

CHLOR*RID DEMONSTRATION AT JET PROPULSION LABORATORY

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On January 22 (1997) Jim Johnson, representing Chlor-rid, Inc., came to the Jet Propulsion Laboratory to demonstrate the use of the Chlor-rid product which is also called Chlor-rid. Chlor-rid is a chemical concentrate of undisclosed composition which is claimed by the company to improve chloride removal when it is used in dilution as a rinse. Mr. Johnson brought his own prepared coupons, spraying solutions, and sprayer equipment. The sprayer equipment was mounted in the bed of his pick-up truck and consisted of a gasoline engine, a high pressure pump, tanks for both ordinary tap water and one-percent Chlor-rid solution, and the hoses and spraying wand.

The pre-treatment of the coupons, according to Mr. Johnson, consisted of eight days of exposure in a 'standard' salt spray cabinet at a moderately elevated temperature. The coupons consisted of rectangles of sheet steel, three inches by six inches in size and about 0.050 inch in thickness. They had all been grit-blasted before being rusted in the cabinet. The rusted coupons were removed from the cabinet and dried without rinsing. On the day before the demonstration, the coupons were grit-blasted again to remove the rust which had formed in the cabinet. This treatment was presumed to simulate the history of an actual surface being prepared for painting. Such surfaces have often been grit-blasted sometimes in their history, followed by painting and subsequent rusting in the normal environment, followed by another grit-blasting prior to repainting. According to Mr. Johnson, such grit-blasted surfaces, although they look clean, still retain a small residue of chloride that was present before blasting. Presumably the chloride becomes trapped as a result of the grit-blasting process, maybe because of the impact working of the surface by individual grits. Mr. Johnson explained that the Chlor-rid was especially designed to remove the chloride that is trapped by the grit-blasting. It may be unnecessary or superfluous for surfaces which have not been grit-blasted.

When I got a chance to inspect the prepared coupons at JPL, they showed a coarse grit-blasted texture which was slightly streaked with light rust. Most of the area was of a clean gray appearance. Both sides of the coupons had received the same treatment and were indistinguishable from each other. Mr. Johnson attributed the light rust streaks to the moisture they had been exposed to on the one day which had elapsed since the blasting. The weather had been rainy and drizzly for several days and the explanation seemed reasonable.

Six coupons were set aside as controls and were not sprayed. Six coupons were sprayed with a one-percent (by volume) solution of Chlor-rid and six were sprayed with ordinary tap water. For spraying, the coupons were hung, six at a time, on a special hanger which consisted of a metal strap about three feet long with projecting screws to serve as hooks. The coupons each had a hole at one end to fit over the screw/hooks. The spray emerged from the nozzle at a pressure of about 1000 psi, diverging to an cross-sectional area about a half-inch in diameter at the working distance of two or three inches. The spray was moved back and forth over the area of each coupon, attempting to cover the whole area with the high pressure part of jet. The coupons were reversed on their hooks to spray the back in a similar way.

Samples of the Chlor-rid spraying mixture and the tap water were taken directly from the supply tanks for later analysis.

After spraying, the coupons were removed from the hanger using clean rubber gloves and placed in a Pyrex dish. Each coupon was then dried by holding it with tongs in the heated stream of air from a hot air gun. The dry coupons were set aside for subsequent measurement of their residual chloride.

The measurement of the residual chloride was done by boiling the coupons individually in deionized water. Approximately one liter of deionized water was used and the boiling was done on hot plates using stainless steel beakers -with aluminum foil covers. During the boiling, which was continued for about 1 hour and a half, the volume of water was reduced at different rates in the, different beakers. Additional water was added where necessary to keep the coupons immersed. At the end of the boiling period, the coupon was removed and the volume of water remaining was measured. A small portion of the water was put in a glass sample bottle for chloride determination and the rest was discarded. All eighteen coupons received the same treatment.

The chloride content of the boil-water samples and of the wash solution was measured using a Dionix ion chromatograph. The samples were measured without the addition of buffer. Standard solutions containing 2 ppm chloride were run before and after the other samples. The data and the chloride determinations are contained in the table below.

Lessons for Salt Measurement from the Chlor-rid Testing

The Chlor-rid testing has brought home to us an unpleasant fact, that some surfaces retain salt more effectively than others. During our salt measurement experiments, we have concentrated on relatively smooth surfaces. Nor have we done any measurements on surfaces where chloride may have been 'worked' into the surface by grit blasting. The texture of rough surfaces may retain salt by itself, which requires high pressure jet blasting to extract. It may be that this salt will not be removed by low pressure methods such as simple swabbing or the Bresle patch.

Salt can be retained under and interspersed in a porous rust layer. Simple swabbing or soaking (as with the Bresle patch) will not remove all the salt that is trapped in the rust. To remove this salt from the surface, the rust should probably be dissolved with acid. Where the surface has previously been grit blasted, a longer exposure to acid may be necessary.

Fortunately, there seems no easy way to use high pressure while sampling. May be useful to use ultrasound to agitate the water in a sample patch.

Pressures may be achieved in this way that are equivalent to a water jet

	(micrograms per square centimeter)			
	Flouride	Sulphate	Chloride	As Sodium Chloride
Unsprayed 1	0.36	0.62	4.60	
Unsprayed 2	0.49	0.95	4.02	
Unsprayed 3	0.35	1.40	4.63	
Unsprayed 4	0.63	N/A	4.37	
Unsprayed 5	0.53	0.72	5.20	
Average	0.47	0.87	4.56	7.52
	(Chloride Standard Deviation)			
	Flouride	Sulphate	Chloride	As Sodium Chloride
Tap Sprayed 1	0.54	0.79	6.46	
Tap Sprayed 2	0.21	0.85	5.36	
Tap Sprayed 3	0.92	0.92	4.33	
Tap Sprayed 4	0.77	N/A	3.39	
Tap Sprayed 5	0.76	0.92	4.05	
Tap Sprayed 6	0.24	0.59	2.67	
Average	0.57	0.81	4.38	7.23
Chlor-rid 1	0.66	0.97	3.01	
Chlor-rid 2	0.71	0.81	3.01	
Chlor-rid 3	0.27	0.80	2.54	
Chlor-rid 4	0.40	0.83	3.37	
Chlor-rid 5	0.29	0.68	2.16	
Chlor-rid 6	0.57	0.87	2.84	
Chlor-rid				
Chlor-rid				
Average	0.48	0.83	2.82	4.65
Chloride Standard Deviation			0.42	