg/L as CaCO <sub>3</sub> (268 mg/L as CO <sub>3</sub> <sup>-2</sup> )
Fe	0.5 mg/L
pH	8.8-8.9
Temperature	43-44°C
Polymer concentration (active)	10 mg/L

### Bleach stability test conditions

Ca	300 mg/L as CaCO <sub>3</sub> (120 mg/L as Ca)
Mg	147.6 mg/L Mg as CaCO <sub>3</sub> (36 mg/L as Mg)
Bicarbonate	350 mg/L as CaCO <sub>3</sub> (427 mg/L as HCO <sub>3</sub> <sup>-</sup> )
Carbonate	80 mg/L as CaCO <sub>3</sub> (48 mg/L as CO <sub>3</sub> <sup>-2</sup> )
pH	8.7-8.9
Temperature	50°C
Time elapsed	17 hours
Halogen	1 mg/L chlorine

### Calcium sulfate test conditions

Ca	3400 mg/L
Sulfate	8470 mg/L
pH	8.4-8.6
Temperature	50°C
Time elapsed	17 hours

## Toxicity

OECD 202 Daphnia: LC<sub>50</sub> 2782 mg/L

OECD 236 96h Fish Embryo/Sac Fry: LC<sub>50</sub> ~3000 mg/L

## Specifications

% solids: 40-42

pH: 2.5-3.5

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Figure 2: Dynamic test

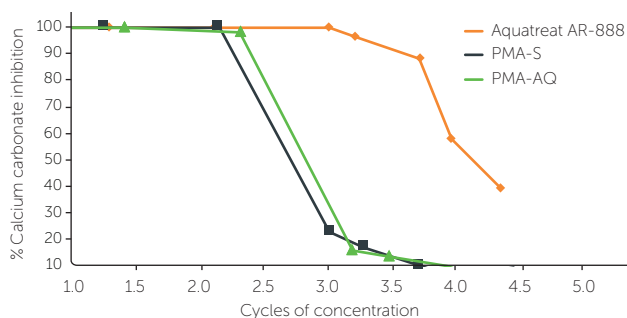


Figure 3: Bleach stability test

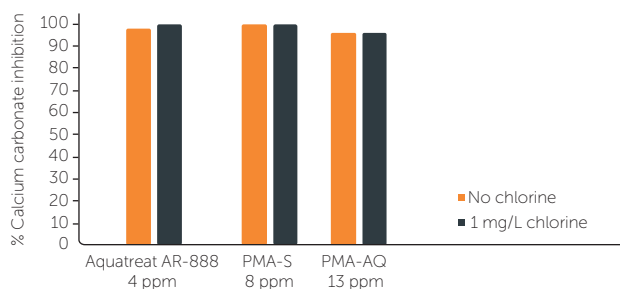
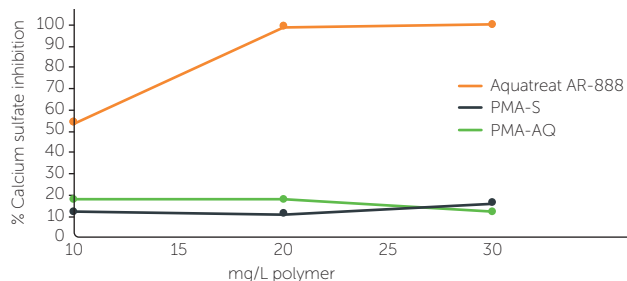


Figure 4: Calcium sulfate inhibition test



## Aquatreat AR-888

- is an efficient calcium carbonate inhibitor with low toxicity.
- is superior to competitive maleic homopolymers with regards to dispersancy, crystal modification, and calcium sulfate inhibition.
- can eliminate the need for additional dispersant polymers in formulations.

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