WHITE PAPER

Mold and IAQ

Protecting ductwork and cold water piping from mold growth is key to the preservation of indoor air quality and the comfort of building occupants. Selecting closed-cell elastomeric foams is one way to inhibit the growth of mold on your mechanical equipment.

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MAKING A DIFFERENCE AROUND THE WORLD

WHITE PAPER

The Nature of Mold

How and why we need to prevent its growth in buildings

There are more than 100,000 known species of mold. Mold spores (seeds) are everywhere, indoors and outdoors, in our building materials, on our clothes, and in the air we breathe. We can't avoid them, but we can minimize their potential for growth in our buildings. And we should. Mold is a common allergen; it exacerbates asthma, and can cause infectious disease in some people. It can also have far reaching legal consequences for owners and others in the construction industry.

Mold requires 3 things to grow: (1) food (2) temperatures between 40 to 100ºF and (3) moisture. Virtually any organic material will do for food, including dust, and our indoor temperatures are well within the acceptable range. Therefore, the best bet for controlling mold is to carefully control the moisture in our buildings. This involves much more than wiping up the occasional leak. It requires vigilant control of moisture entry into the building and prevention of condensation throughout our ductwork and cold water piping.

Moisture Happens

Mold doesn't require standing water to grow. High humidity is moisture enough for mold spores to germinate. Ideally, buildings should maintain relative humidity of 60% or lower – not only for comfort, but to prevent mold growth. Unfortunately, areas of high humidity are bound to occur in some areas of an HVAC system.

High relative humidity levels in air handling units occur any time outdoor air dew points are above the coiling coil discharge temperature (typically 61°F) Air discharged from the cooling coils under these conditions usually has a relative humidity level of 90% or higher. Provided food is present, this is all it takes for mold to grow.

Condensation is another problem, occurring whenever air comes in contact with surfaces that are cooler than the dew point of the surrounding air. This makes cold water piping and cold ductwork prime areas for unwanted moisture. This moisture can condense into liquid at the wrong place and the wrong time, wetting building components such as ceiling tiles, drywall and carpeting, and setting the stage for mold growth.

Insulation: The Key to Preventing Unwanted Moisture

Insulation is the best way to avoid condensation in ductwork and piping systems. However, if improperly installed or damaged, some types of insulation can provide a cozy breeding ground for mold. Closed-cell, elastomeric foam is the first and only type of insulation to provide thermal efficiency along with the necessary prevention of condensation and water vapor transmission on cold water and air handling systems. There have been numerous studies that support the case for closed-cell, elastomeric foam over fiber glass and cellulous-based products when it comes to mold prevention. The reason for this is twofold.

1. Fiberglass structure provides a wicking opportunity for moisture; therefore moisture can quickly travel, expanding the area for potential mold growth.

2. Fiberglass tends to trap and collect dirt. In fact, the air pockets that make fibrous type materials an effective insulator also makes them prone to trap and retain dirt.

According to the April 2004 ASHRAE Journal, "Porous materials such as internal fibrous glass liner have been identified as a major source of fungal contamination."

The same article references a study in which fungal growth on fiberglass linings was found in 92% of 150 office buildings in Minnesota with IAQ problems.

This particular study found that the average microbial levels in fibrous glass insulation are hundreds – and in some cases thousands – of times higher than the microbial levels found on closed cell foam insulation under the very same environmental conditions.[1]

Based on these facts, many experts recommend replacing fibrous glass liners with materials that are less likely to encourage fungal growth (i.e. closed-cell foam insulation) in areas where humidity is likely to exceed 70%.

An increasing number of schools, universities and other facilities seeking better IAQ have made the same decision, replacing existing insulation with elastomeric foam, not only for its mold-resistant properties, but its fiber-free, dust-free, and non-particulating construction.

Why Closed Cell Foam Is the Better Choice for Mold Prevention

Unlike fiber-based products, which have been found to hold moisture for up to 16 days,[2] closed-cell elastomeric foam won't absorb moisture. Its smooth surface also inhibits the accumulation of dirt which serves as a food source for mold.

Properly installed and maintained, elastomeric foam is an extremely effective deterrent to biological contamination. Even if closed-cell foam duct liner gets dirty or wet, its smooth surface makes it extremely easy to clean. The same cannot be said of fiber-based duct liners, which are notoriously difficult to clean, and deteriorate more quickly under adverse conditions. While many fiberglass duct liners are now encapsulated with a protective jacket that acts as a vapor retarder, this outer covering is easily punctured. Closed-cell elastomeric foam requires no such vapor retarder or protection.

Finally, when fiberglass insulation gets wet, the North American Insulation Manufacturers Association (NAIMA) recommends that it be removed and thrown out as soon as possible to prevent mold and fungi growth.

Microban Antimicrobial Product Protection

The AP ArmaFlex family of products are infused with Microban antimicrobial product protection to inhibit the growth of stain and odor-causing mold and mildew from growing on any surface of the insulation. Unlike disinfectants which provide a limited residual activity once the treated surface dries, the integrated antimicrobial technology works to continuously reduce the growth of microbes throughout the entire lifecycle of a product. Built into the insulation material, it will not wash off or wear away, making it the ideal option for specification into cleanliness-critical environments such as healthcare.

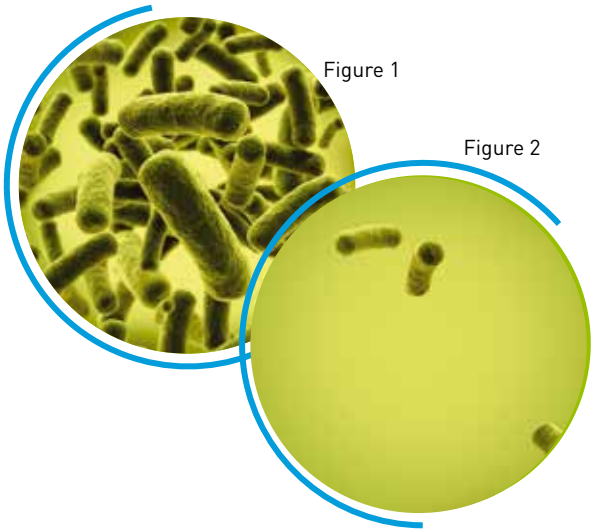
Microban antimicrobial chemistries are continuously working within the molecular structure of ArmaFlex products, creating an inhospitable environment for microbes to grow and multiply. Product protection begins to work as soon as a microorganism comes into contact with a product

surface and the Microban antimicrobial protection penetrates the cell wall of the microorganism, disrupting the cell and making the microorganism unable to grow and reproduce. The antimicrobial protection then works continuously to maintain a consistently lower bio-burden than would be expected on a product without Microban protection.

Microban antimicrobial technologies have undergone extensive independent laboratory testing and have a long history of safe use. The biocidal active components of Microban antimicrobial additives are notified with the Biocidal Products Regulation and approved for use by the Environmental Protection Agency of the United States of America.

Microban in practice: simulated petri dish images

Under the right conditions, microbes on an untreated surface can double every 20 minutes. The image on the left shows an unprotected surface (figure 1) as compared to a surface protected with Microban antimicrobial additive 24 hours after exposure (figure 2).



10 Steps to Prevent Moisture in Piping and Ductwork

Moisture needn't be a problem in a well-designed and maintained HVAC system. The following preventative measures will help facilities eliminate moisture problems and minimize the risk of mold growth.

1. Fully insulate all cold water pipes and fittings and condensate drain pipes with closed-cell elastomeric foam material.

2. Avoid gaps or unsealed seams, and be sure to insulate all fittings, valve stems, etc.

3. Whenever possible, use insulation materials that have non-moisture-absorbing properties – especially on chilled water and refrigeration piping where condensation can become a problem.

4. Fully insulate cold-air supply ducts and air handling equipment.

5. Specify and install adequate insulation thickness to maintain surface temperature above the dewpoint and control condensation. Condensation control typically requires greater insulation thickness than thermal efficiency.

6. Carefully monitor indoor relative humidity, keeping RH at 60% or below.

7. Design systems with adequate drainage in mind. This means installing equipment at appropriate pitch for proper drainage, as well as providing for easy access to drain pans so that workers will be more inclined to check for drainage more often.

8. Change filters regularly and inspect for any accumulation of moisture or mold.

9. Clean and inspect air handlers annually and clean ducts every 5 to 10 years. In certain climates and environments, cleaning may be required more often.

10. Seal cooling ducts during the heating season to prevent moisture from accumulating. Dampers are not airtight and therefore should be sealed by taping plastic sheeting over them.

Keep It Clean. Keep It Dry.

We have a lot to learn about mold and its impact on our indoor environments. While we may not fully understand the degree of hazard mold presents, we do know this: Mold has become a serious concern for building occupants. Mold-related litigation and workers compensation claims are on the increase. These are realities that every building owner, engineer, and contractor must face.

Proper insulation practices are the owners' best defense against mold infestation in chilled water, refrigeration, and HVAC systems. Materials that are non-absorbent, fiber-free, and easy-to-clean are the best choice for avoiding mold and its far-reaching consequences. Closed-cell, elastomeric foam provides these properties for longer lasting systems and greater owner peace of mind.

1) MICROBIAL LEVELS ON INTERIOR SURFACES OF VENTILATION DUCTWORK, CLOSED CELL FOAM VS.FIBROUS GLASS INSULATION AND GALVANIZED METAL. P. Ellringer, S. Hendrickson, Tamarack Environmental Inc., St. Paul, MN; C. Yang, P&K Microbiology Services, Inc., Cherry Hill, NJ

2 (Samimi BS. The environmental evaluation: Commercial and home. Occupational Medicine: State of the Art Reviews. 1995;10(1):95-118.

Note: Armacell closed-cell, elastomeric foam meets important testing criteria for fungal and bacterial resistance, including UL181 for mold growth, ASTM G21/C 1338 for fungi resistance.

Microban antimicrobial product protection is limited to the product itself and is not designed to protect the users of these products from disease causing microorganisms, or as a substitute for normal cleaning and hygiene practices.

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ABOUT ARMACELL

As the inventors of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal, acoustic and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With 3,100 employees and 24 production plants in 16 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for high-tech and lightweight applications and next generation aerogel blanket technology.

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