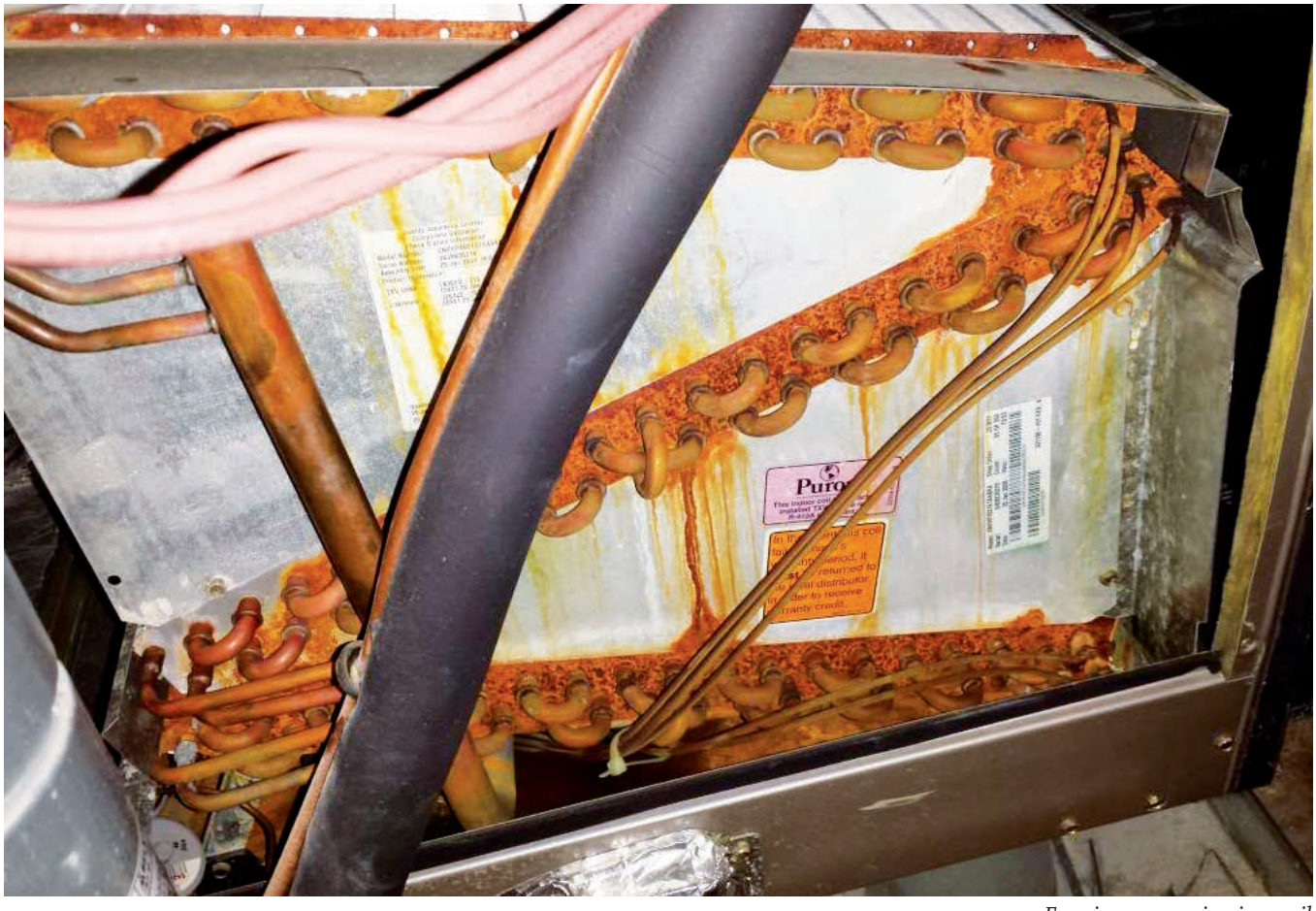

Formicary corrosion in a coil

HVAC in Corrosive Environment

By Mahesh R. Mehta Ecochem Plus, Mumbai

Part 6

Disruption in HVAC Industry

Everyone is talking of disruptive forces, which change market forces instantly. The entry of Jio in the mobile market and Tesla in the automobile market are such examples when a new breed of competition changes the market beyond recognition. Is the HVAC industry fighting such disruptive forces? Yes. Who is behind such disruption? Nature's forces. The industry is competing against Nature, and should not take it lightly.

The HVAC industry is moving towards energy efficient units. Clients want power savings. The industry has introduced various technologies, e.g. higher fins/inch (FPI) and rifled tubes, to get maximum flow and efficiency within limited space. Can such units cope with corrosive forces? Signals coming from the field are very discouraging. Innovative clients staying in corrosive areas, who have adopted new 5 star technologies and inverter units, are finding it hard to believe that their IDU coils, even from leading brands, are barely able to survive12-15 months. Leaks are seen coming from below coil fins even from straight tubes, where no joints exist; this never occurred earlier. ODU fins are also getting corroded in no time. New types of

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About the Author

Mahesh Mehta entered HVAC industry accidentally, being a Textile Engineer. He started by marketing eco-friendly non-toxic imported chemicals in Western India in 1999, conforming to standards like RoHS and MIL. He then began executing turnkey orders for coil cleaning in industrial AC plants with specialized equipment, using a combination of mechanical and chemical cleaning. He has worked with multinationals and Indian companies in pharmaceutical, food, hotel and IT industries for deep coil cleaning, descaling, fin coating, environmental corrosion control, power saving, etc. He likes to work at challenging sites.

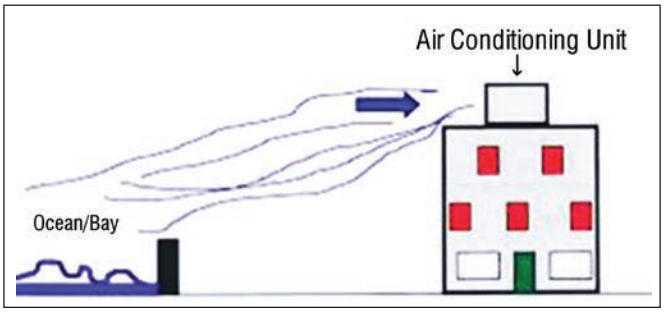

Figure 1: AC unit located at building rooftop

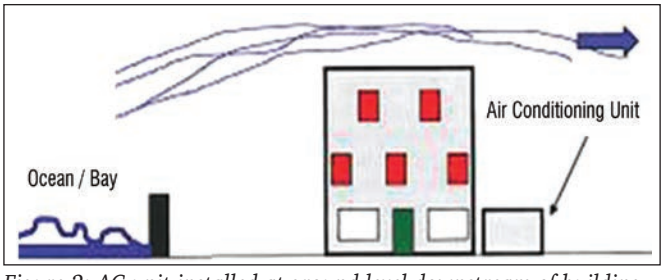

Figure 2: AC unit installed at ground level downstream of building

corrosion complaints are on the rise; even PCB failures are on rise. What is the reason?

Let me recall *Figure 1* and *2* from Part 1 of this series published in the September-October 2016 issue of *Service, Installation, Maintenance* (SIM) supplement to the *Journal*. Which is the ideal place for installing this air conditioning unit?

Nature's Dictates

The first point to be noted in *Figure1* is that in the HVAC vs. corrosion fight, basic HVAC principles are being thrown to the winds by Nature's dictates. Worldwide the practice is to install HVAC units in the open, but saline corrosion will make it a wrong choice.

Higher FPI

The second point is, energy efficient units have more FPI for compact cooling; in such a situation, fins are becoming thinner and thinner, so they easily succumb to saline and corrosive forces.

Rifled Tubes

The third point is, copper tubes are rifled, with their wall thickness drastically reduced, and the new refrigerant gases work at higher pressure. Internal gas pressure ranging from 250-550 psi acts as an invisible hand for faster damage. This leads to tube ruptures, resulting in leaks in no time. Please see *Figure 4*.

Figure 3: Rifled tube

Unprotected PCB Brains

The fourth point is, inverter units with unprotected PCBs brains are easily corroded within a short period.

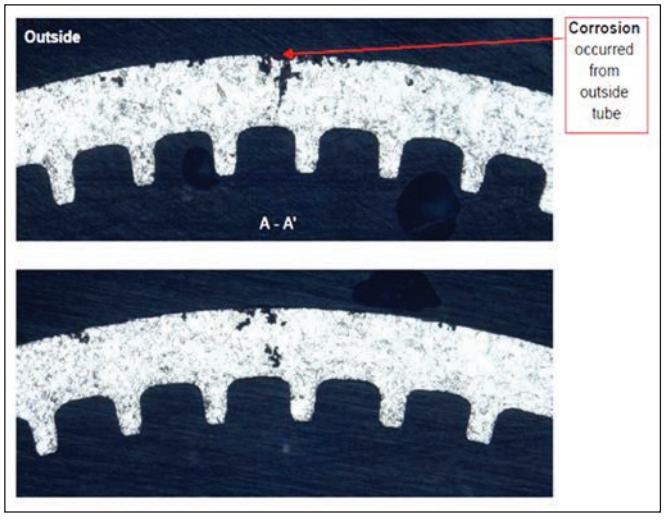

Figure 4: Transverse cross section of a tube at leak area, showing corrosion (A-A')

Epoxy Precoating

The fifth major concern is that some OEMs bring their air cooled chillers pre-coated from abroad; they are generally coated with epoxy, which has seen the highest failure ratio in Indian conditions. Due to the large difference in environmental conditions and crude maintenance practices (for example, maintenance personnel jumping on air cooled chiller parts for coil cleaning), a successful protection in one country cannot be replicated elsewhere. A leading retail chain project head recently confided to me that micro channels coils are a strict no-no in their premises. Technological advancement has not brought any change in cleaning and maintenance practices. OEMs who invested heavily in such technology are having second thoughts.

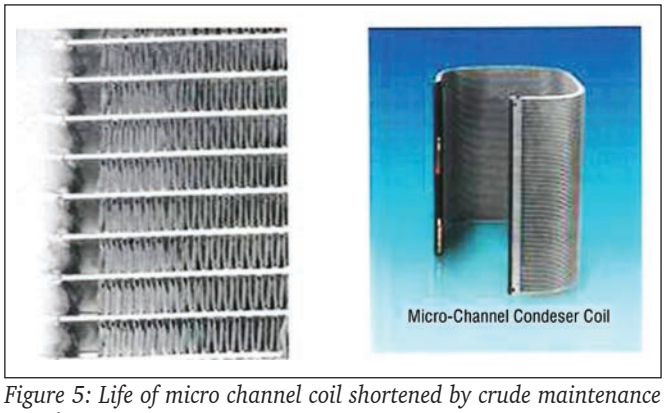

Figure 5: Life of micro channel coil shortened by crude maintenance practices

Crude Maintenance Practices

The sixth serious concern is after sales service, which each customer needs for maintaining the units in their original efficiency plus for stretching equipment life. Such issues are not adequately addressed. Over-enthusiastic but ill equipped

contractors clean such units with very high water flow, like garden hoses with flow of 30-50 liters/minute, and damage the fins instantly and permanently, without any scope for repairs. Such damages may be passed off as corrosion damage, and the client is forced to buy new equipment/coils in 2-5 years.

In brief, the 5 star energy saver units have been short changed on the metal thickness of tubes and fins, which are easily prone to Nature's non-stop corrosive attack. If it survives Nature's attack, crude maintenance can complete the remaining job. OEMs need to act fast, or else 5 star energy saver units will meet a premature death.

Roles of Different Players

OEMs

Every area of HVAC technology – compressors, fins, tubes, PCBs, inverters – is advancing at a faster pace than before. So is corrosion. There are some maintenance and reliability truths that should be applied at the earliest. Serious complaints that bring the most pain need to be identified.

Dealers and Sales Teams

They need to educate customers well in advance. Dealers have pushed the 100% micro channel aluminum coil out of the market, as they were ill equipped to either service them or braze them. If possible, they should promote products/coatings that have stood the ground. Investing in technology for equipment servicing, regular studying of units in corrosive areas, involving the clients too in the process as action can be taken at the earliest if traces of corrosion are seen.

Buyers

They need to understand the technology and make judicious choices while going in for energy saving products.

Conclusion

Let us sum up the present situation.

a. OEMS are in a race to build Unicorn products, but environmental changes need to be respected.
b. HVAC industry is already knee-deep in the environmental corrosion game, and is not immune to what is happening at the end customer's place. More than winning market share, it is high time to build heavy duty plus energy saving products. OEMs must strengthen their products both internally and externally.
c. The HVAC industry needs to take into its fold the anti-corrosive industry at the earliest.
d. The time has come for OEMs, academics, designers, engineers and other stakeholders to do some disruptive thinking.
e. Corrosion in HVAC, like cancer, seems to progress in a relatively orderly manner. How can the HVAC community unite against it? The way we address the crisis will define our community for decades.