# FOGGHIELD

# Antimicrobial technology for water filtration

**By Konstantin Goranov** 

osshield Antimicrobial Technology was developed to protect filters against the growth of odor-causing bacteria and mold which naturally exist in water. Using its patented process of incorporating silverbased, inorganic antimicrobial protection agents into synthetic fibers, Fosshield provides permanent, environmentally safe and effective bacteriostatic protection to the filter media. Besides numerous applications for Fosshield products in air filters, apparel and home furniture, this technology is particularly effective in water filtration. All agents in Fosshield fibers meet the necessary EPA regulatory requirements, and filtration media containing Fosshield is approved by the NSF.

#### Performance of Bag Filter made with 25% Fosshield Fiber



Filters protected with fosshield maintain efficacy throughout the life span of the filter media.

#### Silver—A Safe and Effective Way to Protect Fibers

Foss Manufacturing has successfully incorporated silver into bicomponent and binder fibers. The company was recently granted Patents # 6,723,428 and 6,841,244 reflective of this technology.

For centuries, all natural silver has been recognized for its purification abilities, for example, in ancient Egypt, longterm storage water vessels were lined with silver to retain purity, and in the 11<sup>th</sup> Century, the Vatican decreed that communion chalices should be made of silver to reduce the spread of disease. Silver has been proven effective against more than 650 strains of bacteria, yeast, fungi and mold. Based on these proven capabilities, the medical community has recognized silver as an important antimicrobial agent and incorporates silver into treatments for burn patients and several instruments found in today's medical settings such as stethoscopes, IVs and catheters. Silver is an inert, nontoxic antimicrobial that is safe for prolonged contact with skin. Therefore, Fosshield's has

incorporated silver into bicomponent and binder fibers.

Fosshield's specially designed bicomponent fibers ensure the active ingredient is uniformly dispersed only on the sheath of the fiber for the most effective exposure to damaging bacteria, not wasted in the core of the fiber.

#### **How does Fosshield Work?**

Although several different antimicrobial agents have been incorporated in Fosshield fibers, zeolites demonstrated the best potential for water purification. Basically, this antimicrobial agent is a compound of silver ions, bonded to a ceramic material which is completely inert. Due to its porous structures, the carrier matrix, zeolite, provides a slow and steady rate of silver ion release. Water wets very hydroscopic zeolites exposed on the fiber surface, thus causing even further low-level release of silver ions that effectively maintain an antimicrobial surface. As water passes through the filter media and provides ideal environment for bacterial growth, more silver is released. Yet, there is a maximum release rate controlled by the zeolite structure and polymer nature of the fiber surface. For that reason, even in high volume of filtered water, the silver releases very slowly, insuring long-term protection. Because silver kills microbes by interacting with multiple binding sites on their surface that are completely unlike those used by organic antibiotics, the likelihood of bacteria

becoming resistant to antibiotics due to use of silver is fundamentally impossible. Most importantly, Fosshield technology allows a controlled release rate of silver ions that does not affect water quality.

Additionally, the zeolite-based antimicrobial compound has several major advantages over other antimicrobial compounds used in the manufacturing process. Zeolites are tolerant of the high temperatures used in fiber formation process. These agents remain effective against a significantly broader spectrum of bacteria much longer than alternative silver-based compounds. standing the dilution effect of thousands of gallons of water.

*Effectiveness.* Fosshield's specially designed bicomponent fibers ensure the active ingredient is only on the sheath of the fiber for greatest exposure to damaging bacteria, not wasted in the core.

Independent test labs have proven that Fosshield is highly effective against bacteria commonly found in water filters.

Versatility. Fosshield's specially

designed binder fibers allow it to be combined with natural fibers such as cotton.

#### **Applications**

Bacteria, mold and mildew often affect the integrity of filters, causing products to degrade quickly, shortening product life cycles. Fosshield can be used in a variety of filtration products including:

*Drinking water cartridges.* Fibers found in this type of cartridge, such as spun-wound, are typically used in residential filtration systems. They can be blended with Fosshield to dramatically reduce the amount of destructive bacteria that grows on the filter, giving the filter a longer life cycle and greater product efficacy.

**Pool and spa filtration.** Incorporating Fosshield fiber into pool and spa filtration greatly reduces filtration clogging and cleaning intervals. Hollingsworth & Vose Company



Activated carbon particles bonded to the surface of the non-woven filter media with exposed bright spots of zeolites which provides the bacteriostatic properties.

#### Carbon Filter Performance Improvement

Activated carbon particles bonded to the surface of the non-woven filter media are broadly used in water purification. An anticipated challenge for Fosshield is that activated carbon absorbs silver, along with many other metals and dissolved species, as it is designed to do. However, due to the porous coated structure, the combination of Fosshield and active carbon does not eliminate the ability to control bacteria growth on the filter surface. The silver is released from the fiber into the water and then absorbed by the carbon; therefore, the surface of the carbon, where microorganisms can grow is constantly being bathed with a flux of silver. SEM pictures and AA analysis demonstrate the sufficient availability of silver ions from zeolites in impregnated Fosshield non-woven media used as a substrate for activated carbon.

#### **Benefits**

#### Antimicrobial protection.

Fosshield protects filtration media against a wide range of bacteria including those that may cause deterioration and odor. It is also effective against mold or mildew growth.

*Silver.* The active ingredient is a historically proven safe and effective antimicrobial agent. Research has shown that combination of copper, zinc and silver provides a powerhouse against mold mildew and fungus.

*Long lasting protection.* Fosshield's antimicrobial protection lasts throughout the life of the product, with-

## market outreach



SEM of Fosshield fibers with active zeolites, the bright spots on the fiber surface, provide safe, potent and permanent protection to water filter media.

> successfully introduced its AquaSure and AquaSure Ag lines of pool and spa filter media at the National Spa and Pool Industry Expo 2004, Monterey, Calif.

> *Filtration materials for the food service industries.* Utilizing Fosshield in bag-house filter media reduces the bacteria load on the filter, improves efficiency and the life of the media.

*Airlaid/meltblown.* Fosshield fibers can be incorporated into airlaid and meltblown applications.

**Needlepunch filtration media.** With more than 50 years of non-woven manufacturing and development expertise, in addition to the broadest range of capabilities, Foss Manufacturing, Inc. is a filter media supplier. Integrated production processes allow Foss to saturate or coat fabric, introduce scrims, add desired functionality and tailor the filtration media to meet high demanding specifications.

Lab studies proved that Fosshield agents have high efficacy against a broad category of bacteria and mold.

#### Conclusion

Recent developments in Fosshield technology have created several innovative solutions for the filtration industry. With Fosshield fiber imbedded in the filtration medium, the growth of bacteria and mold can be significantly inhibited during the water purification process. *wqp* 

#### About the Author

Konstantin Goranov, PhD is director of fiber research for Foss Manufacturing, Inc., Hampton, N.H. Goranov has taken responsibilities for leading innovation and development initiatives at Foss Manufacturing since his arrival in June 2004. Prior to joining Foss, Goranov provided strategic recommendations and technical expertise for expansion of new products and services to several companies, including: Ancos Inc., Alloy Polymers and Piedmont Chemicals LLC. Goranov holds a PhD and MS in Polymer Engineering from the University of Sofia and an MBA from the University of Richmond. Additional information is available at 603.929.6000.

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#### **Ultrafiltration Cartridge**

The KMS 10-in.-diameter ultrafiltration hollow fiber cartridge contains 60% more



these cartridges typically require fewer valves and pumps.

Koch Membrane Systems Inc. Wilmington, MA booth no. 738 • write in 1137

#### **Drinking Water Filters**

This company's new Quick Change drinking water filters offer easy installation and cartridge replacement. NSF certified and state registered, the undersink filters come in three models including granulated carbon and carbon block. All models remove bad taste and odor including chlorine taste and odor. The California state-certified QC-10CBR reduces lead, cysts, lindane, atrazine and turbidity. These filters are protected from hand contact, making the system completely sanitary.

Pentek Filtration, Sheboygan, WI booth no. 139 • write in 1138

#### **Carbon Blocks**

CB Series carbon blocks are manufactured with high-purity coconut shell activated carbon. Suitable for point-of-use and reverse osmosis applications, these cartridges reduce taste. odor, certain VOCs and chlorine from drinking water. In fact, these filters can displace GAC and PAC filters in applications where high chlorine removal is needed. A wide variety of lengths, diameters and micron ranges is available.

Liquatec Products, Fullerton, CA booth no. 1131 • write in 1139





#### **Extruded Carbon Block Filters**

MATRIKX extruded carbon block filters are created using a patented technology that produces high performance, highly porous and uniform filters. A wide range of standard products and sizes are available that offer reduction of particulates, sediment, turbidity, chlorine, taste, odor, lead and organic materials. These activated carbon filters are manufactured using FDA-compliant and NSF-approved materials.

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