Corrosion monitoring in plastic or non-ferrous pipework systems?

The paradox in corrosion prevention: the more corrodible material, the less potential damage. People tend to think that corrosion monitoring is unnecessary when plastic or non-ferrous pipes are used. The contrary is true.

Plastic or non-ferrous metal does not rust.

Which means, that these pipe materials in modern systems do not rust and therefore cannot consume oxygen. And it is precisely this inability to consume oxygen they are more of a problem.

Oxygen is the problem, not the steel.

Since metal pipes can corrode due to the reaction with oxygen, the (wrong) impression exists that the system is better off with a different material. People think that any material other than steel is better as long as they do not rust and produce sludge. The idea that plastic or copper is better than steel, just isn't true.
After all, the cause of corrosion lies in the continuous **entry of oxygen**. In a good installation there should be no oxygen entering and therefore there is no corrosion. Opponents of steel pipes argue that in practice it is not possible to prevent the oxygen entering and therefore plastic or non-ferrous metal pipes should be selected.
But even if the entry of oxygen cannot be ruled out and e.g. plastic pipes are used, the problem only get bigger! (see "paradox in corrosion prevention")

The corrosion intensity on the remaining ferrous metal parts increases.

The more plastic pipe is used, the less steel is still available.
Which means that there is also less "capacity" to "reduce" any oxygen entering the system. If oxygen enters the system, the corrosion process is inevitable. Conversely the more steel there is, the lower will be the corrosion intensity on it. The total amount of oxygen is then "spread" over a larger surface. The advocates of plastic, stainless or copper pipes thus inadvertently make the problem worse for the ever-decreasing share of ferrous metal left in the system if oxygen enters (which is exactly their argument). The reasoning that less sludge can be formed if there is less steel in the system is also wrong. **The amount of corrosion is of course related to the amount of oxygen entering and not to the amount of steel available!**

Conclusion.

Just because plastic or non-ferrous materials do not rust, the oxygen-depleting capacity of a system is reduced. This increases the corrosion intensity on the remaining ferrous metals, and thus the

Updated:16/03/2022

chance of perforation or other problems.
Corrosion must be prevented **by preventing the ingress of oxygen.**

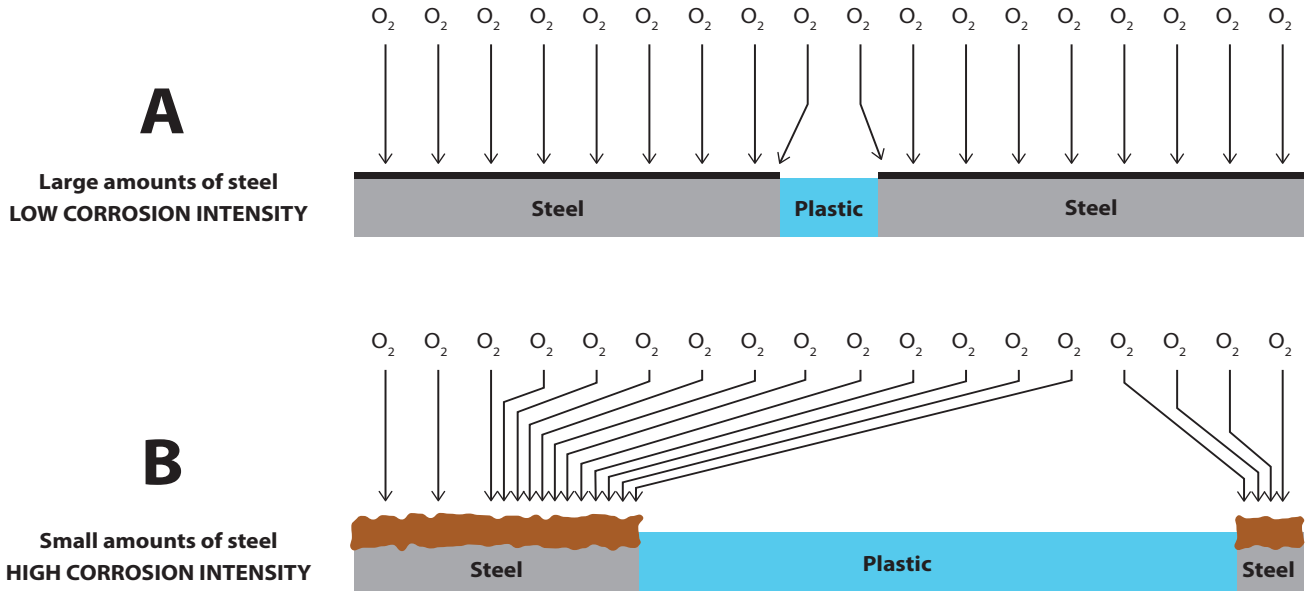
Paradox in corrosion prevention.

The **more corrodible material** an installation contains (think of classic installations built almost exclusively from steel), the **less chance of perforation** that can be caused by the possible entry of limited amounts of oxygen - only corrosion sludge is formed;

Conversely, the **less corrodible material** an installation contains, the more local damage will be caused by the oxygen to the most **corrosion susceptible components**.

This is shown schematically in the figure below. Plastic is considered a non-corrodible material, steel as a corrodible material. With an equal, limited amount of oxygen in the water, the presence of more steel (situation **A**),the corrosion per cm of steel will be less (lower corrosion pressure) than in situation **B**, where little steel is present (and therefore a high corrosion pressure).

Effect of material choice on corrosion pressure. Blue is non-corrodible material, for example plastic, and grey is a corrodible material, usually steel - but occasionally brass as well.



PS: plastic could also be, for example, copper or stainless steel.

Updated: 16/03/2022