CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2006
DateRun:	03/29/2006
Experimenters:	Jason Marshall
ClientType:	Coatings Manufacturer
ProjectNumber:	Project #2
Substrates:	Aluminum
PartType:	Coupon
Contaminants:	None
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric, Visual
Purpose:	To evaluate supplied product for corrosion potential on aluminum.

Experimental Procedure:

Testing was conducted following ASTM G21-72 (2004) Standard Practice for Laboratory Immersion Corrosion Testing of Metals. This practice rather than a standardized procedure is presented as a guide so that some of the pitfalls of such testing may be avoided. Coupon corrosion testing is predominantly designed to investigate general corrosion.

Coupons with a large surface-to-mass ratio and a small ratio of edge area to total area were used. Two inch by four inch square coupons were used that had a thickness of 0.034" thick.

The temperature was held at 71 F +/- 2 F.

The volume of the test solution should be large enough to avoid any appreciable change in its corrosivity during the test, either through exhaustion of corrosive constituents or by accumulating of corrosion products that might affect further corrosion. The lab filled two 400 ml Pyrex beakers with 350 ml of the solution.

Three aluminum coupons (AL-1100) were precleaned for five minutes in a 5% solution of Armakleen M Aero in an ultrasonic tank. Cleaned coupons were rinsed in tap water at 120 F for 15 seconds and dried using compressed air for 30 seconds. The coupons were then weighed to establish baseline weights. Three coupons were immersed into each solution, suspended by stainless steel hooks. Beakers were then covered with parafilm to reduce evaporation or contamination of the solutions. The soak time was set at 24 hours (1440 minutes). At the end of the soak time, coupons were removed from the beakers and observations were made prior to cleaning.

Coupons were cleaned for 15 seconds in M Aero 5% solution using immersion soaking. Coupons were not rinsed but were dried using compressed air for 15 seconds. Dry coupons were then weighed to determine the amount of weight loss if any. After reweighing, coupons were examined for the presence of pits.

Interpretation of Results
The mass loss during the test period can be used as the principal measure of corrosion. Average corrosion rate can be calculated from the following equation:

Corrosion Rate = (K*W)/(A*T*D)
K = a constant
T = time of exposure in hours to the nearest 0.01 h
A = area in cm2 to the nearest 0.01 cm2
W = mass loss in g, to the nearest 1 mg (corrected for any loss during cleaning)
D = density in g/cm3

Corrosion Rate Units Desired	Constant (K) in Corrosion Rate Equation
mils per year (mpy)	3.45 x 10^6
inches per year (ipy)	3.45 x 10^3
inches per month (ipm)	2.87 x 10^2
millimeters per year (mm/y)	8.76 x 10^4
micrometers per year (um/y)	8.76 x 10^7
picometers per second (pm/s)	2.78 x 10^6

CLEANING LABORATORY EVALUATION SUMMARY

g per sq. meter per hour (g/m2-h)	1.00 x 10^4 x D

Results:

Data used in calculation:
K = 8.76 x 10^4 in millimeters per year (mm/y)
T = 22 h
A = 100 cm^2
w = 0.0006 g

Coupon	Initial	24 Soak	Wt Loss	Ave Change	Coupon Obs
1	21.1180	21.1182	-0.0002		yellow tint
2	21.1412	21.1402	0.0010	0.0006	yellow tint
3	21.1413	21.1403	0.0010		yellow tint

Each coupon had areas that were yellow in color. Appeared to be stained from cleaner

Calculated Corrosion Rate

Product	Corrosion Rate (mm/y)
Tigmar 521	0.000024
Water	0.000009

Summary:

Substrates:	Aluminum				
Contaminants:	None				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
United Organics Corp	Tigmar 521	100		☑	Compatible with aluminum

Conclusion:

The supplied product appears to be compatible with aluminum based on the calculated corrosion rate, 0.000024 mm/y