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## **SERVICE BULLETIN SA-003**

**DATE: September 1, 2005**  
**TO: All Service and Parts Managers**  
**SUBJECT: Dirty Sock Syndrome**

**What is dirty sock syndrome?** An unpleasant odor (i.e. wet, dirty sock smell) that comes from micro-organisms growing on the cooling coil surface, in the crevices of the tubes and fin stock of the indoor coil and in the drain pan. This growth of mold and bacteria is more susceptible in high-efficiency heat pumps. It occurs when switching between the cooling cycle and the heat pump cycle (also known as the “defrost mode”) because the heating cycle is not hot enough to destroy the microorganisms.

In some homes, the spore phases of these microbes accumulate from changes in moisture and temperature, causing the spore sacks to release gases that result in odors. Poor indoor air quality comes from the release of these and other gases that build up in the home. Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from these indoor sources and by not carrying indoor air pollutants out of the home.

The dirty sock syndrome happens with a very small amount of heat pumps that are installed. The U.S. Environmental Protection Agency (EPA) confirms the primary problem by saying, “There is no practical way to eliminate all mold and mold spores in the indoor environment; the way to control indoor mold growth is to control moisture.” <http://www.epa.gov/mold>

Homes that have a higher mold spore and moisture content, will add to the possibility of the “dirty sock syndrome.” Newer homes that are built “tight” (very little infiltration) can suffer from this syndrome. Homes built off the ground, and enclosed at the bottom, can hold excessive moisture. It may help to install a plastic moisture barrier on the ground, under the house.

### **Common Questions?**

**Does the equipment cause this condition?** NO! This condition is **not** the result of a design or manufacturing defect.

**Why does the odor occur mainly with heat pumps?** The indoor coil temperature reaches approximately 120 – 130°F and has a higher humidity at the coil surface area. This is a ideal condition for micro-organisms to thrive. In most gas fired furnaces, the coil temperature can exceed 160° F. This higher heating temperature is a dry enough atmosphere to virtually eliminate this condition and destroy the organisms.

**What causes the smell and is it dangerous?** Spores, molds and fungi may attach themselves to the coil and water from the drain pan. These substances may be found in systems that have never experienced any odors. In some homes, the spore phases of these microbes accumulate from changes in moisture and temperature, causing the spore sacks to release gases that result in odors.



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There is no medical evidence to establish that the “Dirty Sock” smell is associated with any ailments. It can be a very pungent smell that is said to resemble “sweaty feet” or a smell similar to that experienced in a gymnasium locker room.

**Why do I have the odor and my neighbors don't?** Duplicate conditions such as the amount of moisture, micro-organism food source and temperature may not be the same.

There are instances in which one home has two heat pump systems, but only one exhibits this condition. It has been found, when removing a unit from one location having the problem and later re-installing it at another location that the odor does not come back in the same unit. However, a newly installed unit at the same location may exhibit the effect.

There are also reports that the odor disappeared for several years after cleaning, sometimes returning and sometimes never returning.

One thing that appears constant is that this condition affects mostly heat pumps located in high humidity areas of the country (i.e. Southeastern United States) and a few scattered reports in other areas of the country.

**Will Ultra Violet (UVC) lights help?** Yes! Properly designed and installed UVC/UVGI lights will help. UVC is a short-wave ultraviolet radiation, in the “C” band of 200 – 280 nanometers. It has a germicidal ability to destroy viruses, mold and bacteria. UVGI refers to ultraviolet germicidal irradiation, which is the same as UVC. The key is to install the lights on the supply side, just above the evaporator coil. It may be necessary to install a dual tube light to adequately cover the entire coil surface. Additional UVC lights may also be installed downstream in the main supply duct.

**Will a whole house dehumidifier help?** Yes. According to the EPA, the ideal level of humidity is 30% to 50%. The whole house dehumidifier, with a fresh air exchange option is a good combination. Fresh air exchangers, known as Energy Recovery Ventilators (ERV) are also available for different applications. Exchanging fresh outdoor air with stale indoor air is important to a healthier home.

**What will help reduce the “dirty sock syndrome”?** The U.S. Environmental Protection Agency (EPA) in publication (EPA 402-K-02-003) states: “Keep indoor humidity low. If possible, keep indoor humidity below 60 percent (ideally between 30 and 50 percent) relative humidity. Vent appliances that produce moisture, such as clothes dryers, stoves . . . to the outside where possible. Run the bathroom fan or open the window when showering. Use exhaust fans . . . whenever cooking.”

A clean house, with a high quality air tight filter system, changed regularly, is the first line of defense. Most air filters do not trap tiny particles of mold spores, viruses and bacteria. It is important that the evaporator coil, drain pan and drain lines are clean. Annual cleaning of the coil, drain pan and drain lines is important because there may be some air bypass of the filter. Properly designed and installed UVC/UVGI lights will help.

To help assist you, we evaluated products from Controlled Release Technologies and recommend treating the coil with “Fast Attack” System sanitizer, immediately followed by an application of “First Strike Micro-Coat”. See their website at <http://www.cleanac.com/EPAMoldSolutions.htm> click under Disinfection tab.

These chemicals can be purchased directly from “Controlled Release Technologies” at 1-800-766-9057. Another product called “Klein Shield Mold Encapsulant Plus – Formula 1906” is available from “Kor-Chem, Inc.” at (404) 344-9580. We also recommend kit DS-1 or DS-PG for cleaning as these kits include instructions and all the chemicals needed to treat one system. The DS-PG in particular includes an additional chemical to help eliminate any bacteria that may be present in the drain pan. In some cases, this treatment process may need to be repeated annually. Use of all products must be accomplished using strict adherence to the manufacturer’s directions.

## **Conclusion**

The “Dirty Sock Syndrome” is an indoor air quality problem. It is not caused, nor prevented by, the air conditioning (Heat Pump) equipment. This problem must be properly recognized and addressed by the homeowner in cooperation with the installing dealer.

If your home has musty, stale odors you may have a poor indoor environment. Poor indoor air quality can increase the chances of getting “dirty sock syndrome”.

### **We recommend considering the following as suggestions for improving this condition:**

- (1.) Cleaning the indoor coil, drain pan and drain lines.
- (2.) Application and proper use of the suggested products in the section above, entitled: What will help reduce the “dirty sock syndrome”?
- (3.) Properly designed and installed UVC/UVGI lights.
- (4.) Exchanging stale air for fresh outdoor air. Fresh air exchangers, also known as Energy Recovery Ventilators (ERV), are also available.
- (5.) Keeping the humidity level between 30 – 50% by using a whole house dehumidifier.
- (6.) A high quality air filtration system, annual maintenance of the equipment and keeping the indoor home environment clean.