FAQ

Defining a failure; how do you use a copper Corrometer to measure the corrosion of ferrous metals?

Answer: Have you ever heard of the expression "A canary (bird) in a coal mine"? If not, it is an expression that means if you have a canary in a coal mine you can use them to detect poisonous gasses as they are very sensitive to toxic gasses that can be found in coal mines. If the canary dies it means there are poisonous gasses present that humans may not be able to detect until it's too late. So if the canary dies and the humans see it, they should get out immediately. The copper **Corrometer** model is similar to the canary in that it is a very thin film of metal that will corrode before the corrosion becomes critical for the asset that is being monitored. Now this "critical" area is the "gray" area in the definition for metals, because, for ferrous metals in particular, we need to ask: what constitutes or defines a failure? Does surface rust constitute a failure? Or are they looking for a corrosion rate and then if that is the case, when the question may be, when does the corrosion go to a certain rate and how much time is allowed at a certain rate? So if it is at "X" rate for "Y" amount of time, the question to ask is: what do they do and how do they implement a corrective action or do they replace the part or what? I'm not sure what the policies or the protocol's are, so I think these questions need be asked so everyone is of the same understanding and expectations.

For example, if you have small tolerances (< 25 microns) then surface rust would be a failure, but if we are talking large heavy earth moving equipment, maybe 1000 microns would be the acceptable tolerance and they functionality would still be there. Or if someone is looking to know what the corrosion rate is (say they want to quantify the environment), they could set up two **Corrometer** 's side by side, one protected and one not protected. They could look at how much the rates of the two vary over time and say how effective the protection is that they have chosen. If they wanted to they could do something similar for different locations. An obvious question might be, is one area more corrosive than another? If so, this could impact how and where they store equipment, or how they protect it. It's hard to say exactly what is needed until you have this type of discussion with the customer.

Electrical boxes like Human-Machine Interface's (HMI's) and Programmable Logic Controller's (PLC's) and Traffic Control or Telecom stations incorporate temperature and humidity controls to manage corrosion concerns, why would they want or need a Corrometer?

Answer: First they could use a **Corrometer** to verify if the temp and humidity controls are working properly. Second, although what they have in place is a great way to prevent corrosion and is recommended, a **Corrometer** can be used to alert them of issues before the weakest link in their system would fail or they implement this as a Quality Assurance (QA) device. It works great as QA monitoring device because say for example there was a power outage due to a natural disaster or significant accident. Having a **Corrometer** in place will let inspectors know if real damage had taken place during the down, or no corrosion control, time. Because there are so many different manufacturer's components placed into these boxes of varying quality standards there is no good way to police and know which ones are robust enough for that environment. When they were all installed they most likely manually soldered or made connections in some way where they may not have

used additional corrosion protection, it's very likely that there is some unprotect component which may end up being their "weakest link".

Suggestion: QA managers should want to have a robust disaster-contingency plan in place for components critical to the successful (100%) operation of important equipment.

How do I monitor the corrosion inside a steel pipe?

Answer: You could use **Corrometer** to quantify how corrosive the environment is inside of the pipes. Place one in a pipe and come back over time to check. The corrosion rate would be that of copper, not steel, but this can be used to correlate a relative corrosion rate back to steel.

Can the Corrometer be used to measure corrosion on the inside of water pipes?

Answer: The **Corrometer** should not be used for immersion in water. It is water resistant, and may hold up to being immersed for short periods of time, for now, (< 10 seconds), but it is not water tight or water proof. I would recommend inline water pipe corrosion sensors made specifically for water lines.

Is the Corrometer suited to be used in electrical box enclosures?

Answer: Yes, different locations and environments.

How will a copper Corrometer sensor let me know that my MULTI metal VCI is protecting ferrous metals, when this is a non ferrous sensor?

Answer: For multi-metal VCI products, all VCI manufacturers will have a balance of multi-metal (ferrous and non ferrous) VCI's in their formulations. They will have a specific ratio blend of VCI's in their polymer films as well as their coated papers. So for example they may blend this ratio of inhibitors:

3 parts of a short term volatile ferrous
2 parts of a long term volatile ferrous
1 part of a water soluble contact ferrous (A)
2 parts of a water soluble contact ferrous (B)
0.5 part of a water soluble contact non ferrous
1.5 part of a long term volatile non ferrous
.75 part of a short term volatile non ferrous

You need to know that inhibitors have different solubility in solution's (solvent or aqueous) for paper coatings and temporary coatings and they have different melting points that must be considered when making extruded films, this means multiple inhibitors are most likely used and they will be balanced to expire around the same time. Because they are designed to expire at close to the same times, we can use a copper **Corrometer** to indicate when all the inhibitors are starting to diminish. We can also say that when the copper **Corrometer** corrosion rate increases, that is, when it goes from green to yellow or red, all the inhibitors, most likely, may be losing their efficacy and the user should increase their multi-metal protection.

Can the copper Corrometer alert me to poor protection or efficacy of ferrous

volatile inhibitors?

Answer: Most likely no, ferrous volatile corrosion inhibitors have an attraction to ferrous metals and therefore most like won't help protect non ferrous metals. The user should test these types of scenarios before use to be sure as there may be some adverse affects that may not be commonly known.

How is a failure defined?

Answer: Failure is defined by the Customer's definition or their specifications. The **CORROMETER** will let you know something is in trouble and most cases the asset will still work, however protective measures should be taken to correct the corrosion rate issues before a failure does occur.