

Corrosion/Erosion in Coils - A Difficult Problem

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One of the problems that is least understood in the HVAC industry is the difference between corrosion and erosion. They are completely separate problems and have solutions that are not related at all. When building coils, air handlers, fan/coils or any piece of HVAC equipment, you have to know if you're dealing with either corrosion or erosion, or both at the same time. Let's look at the difference.

Corrosion

Corrosion can be the result of any corrosive agent that can either be in the air that passes through a unit, or in the water or steam that passes through a coil. There are thousands of different elements in different combinations that can cause corrosion inside a unit. It would be bad enough if every corrosive agent acted predictably, but they don't. When you combine different corrosive agents together, they act completely differently than if they were by themselves. If you put an air handler in a chemical plant and there are several corrosive agents in the air, it's very difficult to predict exactly how you need to build the unit, because in tandem, nobody knows what to expect.

Not every corrosive situation has to be complicated. Nothing eats up coils and air handlers any faster than "salt air". Whenever you install any unit near the ocean, you have to design it around corrosive conditions and make the proper allowances. In addition, water and/or steam are often not treated properly and eat up the inside of any coil, because they can be corrosive also. These are simple examples of corrosion.

Erosion

Erosion is not the same as corrosion. Erosion takes place when water or steam goes through a coil, and over time, eats away the inside of the coil. There is always erosion taking place on any system. The question becomes, "How fast is this erosion taking place?" If a coil takes 25 years to fail, because the coil eventually wears out, then this level of erosion is acceptable. If a coil fails in 2 years, then you've got a problem.

Corrosion/Erosion Together

Yes, it's possible to have both of these problems at the same time. Now you really have to know what you're doing to design a unit.

Believe it or not, when coils and air handlers fail due to corrosion or erosion, the symptoms are different. It's not always easy to spot the differences, and on large jobs it's sometimes necessary to call in a metallurgist to run tests to determine what the problem is. But once you figure out what the problem is, then you can design a unit to solve the exact problem that you have. This is particularly helpful on retrofit or replacement jobs when existing units have failed prematurely. You don't want to duplicate the unit, because you're just going to have the same problems all over again.

How do you treat erosion?

The answer is very simple. You have to make the materials of the unit or coil thicker than the standard. Erosion eats away over time, so by making the unit thicker, you extend the amount of time that the equipment will last. You can't eliminate the erosion, but you can account for it by making tubes, fins, casing, supports, etc. all thicker so the air handler or coil lasts longer.

How do you treat corrosion?

If you treat corrosion the same way that you do erosion, you're going to be in trouble. Corrosion eats away from the inside or outside or both, but it happens in a "sneaky" way. It starts slowly and speeds up as the process goes along. By the end, corrosion just wipes out a coil or air handler, because the process happens exponentially. You think that you have it solved by doubling the thickness, but you might only be adding a month to the life of the unit. You either have to change the materials of the unit, so that these materials are not adversely effected, or you have to coat the unit, so that the corrosive agent can't come into contact with the material. There is no other answer! Cupro-Nickle, stainless steel, brass, etc. are some of the materials that can be commonly used. There are special coatings also.

When you examine a damaged unit, you now have (5) choices:

- (1) Did the coil just die of "old age", and was the coil built correctly from the beginning?
- (2) Is the steam or water pressure too high for the coil, and did erosion from the inside out make the coil fail?
- (3) Is there corrosion in the air, and did that make the coil fail from the outside in?

(4) Is there corrosion in the water or steam, and did that make the coil fail from the inside out?

(5) Is there a combination of all the above?

Nobody said replacing coils was easy! There really are many different scenarios, and the solutions required need to be made by somebody who knows what they're doing. Call USA at 1-800-872-2645, and we'll walk through your problems with you. We've done a lot of work with both corrosion and erosion and we know the difference.



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