PROTEK corporation
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781-963-8813

sales@PROTEKCorporation.com

Mold & HVAC Systems

What you can't see *CAN* hurt you!

Since Air Ducts are out of sight and therefore out of mind, they are rarely checked. The problem is, Air Ducts spread harmful substances including microscopic bacteria, mold spores, pollen, dust (along with dust mites), volatile organic compounds (VOCs) and other chemicals.

Indoor mold is a common concern because mold spores are constantly present in the environment and only need three key ingredients to grow: water, warmth and food. Worse, mold can *thrive* in HVAC systems and mold can be very problematic. Not only can mold damage structures, mold poses a significant threat to employees and visitors, ranging from mild discomfort and irritation to sickness and decreased productivity, and even to serious respiratory illnesses and sometimes death.

While mold decomposes dead organic materials like wood, along with materials made from wood like paper and drywall, mold can also digest some synthetic things such as pastes, paints, or adhesives. In addition, mold can digest layers of dust and other things that coat the surfaces of inorganic materials like metal, and gradually destroys what they are growing on.

Therefore, critical parts of every HVAC management plan must include preventing mold growth as well as plans to immediately deal with it if mold is discovered. The good news is that mold problems can frequently be avoided and easily managed if encountered.

Humidity and Mold

To understand how mold grows, one must first understand humidity. Most people think of humidity as the amount of moisture in the air. While this is accurate, it's incomplete. First, we must realize that humidity is expressed as a percentage of the amount of water that the air can hold at that temperature and pressure. Second, we must understand that the total amount of water vapor that air can hold actually increases as the either the temperature rises or the pressure decreases.

Therefore, we use the term **Relative Humidity** (RH), which means the humidity "relative" to air temperature and the pressure of the system of interest. For example, while the maximum amount of water that the air can hold at any point is always called 100% saturation, at warmer temperatures the air can actually hold more water. In other words, if early in the day the RH is 100%, if the temperature rises and the amount of water in the air remains the same, the RH will go down. Conversely, if the RH remains at 100%, the total amount of water held in the air will increase.

Impacts of HVAC Systems

Consider that HVAC systems have a significant impact on whether or not the indoor environment is healthy. When it comes to mold growth, while 60% RH may be sufficient to sustain mold, 70% RH or more is ideal for mold growth. The good news is that HVAC units themselves are designed to maintain RH between 30% to 50%. which inhibits mold growth along with making the indoor environment more comfortable for people.

Unfortunately, HVAC systems have filters. While filters remove particulate matter, many filters are insufficient at removing microorganisms like mold spores and bacteria and can even act as a breeding ground. The problem gets worse when the air that returns to the main unit deposits mold spores and bacteria on moist coil surfaces.

Also, consider that whenever there are cold surfaces, there are opportunities for condensation. Thus, if any duct is at 55°F, and if there is a pathway that allows humid outdoor air to get near the 55°F duct, the duct will start to drip. Surfaces that catch these drips (such as ceiling tiles) provide good spots for mold growth.

Proper HVAC Maintenance

A well-maintained system that maintains to maintain RH between 30% to 50% should *never* have mold growth. A side benefit, low humidity discourages pests such as cockroaches and dust mites. However, while HVAC systems have a significant impact on humidity, the systems can transport mold spores between areas of a building. In addition, poor HVAC design or maintenance may support mold growth which could trigger serious consequences. Thus, it is imperative to set up appropriate Preventive Maintenance (PM) schedules.

Perhaps the most significant component of a PM checklist that helps prevent mold growth (if only because it is too often overlooked or improperly tuned) is ensuring correct refrigerant charge and pressure. Improper charge, whether low or high, can cause lots of problems, not the least of which is supporting an environment that may lead to mold growth.

1) Low refrigerant, for example, means low pressure and low temperatures which will cool the evaporator coil causing condensation and unwanted moisture buildup *inside* the system – which can lead to mold *inside* ductwork.

2) Conversely, overcharging a system means too much refrigerant may remain in a liquid form, limiting its ability to absorb heat. Thus, the evaporator coil temperature may remain too high to condense the water vapor from the indoor air, resulting in higher RH than is desirable. If the indoor air is consistently above 55% RH, mold is a likely outcome.

In addition to monitoring refrigerant, inspecting, cleaning, and lubricating system components, attentive technicians will alert responsible personnel and recommend appropriate proactive steps to prevent and/or resolve these and other possible problems.