THE WD- 40 EXPERIMENTS

(H. Holden, 2019)

Background:

I have been using WD-40 for at least as many years. I have found it very good for preventing corrosion on metal surfaces and particularly good in a coastal area where there is an abundance of salt laden air. Also it appears to improve the quality of electrical connectors/connections (at least this was my practical experience with it).

Also WD-40 does not attack most plastics or insulation materials. One of the few circuit board components it is not compatible with is adjustable capacitors as WD-40 has a dielectric constant which increases their capacity. However WD-40 generally does not damage electronic components on PCB's.

It was brought to my attention by a person who repaired mechanical clocks that WD-40 appeared to increase corrosion in clock mechanisms composed of brass and steel screws and nuts and that it appeared that WD-40 increased corrosion at the interface between the brass and bare steel. I found this a little difficult to believe as being essentially a hydrocarbon based product, there should be few if any ionic compounds in it that could cause or accelerate corrosion on metals. However the results of these experiments are surprising.

The Experiments:

Initially I set up a clean Brass plate with some bare steel nuts (the zinc plating ground off them) screwed to it. One was coated in WD-40 the other not to act as a control. I placed this outdoors in a rain protected area for a couple of months. The photos below show the initial object placed outdoors on the left and on the right after about 2 months outdoors:

As one might have expected, the WD-40 coated nut was fee from rust, but the bare one has significant surface rusting. I then removed the nuts to check for any reaction between the brass and the steel:

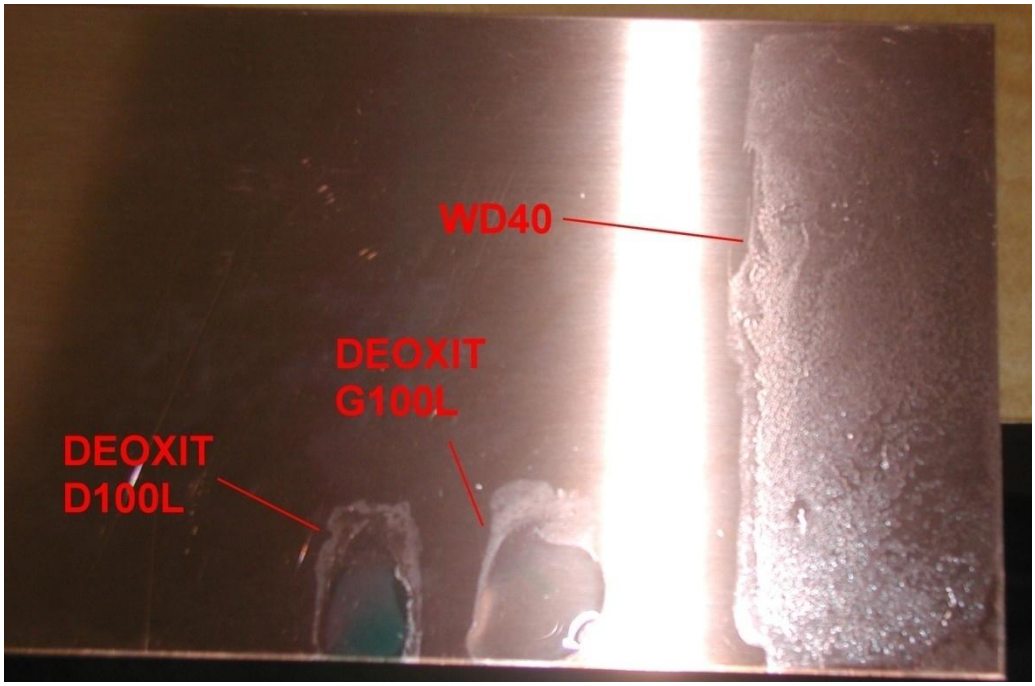
There is no visible reaction between either steel nut and the brass plate. Certainly no evidence of any green corrosion.

Then, much to my astonishment, I noticed when cleaning up the brass plate, that there appeared to be a reaction where the WD-40 had been in contact with it:

After this finding it prompted me to find out how this came about. I wrote to the makers of WD40 but I did not get a reply.

I set up a test protocol to find out if it was the copper or zinc component that had reacted. Also I tried WD-40 on a range of metals. I could not observe this effect easily on aluminium or steel, or nickel plated brass, or nickel plated copper. I could see it most readily with bare copper and bare brass.

Starting with a fresh copper plate I applied WD-40 and also two other workshop products while I was at it. It was interesting that the Deoxit D100L reacted to some extent with the copper to produce a blue compound after some days:

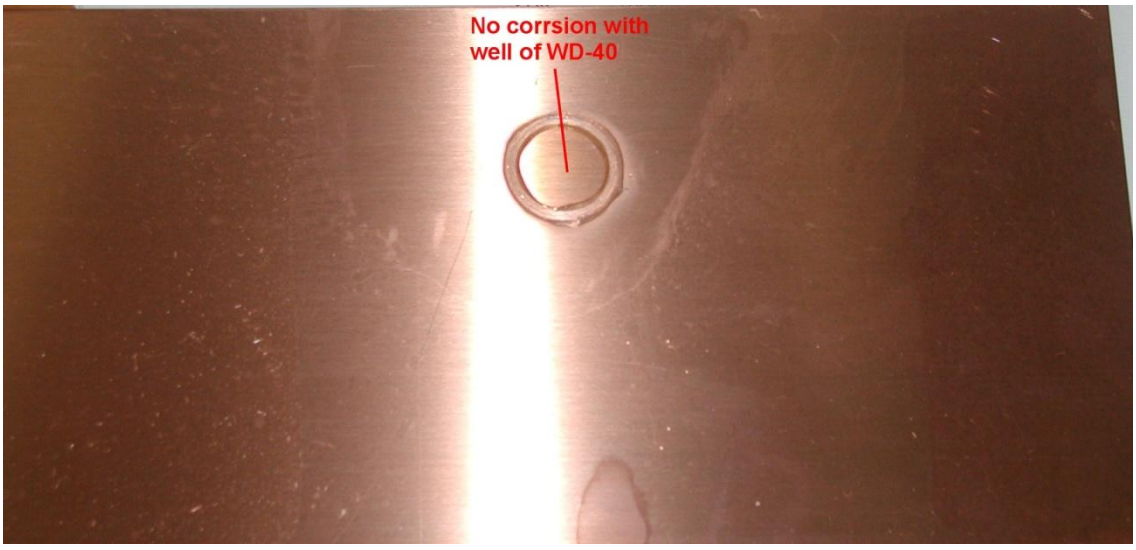


Leaving this for a couple of weeks (indoors) I wiped off the WD-40 (which I had initially applied as a thick coat on the right hand side of the plate) and again found there were multiple spots of corrosion , small brown dots, only where the WD-40 had been applied to the plate's surface.

I repeated the experiment with a very thin coat (wiped off with a cloth) of WD-40 on the left hand side of the plate. The effect was less visible, but still there.

Even after this I still found it difficult to believe that WD-40 contained any elements that directly attacked the copper, so I modified the experiment to help find out. I glued a PCV cylinder to the surface of the plate, where the copper was still perfect. Then I filled this well to a height of about 2cm tall with WD-40:

After 10 days I removed the well and inspected the copper surface in the base of the well. No corrosion at all. This confirmed that WD-40 does not actually harbour any chemical that directly attacks copper.



This photo shows a close up view of the WD-40 induced brown spot corrosion on copper plate:

Conclusion:

The results suggest that a film of WD-40, applied to a bare Copper (or Brass) surface, increases the rate of corrosion of the surface, yet this is not due directly to the chemical makeup of WD-40 itself, as proven by the “well” experiment.

It appears on the face of it, from the experimental results, that the physical coat WD-40 on the surface somehow enhances the rate at which atmospheric substances induce the corrosion, water and oxygen etc. It has been said by some that WD-40 is Hygroscopic, perhaps this explains the effect.

To resolve this issue, films of WD-40 on copper or brass plates need to be placed in enclosures with varying amounts of oxygen and water vapour to determine which atmospheric component, combined with the physical film of WD-40 on the surface is responsible for the corrosion seen.

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