CROWN INDUSTRIAL SERVICES INC. **CLEANLINESS TESTING LABORATORY**

We test to ISO 16232

Washing Multiple Metals in the Same Washer

After looking over the Product Data Sheet of the cleaner and finding it clearly states “all metals safe” and also provides adequate Rust Preventative (RP) time value you breathe a sigh of relief and run a wide array of different metals (aluminum, steel, cast iron, stainless steel, and brass) through the same washer. You personally supervised the initial charge of the newly cleaned washer with the proper concentration of your “all metals safe” cleaner so you know firsthand everything started out with the process in control. To make certain the process stayed in control you gave verbal instruction to your trained concentration control crew and you backed up your verbal instruction with written instruction to carefully control the concentration level within the X-Y% range required to get 10-14 days of Rust Preventative (RP) value. You are caught completely off guard when the final inspector reports to you that the cast iron and steel parts are lightly peppered with little spots of rust at the pre-shipment final inspection the day after washing them. Your RIT (right in time) shipment is in peril. You immediately suspect that concentration control was neglected and have the washer checked for concentration level thinking somehow it got diluted but when the results come back you find it is right at the target concentration you selected and you are left scratching your head wondering **“What happened?”** and **“Why did it happen?”** and **“How can I prevent it in the future?”**

What happened?

Galvanic corrosion occurs when two metals of differing nobility are placed in an electrolyte - very basically forming a cell of a battery with the less noble or more active metal losing electrons to the more noble or more inert metal. The rust spots peppered all over your parts (in this case) are signs of galvanic corrosion.

Why did it happen?

In the case of the steel and cast iron peppered with rust spots just a day after being washed in an “all metals safe” cleaner with an RP value of 10-14 days some very tiny galvanic cells were created with the aqueous cleaner (or sometimes just humidity in the air) acting as the electrolyte and very small metal particles circulating or being “strewn around” in the washer serving as the dissimilar metal (dissimilar to the metal in your part) in the tiny galvanic cell. Voila! Lots of tiny galvanic cells makes for lots of little spots of rust peppered all over your parts.

How can I prevent it in the future?
Well you likely thought you had prevented it by using an "all metals safe" cleaner and while it is true you can safely wash an array of metals safely with an "all metals safe" cleaner you can't safely wash an array of metals in the same bath with the typical "all metals safe" cleaner – you get to choose one metal or you may get away with washing metals of very similar nobility – but you will get galvanic corrosion if you wash metals of quite different nobilities in that same "all metals safe" bath. So one quite obvious method of prevention is to wash dissimilar metals in different baths and often that is exactly what is done after learning the hard way about the galvanic corrosion potential of washing multiple metals in the same "all metals safe" bath. Typically a very labor intensive bath switching and washer cleaning process is implemented whenever a different metal is going to be washed through the same washer. This does work if well implemented but it eats up massive amounts of labor and time – and obviously all that time spent switching a washer over to wash a different metal is time that no parts are getting washed in that washer. Quite candidly we have been there – we have done that bath switchover – MANY times. We feel your pain – BIG time.

So are there other options?
Yes there are other options to the labor intensive bath switchover. Let's look at a couple of them.

Dedicated washers for specific metals
The most obvious option to incessantly doing bath switchovers every time you need to wash a different metal is to have dedicated washers for each different metal – which requires adequate floor space and capital equipment investment. Employing this option you have a washer dedicated to washing only aluminum parts and another that washes only your steel parts for example. To employ this option you look at the galvanic potential charts and religiously avoid washing dissimilar metals in the same washer. The dedicated washer option works very well as long as nobody "goofs up" and runs a load of parts made of a dissimilar metal in that dedicated (to washing one specific metal) washer. If by means of human error a load of dissimilar metal does get run through one of your dedicated washers the system then sits primed with galvanic corrosion potential until completely cleaned and recharged with new wash solution. Additionally as you may have already learned in "the school of hard knocks" that little human error gets compounded if the errant individual is either blissfully oblivious to the seriousness of their error or if they inadvertently or intentionally neglect to report their error. The longer the contaminated bath gets used – the greater the potential population of parts with potential for galvanic corrosion.

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Multiple Metals Wash Solution

Wouldn't it be wonderful if rather than an "all metals safe" cleaner you actually had a cleaner specifically designed to wash multiple metals safely in the same bath in the same washer? We certainly thought that would be wonderful so with our blender we made it reality and called it Hurriclean® AP+. "AP" stands for "All Purpose" and "+" (plus) means we specifically designed it to work with metals from Third World countries which too often have corrosion issues which their stated alloy should not have. Our Precision Cleaning Division cleans thousands upon thousands of parts of varying sizes and dissimilar metals with a very large percentage of them being washed in Hurriclean AP+. Some of those thousands upon thousands of parts of various metals have contamination like dust and synthetic coolant which is fairly easily removed and others have harder to remove straight oil or even some more difficult to remove chlorinated paraffin – so we ensured Hurriclean AP+ was designed to clean off a wide array of contamination types while bestowing a modest level of RP value as well. We know that Hurriclean® AP+ has saved our Precision Cleaning Division lots of time and made it far more productive. Perhaps Hurriclean® AP+ can help alleviate your galvanic corrosion issues as well.

Jack Griffes
Laboratory Supervisor

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If you would like more info or a quote for Hurriclean® AP+
or other members of our Hurriclean® line of aqueous cleaners
Pick up your phone and call Nancy Lawrence (517) 905-5352

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If you are wishing you had read this days or weeks earlier
Pick up your phone and call Bill Ong (517) 905-5313
Ask about Production Rust Removal or Equipment

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To learn more about galvanic corrosion the first two links may prove helpful.
The third link covers many other forms of corrosion as well.

http://corrosion.ksc.nasa.gov/galcorr.htm
http://www.corrosion-doctors.org/Forms-galvanic/galvanic-corrosion.htm
http://www.corrosion-doctors.org/Corrosion-Forms/Introduction.htm