Sanitizers in HVAC Systems – Use and Applications

The Environmental Protection Agency (EPA) has defined Indoor Air Quality by addressing three primary areas: 1) thermal comfort – the temperature and relative humidity in occupied spaces that we would consider comfortable, 2) ventilation rates – the amount of air circulated in these areas, and finally 3) particulate control – the amount of airborne particulates present. With an understanding of these issues and the related ASHRAE standards that are referenced, it is clear that the heating, ventilation and air conditioning system in a home or structure is the primary component that can have an effect on these three areas. The care and maintenance of these systems are crucial to their proper operation and their ability to address these three areas that define indoor air quality. Considering that HVAC systems have the primary responsibility for indoor air quality, the application of any chemical into the system would seem questionable at best. No matter how careful the applicator might be, there is always the chance that someone may have a particular chemical sensitivity to one of these chemicals. Various publications in the industry and most recently the EPA indicate strong concerns about the use of chemicals and specifically sanitizers in HVAC systems.

The industry has adopted source removal practices for the removal of particulate and microbiological contaminants for many years now. While cleaning of the particulates within the systems goes a long way towards removing the food source for fungi, certainly several types of fungal contamination will remain on interior surfaces, and this is where many cleaning companies typically introduce some type of sanitizing solution to combat these known or suspected biological contaminants. It is important for any applicator of these products to understand the definition, purpose and consequences of using these products. A biocide is a chemical or physical agent capable of killing or inactivating various groups of microorganisms. A sanitizer is a biocide that significantly reduces the number of vegetative environmental bacteria of public health importance. A disinfectant is a biocide that significantly reduces the number of recognized human pathogens. There are thousands of biocides registered with the EPA under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). A few of these products have been EPA registered for the use in HVAC systems; however, it is important for the applicators to know that these registrations are for non-porous (basically bare sheet metal) surfaces only. One of the primary reasons for this is simple – spraying a liquid over the surface of insulated materials will not adequately penetrate down into the insulation to be effective against fungal components that lie beneath the surface. While several industry publications suggest that porous materials with visible signs of fungal contamination be discarded, this becomes a complicated issue when considering HVAC ductwork above fixed ceilings or other structural members that would make replacement economically impractical. There are no EPA registered products available for use on porous surfaces inside HVAC systems; however, this still remains a common practice for many contractors. Any company or individual using sanitizers inside of ducting with porous surfaces must recognize that 1) these product are not registered for that use, 2) there is no efficacy information available for this application, 3) they will have limited effect due to the porosity of the materials, and 4) minimally the applicator increases potential liability for himself by using the products contrary to the manufacturer's application recommendations. The application of these sanitizers or disinfectants in the HVAC

system is an application of a pesticide, and as such may require a state pesticide applicators license. Any company or individual using these products should check with the manufacturer of the product and any state and local licensing requirements.

The process of cleaning the HVAC systems typically calls for the particulate cleaning followed by the decision for the use of some form of sanitizer and/or sealant or coating. If after the cleaning some fungal components remain, killing or inactivating of the microbial growth does not destroy the allergenic or toxigentic properties of the contaminants. What this means is that there is a possibility that occupants can still be affected by microbial contamination whether it be dead or alive! The decision about whether to use a sanitizer is normally based on visual inspection for the presence of microbial growth. In some cases pre-testing may be performed to determine the presence of fungal activity, however, this is costly and time prohibitive, certainly in residential situations, and therefore is not normally performed. Certain commercial building uses, such as healthcare facilities, may require specific identification of contaminants to determine if the application of a sanitizer will accomplish the desired result in the cleaning process. The manufacturers of these specialty sanitizers or disinfectants for HVAC systems label the products with general efficacy data established by general industry standards. This data however does not always cover the contaminant encountered or the conditions or materials where it is found. Therefore it is ultimately difficult to know the actual effectiveness of the sanitizer just by reviewing the labels and instructions for use without some form of post-testing strategy. Specific questions about the efficacy of any sanitizer would have to be addressed by the manufacturer.

While there is a shortage of scientific study about the use of sanitizers in HVAC systems, some studies have shown that these chemicals, having a rather broad spectrum of efficacy, have shown some effect in reducing microbial levels of the common species found inside duct systems. In a precedence study, L.D. Robertson and his research team set out to evaluate the overall efficacy of the HVAC sanitation process[1]. These processes included the complete disassembly of HVAC fan-coil system, cleaning and subsequent treatment with a biocidal agent. Robertson was later involved with an extended HVAC study performed by Florida International University [2]. In that study, the internal blower and coils systems were only partially disassembled and cleaned; however, no biocidal agents were used. A comparison between these research projects indicates the research that incorporated the use of biocides only demonstrated a 5% greater reduction in fungal bioaerosols when compared with sanitation processes that did not use any biocidal agents. These data support the premise that the physical cleaning, and not the chemical treatment, represents the fundamental process with respect to cleaning an HVAC system, and while biocidal treatment may provide some minimal value, such value may not be offset by cost and/or the potential legal liabilities that may result from using biocidal agents in HVAC systems.

Some of the sanitizers and disinfectants on the market also have a label claim as a deodorizer. Deodorization typically is accomplished by one of two means – killing of the microbial contamination and therefore stopping the source of the microbial volatile organic compounds (MVOCs) or through some form of masking of the odor. While eliminating microbial contamination and the associated odors is normally desirable, masking odors inside the system with another chemical is not typically recommended. With increased chemical sensitivities of

occupants, the introduction of another chemical to combat the odor problem is again another reason why the use of chemicals is still questionable!

Sealants and coatings are other chemicals that are widely used in the industry today. Generally speaking, sealants are used to lockdown residual particles remaining after the cleaning process and are commonly used in specialty situations, such as after fire damage to a structure and the HVAC system. While these products should never be used as a substitute for a thorough source removal, they do have some value in certain situations. Coatings are somewhat different from sealants in that they typically have a higher percentage of solids and form a new surface or skin on the surface of the duct. Coatings may be to seal the surface, repair or resurface interior lined duct, or in the case of some specialty coatings, provide some form of microbial inhibitor to the interior surface treatment. While some lower viscosity sealants might be applied with foggers, heavier viscosity materials typically need to be applied manually or with the use of an airless sprayer.

The application of most sanitizers is typically done with the use of a ULV (Ultra Low Volume) electric fogger. These devices usually have adjustments to atomize the chemical and are fan powered to blow the chemical down inside of the system. It is impossible to properly apply the sanitizer with a ULV fogger through an entire system from one access point. Turning the system on and spraying the fogger until chemical comes out of the registers is NOT recommended. Just as the ACR 2006 Standard describes the cleaning process and the purposeful control of contaminants by means of negatively pressurizing the system, the application of any sanitizer in a controlled manner is recommended. After a thorough source removal process has been completed and verified, and while the system is still under negative pressure, the sanitizer should be applied. If measures were taken to maximize the pressure and velocity of the air under negative pressure during cleaning (vents blocked off; cleaning zones created; vacuum speed increased etc.), these measures should be reduced so that a minimal amount of negative pressure remains. The fan powered ULV fogger is what is delivering the atomized chemical to the source of contamination – not the power of the negative pressure devices. Negative pressurization is used simply to control the chemical overspray and keep it within the system during application. With the negative pressure established, the fogger is typically inserted into registers or other access openings created for the cleaning process, and fogged (in a typical residential setting) for approximately four to seven seconds (amount of fogging will vary with duct size). Larger commercial projects may see the use of airless sprayers. A light mist is the intended result, not dripping or saturation. Other components of the systems can be treated such as the coils, fan housing, return air, fresh air inlet(s) - following the manufacturer's application recommendations.

While the use of sanitizers is widespread in the industry today, there continues to be concern from many industry sources about proper and appropriate use of these chemicals. Anyone applying these products should be aware of these concerns and consider the following points prior to application:

- Be sure that the product is intended for that specific use
- Follow manufacturer's application recommendations

- Make sure that MSDS sheets are available on-site and to any homeowner/client when requested
- All personnel must be properly trained in the proper application of the product
- Appropriate personal protective equipment should be used
- Discuss the application of the sanitizer with the homeowner/client – discuss any concerns of exposure, suspected health affects or allergic histories
- Consider sign-off forms or discloser documents to use prior to use
- Do not apply sanitizers into HVAC systems that are operating
- Consider the occupancy of the structure prior to application

1. "Effect of Heating-Ventilation-Air Conditioning System Sanitation on Airborne Fungal Populations in Residential Environments", R.A. Garrison; L.D. Robertson; R. D. Koehn, Ph.D.; S.R. Wynn, M.D.; Annals of Allergy, December 1993, Vol. 71(6): 548-556.

2. "The Effectiveness of HVAC Sanitation; Processes in Improving Indoor Air Quality, Phase I & Phase II", designed by L. D. Robertson, R. A. Garrison, and Mycotech Biological, Inc., Florida International University Technical Publication No. 113, Department of Construction Management, Ahmad, Irtishad, Ph.D., et al, Research sponsored by: The Building Construction Industry Advisory Committee under a grant from the State of Florida Department of Education, The North American Insulation Manufacturers Association (NAIMA), and The Florida Air Conditioning Contractors Association, July 1994.

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Institute of Inspection, Cleaning and Restoration Certification IICRC S520 Standard and Reference Guide for Professional Mold Remediation First Edition December 2003

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National Air Duct Cleaners Association Understanding Microbial Contamination in HVAC Systems 2002/2003

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North American Insulation Manufacturers Association Cleaning Fibrous Glass Insulated Air Duct Systems – Recommended Practice 1993

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