



## INTRODUCTION

A S Filtration™ is pleased to introduce PathShield™ Antimicrobial Filter Media for the reduction and control of coliform bacteria in industrial water treatment applications. PathShield™ is registered with the U.S. Environmental Protection Agency (EPA) in accordance with Federal law for its intended antimicrobial uses. PathShield™ media can be employed in batch or continuous operation treatment systems for industrial discharges and process water (excluding potable water).

PathShield™ effectively reduces coliform bacteria without releasing, discharging, or leaching any antimicrobial agents, chemicals, or heavy metals. PathShield™ kills coliform bacteria as the organisms physically move over the hostile surface of filter media granules (Figure 1). Efficacy is achieved at high filtration loading rates up to 20 gallons per minute per square foot (gpm/ft<sup>2</sup>). PathShield™ filter media is not consumed, requires no power source, has no moving parts, is non-corrosive, and is unaffected by seasonal temperature changes as a drop in replacement in industrial sand filter systems.



Figure 1. Bacteria is killed upon contact with hostile surface of PathShield™ media.

## LABORATORY TESTING

Independent long term efficacy testing was performed by a NELAP accredited laboratory using stock solutions of *E. coli* using 15 separate quality

control PathShield™ filter media samples. Table 1 summarizes testing results using an average target influent *E. coli* concentration of 16,500 cfu/100 ml and an influent loading rate of 10 gpm/ft<sup>2</sup>. Over 99.99% removal efficiency, or greater than a log four reduction, was consistently achieved for this long term testing program.

Table 1. Long Term Laboratory Efficacy Testing

Influent <i>E. coli</i> (cfu/100 ml)	Effluent <i>E. coli</i> (cfu/100 ml)	Efficacy (%)
15,900	0.5	99.997
15,900	0.5	99.997
16,100	0.5	99.997
16,200	0.5	99.997
16,200	0.5	99.997
16,300	0.5	99.997
16,500	0.5	99.997
16,500	0.5	99.997
16,600	0.5	99.997
16,800	0.5	99.997
17,100	0.5	99.997
17,200	0.5	99.997
17,200	0.5	99.997
17,700	0.5	99.997
17,900	0.5	99.997

## COOLING TOWER FIELD TESTING

Three cooling tower field testing programs using PathShield™ filter media are described below.

### Field Test #1

PathShield™ filter media was installed in a 200 ton cooling tower at an urban north Georgia manufacturing facility for the purpose of providing disinfection in lieu of chemical treatment. Prior to PathShield™ installation, independent laboratory analysis of water samples collected during a 62 day baseline period determined an average Total Coliform concentration of 424 cfu/ml. Following installation of the PathShield™ media, analysis of

18 water samples collected over a 90 day test period and 80 million gallons of water determined an average Total Coliform concentration of 0.49 cfu/ml (Figure 2). A 99.88% reduction, or greater than a log two reduction in the Total Coliform concentration was achieved for the duration of the testing period.

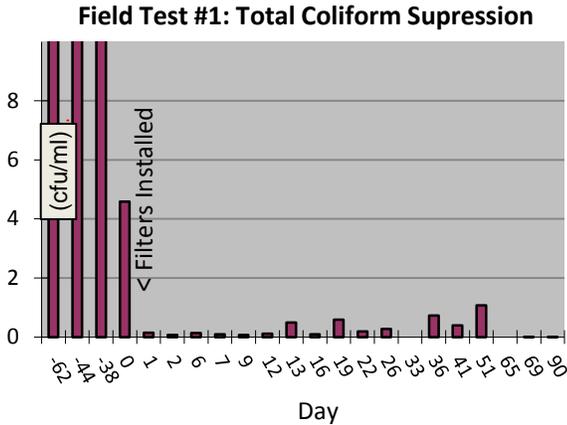


Figure 2. Total Coliform suppression for a 200 ton cooling tower was maintained for a 90 day test period and 80 million gallons of treated water.

Field Test #2

As a means to study the effects of seasonal weather conditions on performance, a second round of testing was performed on the first urban test site cooling tower. PathShield™ media was reinstalled after a 163 day period whereby no treatment other than one chemical shock occurred. The system was measured for Total Coliform bacteria over 88 days and 76,032,000 gallons of treated water. The Total Coliform concentration average was 16.6 cfu/ml, or approximately a level of 10<sup>1</sup> cfu/ml (Figure 3).

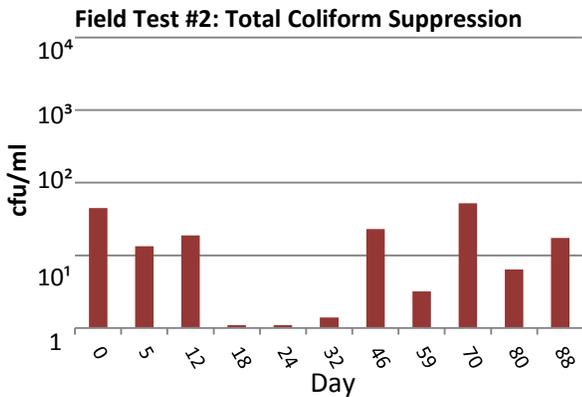


Figure 3. Total Coliform suppression for a 200 ton cooling tower (first test site) was maintained for an 88 day test period. Note log scale for TC count.

Field Test #3

A 200 ton multi-stack cooling tower positioned on a highrise hotel roof in Washington D.C. was tested over 39 days to document the change in water temperature ( $\Delta T$ ) between the inlet and outlet flows in the cooling tower (open) loop and chiller (closed) piping loops of the system. This test documents the enhancement of cooling system operational efficiency with the inclusion of PathShield™ in side-stream filters in both piping loops. The cooling tower side exhibited a net water  $\Delta T$  gain of 2.4°F (4.9° - 2.5°) and averaged 5.5°F. The chiller side exhibited a net water  $\Delta T$  gain of 4.3°F (5.4° - 1.1°) and averaged 3.3°F (Figure 4). System performance was significantly enhanced from prior operations as evident with net  $\Delta T$  gains for both the cooling tower and chiller piping loops. Improved system efficiency provides for increased energy savings and a reduction in operational costs.

Field Test #3: Heat Transfer Improvement Tower (Open) & Chiller (Closed) Loops

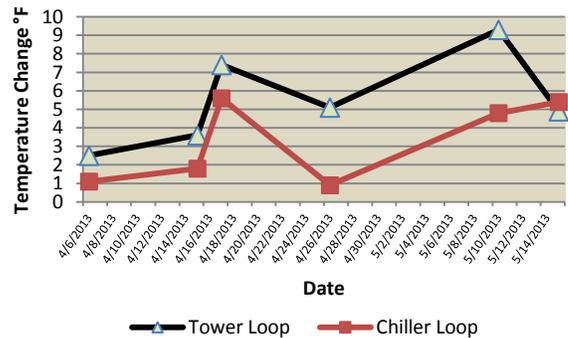


Figure 4. Increase in  $\Delta T$  over 39 days for open and closed loops of 200 ton multi-stack cooling tower unit.

**CONCLUSIONS AND BENEFITS**

Operational benefits can be realized through the use of PathShield™ filter media including:

- EPA registered antimicrobial filter media
- Media does not discharge, release or leach any antimicrobial agents
- Long term and high level of performance
- Does not rely on physical trapping
- No external power source or moving parts
- Media is non-corrosive and is not consumed
- Unaffected by seasonal temperature changes