

# Energy savings in the HVAC environment

As most facility managers are aware of, operating your HVAC equipment accounts for 40-70% of their energy bill. As a result engineers work hard to improve their equipment and make it more energy efficient and economical.

So what is it that we can do in Air Conditioning (AC) that can substantially decrease operating costs and / or increase efficiency? One of the core problems facing many facility managers is the degradation of the HVAC equipment and the subsequent inefficiencies such as increased maintenance and energy costs.

An important part of this degradation is due to corrosion in the coils of the chillers.

- Corrosion will occur in every AC chiller coil
- Corrosion is the most important factor in the decrease of efficiency of your chiller
- Corrosion is also one of the easiest to tackle and avoid.

Most chiller coils are built out of aluminium fins around copper tubes. Copper and aluminium aren't compatible metals and copper being the more cathodic metal will slowly degrade the aluminium fin, make it brittle and thin due to 'galvanic corrosion'.

Another concern is environmental and industrial corrosion caused by, for example, car exhaust gases, industrial pollution, salt in the air etc. Due to this corrosion the fins will reduce their heat transfer / conductivity very significantly, clog up with adhering dirt and salt, become brittle and will literally fall apart, sometimes in a matter of years.

The solution to this problem is the application of an anti-corrosion coating on the coils. Some anti-corrosion coatings will provide units with a very effective protection. With the correct coating up to 20% in your energy bill can be saved and roughly double the lifespan of the coils.

In most cases the lifespan of the coils will determine the lifespan of the chiller, after all the coils are the weakest link! So in doubling that lifespan hundreds of thousands of dollars in premature capital investments will be saved. There are a great number of anti-corrosion treatments available on the market, some more effective than others.

Options for a facility owner will be as follows:

1. **Do nothing and hope for the best.**  
This is not a good option in the short, medium or longer term as corrosion will continue to ravage your chiller coils and the inefficiencies in chillers can reach levels of increased energy use of 40 to 70%.



*Galvanic corrosion in existing coil.*  
*The copper tubes corrode the aluminium fins until they fall apart and disintegrate.*



*Corroded coils due to salt and pollution.*  
*The clogged-up coils will have:*

- greatly reduced airflow
- therefore lose efficiency
- and a substantially higher energy bill
- to generate the same outcome.



*Coil tested by the BSRIA Institute, an independent research house in the UK.*  
*The coil is virtually destroyed after only 4000 hours of salt spray, i.e. six months.*

2. **Treat existing HVAC units on site** with an effective anti-corrosion coating. One of the most successful coatings that can be applied on site is Blygold's 'PoluAl XT' coating. It is a very effective way to protect chiller coils from further corrosion as the coating is a spray-on application (a so-called 'post coat application'):

- a. This coating can be applied in situ
- b. Has a metal pigmentation so the conductivity of your coils is maintained
- c. Is UV resistant and has a salt and acid test resistance of 4000 hours.

3. **Ensure that all new coils are treated** before installation on site. This is the best and most affordable option. However, this is only relevant for new units and will not be available to existing units.

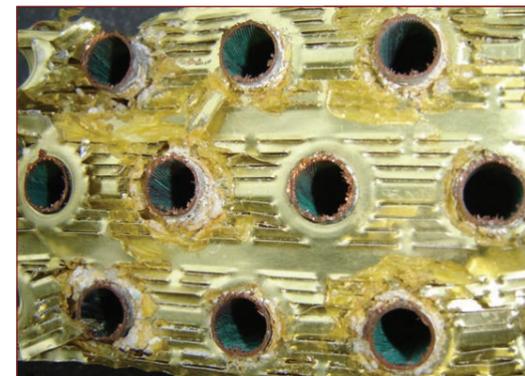
Options are two-fold:

- a. There are the so-called 'pre-coat' options, which is a coating applied to sheets of aluminium during the production process. These sheets are then cut in strips the width of the coil fins and the holes for the tubes are punched in. Then the coil is put together. 'Blue Fin' and 'Gold Fin' are the most commonly known of these coatings.



*On-site treatment of existing chiller coils.*  
*This treatment will include:*

- thorough cleaning of the coil
- drying
- application of anti-corrosion coating from both sides of the coils
- covering the fins, tubes and headers.



*Gold Fin pre-coated coil tested by the BSRIA Institute in the UK.*  
*The coil is corroding significantly after 1000 hours of salt spray, i.e. a month and a half.*  
*Corrosion is most evident around the tubes where there is bare aluminium.*



*Spray-on application of coating on new coil.*  
*This coating is:*

- Blygold polyurethane based coating
- With metal pigmentation
- Only 25 microns thick once dry
- Flexible and UV resistant
- Salt and acid spray resistance of 4000 hrs
- Doubles lifespan of the coils
- Saves up to 20% energy.

The biggest advantage of this process is that it is fast, automated and cheap. The biggest drawback is that it is not very effective as it will have bare aluminium where the sheets have been cut and the holes been punched. This is around the edges of tubes and the fins, where corrosion will normally occur.

Other coatings use the dipping process where the coils are submerged. Its advantage is that it is cheaper, but the coating thickness is uneven, most coatings are not UV resistant and the coating can't be applied or maintained on site.

- b. The most effective option is to apply the earlier mentioned 'post-coating' on the new coils, which means that the coating is applied after the coil has been fully assembled. The coating is applied by spray and the coating will not only cover the fins, but also the connection between the fins and the tubes, the tubes themselves, as well as the headers. This way the coil will be fully protected and stop the corrosion from occurring.

What about the newest coils that are made out of aluminium only? Surely they don't need protection? Well, we have to disagree here as these MCHX aluminium coils (MCHX stands for Micro Channel Heat Exchanger) obviously don't have the galvanic corrosion as discussed earlier, but by being exposed to air the aluminium will oxidize and therefore will become thinner and more brittle over time. An effective coating here can save substantial money too.

We can confidently state that an anti-corrosion coating can be a very worthwhile initiative as it can actually realize substantial savings. As always: the devil is in the detail, so facility managers should make sure they are well informed before making any decisions.

Ray Van Haven, GM  
Blygold Oceania.