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FUNCTIONAL ADDITIVES FOR MEDICAL NONWOVENS

By Roger Threadgill
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INTRODUCTION

Medical nonwovens are essential to modern healthcare, forming the basis of products such as surgical masks, hospital gowns, wound dressings, and filtration systems. Enhancing these materials with functional additives allows manufacturers to improve properties like softness, hydrophilicity, antimicrobial resistance, and more. This whitepaper explores how functional additives elevate medical nonwoven performance and why incorporating them directly into the polymer matrix—via an in-melt approach—offers long-term advantages.

The Importance of Medical Nonwovens

Nonwoven textiles are engineered fabrics made by bonding fibers through thermal, chemical, or mechanical processes. Their strength-to-weight ratio, breathability, and microbial resistance make them ideal for healthcare use. Applications include medical scrubs, disposable drapes, bedding, filtration media, and hygiene products.

According to Grand View Research, the medical textile market reached $32.2 billion in 2022 and is expected to grow at a CAGR of 4.3% through 2030. This growth is fueled by increased healthcare awareness, rising demand for implantable medical devices, and an aging global population. The Asia-Pacific region, in particular, is seeing rapid expansion through manufacturing investment and government-led innovation.

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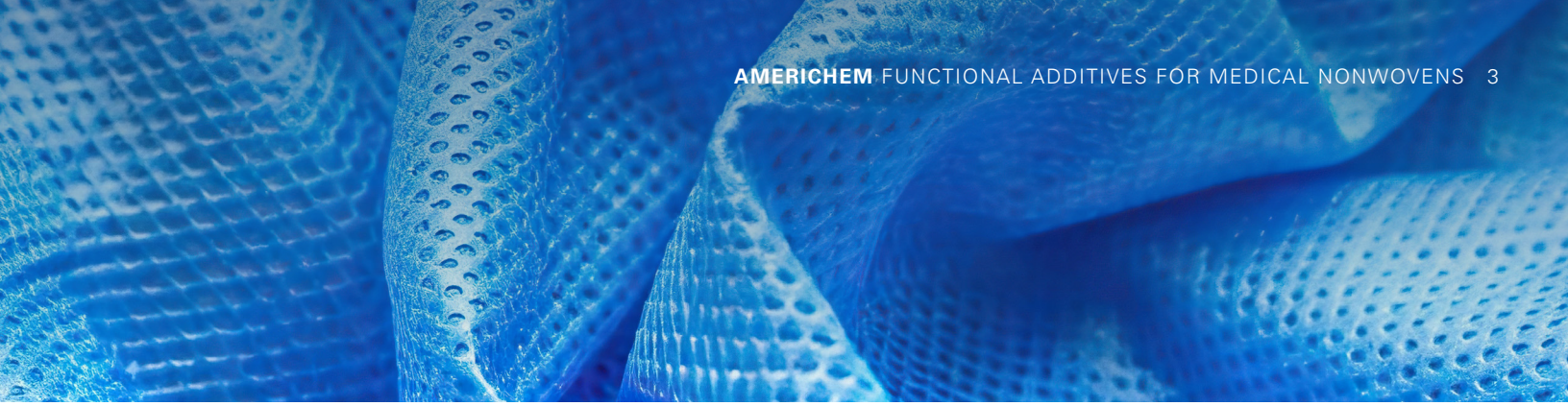
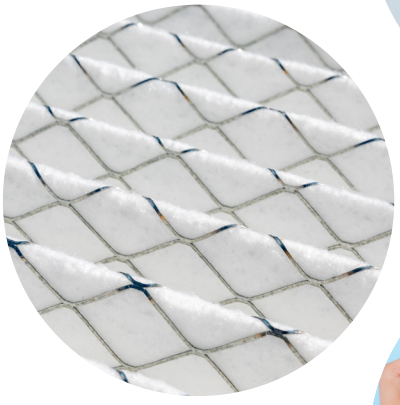
Grand View Research



Nonwoven textiles are widely used in medical applications due to their unique properties and versatility.

Applications

1. Surgical Gowns and Masks
2. Wound Care Products
3. Filtration Systems
4. Disposable Medical Products
5. Incontinence Products



Nonwoven textiles have revolutionized the medical field by providing cost-effective, disposable, and highly effective solutions for various medical needs.

THE ROLE OF FUNCTIONAL ADDITIVES

ANSWERING CHANGING MARKET DEMAND

Nonwovens offer inherent versatility, but evolving market demands require continued innovation in comfort, functionality, and sustainability. For nearly two decades, Americhem has supported the healthcare industry with advanced functional technologies for nonwoven materials.

Today's priorities include enhancing comfort through improved softness, odor control, thermal regulation, and sustainability. As end-users demand more from their products, additive technology must advance in tandem.

Key developments include:

- Antimicrobial additives that help prevent microbial growth, including bacteria, fungi, and algae.
- Sustainable solutions, such as botanical-based and PFAS-free additives, addressing the global push for greener materials.

Antimicrobial

Sustainability

Botanicals

PFAS-Free

A STRATEGIC PROCESS

Incorporating additives allows manufacturers to customize nonwoven properties for specific applications. However, effective additive selection requires careful evaluation of several factors.

Key questions to consider:

- What is the intended function of the textile?
- What environmental conditions or lifespan must it withstand?
- What polymer base is used, and what level of performance is required?

Other critical considerations include:

- Thermal stability
- Partical or filament size
- Optical clarity (e.g., haze or transparency)

KEY FUNCTIONAL ADDITIVES FOR MEDICAL NONWOVENS

HYDROPHILIC ADDITIVES

Hydrophilic additives modify the interaction between synthetic fibers and water, improving moisture management. Since most medical nonwovens are petroleum-based and naturally hydrophobic, hydrophilic additives are essential for enhancing water absorption and comfort—particularly in wipes and wound care products.

For in-melt applications, additives must endure high processing temperatures, maintain uniform dispersion, and avoid filtration blockages. With the right formulation, medical nonwovens can achieve targeted moisture control and meet regulatory standards.

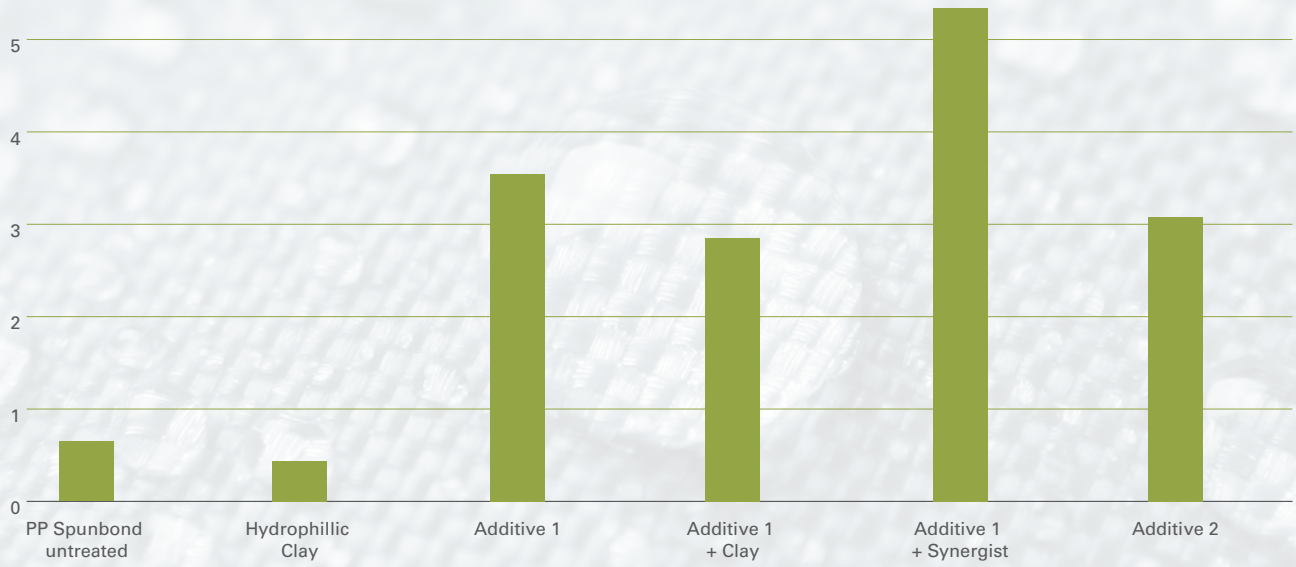
Hydrophilicity involves three key attributes:

- **Wicking:** Facilitates fluid movement via capillary action
- **Absorbency:** Retains moisture within the fabric
- **Wettability:** Improves liquid penetration by lowering surface tension

AMERICHEM'S DEEP UNDERSTANDING OF SURFACE INTERACTIONS AND POLYMER BEHAVIOR HAS LED TO MULTIPLE IN-MELT SOLUTIONS FOR HYDROPHILIC ENHANCEMENT. WE OFFER TAILORED PRODUCTS TO SOLVE UNIQUE MOISTURE MANAGEMENT CHALLENGES IN NONWOVENS.

Enhancing Absorbency from the Inside Out

As demand grows across adult care, infant hygiene, and hospital applications, intrinsic absorbance has become a key differentiator in product performance. Intrinsic absorbance measures a nonwoven's ability to absorb and retain moisture—an essential property for products like wipes, wound care dressings, and incontinence solutions. Defined as the ratio of a fabric's wet weight to its dry weight, intrinsic absorbance provides a quantifiable benchmark for how effectively a material manages fluid. Americhem's in-melt hydrophilic additives significantly enhance this capability, integrating directly into the polymer to promote wicking, wettability, and fluid retention without compromising processability.



Featured Additives for Medical Nonwovens

In recent testing, formulations combining two additive technologies with a synergist demonstrated the highest absorbance, enabling spunbond nonwovens to retain multiple times their body weight in water.

SOFTNESS ENHANCERS

Softness is crucial in medical applications that involve skin contact—such as masks, gowns, and hygiene products. Additives that reduce surface friction and improve drapeability can significantly enhance user comfort.

New Horizons in Softness Additives

Advances in acoustic intensity testing now allow objective measurement of softness via surface friction data. This speeds up formulation refinement and accelerates product development cycles. Hand samples can then be evaluated by Human Affective Perception Evaluation (HAPE) panels—still the gold standard for tactile feedback.

Americhem's **mBrace™ line** exemplifies this innovation, offering superior softness, minimal volatiles, and easy processing for premium nonwoven products.

Key softness attributes include:

- **Surface smoothness:** Creates a cotton-like or silky feel
- **Flexibility:** Enhances fabric drape and fit
- **Durability:** Maintains softness after sterilization

As active, aging populations grow, especially in the adult hygiene market, comfort expectations are evolving. These users have different needs from infants or children—comfort, reliability, and fit are now defined by adult standards.

mBRACE™: NEXT-LEVEL SOFTNESS SOLUTIONS

mBrace™ technology has been advancing nonwoven softness for years through multiple generations of innovation. Each solution is meticulously designed and tested ensuring seamless integration into the nonwovens process without disrupting web formation.

Generation 1 (Industry Std)

- SL490-D1

Generation 2 (Internal Std)

- SL137-R1

Generation 3
(Ready for Beta Testing)

- SC375-R1 (Extension of Generation 2)
- SC367-R1 (New)
- SH509-R1
  (New – for Melt-blown applications)

KEY FUNCTIONAL ADDITIVES FOR MEDICAL NONWOVENS

ANTIMICROBIAL ADDITIVES

When left untreated, microbes can proliferate and cause an array of issues like odors, stains, hospital infections and contaminated water. Antimicrobial additives help prevent the deterioration and fouling of textile fibers, fabrics, and molded articles. How? They make surfaces inhospitable to microbes, including bacteria, fungi and algae.

Antimicrobial additives are active agents that will inhibit the life or growth of microbes when included in the processing of a material. They're typically characterized by broad spectrum efficacy, but they're limited by their inherent thermal properties. They can be classified into the following categories:

Organics
These are relatively small molecules that are incompatible with the polymer matrix. The molecules interact with the microorganism and prevent its reproduction. Examples include Triclosan, quaternary ammonium compounds (QACs) and plant extracts.

Inorganics
These additives are more likely to be incorporated into molded plastic products. They remain stored in the polymer, being released gradually to the surface and provide continual, long-lasting protection. Examples include silver, copper and zinc.

Performance evaluation methods:
AATCC 147 / AATCC 174 – Zone of Inhibition
Log Reduction Testing – Bacterial reduction measurements.

SUSTAINABLE AND BOTANICAL ADDITIVES: THE NEXT FRONTIER

Innovation is shifting toward natural and botanical solutions, offering environmental and processing benefits without sacrificing efficacy.

Sustainable Solutions
PFAS-Free Technologies
"Forever chemicals" like PFAS are under increasing regulatory pressure due to their persistence in the environment and biological systems. However, the functionality they provide—such as repellency, friction reduction, and durability—remains in demand.

Americhem is actively developing non-fluorinated alternatives that maintain these properties while minimizing environmental impact.

Botanical Additives
As highlighted in antimicrobial applications, botanical solutions also hold promise in sustainability efforts. Plant-derived additives can offer multifunctional performance with a cleaner environmental profile.

ADDITIONAL FUNCTIONAL ADDITIVES:

In addition to core performance enhancements like softness, hydrophilicity, and antimicrobial protection, medical nonwovens can be further optimized with specialty additives that address specific environmental and functional demands. These solutions enhance barrier performance, durability, and safety in critical healthcare settings.

Hydrophobic & Alcohol-Repellent Additives: Provide essential barrier protection

UV Stabilizers: Improve resistance to sterilization and light exposure

Anti-Static Agents: Reduce electrostatic discharge in sensitive environments like ORs

The Advantage of the In-Melt Approach:
Compared to topical treatments, in-melt additive incorporation offers significant benefits:

- **Permanent Functionality:** Additives are embedded in the fiber for long-lasting effect
- **Uniform Distribution:** Ensures consistent product performance
- **Manufacturing Efficiency:** Eliminates secondary treatments, reducing cost and complexity

OFFERINGS FROM AMERICHEM

At Americhem, we go beyond materials—we deliver custom-engineered solutions that empower innovation in the medical nonwovens industry. Our expertise in functional additive technologies is backed by a commitment to R&D, collaborative development, and global insight.

Research & Development

We maintain a strong focus on innovation through robust R&D investments and partnerships with leading academic institutions and global collaborators. This proactive approach keeps us ahead of emerging market needs and drives continuous improvement across our additive platforms.

Customer Collaboration

Our success is rooted in close collaboration with customers. Through ideation sessions and real-time market feedback, we co-develop targeted solutions that are both technically sound and commercially relevant. Every product we create reflects the unique performance, regulatory, and sustainability goals of our partners.

Featured Additive Solutions

mBrace® – Softening Functional Additives

mBrace® delivers exceptional softness and drape, making it ideal for hygiene products, wipes, and applications where comfort is critical. These customizable additives help manufacturers meet specific tactile and performance targets while optimizing processing.

nShield® – Advanced Antimicrobial & Antifungal Additives

nShield® protects nonwoven fabrics against bacteria, mold, mildew, and fungi. Engineered for long-lasting protection and regulatory compliance, nShield® supports hygiene and safety in medical and consumer applications.

nREPEL / nBlock – PFAS-Free Alcohol Repellent Additives

Americhem's nREPEL and nBlock additives offer effective alcohol repellency and fluid resistance without PFAS or fluorine-based compounds. Designed for medical, hygiene, and industrial applications, these additives enhance durability and sustainability with seamless in-melt integration.

nDryve™ PFAS-Free Alcohol Repellent Additives

As global regulations tighten on PFAS chemicals, Americhem has introduced nDryve™, a PFAS- and PFOS-free additive designed for alcohol repellency in polyoleftin nonwovens. This in-melt technology improves alcohol resistance, durability and fluid protection in medical, hygiene and industrial applications while supporting environmental sustainability.

ABOUT THE AUTHOR:

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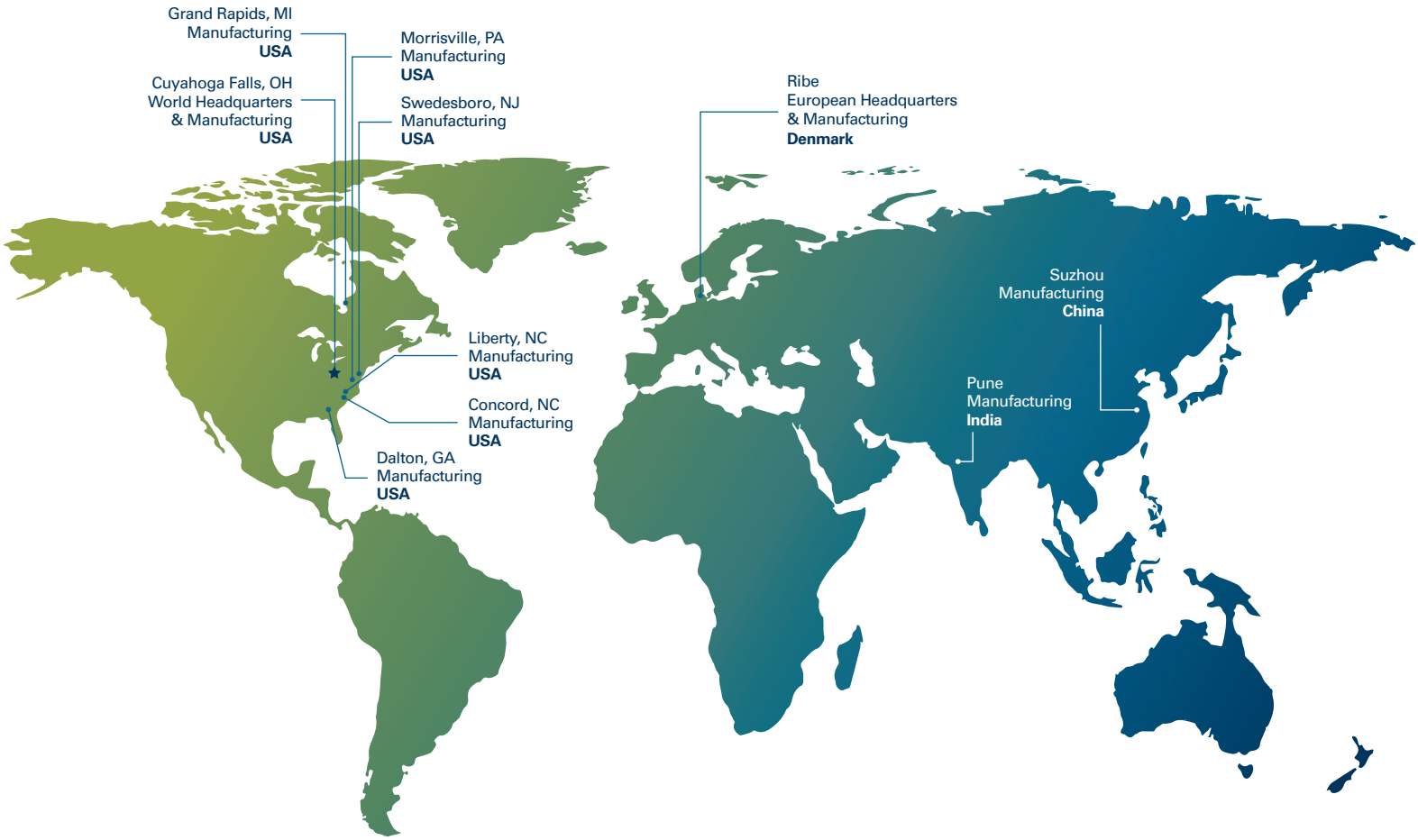
Roger Threadgill is the Director of Global Technology for Americhem's fibers segment. He brings over 36 years of experience to Americhem, having joined the company at the opening of its Concord, North Carolina facility in 1989. Throughout his tenure, he has held a variety of leadership roles across technical and market-facing functions. His deep expertise in fiber technologies and polymer additive solutions has been instrumental in advancing Americhem's innovations in the nonwovens. Contact Mr. Threadgill at rthreadgill@americhem.com.

A GLOBAL LEADER



BATCH TO BATCH.
MARKET TO MARKET.
CONTINENT TO CONTINENT.

From our headquarters in Cuyahoga Falls, Ohio, to our manufacturing locations and sales offices across the world, our expansive footprint provides global reach for your organization's needs. Not only are we dedicated to getting your materials where they need to be, when they need to be there, we work behind the scenes to reduce your supply risks. In addition to our network of plants, regulatory and compliance teams, we have contingency plans and support services in place to secure your product against unforeseen interruptions.

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05/2025