VANCOR® Corrosion Inhibitor Products for Paints and Coatings

Before viewing the following presentation, please be sure to read the usage statement:

Before using, read, understand and comply with the information and precautions in the Material Safety Data Sheets, label and other product literature. The information presented herein, while not guaranteed, was prepared by technical personnel and, to the best of our knowledge and belief, is true and accurate as of the date hereof. No warranty, representation or guarantee, express or implied, is made regarding accuracy, performance, stability, reliability or use. This information is not intended to be all-inclusive, because the manner and conditions of use, handling, storage and other factors may involve other or additional safety or performance considerations. The user is responsible for determining the suitability of any material for a specific purpose and for adopting such safety precautions as may be required. Vanderbilt Minerals, LLC does not warrant the results to be obtained in using any material, and disclaims all liability with respect to the use, handling or further processing of any such material. No suggestion for use is intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patent or to violate any federal, state or local law or regulation.

Outline

I Introduction

II Corrosion Basics

III The Use of Organic Coatings to Protect Steel

IV Chemistry of the VANCOR® Products

V Testing of Coatings for Corrosion Resistance

VI Examples of the Use of VANCOR Products as Corrosion Inhibitors

VII Summary

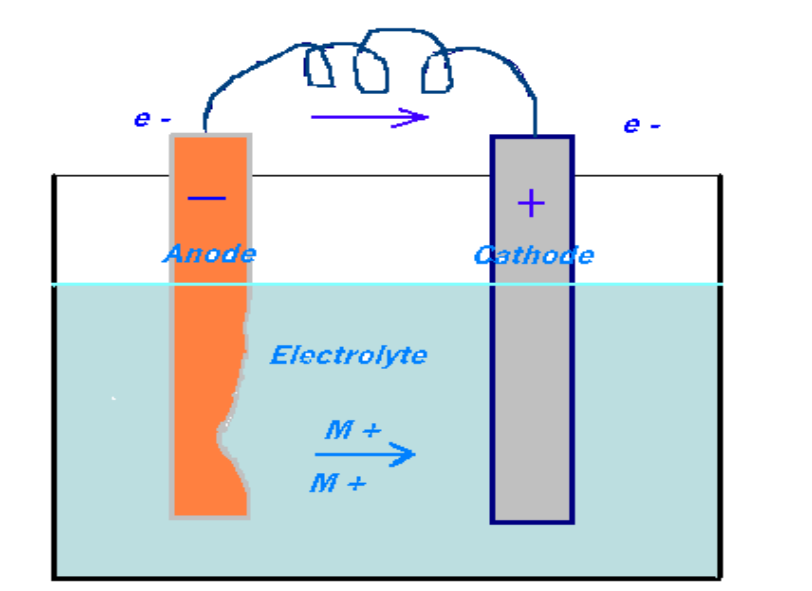
Introduction

The losses due to corrosion in the United States are estimated to be in excess of $200 billion per year, or 4.2 % of the Gross Domestic Product.

Corrosion Basics

Four elements must be present for corrosion to occur:

- Anode
- Cathode
- Electrolyte
- Conductor



The absence of any one of these will stop the corrosion process.

Corrosion Equations

Anode $4\ Fe^{o} \rightarrow 4\ Fe^{++} + 8\ e^{-}$

Cathode $8\ e^{-} + 4\ H_2O + 2\ O_2 \rightarrow 8\ OH^{-}$

Further Oxidation $O_2 + 4\ Fe^{++} + 8\ OH^{-} \rightarrow 4\ Fe_2O_3 + 4\ H_2O$

Overall Reaction $4\ Fe^{o} + 3\ O_2 \rightarrow 2Fe_2O_3$

The Use of Organic Coatings to Protect Steel

Coatings protect steel by three mechanisms:

- Sacrificial or galvanic protection
- Passivation
- Barrier coatings

Coating Failures Due to Corrosion

Blistering

Early/Flash Rusting

Anodic Undermining

Filiform Corrosion

Cathodic Delamination

Pitting and Flaking

Chemistry of the VANCOR® Corrosion Inhibitor Products

Prepared by acid base reactions of alkyl-aryl mono sulfonic acids plus metal hydroxides.

Prepared in solution.

Most commonly used metals are calcium, barium, zinc and magnesium.

Different Metals Give Different Properties:

Calcium: Used in water-reducible alkyd coatings

Barium: Used in latex and water-reducible alkyd/latex coatings, good for flash/early rust resistance

Zinc: Helps aid adhesion in acid catalyzed coatings

Magnesium: Contributes to improved film hardness

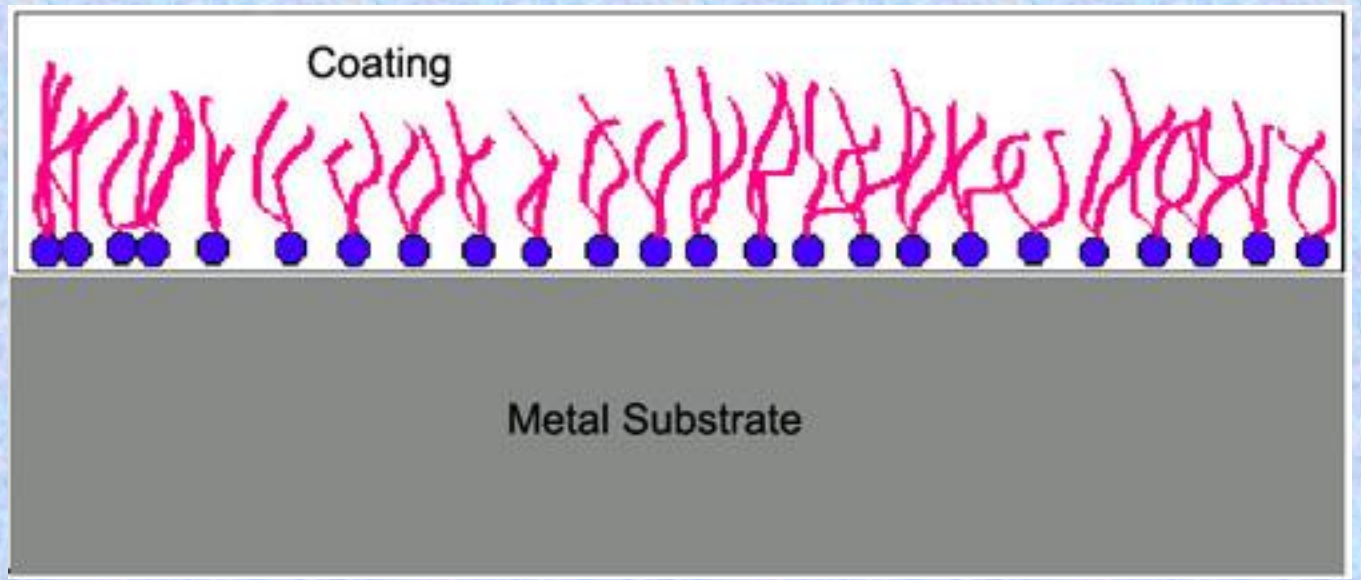
Typical Properties of VANCOR® 073

Active Ingredient:	Calcium Alkyl-aryl Sulfonate
% Activity:	50 % by weight, 46 % by volume
Physical State:	Dark Brown Liquid
Solvent:	Ethylene Glycol mono Butyl Ether
Density:	0.98 g/cc (8.17 lbs/gal)
Brookfield Viscosity:	200 cps (20 rpm. 25 ^{o} C)
VOC:	474 g/L (3.95 lbs/gal)
Recommended use level:	1 to 3 % based on total weight of coating

Typical Properties of VANCOR® 081

Active Ingredient:	Barium Alkyl-aryl Sulfonate
% Activity:	50 % by weight, 46 % by volume
Physical State:	Dark Brown Liquid
Solvent:	Ethylene Glycol mono Butyl Ether
Density:	1.0 g/cc (8.34 lbs/gal)
Brookfield Viscosity:	200 cps (20 rpm. 25 ^{o} C)
VOC:	474 g/L (3.95 lbs/gal)
Recommended use level:	1 to 3 % based on total weight of coating

The Process of Protection of Steel with Coatings Containing VANCOR® Products



Testing of Coatings Containing VANCOR® Products

Test the actual coating in which the VANCOR product will be used.

Use a substrate that is of the same type of metal and has the same type of pretreatment.

Testing must be indicative of real environment.

Include a blank with no inhibitor and a standard with an approved inhibitor.

Run a ladder series to determine optimum dosage level.

Include statistical analysis of data to assure reliable conclusions.

Water Reducible Alkyd Modified Acrylic Latex Primer

Formula 020398

DISPERSION		pounds	gallons
KELSOL ® 3961-B2G-75		68.1	7.8
Premix the next four items and add:			
	ARCOSOLV ® PnB	26.2	3.6
	ARCOSOLV PM Acetate	5.2	0.7
	Co HYDRO-CURE ® II	1.5	0.2
	ACTIV-8®	0.4	0.1
VANCOR ® 081		25.0	3.2
Triethanol Amine		2.6	0.3
Water		125.3	13.8
Triethanol Amine (to pH 8.0--8.5)		1.6	0.2
Ti-Pure ® R-900		50.0	1.5
High speed disperse to 7 Hegman Fineness, then reduce speed for let down.			
LET DOWN			
NeoCryl ® 6085		523.8	60.2
ARCOSOLV PnB		31.4	4.3
Water		34.2	4.1
Slow speed mix for 5 minutes. Post add Colloid 640 defoamer as needed.			
	Totals	885.3	100.0
PAINT PROPERTIES:			
Weight per gallon		8.85	
% Solids	by weight	36.5	
	by volume	30.7	
% PVC		5	
Pigment to Binder Ratio		0.19 to 1	
calculated VOC			
	lbs/gal	1.98	
	g/L	238	

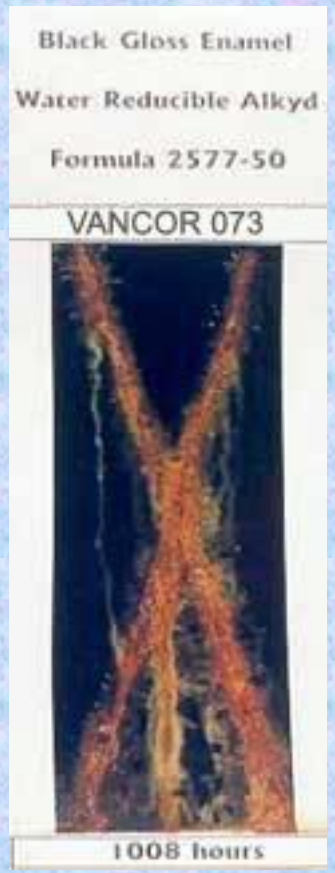
Formula 020398 Salt-Spray Results 840 hours

Formula 2577-50

Black Gloss Enamel Water Reducible Alkyd

		pounds	gallons
GRIND			
KELSOL ® 3961-B2G-75		144.6	16.5
Premix next 4 items and add:			
ARCOSOLV ® PnB		20.0	2.7
VANCOR® 073		20.0	2.4
ACTIV-8®		2.0	0.3
6% Co HYDRO-CURE ® II		4.8	0.7
NH_4OH		10.0	1.3
Adjust pH to 8.0 - 8.5			
Raven ®1255		17.5	1.2
Water		250.7	30.1
Steel Ball mill to 7 Hegman Fineness			
LET DOWN			
KELSOL ® 396-B2G-75		114.2	13.0
NH_4OH		5.3	0.7
Adust pH to 8.0 -8.5			
Premix			
ARCOSOLV PnB		10.0	1.4
Water		247.7	29.7
Slow speed mix for 5 minutes.			
	Totals	846.8	100.0
PAINT PROPERTIES:			
Weight per gallon			8.5
% Solids	by weight		26.2
	by volume		22.2
% PVC			5.7
Pigment to binder ratio			0.90 to 1
Calculated VOC			
	lbs/gal		2.60
	g/L		312

Formula 2577-50 Salt-Spray Results 1008 hours



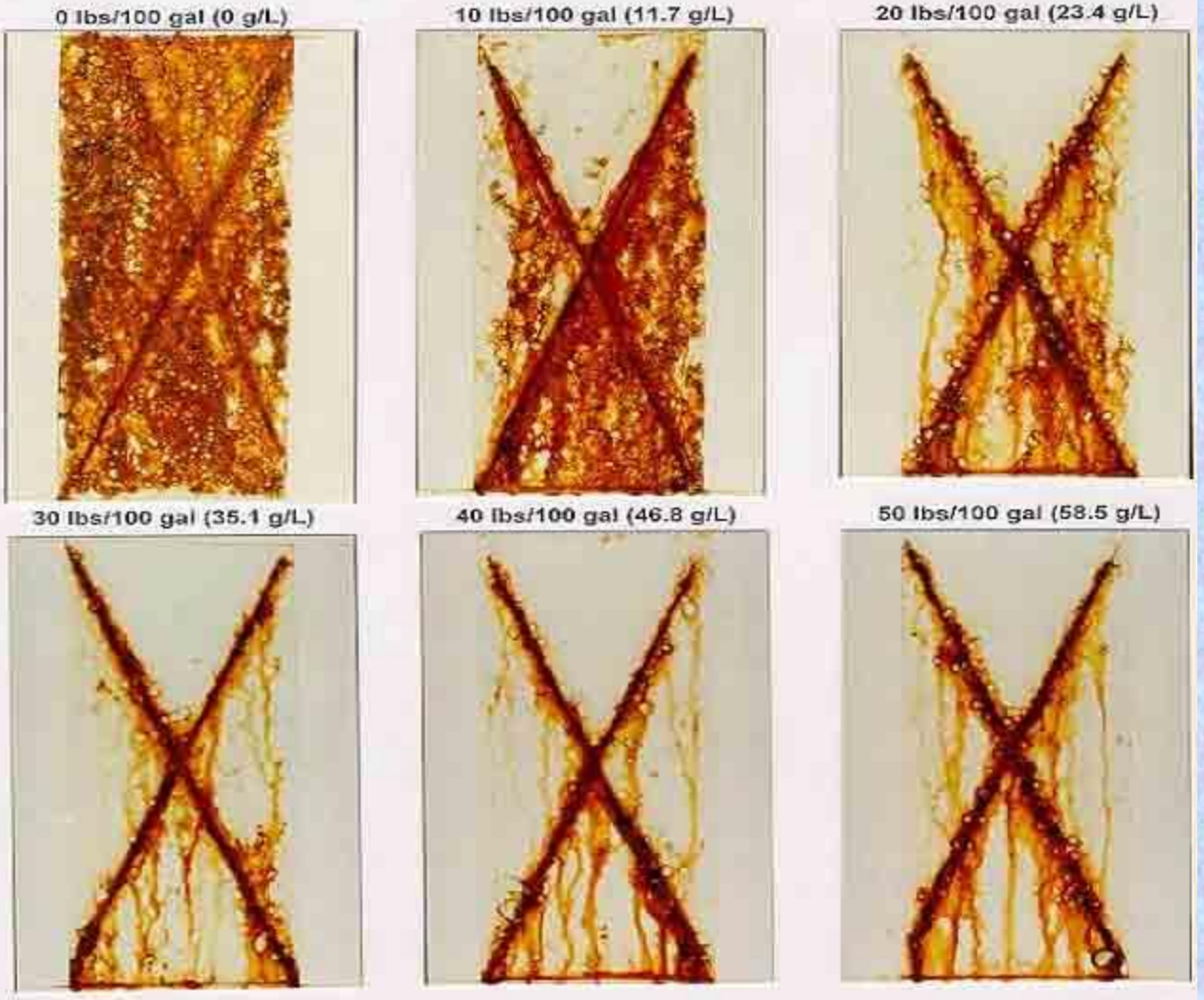
Formula 129
Gloss White DTM Primer

	pounds	gallons	
DISPERSION			
KELSOL ® 3960-B2G-75	68.1	7.9	
VANCOR ® 081	variable **		
ARCOSOLV ® PnB	26.2	3.6	
Premix and add:			
ARCOSOLV PM Acetate	5.1	0.6	
10 % Co HYDRO-CURE ® II	0.15	0.0	
ACTIV-8®	0.15	0.0	
Ti-Pure ® R-900	100.0	3.0	
Premix and add:			
Triethanol amine (TEA)	3.7	0.4	
Water	52.4	6.3	*Check pH (target 8.2 to 8.5)*
High speed disperse to 7 Hegman Fineness, reduce speed.			
Water	62.9	7.5	
TEA	1.9	0.2	*Check pH (add TEA to be in range)*
LET DOWN			
NeoCryl ® 6085	523.8	60.2	
Premix and add:			
ARCOSOLV PnB	31.4	4.3	
Water	50.0	6.0	
Mix 5 minutes at slower speed. Add defoamer if needed.			
Totals	variable	100.0	

** Add VANCOR 081 at 10, 20,30,40,50 lbs / 100 gal

PAINT PROPERTIES		
Weight per gallon	9.25	
% Solids		
by weight	39.4	
by volume	30.9	
% PVC	9.6	
P / B Ratio	0.28 to 1	
Calculated VOC		
lbs / gal	2.01	
g / L	241	

Alkyd Modified Acrylic Latex Primer Formula 129 with VANCOR 081



504 hrs.

The Use of VANCOR® Products to Protect Uncoated Steel

1 week

4 weeks

6 weeks

Summary

Corrosion processes affect every part of our lives.

Paints and coatings play a vital role in the control of corrosion.

Chemicals such as VANCOR® metallic alkyl-aryl-sulfonates inhibit corrosion when added to water-borne paints and coatings.

The effectiveness of VANCOR metallic alkyl-aryl sulfonates have been shown in several examples.

You may call the Paint Department at (203) 853-1400 or e-mail us at paint@vanderbiltminerals.com for further assistance and to answer your questions.

Visit our web site: www.vanderbiltminerals.com