

TECHNICAL INFORMATION COMMUNICATION



Quality and Continuous Improvement

Number: TIC2021-0006

Date: 3/29/2021

Title: Slime Accumulation in Condensate Management Systems

Product Category: Cooling Product

Products Affected

Evaporator coils and Fan Coils

Technical Information

What is the problem:

A slime has been reported that clogs condensate management systems of evaporator coils. The slime is usually whitish in color, but may have different colors like red, pink or gray depending on impurities in the system. It typically occurs in HVAC condensate drain pans, condensate drain lines or at the termination of the drain line.

What is the slime:

The slime is what is called a biofilm and it is a natural defense mechanism of many microorganisms or bacteria. The slime forms around bacteria and acts as a protective armor for the bacteria. Nutrients and moisture can pass through the biofilm but many chemicals that can harm the bacteria have more difficulty passing through the biofilm.

Testing has been conducted on slime and condensate samples from multiple systems that have had slime concerns. The results of the testing showed that all the bacteria were identified as common environmental bacteria and that there wasn't one single type of bacteria that was the main cause of the issue.

Where is the slime occurring:

Air Conditioning coils cool the air passing over it and dehumidify the air creating condensate. Airborne bacteria can collide with condensate droplets and become entrapped inside of the droplet. The droplet can then transport the bacteria through the entire condensate management system. Bacteria will accumulate in any area that does not dry out and has very slow-moving condensate. Common collection areas are drain line connection points, the condensate trap or ground terminations of the condensate drain line.

Why does slime occur:

For the bacteria to have a capability to grow to a level that could be a concern it must have a suitable habitat, consistent access to moisture and consistent access to nutrients. The ideal habitat needs to be absent of extreme temperature swings, UV light or harsh disinfectants. A consistent supply of

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moisture ensures that the bacteria will not dry out and die. Nutrients come in the form of any organic material that is present in the airstream. The organic material can be any small particle that have been released from any plant, animal or human present in the dwelling or local environment. These particles can be small enough to pass through the air filtration system. That material can then collide with the condensate droplets in the same manner as the bacteria itself. The organic matter in the condensate can then be delivered through the condensate management system to any area which the bacteria has accumulated. Some bacteria need to absorb very little organic matter in order to survive.

What to do about the slime:

What is known is that the bacteria and its needed nutrients are located in the environment and are in contact with the evaporator coil and condensate management system from normal cooling operation. It is also known that regions exist in the US that produce a relatively constant amount of condensation due to high cooling demands or high dehumidification needs. Finally, the design of the condensate management system being a dark environment with relatively mild temperature changes combined with areas that can accumulate bacteria make it a very suitable habitat for growth.

These condensate management systems include all field installed piping are not unique to Carrier, and thus can be considered an industry wide issue.

An economical method to completely remove all bacteria from the condensate system is not known at this time. In lieu of removing the bacteria Carrier currently recommends a high-quality maintenance program for areas that are prone to this concern. This maintenance program should be looking to clean condensate management systems prior to blockages occurring.

What NOT to do about the slime:

Through research and testing, it was found that addition of UV light in the condensate drainage system or addition of antimicrobial impregnated materials may have minimal results in preventing biofilm growth. The use of bleach may have negligible results or may damage the HVAC system.

- UV lights were found to slow growth in the area in which the light was present but had little effect or accelerated growth in areas where the light did not reach. It is believed that the light can heat up the condensate and allow for quicker growth.
- Antimicrobial impregnated materials have limited effect on the rate of microbe growth because either the antimicrobial material leaches out of the system and becomes ineffective, or a layer of dead bacteria forms on the surface protecting future bacteria growth.
- Bleach was found to be of limited effectiveness because it becomes neutralized quickly as it attacks the biofilm. Furthermore, vapors released by bleach can create a corrosive environment for materials used in HVAC equipment. **Carrier does not recommend the usage of bleach near HVAC equipment.**

Corrective Action

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A combination of a cleaning method below along with regular monitoring for system blockages or backups will be needed. Each application will have a different amount of time required to block the drain lines, but the methods below will help minimize regrowth rates of the biofilm.

Recommended cleaning method:

- Remove as much water and biofilm as possible from coil and pan with vacuum.
- Flush with large quantities of fast moving water.
- Optional - Use one of the cleaning chemicals listed below in order to delay regrowth.

Directions for completely blocked drainage systems with accessible drain terminations:

- Vacuum out any slime located in the drain pan or on the fin surface.
- Optional - Pour 2 quarts of Totaline® Cooling Coil Treatment P902-1101 and let sit for 10 minutes.
- Fill drain pan with clean water.
- Attach vacuum hose to outlet of the drain termination and vacuum all liquids out of drain pan.
- Flush system with either 5 gallons of water or with a hose. For maximum effectiveness when using a bucket, be sure to fill drain pan as much as possible without overflowing.

Directions for completely blocked drainage systems without accessible drain lines:

- Vacuum out any slime located in the drain pan or on the fin surface.
- Optional - Pour 2 quarts of Totaline® Cooling Coil Treatment P902-1101 and let sit for 10 minutes.
- Insert a hose to the inlet of the drainage system in the drain pan and turn on faucet. Allow system to build pressure to dislodge blockage and then allow ample water to flow once blockage is removed.
- If blockage does not come free before drain pan fills with water, remove hose, run a long, small wire brush through the drainage system to mechanically dislodge the blockage and then repeat previous step.

Directions for drainage systems that have been partially blocked:

- Vacuum out any slime located in the drain pan or on the fin surface.
- Flush system with either 5 gallons of water or with a hose. For maximum effectiveness when using a bucket, be sure to fill drain pan as much as possible without overflowing.
- Optional - Use Totaline® Cooling Coil Treatment P902-1101, add slowly allowing chemical to interact with biofilm in drainage system and then flush with large quantities of water.

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Figure 1 - Totaline® Cooling Coil Treatment P902-1101

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Directions for a continuous disinfectant method between preventative maintenance:

- Use Totaline® Condensate Pan Strip P902-38003 through P902-38007 based on size of the cooling system.
- Place close to the drain pan outlet. Testing has shown to delay the growth of biofilm downstream of the pan strip.
- This product is currently available in the following states: AL, AR, CO, CT, FL, HI, LA, MA, MD, ME, MS, NC, NH, NJ, NY, OK, PA, RI, SC, TN, TX, VA, WV. Certifications for additional states are currently being pursued. The chemicals leached from this product can become loose effectiveness over time.
- Strips will need to be replaced and a new strip inserted on a regular PM schedule.



Figure 2 - Pan Saver Strip Options

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