Appendix E:

South Coast AQMD Phase II Assessment Study of Architectural Coatings by National Technical Systems.

SCAQMD Phase II Assessment Study
of
Architectural Coatings
by
National Technical Systems

(Summarized by the California Air Resources Board)

Objective: Compare performance characteristics of higher VOC coatings with lower VOC coatings via laboratory, field application, and long term exposure tests.

Coating Categories Examined:

1. Industrial Maintenance
   - Primer
   - Topcoat
   - Systems
2. Nonflat - Interior & Exterior
   - Primer
   - Topcoat
   - System
3. Primers, Sealers, & Undercoaters - Interior & Exterior
4. Quick Dry Primers, Sealers, & Undercoaters - Interior & Exterior
5. Quick Dry Enamels - Interior & Exterior
   - Topcoat
   - System
6. Waterproofing Sealers
   - Concrete
   - Wood

Total # of manufactuers or brands - 31
Total # of coatings - 94
Total # of systems - 46
Total # of test panels - 3000+

Comments:

The summary and analysis provided by ARB staff in the following pages represents laboratory testing data available (as of April 2000) from the SCAQMD "Phase II Assessment Study of Architectural Coatings" and their contractor National Technical Systems (NTS). Conclusions are based on the data supplied. The field application and long term exposure tests are currently ongoing.

Members of the Technical Advisory Committee (also referred to as the "TAC")

Name	Company / Organization
Harley Fung	Benjamin Moore & Co
Mike Jaczola Jim Nyarady	CARB
Tim Carmichael	Coalition for Clean Air
Robert Wendoll	Dunn-Edwards
Steve Murphy	Murphy Industrial Coatings
Naveen Berry	SCAQMD
Madelyn Harding	Sherwin-Williams
Alexander Ramig	Sierra Performance Coatings
Yin Aye	Smiland Paint Co
David Leehy	Vista Paints

Manufactuers	# of Coatings in Study	Manufactuers	# of Coatings in Study
Advanced Polymer Sciences	1	Insl-X	1
Ameron Protective Coatings	2	Masterchem	1
Aquarius Coatings	1	Morewear	3
Behr Process	3	OKON, Inc.	1
Benjamin Moore	8	PPA Technologies	3
Coatings Resources Corp.	2	Seal-Krete, Inc.	1
Dunn Edwards	11	Sherwin Williams	7
EMU	1	Sigma Coatings	2
Flood Company	1	Superior Environmental Products	2
Frazee Industries	6	TCA	2
GaLXE-2010	4	Thompson's	1
Gloucester Company	1	Tnemec	7
H&C	2	Vista Paints	4
Hart Polymers	3	X-I-M Products	1
ICI/Devoe	6	Zehrung	2
ICI/Glidden	4		
		Total	**94**

Coating Categories by Section:

The original grouping of data by NTS is shown on the next page. The following represents the coating categories included in the NTS performance study reorganized by category in alphabetical order. Please note that although the coating categories are in alphabetical order, the section numbers are not in numerical order.

Category	Section
Industrial Maintenance	
Primer	1
Topcoat	2
Systems	3
Nonflat - Interior	
Primer	4
Topcoat	6
System	8
Nonflat - Exterior	
Primer	5
Topcoat	7
System	9
Primers, Sealers, & Undercoaters - Interior	4
Primers, Sealers, & Undercoaters - Exterior	5
Quick Dry Primers, Sealers, & Undercoaters - Interior	4
Quick Dry Primers, Sealers, & Undercoaters - Exterior	5
Quick Dry Enamels - Interior	
Primers	4
Topcoat	6
System	8
Quick Dry Enamels – Exterior	
Primers	5
Topcoat	7
System	9
Waterproofing Sealers	
Concrete	10
Wood	11

Original Test Groups or Summaries as Organized by NTS

Industrial Maintenance - Primer (Section 1)
Industrial Maintenance - Topcoat (Section 2)
Industrial Maintenance - System (Section 3)

Nonflat Primer, Quick Dry Primer, and Primer Sealer Undercoater - Interior (Section 4)
Nonflat Primer, Quick Dry Primer, and Primer Sealer Undercoater - Exterior (Section 5)

Nonflat Topcoat and Quick Dry Topcoat - Interior (Section 6)
Nonflat Topcoat and Quickdry Topcoat - Exterior (Section 7)

Nonflat System and Quick Dry System - Interior (Section 8)
Nonflat System and Quick Dry System - Exterior (Section 9)

Water Proofing Sealer – Concrete (Section 10)
Water Proofing Sealer – Wood (Section 11)

Section 1: Industrial Maintenance Primer

Total # manufactuers or brands	11
Single component coatings	8
Multi-component coatings	10
Total # coatings	18

Test Summary

Brushing Properties Wet:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Brushing Properties Dry:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Dry Time - Dry To Touch:
- Low VOC coatings required longer dry times compared to high VOC coatings.

Dry Time - Dry Hard:
- Low VOC coatings required longer dry times compared to high VOC coatings.

Contrast Ratio (Hiding Power):
- Low VOC coatings exhibited lower performance compared to high VOC coatings.

Spreading Rate:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Leveling:
- Low VOC Coatings exhibited similar performance compared to high VOC coatings.

Sag Resistance:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Hiding Wet to Dry Changes:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Taber Abrasion Resistance:
- Low VOC coatings exhibited lower performance compared to high VOC coatings.

Dry Film Thickness:
- Low VOC coatings exhibited slightly higher dry film thicknesses compared to high VOC coatings.

Film Flexibility:

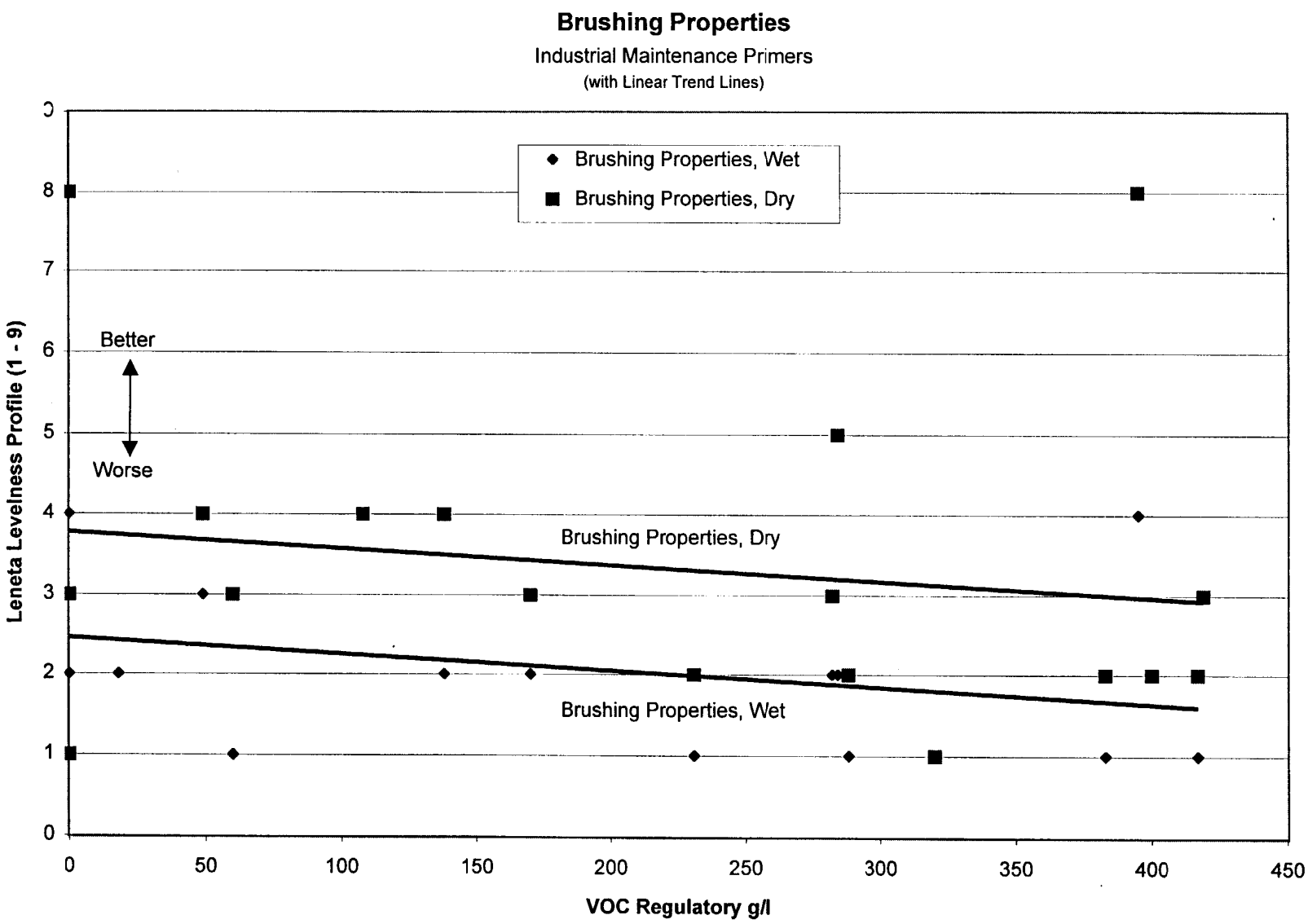
- Fourteen out of 18 coatings passed this test. The four coatings that failed had VOC contents of 0 g/l, 0 g/l, 60 g/l, and 320 g/l.

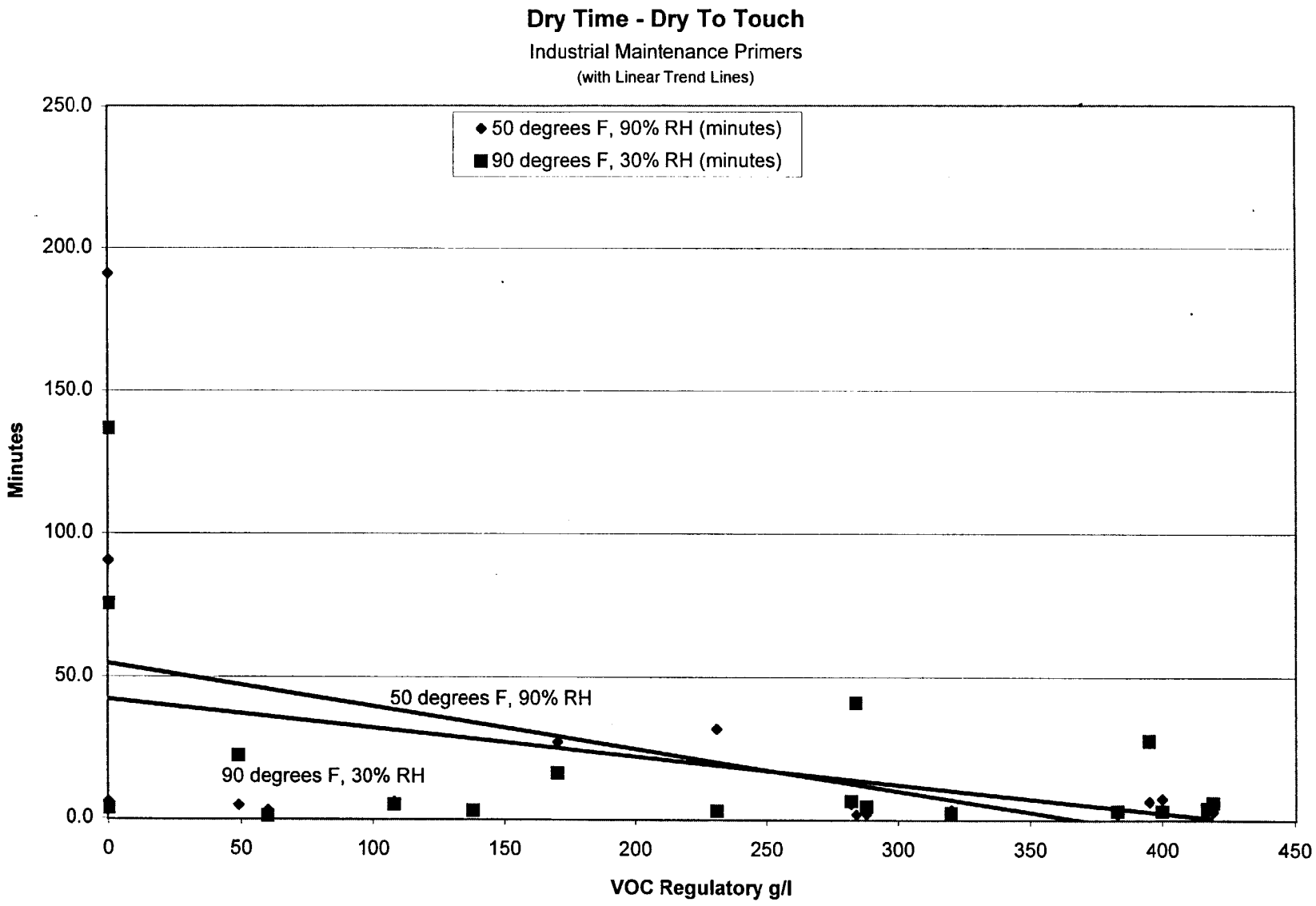
Comments:

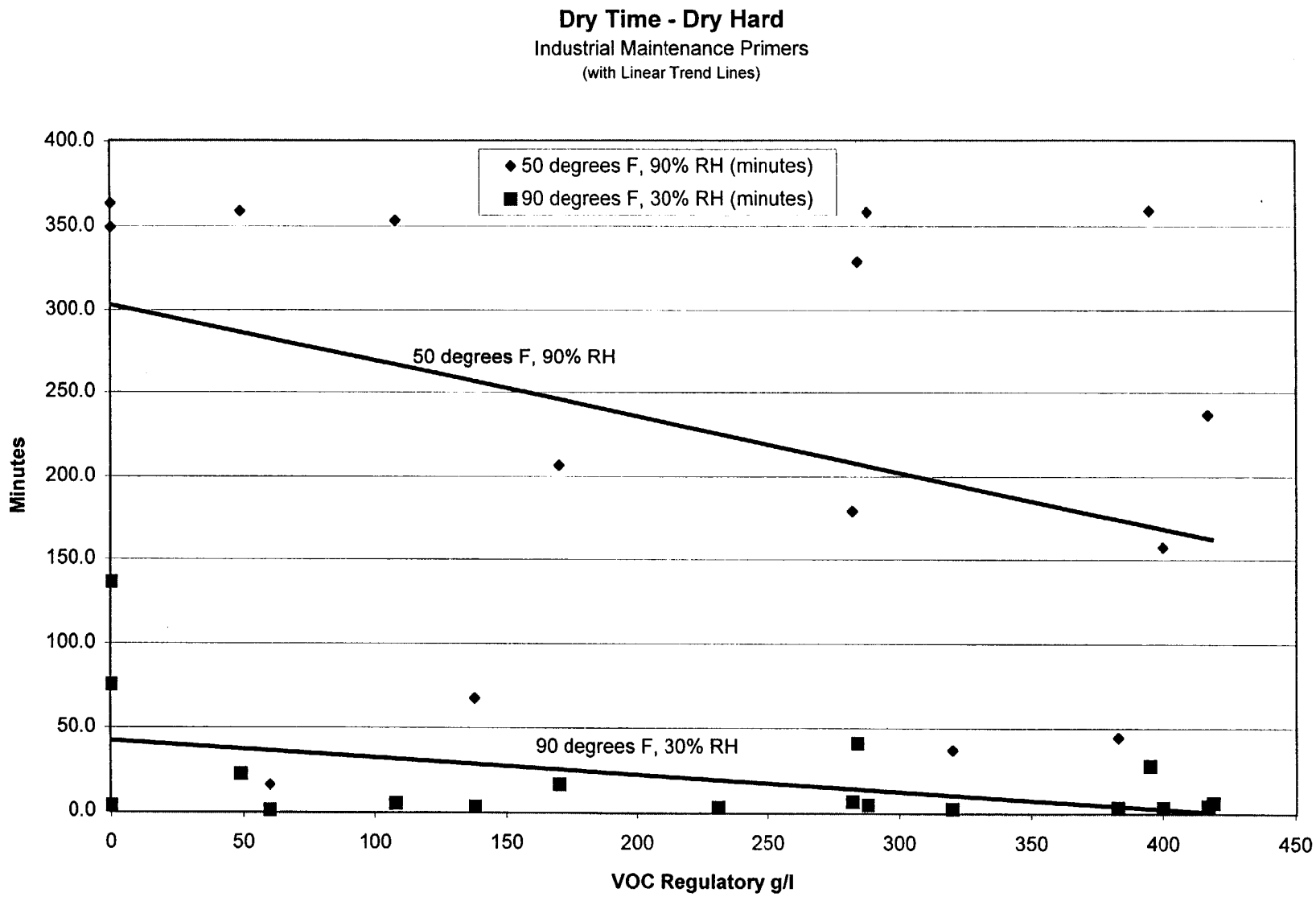
Overall, low VOC coatings exhibited similar performance compared to high VOC coatings.

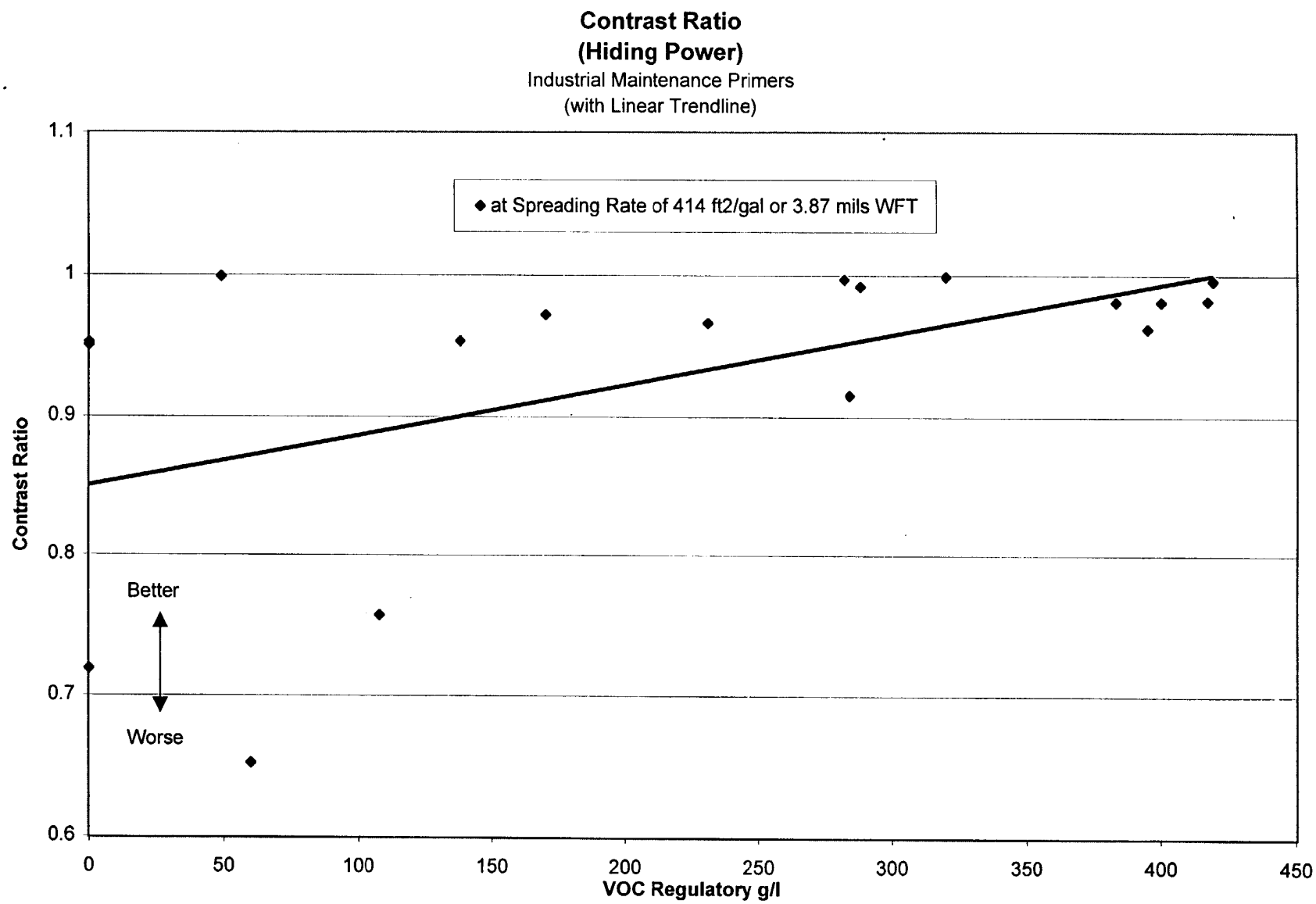
Industrial Maintenance Primer

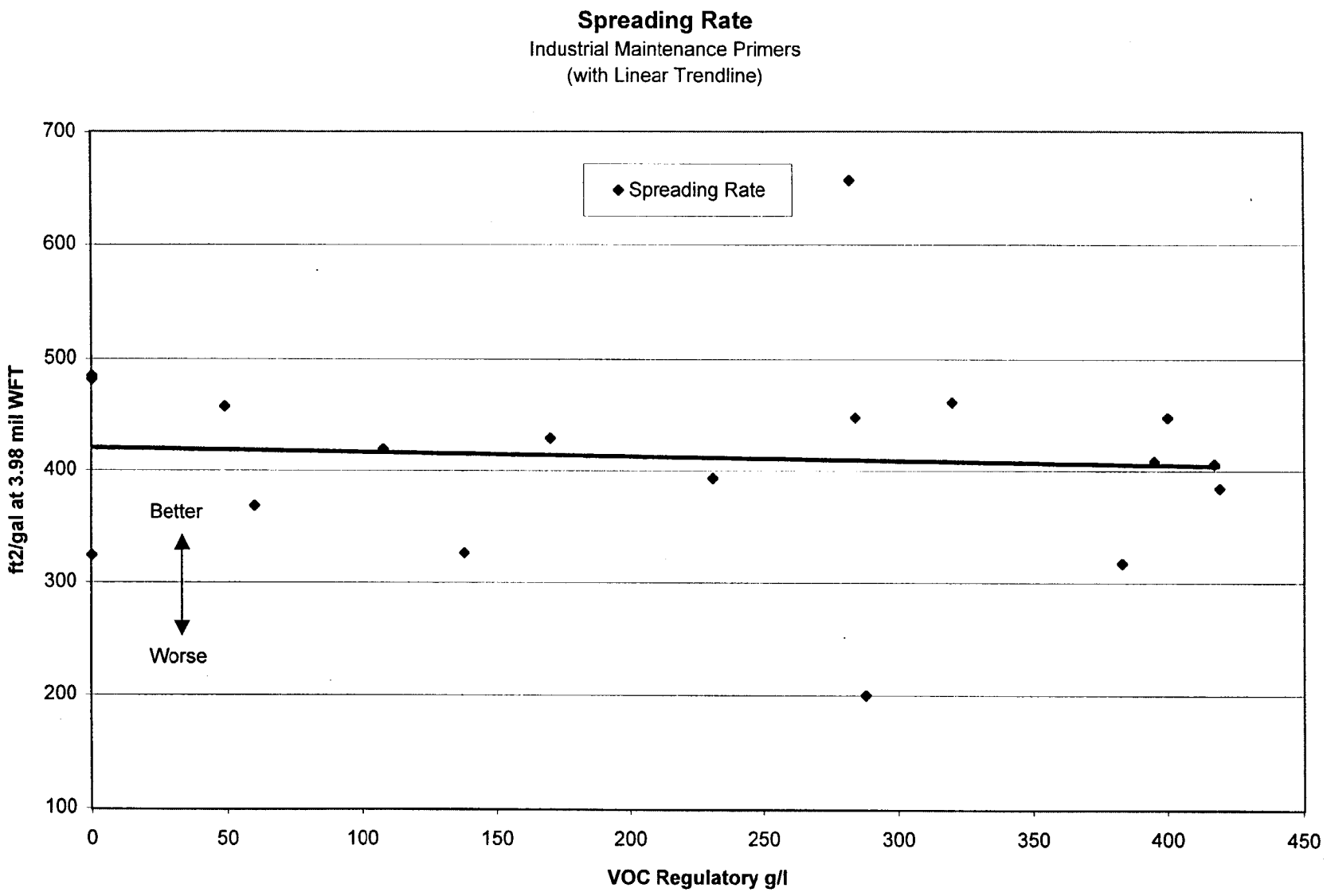
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
901	108	2	Siloxirane	T	1
920	288	2	Epoxy	P	1
917	417	1	Alkyd	P	1
910	0	2	Epoxy	P	1
902	400	1	Epoxy Ester	P	1
914	0	2	Butadiene-Epoxy	P	1
919	170	2	Epoxy	P	1
933	282	2	Inorganic Zinc Silicate	P	1
932	284	2	Epoxy	T	1
930	419	1	Alkyd	P	1
906	138	1	Acrylic	P	1
904	49	1	Organic Zinc	P	1
908	60	1	Acrylic	P	1
912	0	2	Novolac	P	1
925	395	2	Epoxy	T	1
923	382	1	Alkyd	P	1
922	231	1	Acrylic	T	1
927	320	2	Epoxy	P	1
Grand Total					18

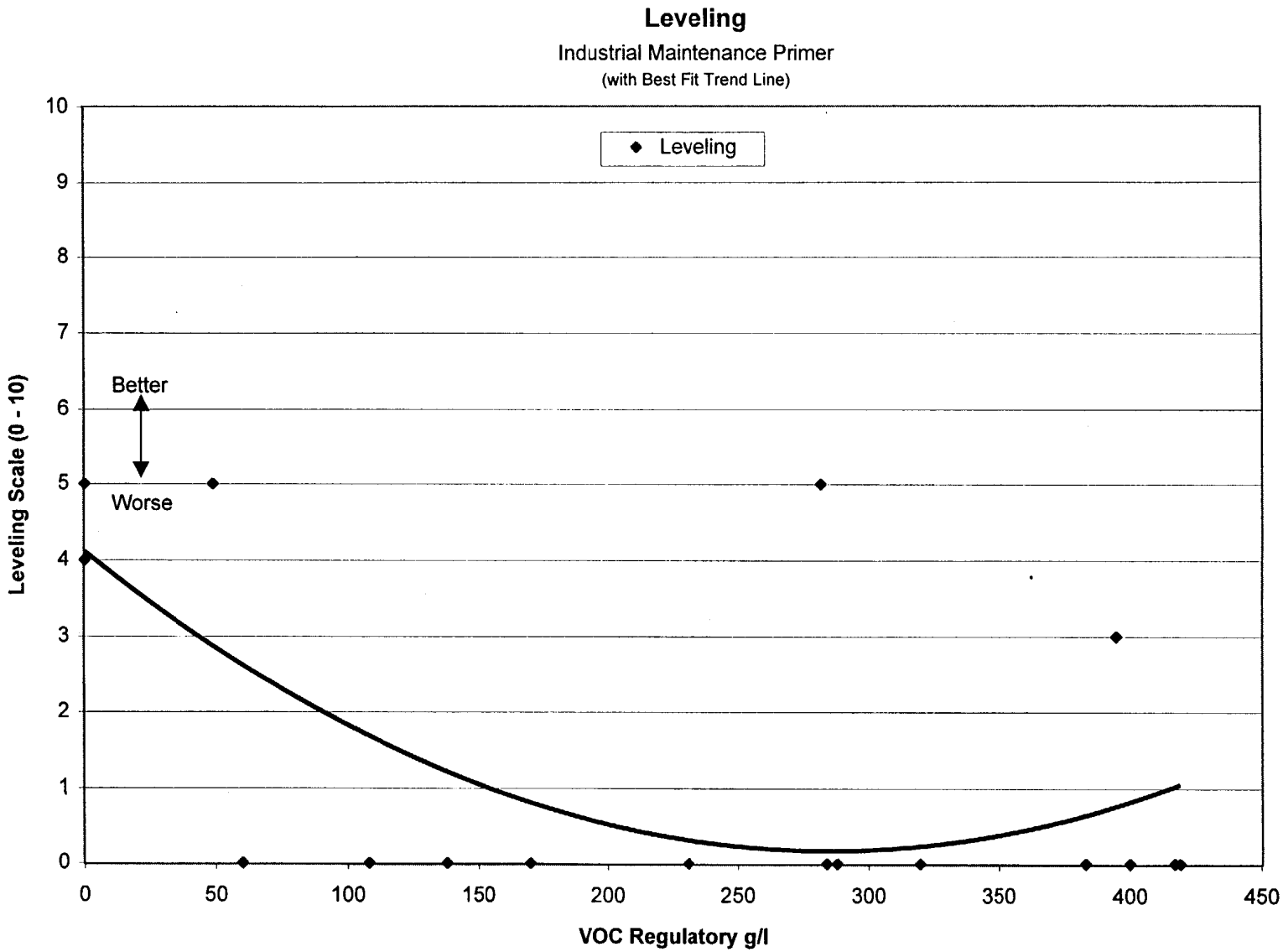

Brushing Properties
Industrial Maintenance Primers
(with Linear Trend Lines)
Brushing Properties, Wet
Brushing Properties, Dry
Better
Worse
Brushing Properties, Dry
Brushing Properties, Wet
Leneta Levelness Profile (1 - 9)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
0
50
100
150
200
250
300
350
400
450

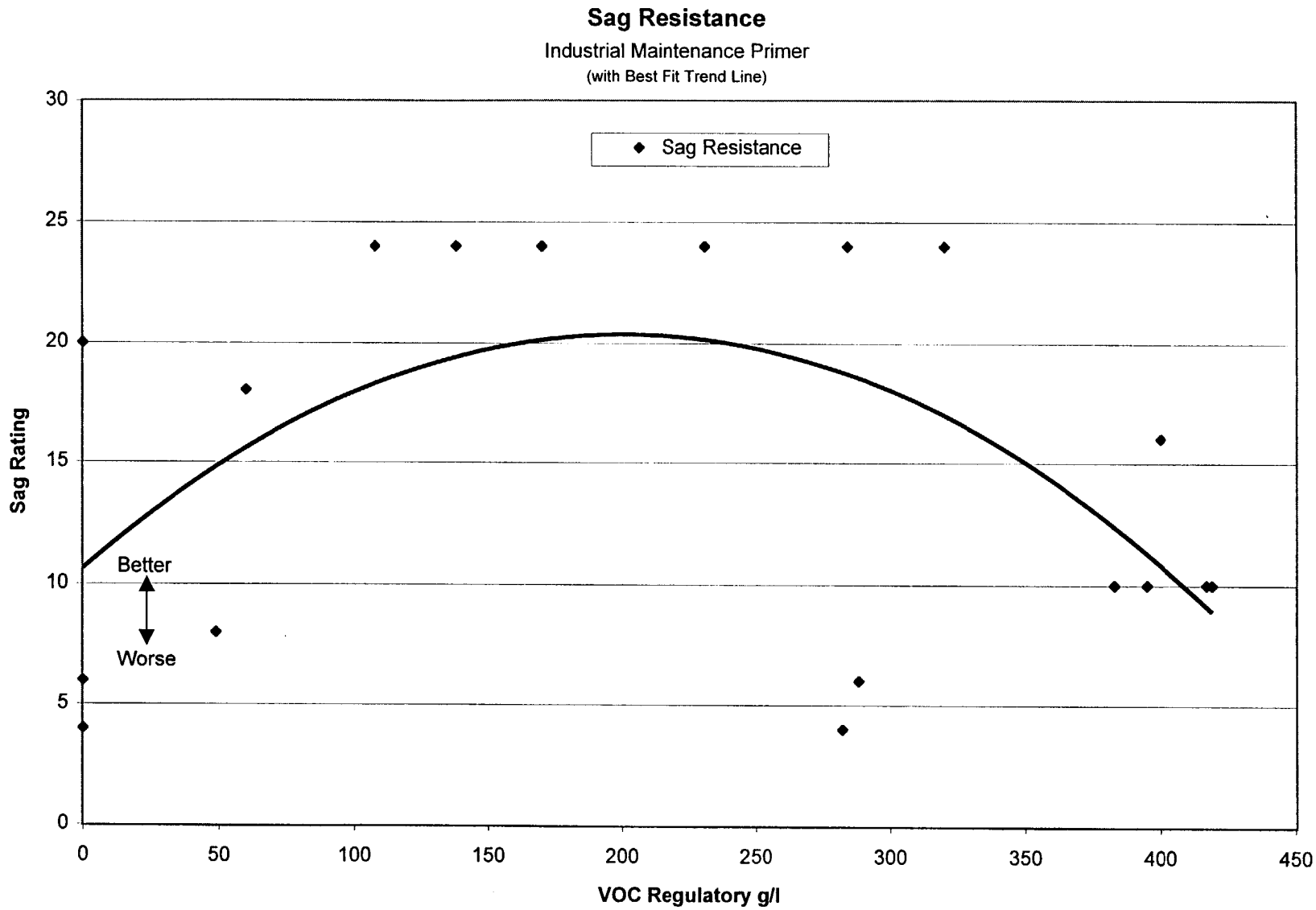

Dry Time - Dry To Touch
Industrial Maintenance Primers
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
Minutes
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l
50 degrees F, 90% RH
90 degrees F, 30% RH

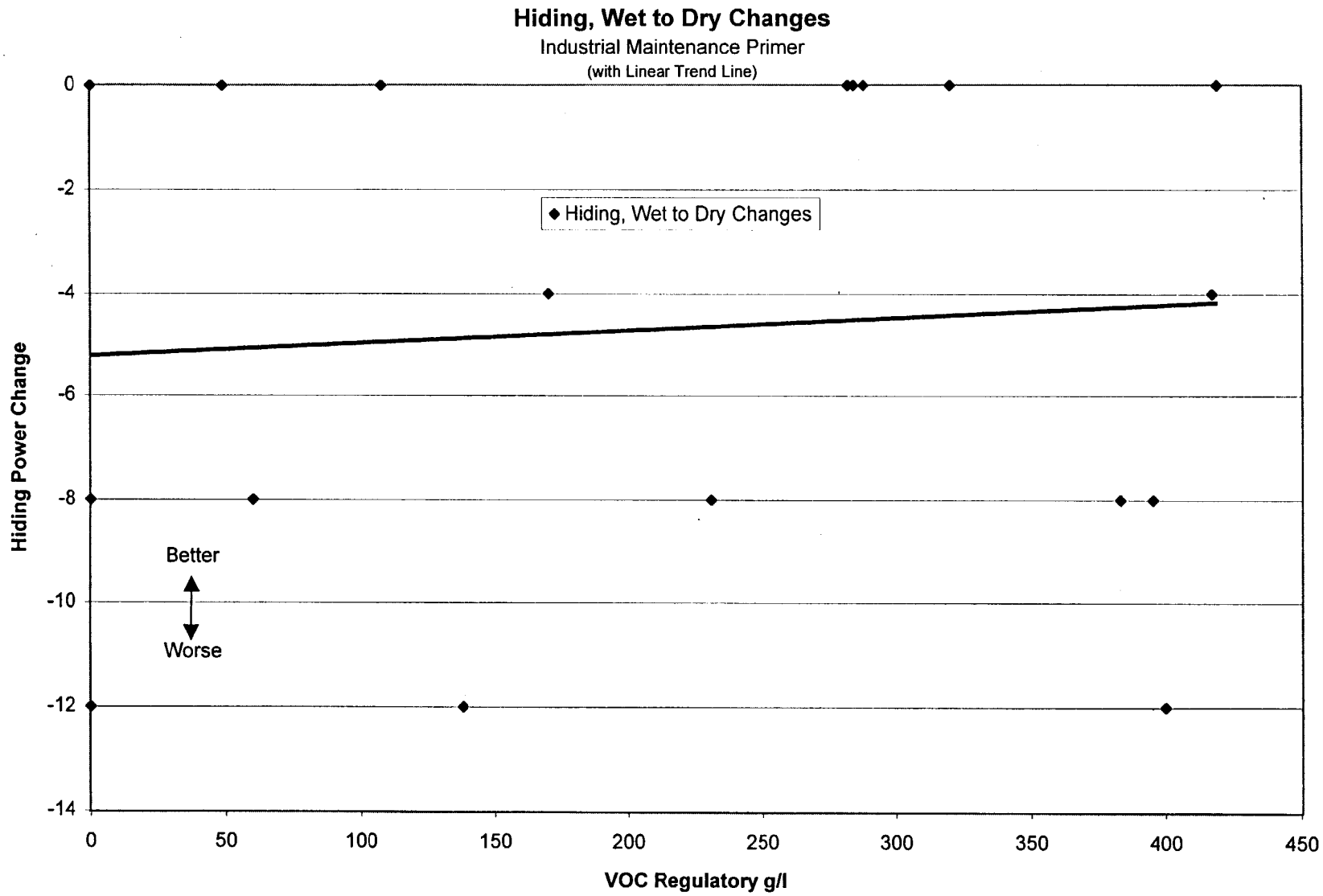

Dry Time - Dry Hard
Industrial Maintenance Primers
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

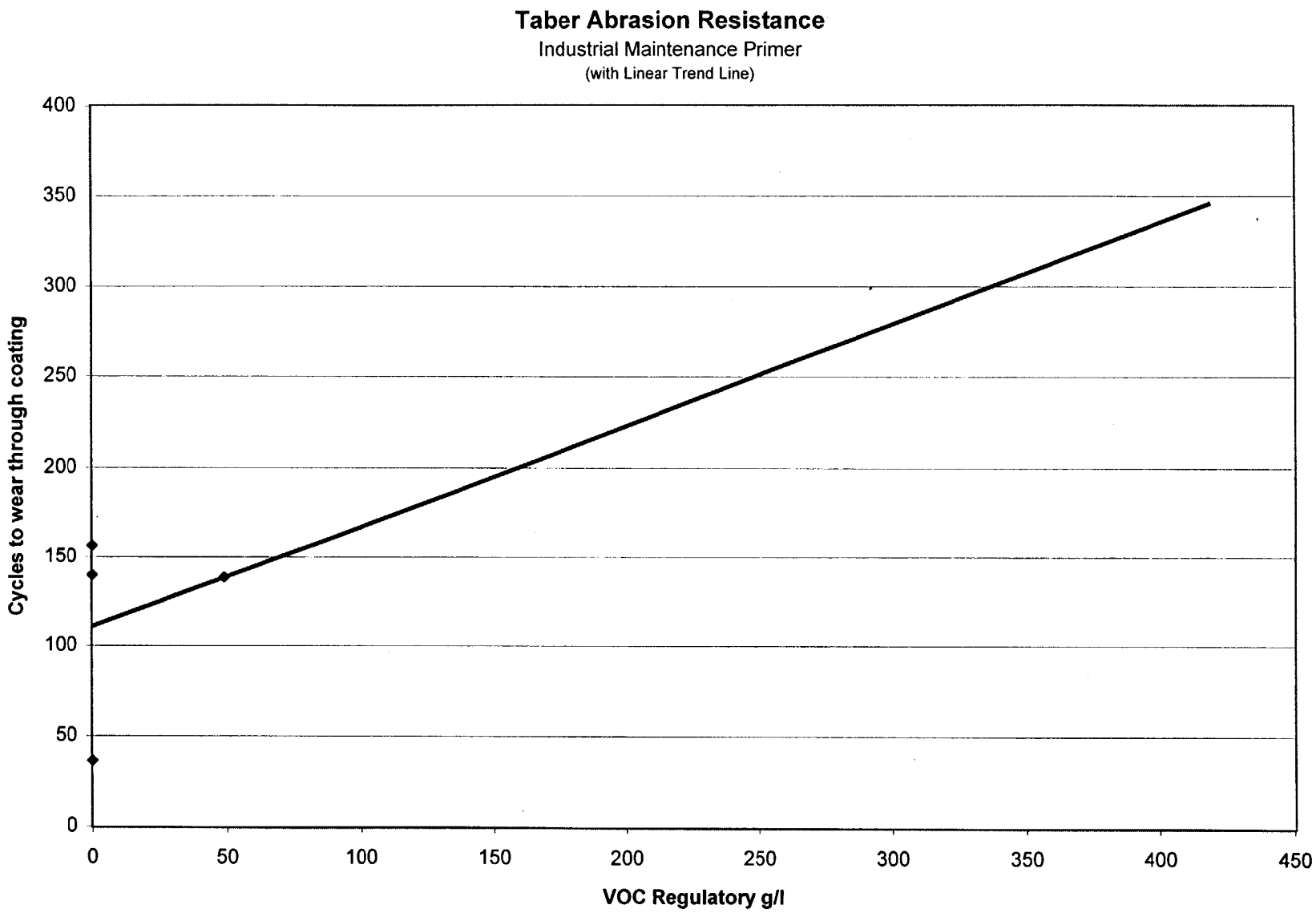

Contrast Ratio
(Hiding Power)
Industrial Maintenance Primers
(with Linear Trendline)
at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
Better
Worse
Contrast Ratio
VOC Regulatory g/l
1.1
1
0.9
0.8
0.7
0.6
0
50
100
150
200
250
300
350
400
450

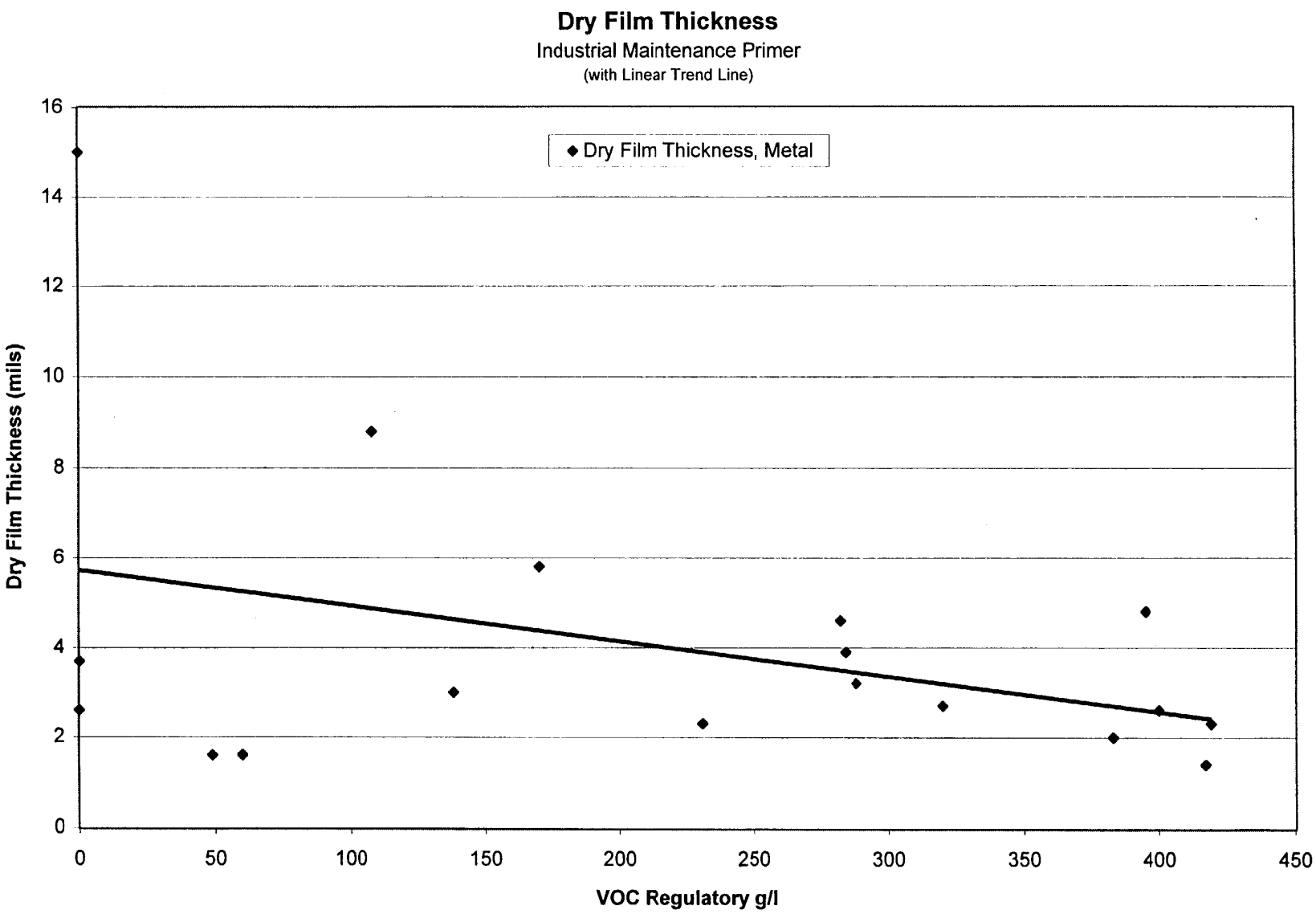

Spreading Rate
Industrial Maintenance Primers
(with Linear Trendline)
Spreading Rate
ft2/gal at 3.98 mil WFT
700
600
500
400
300
200
100
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Leveling
Industrial Maintenance Primer
(with Best Fit Trend Line)
Leveling
Better
Worse
Leveling Scale (0 - 10)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
300
350
400
450


Sag Resistance
Industrial Maintenance Primer
(with Best Fit Trend Line)
Sag Resistance
Better
Worse
Sag Rating
VOC Regulatory g/l
0
5
10
15
20
25
30
0
50
100
150
200
250
300
350
400
450


Hiding, Wet to Dry Changes
Industrial Maintenance Primer
(with Linear Trend Line)
Hiding, Wet to Dry Changes
Better
Worse
Hiding Power Change
VOC Regulatory g/l
0
-2
-4
-6
-8
-10
-12
-14
0
50
100
150
200
250
300
350
400
450


Taber Abrasion Resistance
Industrial Maintenance Primer
(with Linear Trend Line)
Cycles to wear through coating
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Dry Film Thickness
Industrial Maintenance Primer
(with Linear Trend Line)
Dry Film Thickness, Metal
Dry Film Thickness (mils)
16
14
12
10
8
6
4
2
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

Industrial Maintenance Coating Primer (IMCP) Data Table

Protocol Test Number							2.1	2.1	2.2		2.2		3.14	3.14	2.4
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Nonvolatile by Weight	Coarse Particles	Density	Brushing Properties, Wet	Brushing Properties, Dry	Dry time, Dry to Touch - One Part Coatings		Dry time, Dry Hard - One Part Coatings		Contrast Ratio (Cw) Hiding Power	Spreading Rate	Leveling
Units		g/l		%	Size in Microns	lbs/gal	Leneta Levelness Profile, 1 - 9	Leneta Levelness Profile, 1 - 9	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	at Spreading Rate of 414 ft2/gal or 3.87 mils WFT		Scale, 0-10
910	IMC10	0	Epoxy	61.5	20	10.18	2	<1	90.6	136.5	349.2	337.5	0.952	482	5
912	IMC12	0	Novolac	89.2	97	9.75	4	8	191.1	75.6	349.2	212.7	0.95	324	4
914	IMC14	0	Butadine-Epoxy	66.3	24	9.95	2	3	6.1	3.7	363.2	297.7	0.719	485	5
904	IMC4	49	Epoxy-Polyamide, Zinc-rich	84.3	24	23.65	3	4	4.8	22.5	358.8	304.2	0.999	458	5
908	IMC8	60	Acrylic	60.4	24	12.19	1	3	3.0	1.0	15.9	4.0	0.652	368	0
901	IMC1	108	Siloxirane	95.16	36	12.59	4	4	6.1	5.1	353.2	298.5	0.757	419	0
906	IMC6	138	Acrylic	59.1	64	11.26	2	4	2.5	3.0	67.3	10.5	0.953	326	0
919	IMC19	170	Epoxy	89.2	60	12.82	2	3	27.1	16.5	206.5	48.9	0.972	429	0
922	IMC22	231	Acrylic	59.5	60	12.01	1	2	31.8	3.0	360.0	71.1	0.966	393	0
933	IMC32	282	Inorganic Zinc Silicate	79.4	96	19.01	2	3	5.5	6.6	179.2	155.1	0.997	657	5
932	IMC31	284	Epoxy	73.8	44	11.48	2	5	1.6	41.1	328.9	181.8	0.915	448	0
920	IMC20	288	Epoxy	94.5	72	11.71	1	2	1.9	4.6	358.0	357.1	0.992	200	0
927	IMC26	320	Epoxy	91.5	100	28.53	<1	<1	3.3	2.4	36.9	24.6	0.999	462	0
923	IMC23	383	Alkyd	75.6	26	12.31	1	2	1.9	3.1	44.5	12.4	0.981	317	0
925	IMC25	395	Epoxy	77.3	24	12.5	4	8	6.4	27.9	358.9	263.4	0.962	408	3
902	IMC2	400	Epoxy Ester	74.1	92	11.98	2	2	7.3	3.1	157.3	76.0	0.981	448	0
917	IMC17	417	Alkyd	71.7	60	11.89	1	2	2.8	4.0	236.5	215.2	0.982	406	0
930	IMC29	419	Alkyd	65.4	32	11.49	2	3	2.7	6.0	6.3	20.1	0.996	384	0

Industrial Maintenance Coating Primer (IMCP) Data Table

Protocol Test Number		2.7	2.10								3.2	3.2	3.10	3.9
Coating Reference Number	Coating Reference Designator	Sag Resistance	Hiding, Wet to Dry Changes	Wet Film Thickness			Wet Film/Dry Film/WW & Bar Applicator Gap Relationships			Abrasion Resistance, Taber	Appearance and Finish, Drawdown Charts	Appearance and Finish, Coted Panels	Dry Film Thickness, Metal	Film Flexibility
Units		Notch Clearance in mils		Mils, #30 Rod	Mils, #48 Rod	Mils, #80 Rod	Mils, #30 Rod	Mils, #48 Rod	Mils, # 80 Rod	Wear Index or Cycles to Expose Substrate			mils	pass/fail
910	IMC10	<4	0	4.5	4.5	6.5	2.2	3.3	4.7	N/A	glossy, uneven	satin, yellowed	3.7	Fail
912	IMC12	6	8	4.5	4.5	6.5	3.5	3.7	5.4	N/A	glossy, grainy	gloss, uniform	15	Fail
914	IMC14	20	12	6.5	6.5	10.5	2.8	3.2	4.5	N/A	satin flat, gelled particles	satin flat, gelled particles	2.6	Pass
904	IMC4	8	0	3.5	6.5	7.5	2.2	3.0	4.5	N/A	eggshell, smooth	eggshell, smooth	1.6	Pass
908	IMC8	18	8	5.5	5.5	7.5	2.2	2.3	2.1	N/A	flat, uniform	satin, uniform	1.6	Pass
901	IMC1	>24	0	4.0	5.5	9.5	3.4	4.9	6.0	36.3	semi gloss, grainy	glossy, grainy	8.8	Fail
906	IMC6	>24	12	5.5	6.5	8.5	2.6	2.6	3.5	N/A	matte, smooth	flat, smooth	3	Pass
919	IMC19	>24	4	4.5	4.5	6.5	3.3	3.4	5.4	N/A	satin flat, uniform	satin, uniform	5.8	Pass
922	IMC22	>24	8	4.5	5.0	8.0	1.5	2.1	2.5	156.4	uniform, flat	uniform, flat, w/rust spots	2.3	Pass
933	IMC32	4	0	4.5	4.5	8.5	2.8	3.1	4.6	N/A	uniform, flat	uniform, flat	4.6	Pass
932	IMC31	24	0	3.5	5.5	9.5	1.9	2.9	4.6	139.7	smooth, satin	smooth, satin	3.9	Pass
920	IMC20	6	0	3.5	5.5	8.5	2.2	3.5	4.7	N/A	uniform, flat	uniform, flat	3.2	Pass
927	IMC26	>24	0	4.5	6.5	10.5	4.3	4.2	6.0	N/A	uniform, flat	uniform, flat	2.7	Fail
923	IMC23	10	8	4.5	6.5	8.5	2.4	2.6	3.4	N/A	smooth, matte	smooth, matte	2	Pass
925	IMC25	10	8	3.5	6.5	8.5	2.4	2.9	3.5	138.3	smooth, satin	smooth, satin	4.8	Pass
902	IMC2	16	12	4.5	5.5	7.5	2.1	2.4	3.2	N/A	matte, smooth	eggshell, uniform	2.6	Pass
917	IMC17	10	4	4.5	6.5	8.5	2.0	2.2	3.4	N/A	smooth eggshell	smooth matte	1.4	Pass
930	IMC29	10	0	3.5	4.5	9.5	1.8	2.7	3.8	N/A	smooth, satin	uniform, flat	2.3	Pass

Section 2: Industrial Maintenance Topcoat

Total # manufactuers or brands	11
Single component coatings	6
Multi-component coatings	13
Total # coatings	21

Test Summary

Brushing Properties Wet:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Brushing Properties Dry:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Dry Time - Dry To Touch:
- Low VOC coatings required longer dry times compared to high VOC coatings.

Dry Time - Dry Hard:
- Low VOC coatings required similar dry times compared to high VOC coatings.

Contrast Ratio (Hiding Power):
- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings.

Spreading Rate:
- Low VOC coatings exhibited lower performance compared to high VOC coatings.

Leveling:
- Three Low VOC coatings exhibited similar performance compared to high VOC coatings. Five of the coatings within the 50 g/l to 275 g/l range exhibited poor performance.

Sag Resistance:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Hiding Wet to Dry Changes:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Taber Abrasion Resistance:
- Low VOC coatings exhibited lower performance compared to high VOC coatings.

Dry Film Thickness:
- Low VOC coatings exhibited slightly higher dry film thicknesses compared to high VOC coatings.

Film Flexibility:

- Eighteen out of 21 coatings passed this test. The three coatings that failed had VOC contents of 0 g/l, 0 g/l, and 108 g/l.

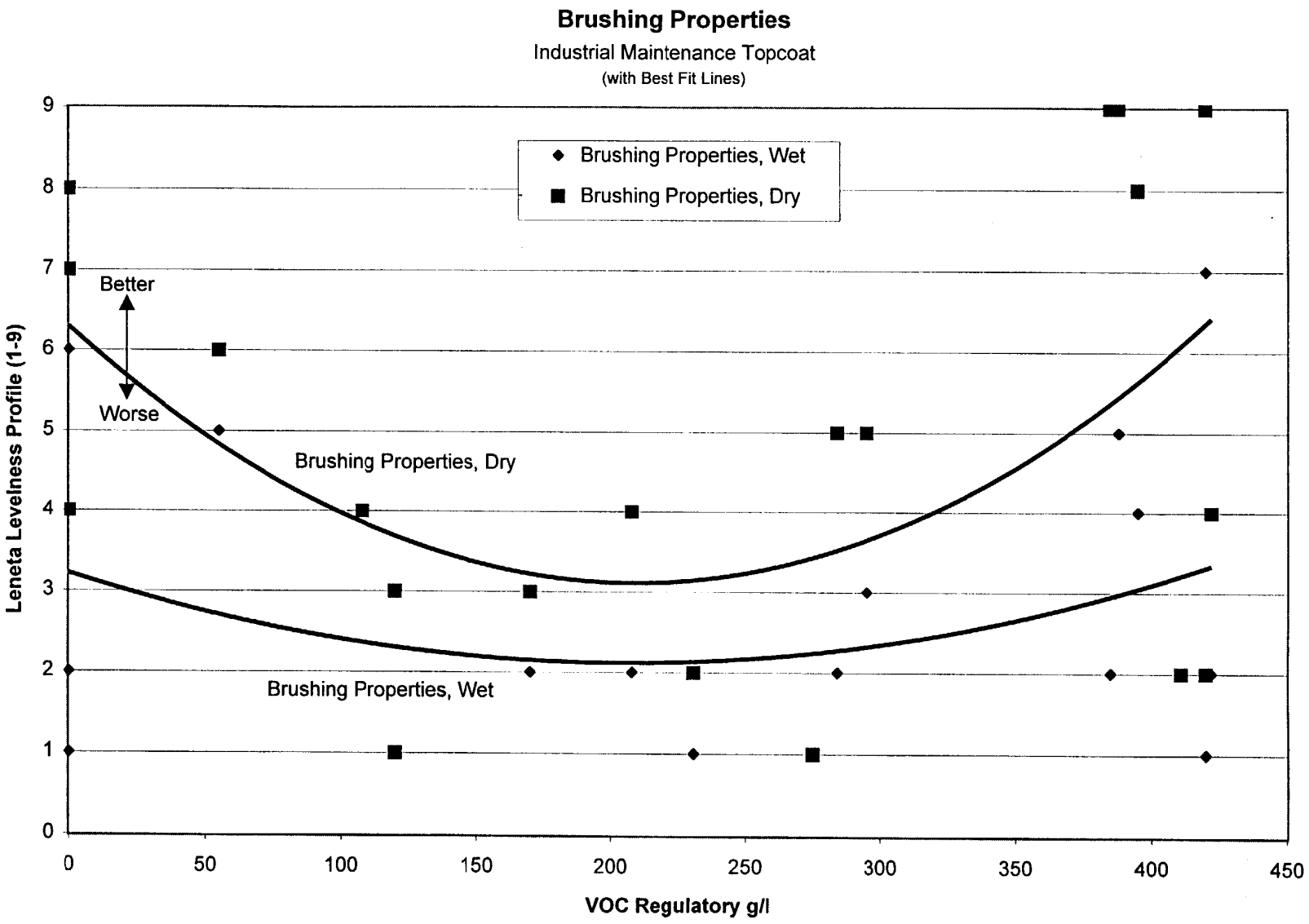
Comments:

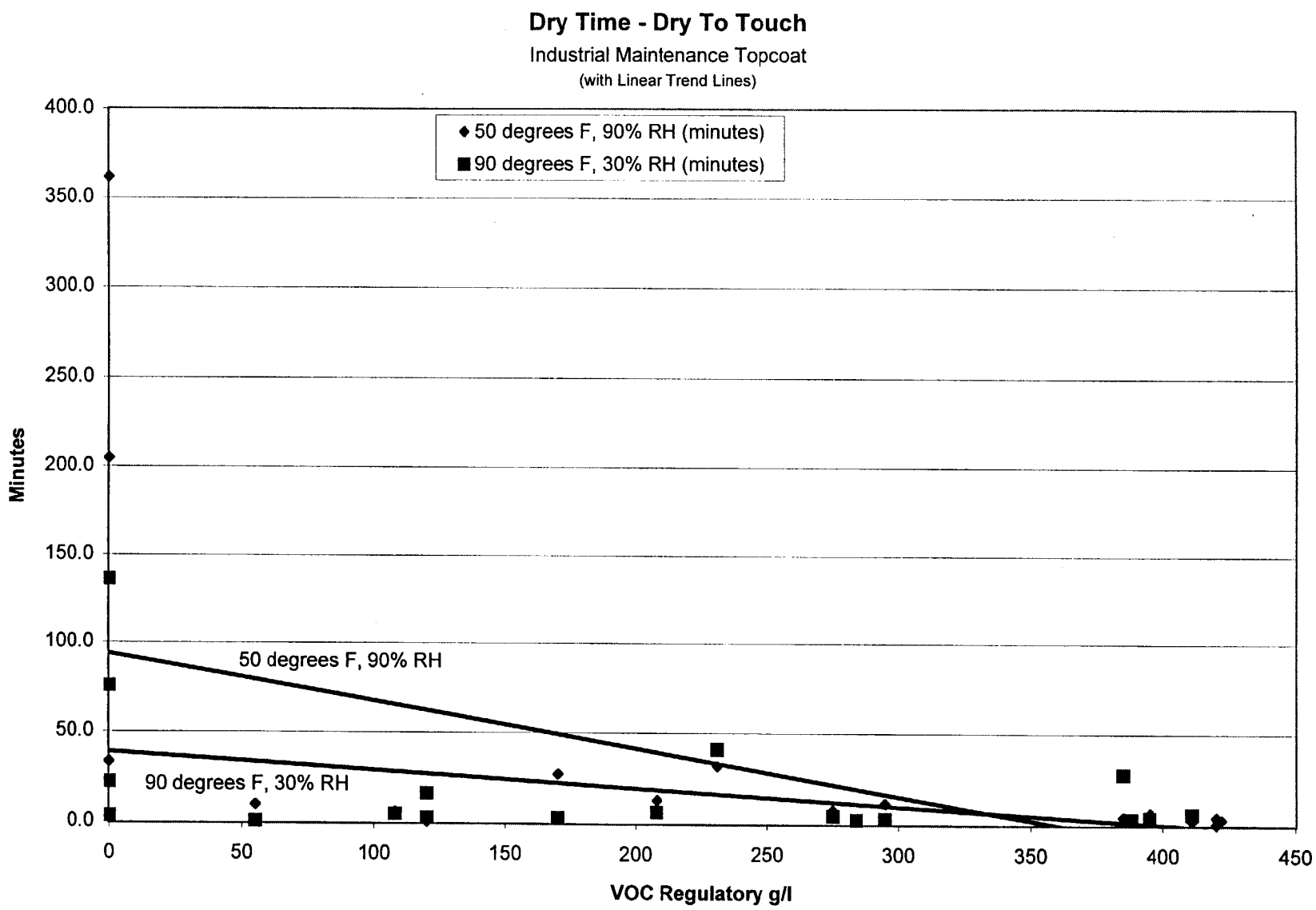
Overall, low VOC coatings exhibited similar performance compared to high VOC coatings.

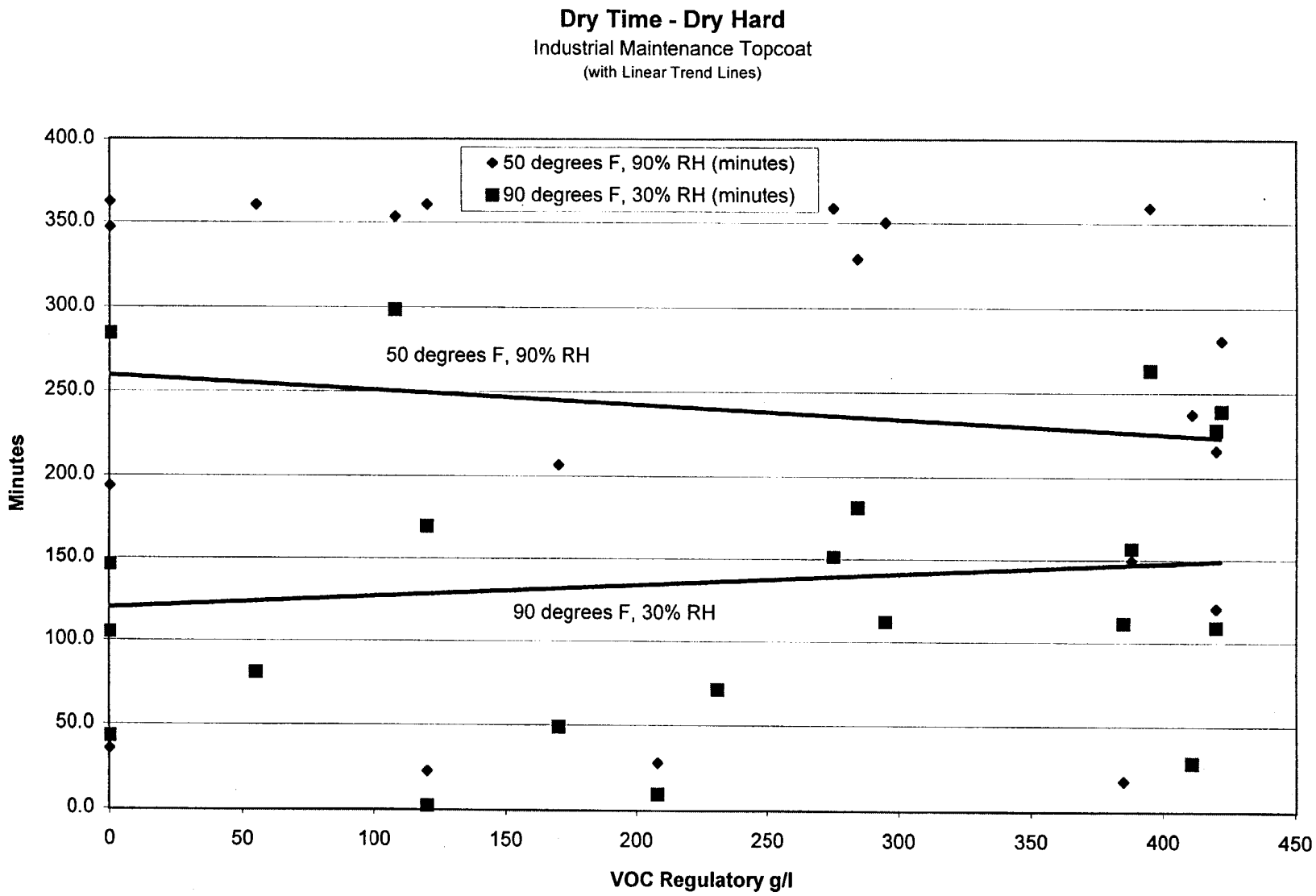
Industrial Maintenance Topcoat

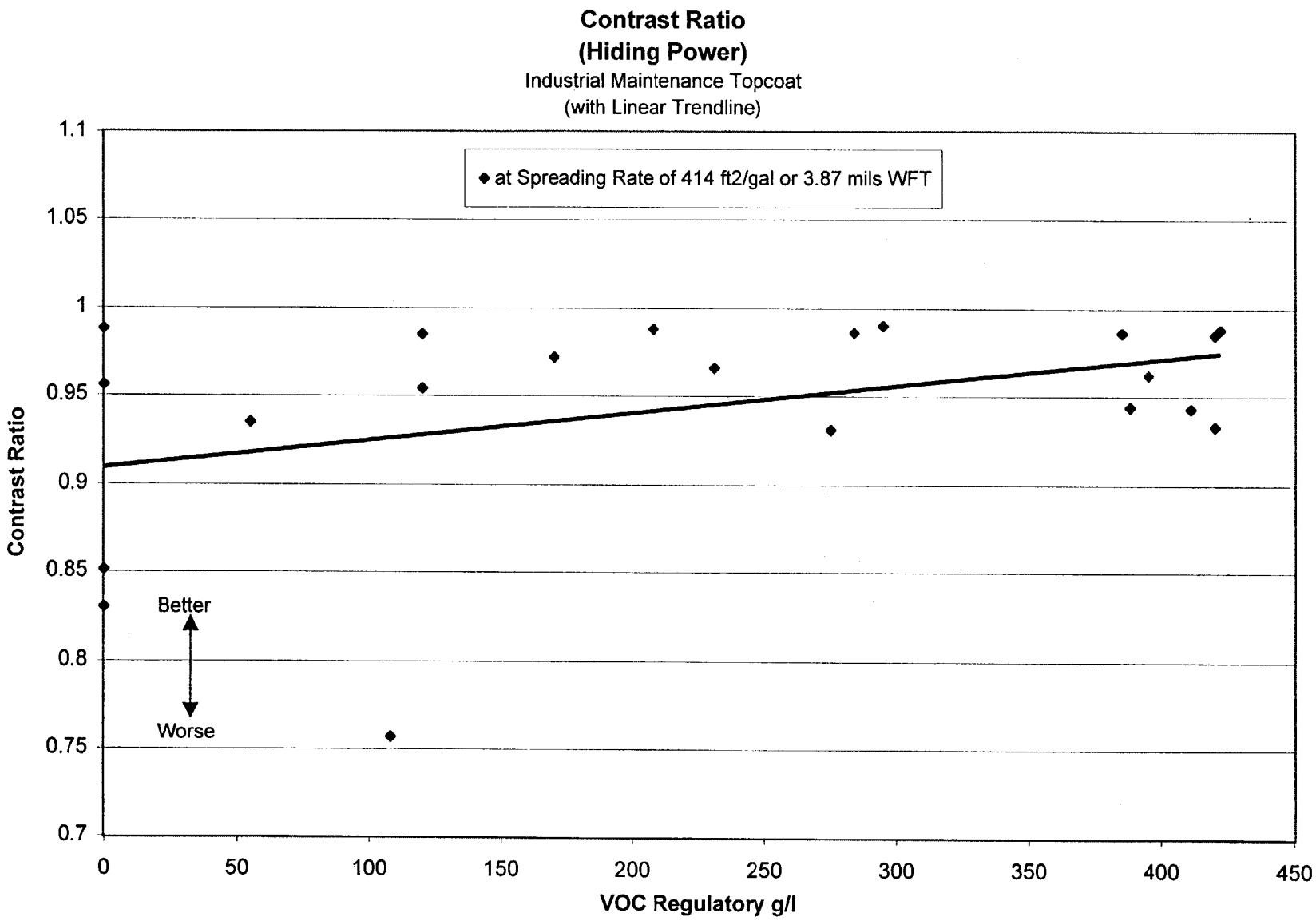
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
901	108	2	Siloxirane	T	1
921	120	2	Siloxane	T	1
918	411	1	Urethane Alkyd	T	1
911	0	2	Urethane	T	1
903	420	1	Silicone Alkyd	T	1
10	420	2	Urethane	T	1
915	0	2	Urethane	T	1
916	0	2	Epoxy	T	1
919	170	2	Epoxy	P	1
931	385	1	Alkyd	T	1
932	284	2	Epoxy	T	1
934	388	2	Urethane	T	1
907	208	1	Acrylic	T	1
905	55	2	Urethane	T	1
909	120	1	Acrylic	T	1
913	0	2	Novolac	T	1
925	395	2	Epoxy	T	1
928	275	2	Epoxy	T	1
924	422	1	Alkyd	T	1
922	231	1	Acrylic	T	1
929	295	2	Urethane	T	1
Grand Total					21

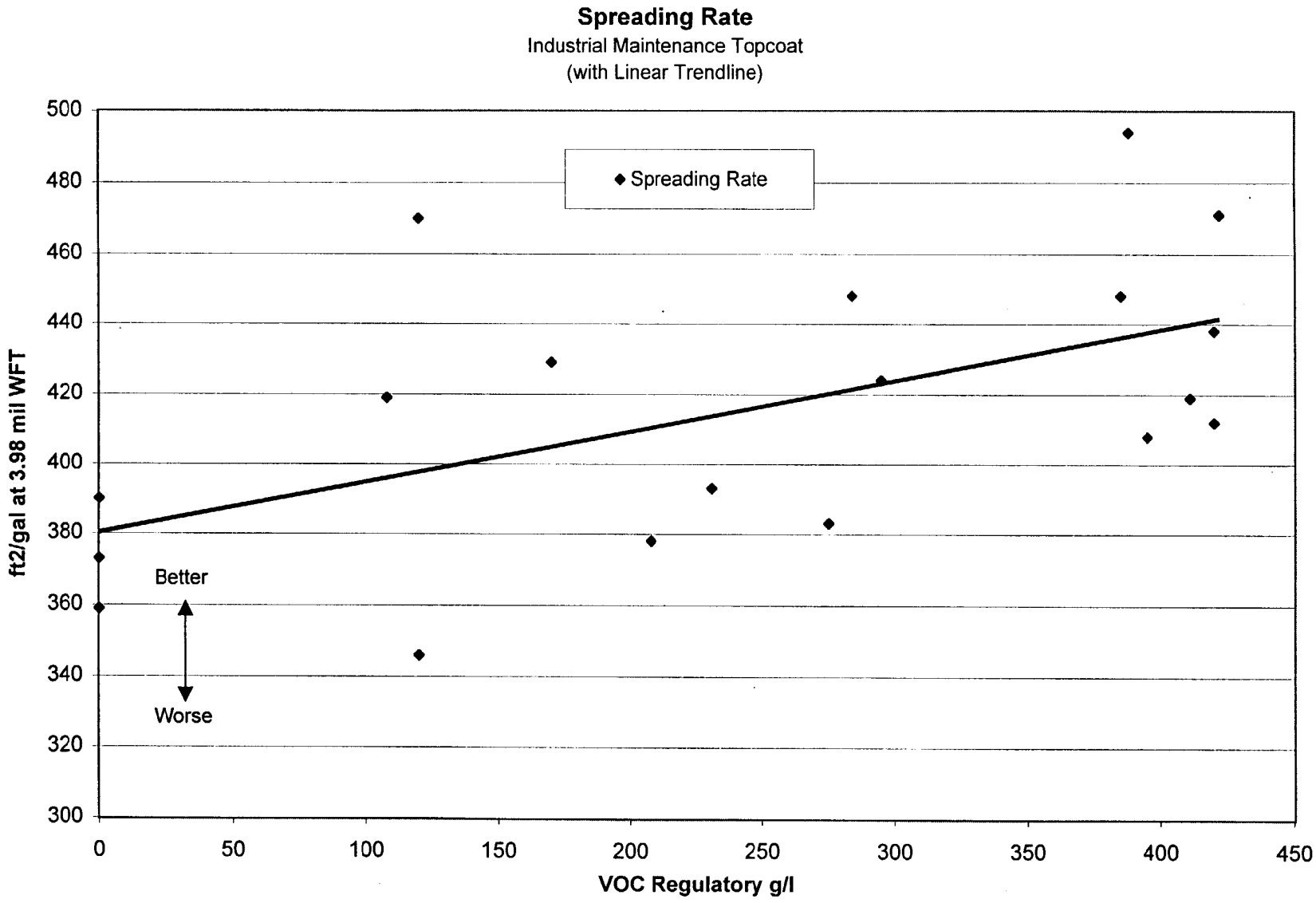
Single component coatings = 6 Multi-component coatings = 13

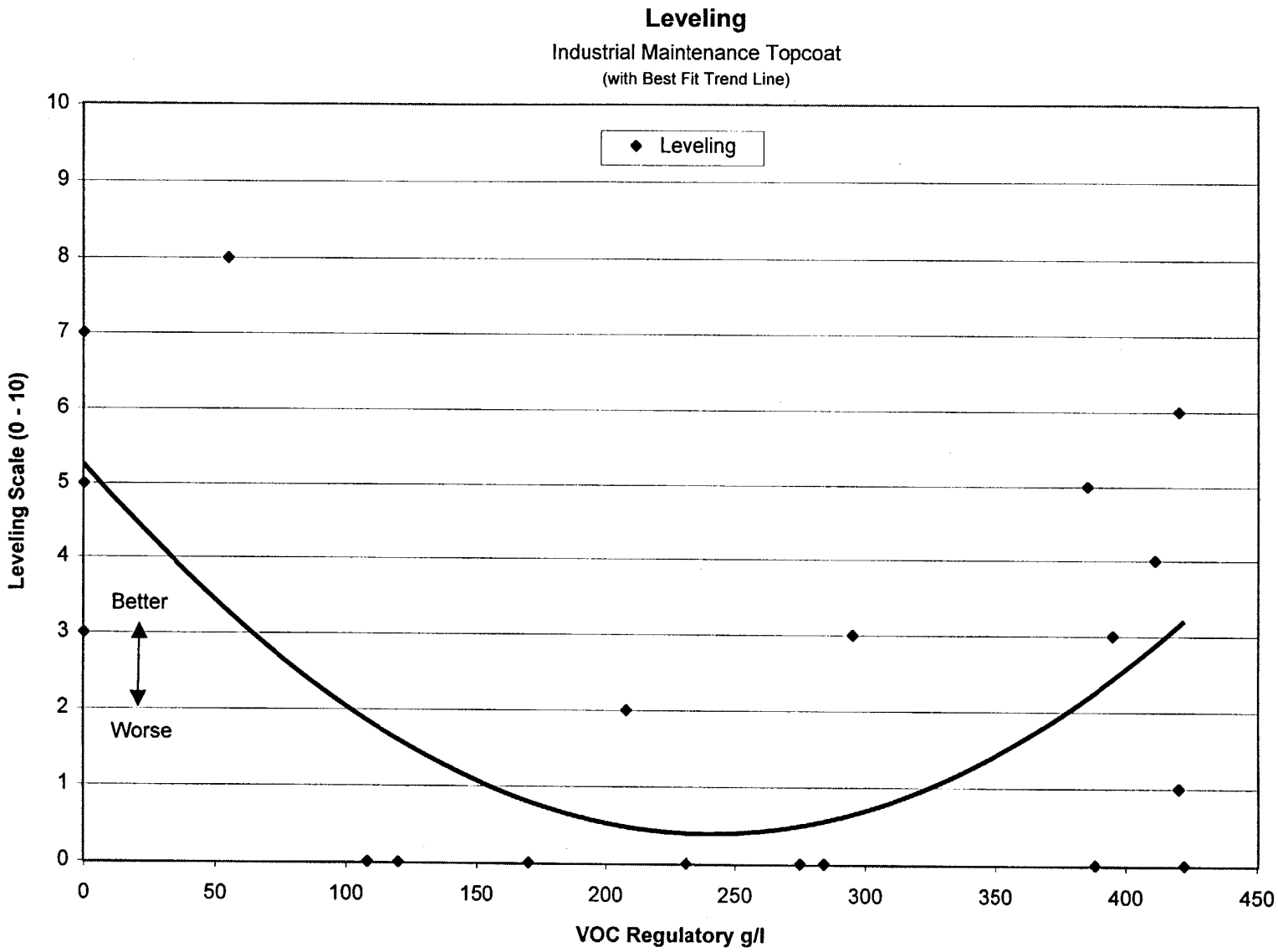

Brushing Properties
Industrial Maintenance Topcoat
(with Best Fit Lines)
Brushing Properties, Wet
Brushing Properties, Dry
Better
Worse
Brushing Properties, Dry
Brushing Properties, Wet
Leneta Levelness Profile (1-9)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
0
50
100
150
200
250
300
350
400
450

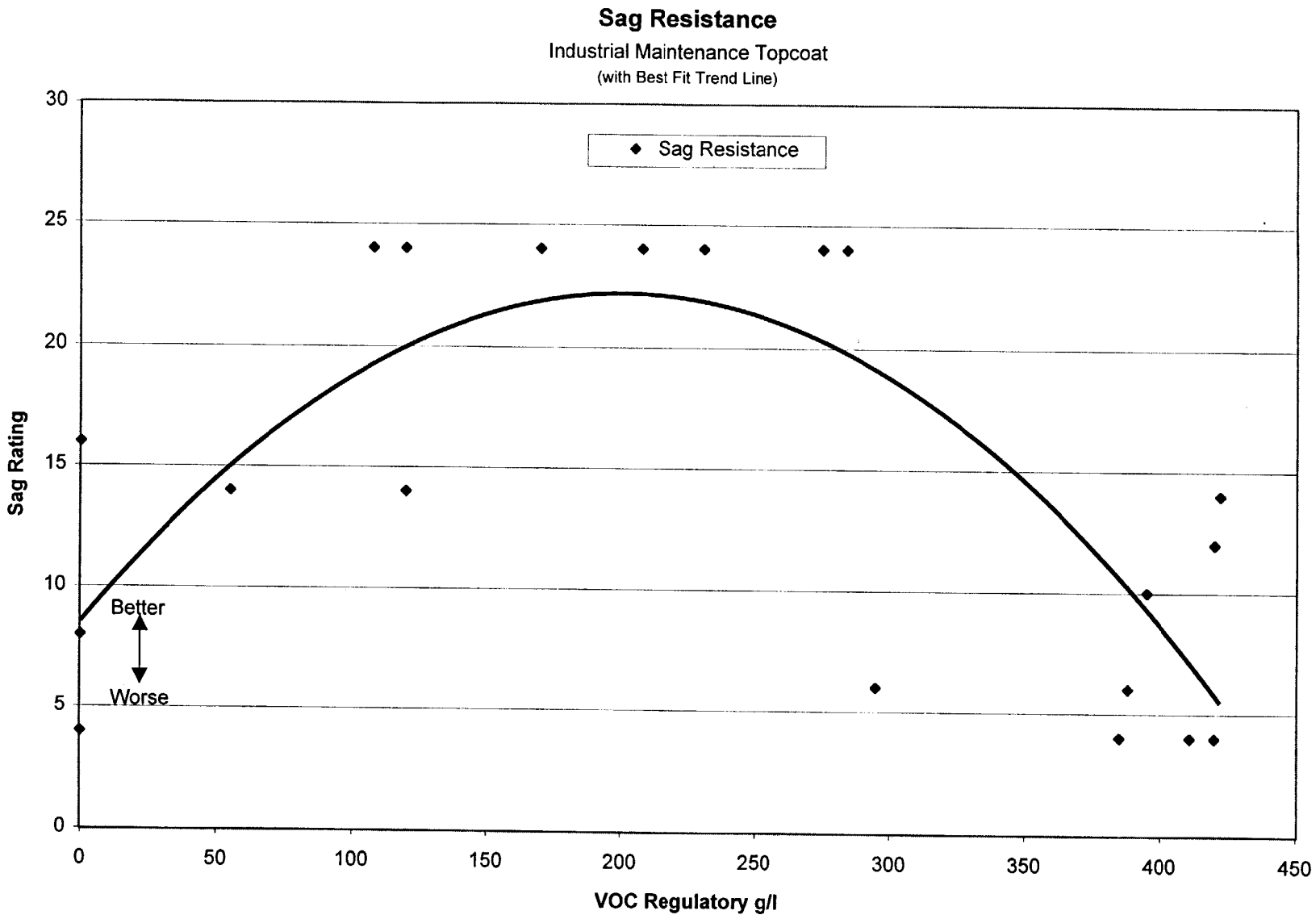

Dry Time - Dry To Touch
Industrial Maintenance Topcoat
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

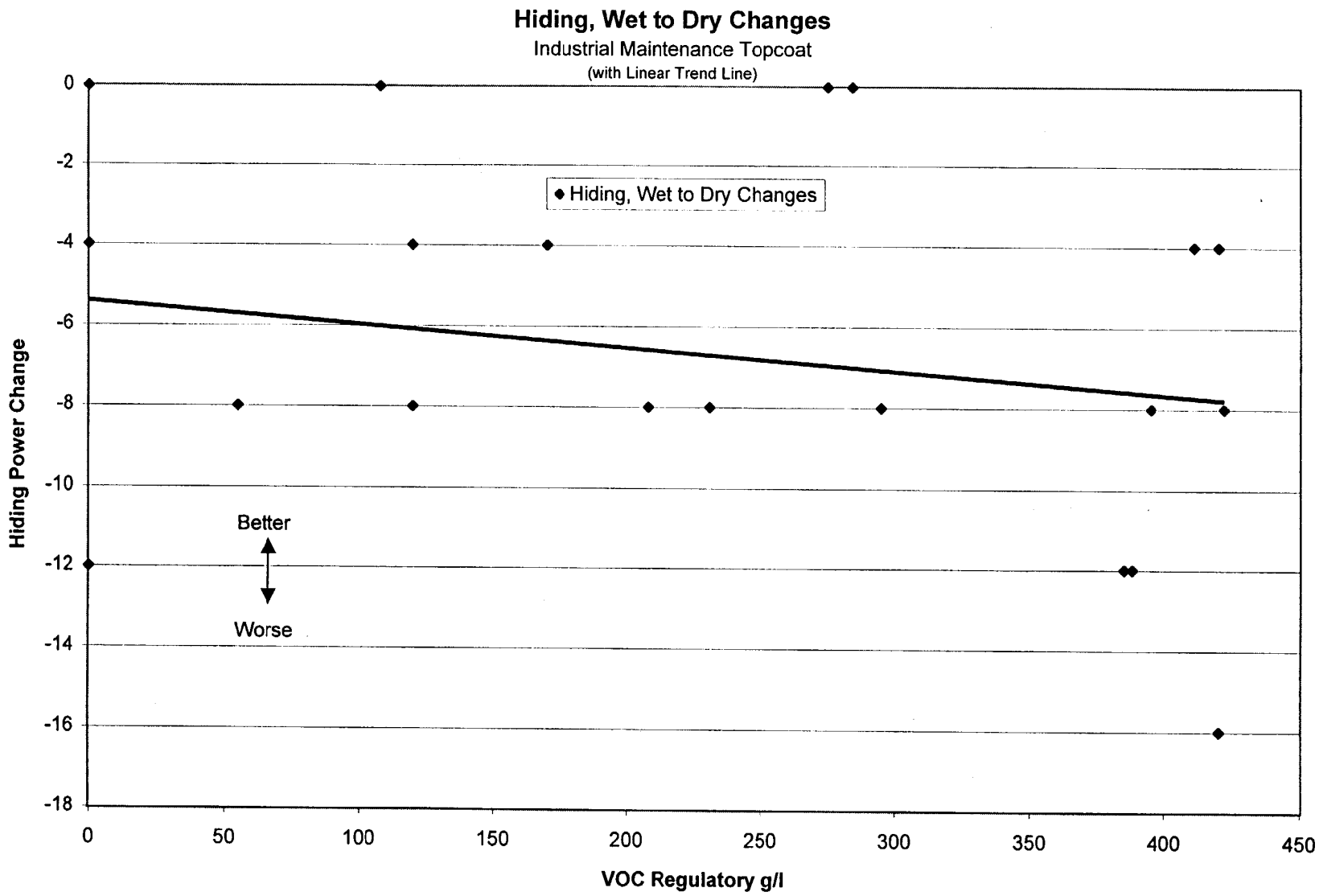

Dry Time - Dry Hard
Industrial Maintenance Topcoat
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

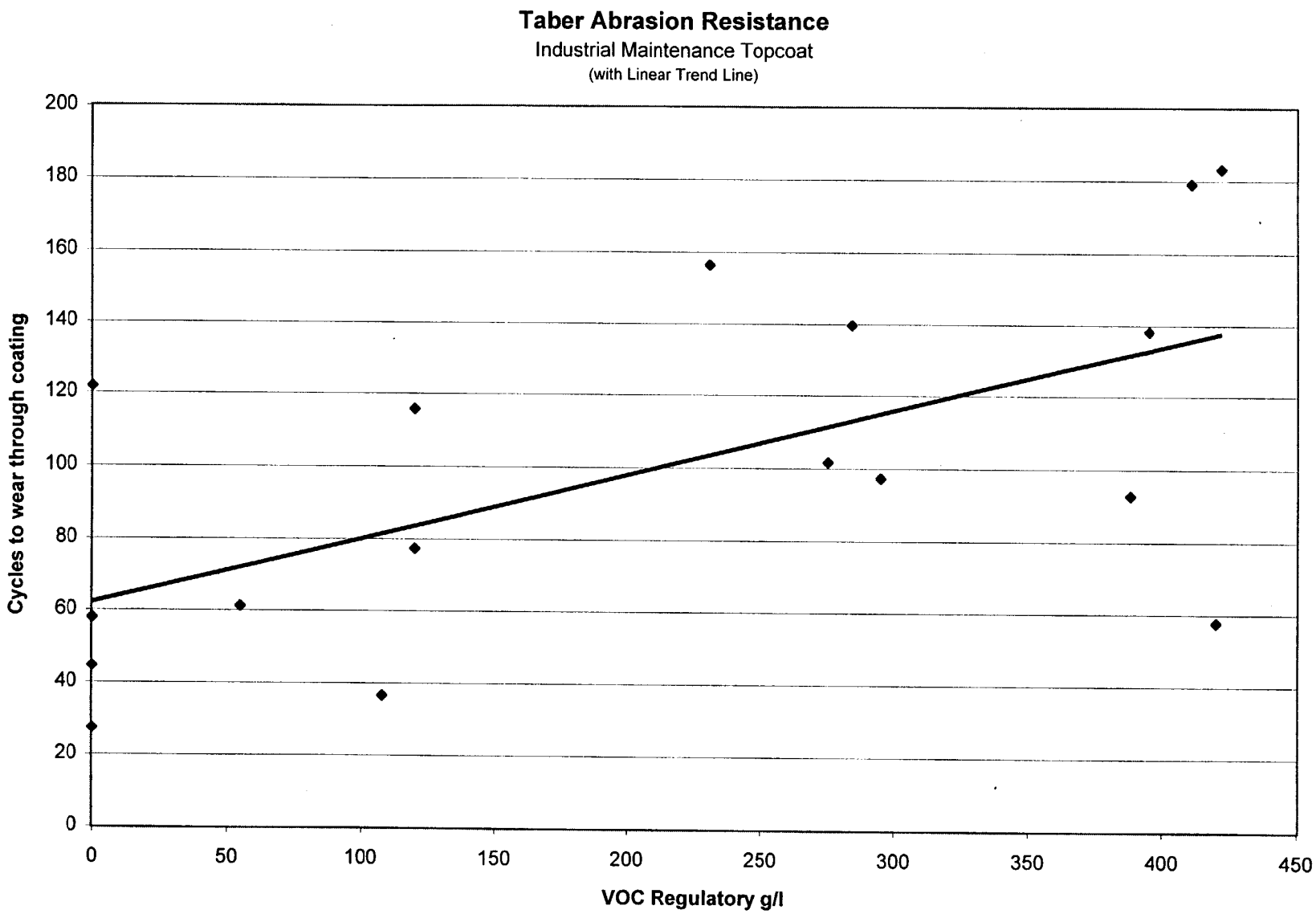

Contrast Ratio
(Hiding Power)
Industrial Maintenance Topcoat
(with Linear Trendline)
at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
Better
Worse
Contrast Ratio
VOC Regulatory g/l
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0
50
100
150
200
250
300
350
400
450

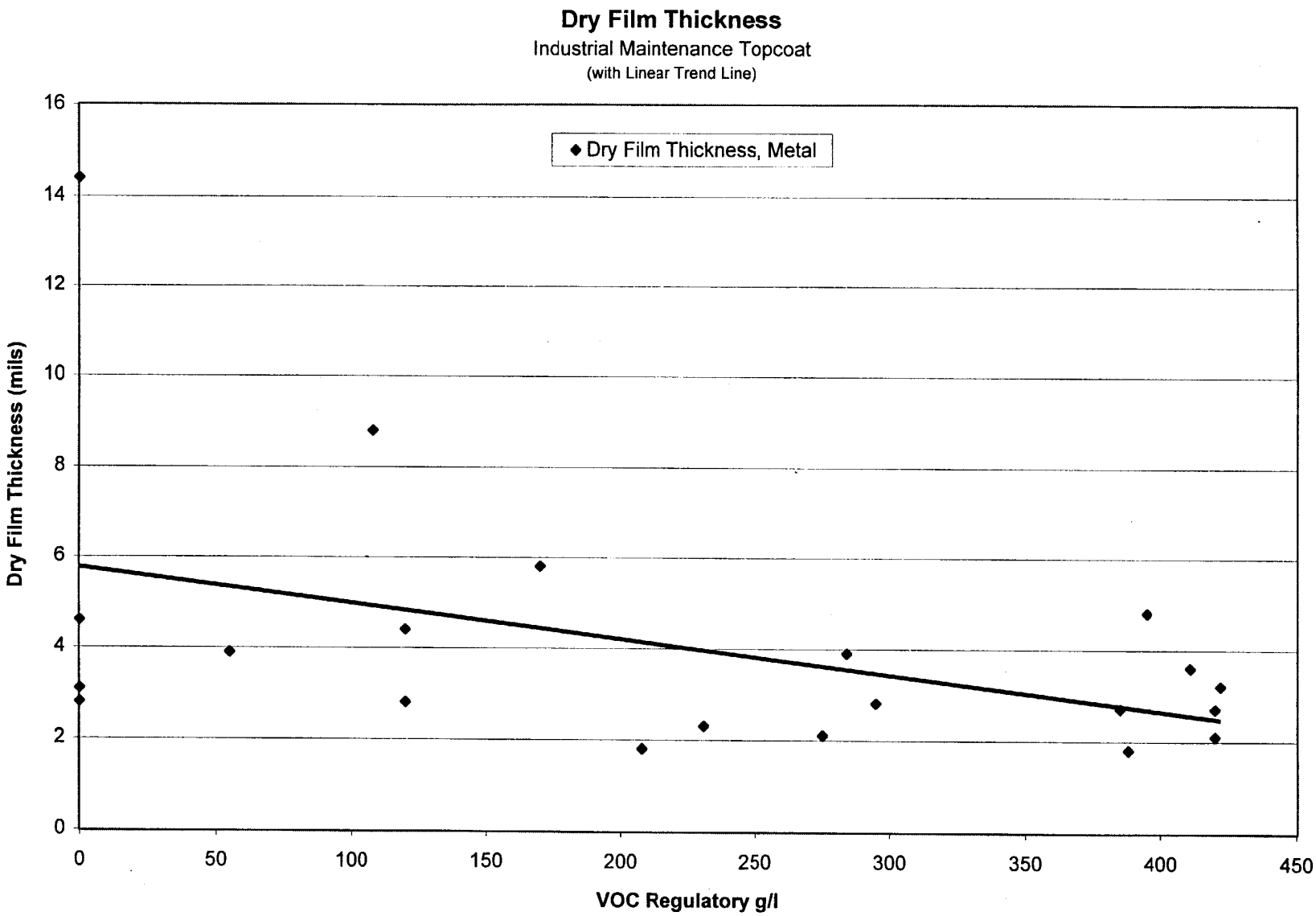

Spreading Rate
Industrial Maintenance Topcoat
(with Linear Trendline)
Spreading Rate
ft2/gal at 3.98 mil WFT
500
480
460
440
420
400
380
360
340
320
300
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Leveling
Industrial Maintenance Topcoat
(with Best Fit Trend Line)
Leveling
Leveling Scale (0 - 10)
10
9
8
7
6
5
4
3
2
1
0
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Sag Resistance
Industrial Maintenance Topcoat
(with Best Fit Trend Line)
Sag Resistance
Better
Worse
Sag Rating
VOC Regulatory g/l
0
5
10
15
20
25
30
0
50
100
150
200
250
300
350
400
450


Hiding, Wet to Dry Changes
Industrial Maintenance Topcoat
(with Linear Trend Line)
Hiding, Wet to Dry Changes
Better
Worse
Hiding Power Change
VOC Regulatory g/l
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
0
50
100
150
200
250
300
350
400
450


Taber Abrasion Resistance
Industrial Maintenance Topcoat
(with Linear Trend Line)
Cycles to wear through coating
200
180
160
140
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Dry Film Thickness
Industrial Maintenance Topcoat
(with Linear Trend Line)
Dry Film Thickness, Metal
Dry Film Thickness (mils)
16
14
12
10
8
6
4
2
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

Industrial Maintenance Coating Topcoat (IMCT) Data Table

Protocol Test Number							2.1	2.1	2.2		2.2		3.14	3.14	2.4	2.7	2.10			
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Nonvolatile by Weight	Coarse Particles	Density	Brushing Properties, Wet	Brushing Properties, Dry	Dry time, Dry to Touch - One Part Coatings		Dry time, Dry Hard - One Part Coatings		Contrast Ratio (Cw) Hiding Power	Spreading Rate	Leveling	Sag Resistance	Hiding, Wet to Dry Changes	Wet Film Thickness		
																		WW Rod #20	WW Rod #40	WW Rod #80
Units		g/l		%	Size in Microns	lbs/gal	Leneta Levelness Profile, 1 - 9	Leneta Levelness Profile, 1 - 9	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	at Spreading Rate of 414 ft2/gal or 3.87 mils WFT		Scale, 0-10	Notch Clearance in mils		mils	mils	mils
911	IMC11	0	Urethane	79.2	44	11.83	2	4	33.4	60.0	193.6	146.1	0.956	373	3	8	12	4.5	4.5	9.5
913	IMC13	0	Novolac	95.5	100	12.50	2	8	204.8	135.0	346.8	284.4	0.988	390	5	4	4	3.5	4.5	6.5
915	IMC15	0	Urethane	67.1	67	9.77	6	7	3.0	2.5	35.4	43.0	0.851	not possible	5	16	0	4.5	5.5	7.5
916	IMC16	0	Epoxy	40.2	12	8.98	1	7	361.8	4.9	361.8	105.1	0.83	359	7	4	12	4.5	8.5	12.5
905	IMC5	55	Water-based polyester-urethane	61	0	10.57	5	6	9.9	4.2	360.0	81.0	0.935	not possible	8	14	8	3.6	5.5	8.5
901	IMC1	108	Siloxirane	95.2	36	12.59	4	4	6.1	5.1	353.2	298.5	0.757	419	0	>24	0	4.0	5.5	9.5
909	IMC9	120	Acrylic	47.7	70	9.50	<1	1	2.7	2.1	22.5	2.1	0.954	346	0	>24	8	4.5	6.5	7.5
921	IMC21	120	Siloxane	91.4	28	11.56	3	3	0.6	3.0	360.3	170.1	0.985	470	0	14	4	5.5	5.5	7.5
919	IMC19	170	Epoxy	89.2	60	12.82	2	3	27.1	16.5	206.5	48.9	0.972	428	0	>24	4	4.5	4.5	6.5
907	IMC7	208	Acrylic	47	66	9.88	2	4	13.0	2.4	27.7	9.3	0.988	378	2	>24	8	5.5	6.5	9.5
922	IMC22	231	Acrylic	59.5	60	12.01	1	2	31.8	3.0	360.0	71.1	0.966	393	0	>24	8	4.5	5.0	8.0
928	IMC27	275	Epoxy	81.6	20	13.34	1	1	7.5	4.5	358.5	151.5	0.931	383	0	24	0	4.5	4.5	7.5
932	IMC31	284	Epoxy	73.8	44	11.48	2	5	1.6	41.1	328.9	181.8	0.986	448	0	24	0	3.5	5.5	9.5
929	IMC28	295	Alkyd	79.9	2	11.02	3	5	11.5	19.2	350.2	112.2	0.99	424	3	6	8	4.5	6.5	10.5
931	IMC30	385	Alkyd	68.8	8	10.47	2	9	4.2	3.6	17.7	111.6	0.986	448	5	4	12	4.5	5.5	7.5
934	IMC33	388	Urethane	73.1	16	10.80	5	9	2.2	4.9	149.5	157	0.944	494	0	6	12	4.5	7.5	8.5
925	IMC25	395	Epoxy	77.3	60	12.50	4	8	6.4	27.9	358.9	263.4	0.962	408	3	10	8	3.5	6.5	8.5
918	IMC18	411	Urethane Alkyd	62.4	36	11.87	2	2	2.5	4.0	237.1	28.6	0.943	419	4	4	4	4.5	5.5	8.5
10	Ref	420	Urethane	73.6	0	11.10	7	9	0.3	3.0	120.3	109.2	0.985	438	6	<4	4	4.5	6.5	8.5
903	IMC3	420	Silicone Alkyd	64.7	4	9.83	1	2	4.2	5.5	215.7	228.1	0.933	412	1	12	16	3.5	5.5	7.5
924	IMC24	422	Alkyd	74.4	28	10.12	2	4	2.8	2.2	280.9	239.2	0.988	471	0	14	8	5.5	5.5	8.5

Industrial Maintenance Coating Topcoat (IMCT) Data Table

Protocol Test Number						3.2	3.2	3.10	3.9
Coating Reference Number	Coating Reference Designator	Wet Film/Dry Film/WW & Bar Applicator Gap Relationships			Abrasion Resistance, Taber	Appearance and Finish, Drawdown Charts	Appearance and Finish, Coted Panels	Dry Film Thickness, Metal	Film Flexibility
		WW Rod #30	WW Rod #48	WW Rod #60					
Units		mils	mils	mils	Wear Index or Cycles to Expose Substrate			mils	pass/fail
911	IMC11	2.1	2.8	4.2	44.6	smooth, high gloss	exotherm-rough, gloss	4.6	fail
913	IMC13	2.7	3.7	6.3	57.9	grainy, semigloss	uniform, gloss	14.4	fail
915	IMC15	2.3	3.2	3.2	27.3	smooth, glossy	gelled particles, semigloss	3.1	pass
916	IMC16	1.1	1.4	2.2	121.7	smooth, glossy	smooth, glossy	2.8	pass
905	IMC5	1.6	2.6	3.5	61.1	grainy, semigloss	grainy, glossy	3.9	pass
901	IMC1	3.4	4.9	6.0	36.6	grainy, semigloss	grainy, glossy	8.8	fail
909	IMC9	1.9	2.2	3.0	77.4	uniform, semigloss	uniform, semigloss	2.8	pass
921	IMC21	2.2	2.4	4.7	115.7	smooth, high gloss	uniform, high gloss	4.4	pass
919	IMC19	3.3	3.4	5.4	test not conducted	uniform, satin-flat	uniform, satin	5.8	pass
907	IMC7	1.8	1.9	2.0	112.2/585 cycles	smooth, glossy	smooth, satin	1.8	pass
922	IMC22	1.5	2.1	2.5	156.4	uniform, flat	uniform, flat w/rust spots	2.3	pass
928	IMC27	3.4	3.3	5.2	101.6	smooth, satin	smooth, satin	2.1	pass
932	IMC31	1.9	2.9	4.6	139.7	smooth, satin	smooth, satin	3.9	pass
929	IMC28	2.2	3.2	3.9	97.3	smooth, high gloss	smooth, gloss	2.8	pass
931	IMC30	1.8	2.3	3.3	203.9/700 cycles	uniform, satin	uniform, satin	2.7	pass
934	IMC33	2.4	2.6	3.2	92.7	smooth, high gloss	smooth, high gloss	1.6	pass
925	IMC25	2.4	2.9	3.5	138.2	smooth, satin	smooth, satin	4.8	pass
918	IMC18	1.6	1.7	2.7	179.1	smooth, high gloss	smooth, glossy	3.6	pass
10	Ref	1.2	2.5	3.4	57.6	smooth, high gloss	smooth, glossy	2.1	pass
903	IMC3	1.1	2.1	2.4	197.1/700 cycles	smooth, high gloss	smooth, high gloss	2.7	pass
924	IMC24	1.7	2.0	3.1	183.2	smooth, glossy	uniform, semigloss	3.2	pass

Section 3: Industrial Maintenance System

	1st Coat	2nd Coat	3rd Coat
Total # manufactuers or brands	11	11	5
Single component coatings	9	7	1
Multi-component coatings	11	13	6
Total # coatings	20	20	7

Test Summary

Adhesion to Substrate:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Corrosion Resistance - Blistering:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Corrosion Resistance - Filiform Corrosion:
- Low VOC coatings exhibited marginally better performance compared to high VOC coatings.

Corrosion Resistance - Rust:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Dry Film Thickness:
- Low VOC coatings exhibited higher film thickness compared to high VOC coatings.

Water Resistance (100 °F & 100% RH) - Scratch after two week exposure:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Water Resistance (100 °F & 100% RH) - Gouge after two week exposure:
- Low VOC coatings exhibited marginally better performance compared to high VOC coatings.

Water Resistance (100 °F & 100% RH) - Adhesion tape test after two week exposure:
- Low VOC coatings exhibited similar performance to high VOC coatings.

Industrial Chemical Resistance (7 day exposure) - Bleach:
- Low VOC coatings exhibited marginally lower performance compared to high VOC coatings.

Industrial Chemical Resistance (7 day exposure) - MEK
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Industrial Chemical Resistance (7 day exposure) - Acid

- Low VOC coatings exhibited marginally lower performance compared to high VOC coatings.

Water Resistance (Rust or Blisters after 1000 hr Immersion @ 100 °F):

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Mar Resistance (Load/Force to mar film in grams):

- Low VOC coatings exhibited better performance compared to high VOC coatings.

Comments:

Overall, low VOC coatings exhibited similar performance compared to high VOC coatings, except one test. In the Mar Resistance test low VOC coatings exhibited better performance compared with their high VOC counterparts. More than half of the 47 coatings used by NTS for the industrial maintenance category were two-component coatings.

Industrial Maintenance System 1st Coat / Primer

Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
901	108	2	Siloxirane	T	1
920	288	2	Epoxy	P	1
917	417	1	Alkyd	P	1
910	0	2	Epoxy	P	1
902	400	1	Epoxy Ester	P	2
914	0	2	Butadiene-Epoxy	P	2
919	170	2	Epoxy	P	1
933	282	2	Inorganic Zinc Silicate	P	1
932	284	2	Epoxy	T	1
930	419	1	Alkyd	P	1
906	138	1	Acrylic	P	1
904	49	1	Organic Zinc	P	1
908	60	1	Acrylic	P	1
912	0	2	Novolac	P	1
925	395	2	Epoxy	T	1
923	382	1	Alkyd	P	1
922	231	1	Acrylic	T	1
927	320	2	Epoxy	P	1
Grand Total					20

Single component coatings = 9 Multi-component coatings = 11

Industrial Maintenance System 2nd Coat / Mid Coat

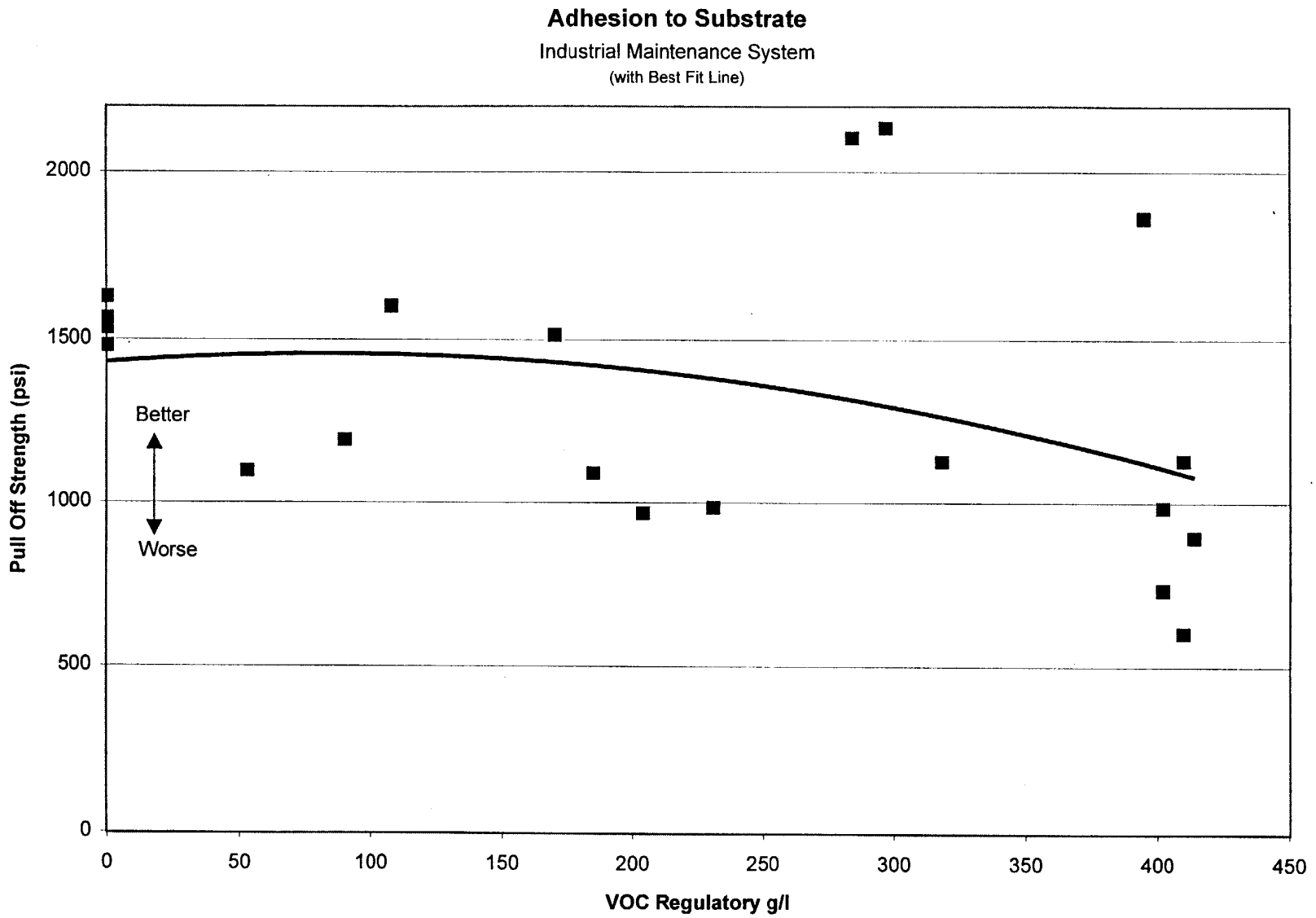
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
901	108	2	Siloxirane	T	1
921	120	2	Siloxane	T	1
918	411	1	Urethane Alkyd	T	1
911	0	2	Urethane	T	1
903	420	1	Silicone Alkyd	T	1
10	420	2	Urethane	T	1
915	0	2	Urethane	T	1
916	0	2	Epoxy	T	1
919	170	2	Epoxy	P	1
931	385	1	Alkyd	T	1
932	284	2	Epoxy	T	2
907	208	1	Acrylic	T	1
905	55	2	Urethane	T	1
909	120	1	Acrylic	T	1
913	0	2	Novolac	T	1
925	395	2	Epoxy	T	1
928	275	2	Epoxy	T	1
924	422	1	Alkyd	T	1
922	231	1	Acrylic	T	1
Grand Total					20

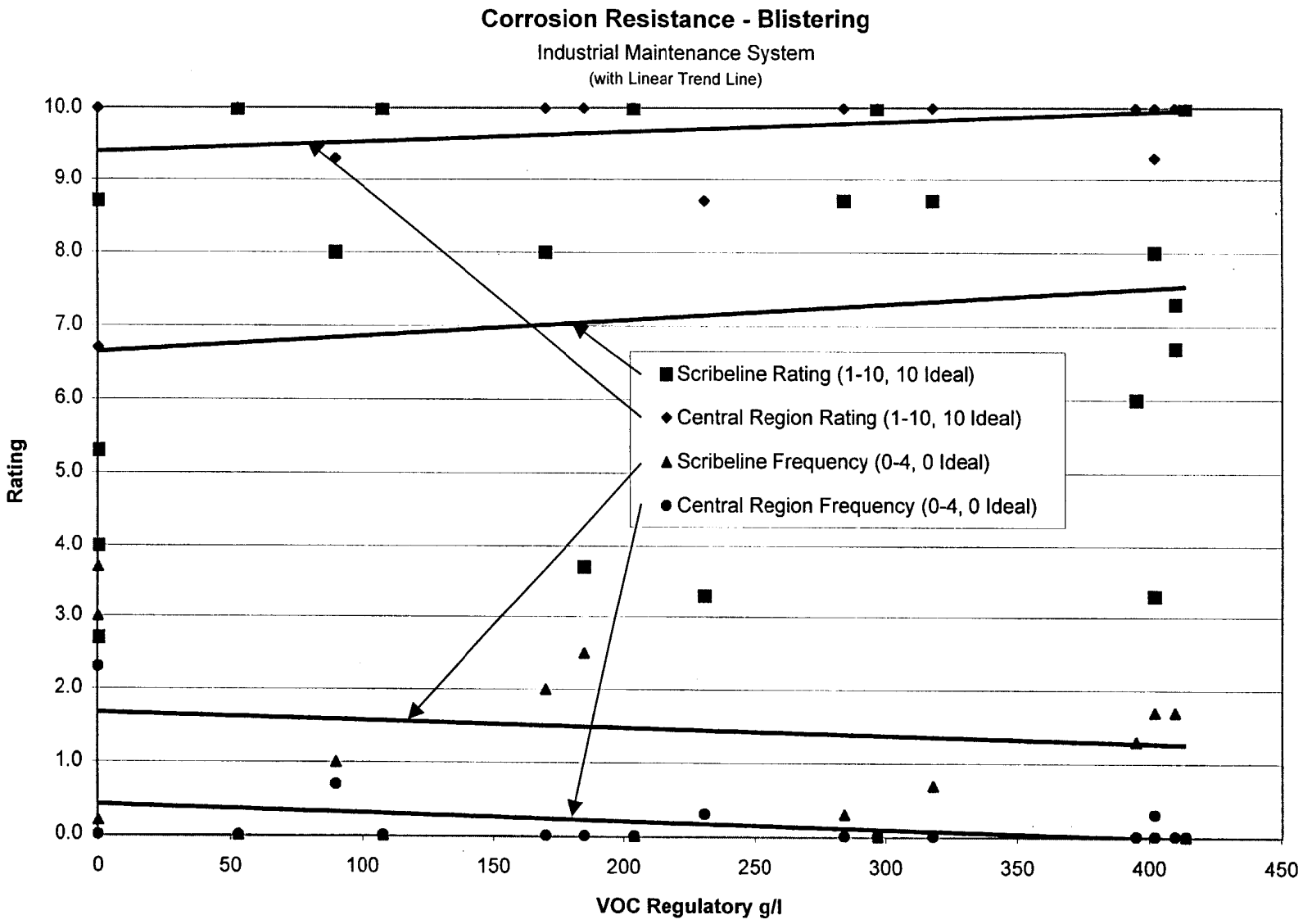
Single component coatings = 7 Multi-component coatings = 13

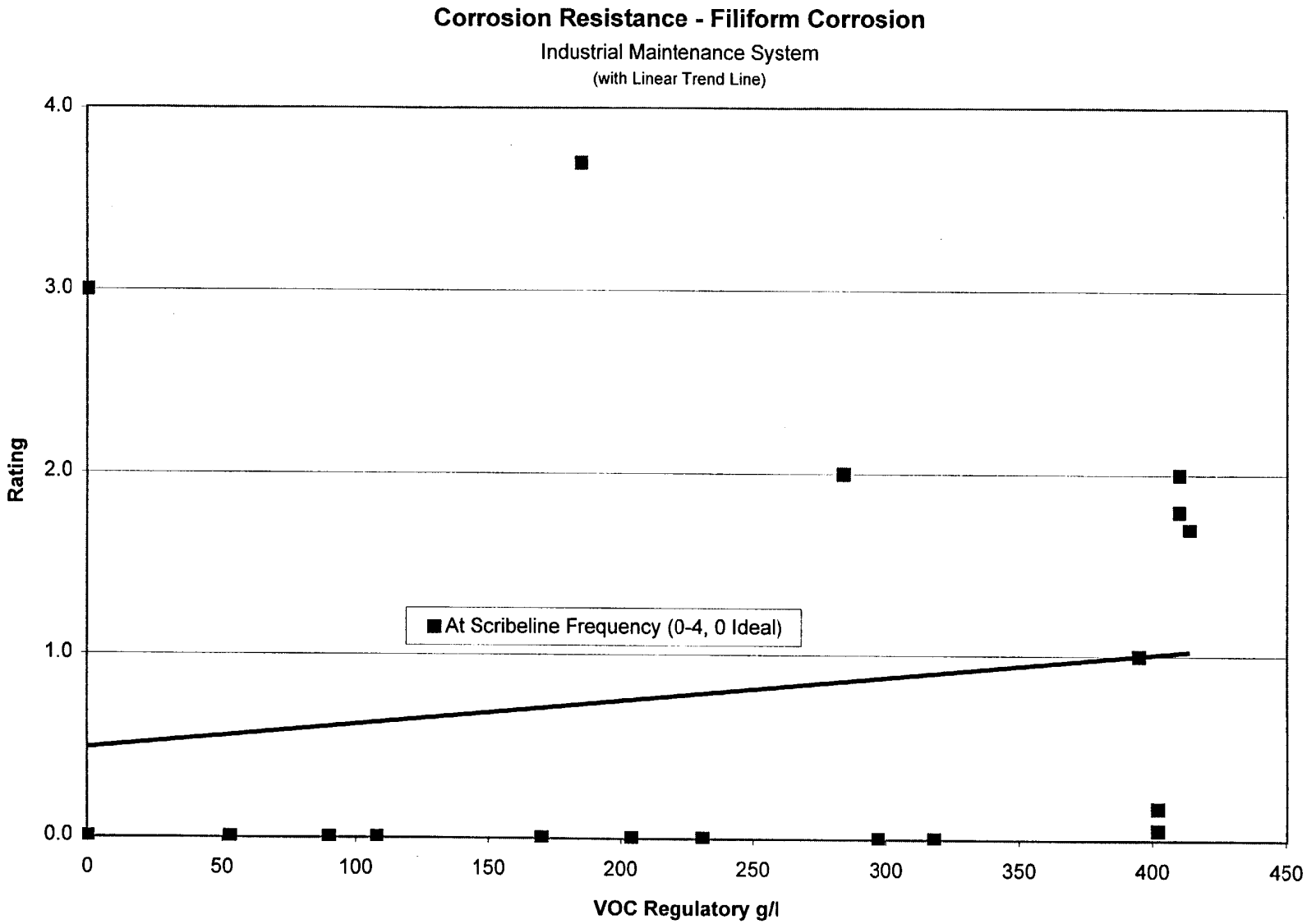
Industrial Maintenance System 3rd Coat / Topcoat

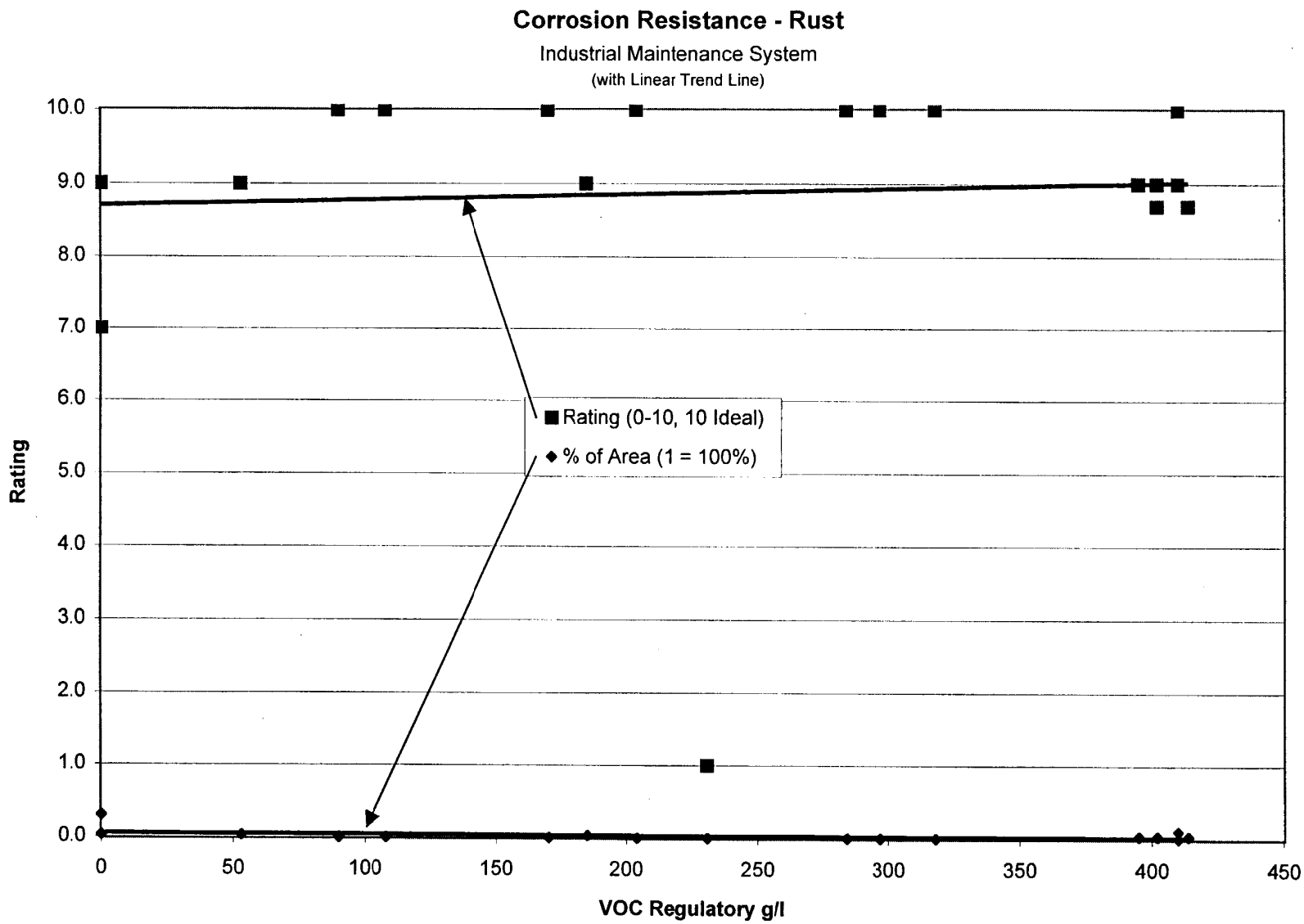
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
915	0	2	Urethane	T	1
916	0	2	Epoxy	T	1
934	388	2	Urethane	T	1
907	208	1	Acrylic	T	1
905	55	2	Urethane	T	1
913	0	2	Novolac	T	1
929	295	2	Urethane	T	1
Grand Total					7

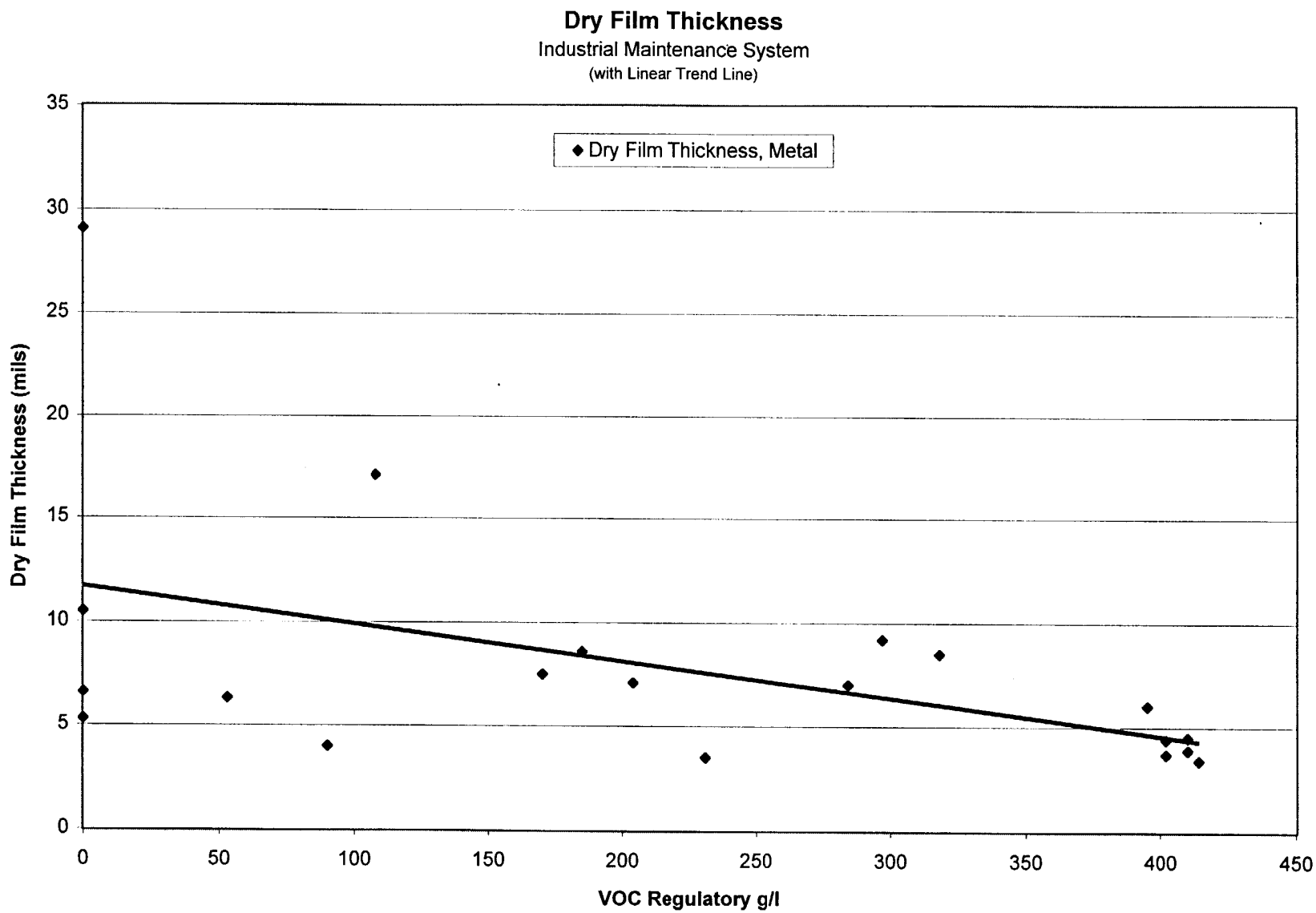
Single component coatings = 1 Multi-component coatings = 6

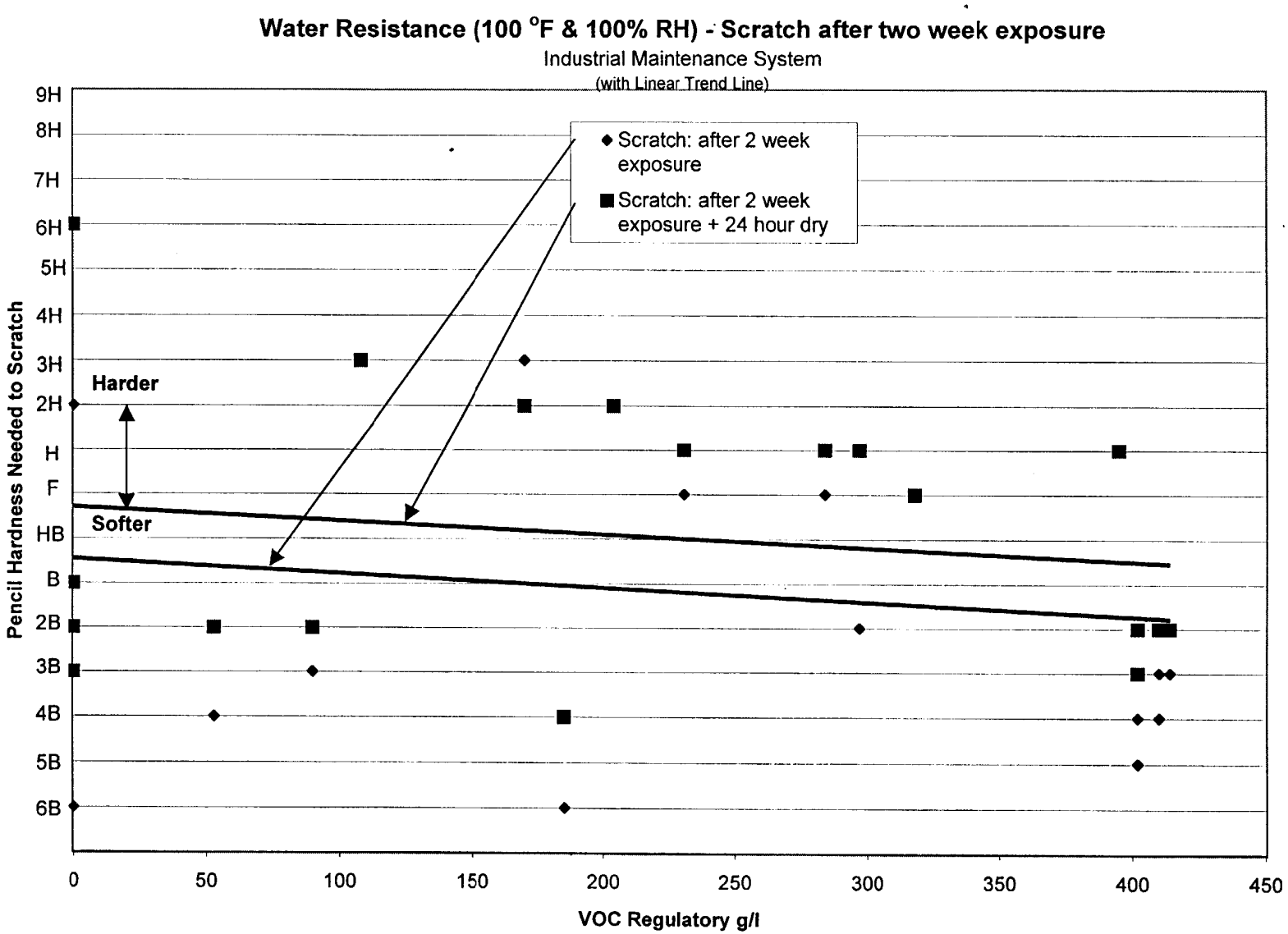

Adhesion to Substrate
Industrial Maintenance System
(with Best Fit Line)
Pull Off Strength (psi)
2000
1500
1000
500
0
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

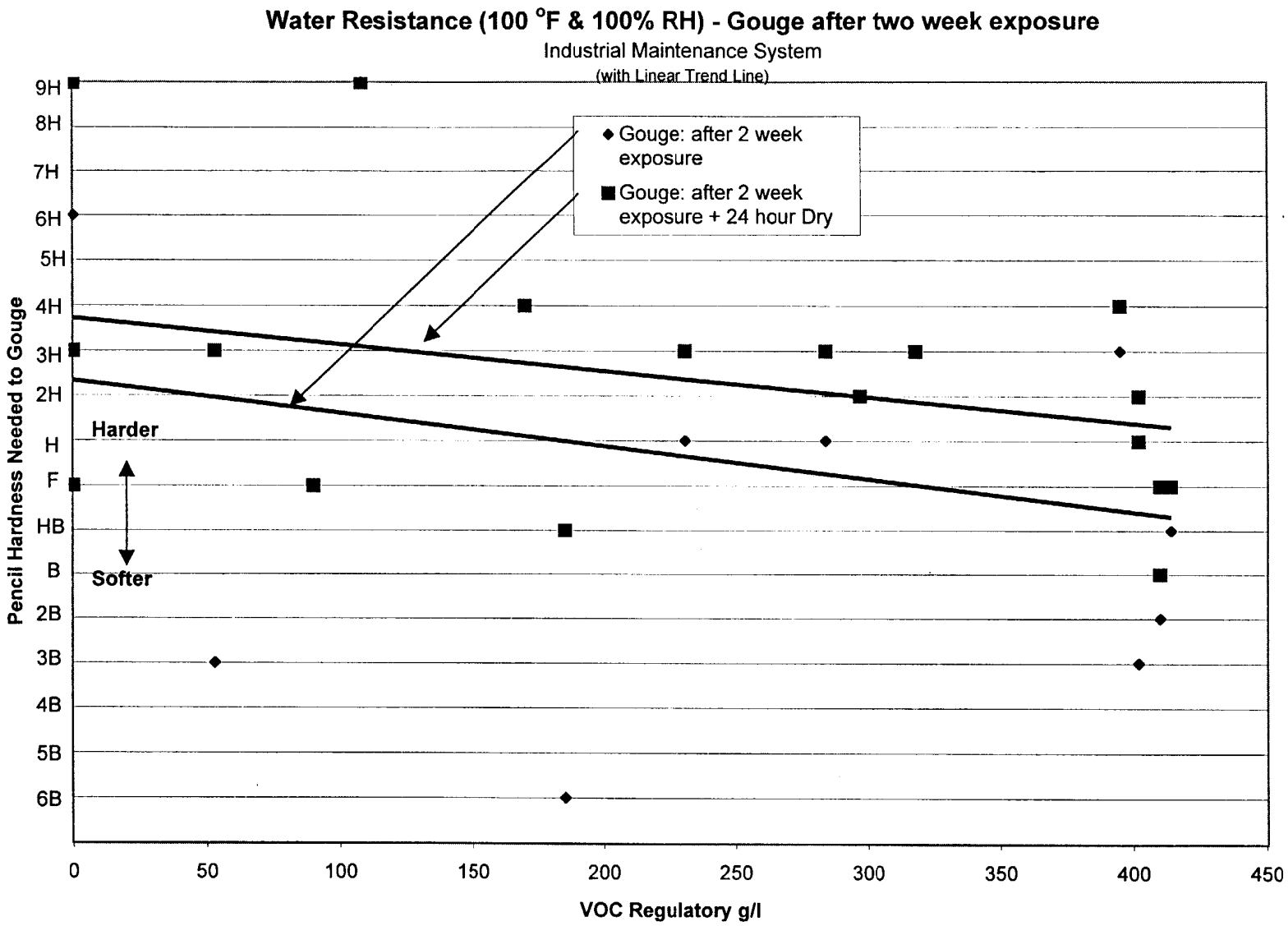

Corrosion Resistance - Blistering
Industrial Maintenance System
(with Linear Trend Line)
Rating
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l
Scribeline Rating (1-10, 10 Ideal)
Central Region Rating (1-10, 10 Ideal)
Scribeline Frequency (0-4, 0 Ideal)
Central Region Frequency (0-4, 0 Ideal)

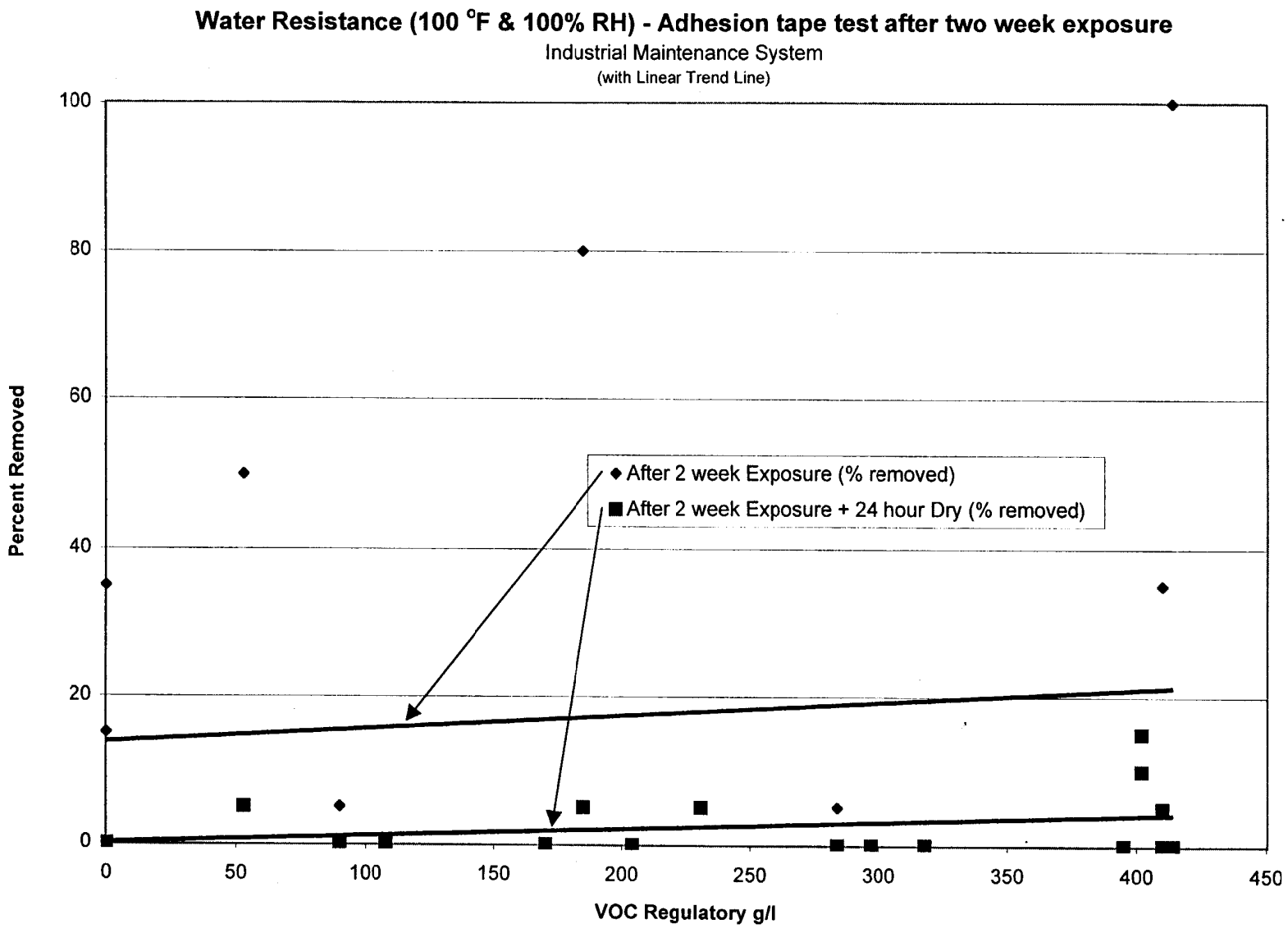

Corrosion Resistance - Filiform Corrosion
Industrial Maintenance System
(with Linear Trend Line)
4.0
3.0
2.0
1.0
0.0
Rating
At Scribeline Frequency (0-4, 0 Ideal)
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

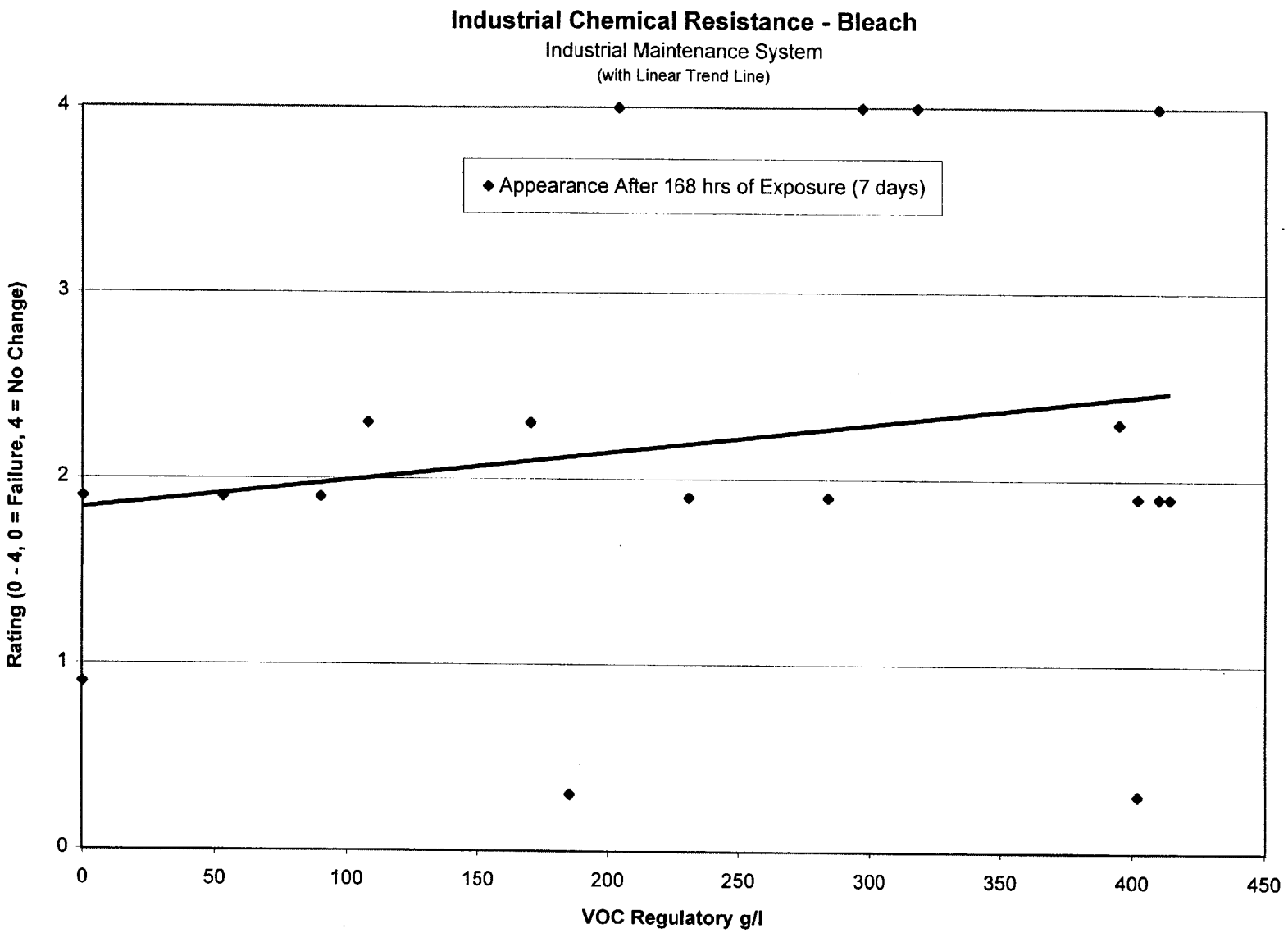

Corrosion Resistance - Rust
Industrial Maintenance System
(with Linear Trend Line)
Rating
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l
Rating (0-10, 10 Ideal)
% of Area (1 = 100%)

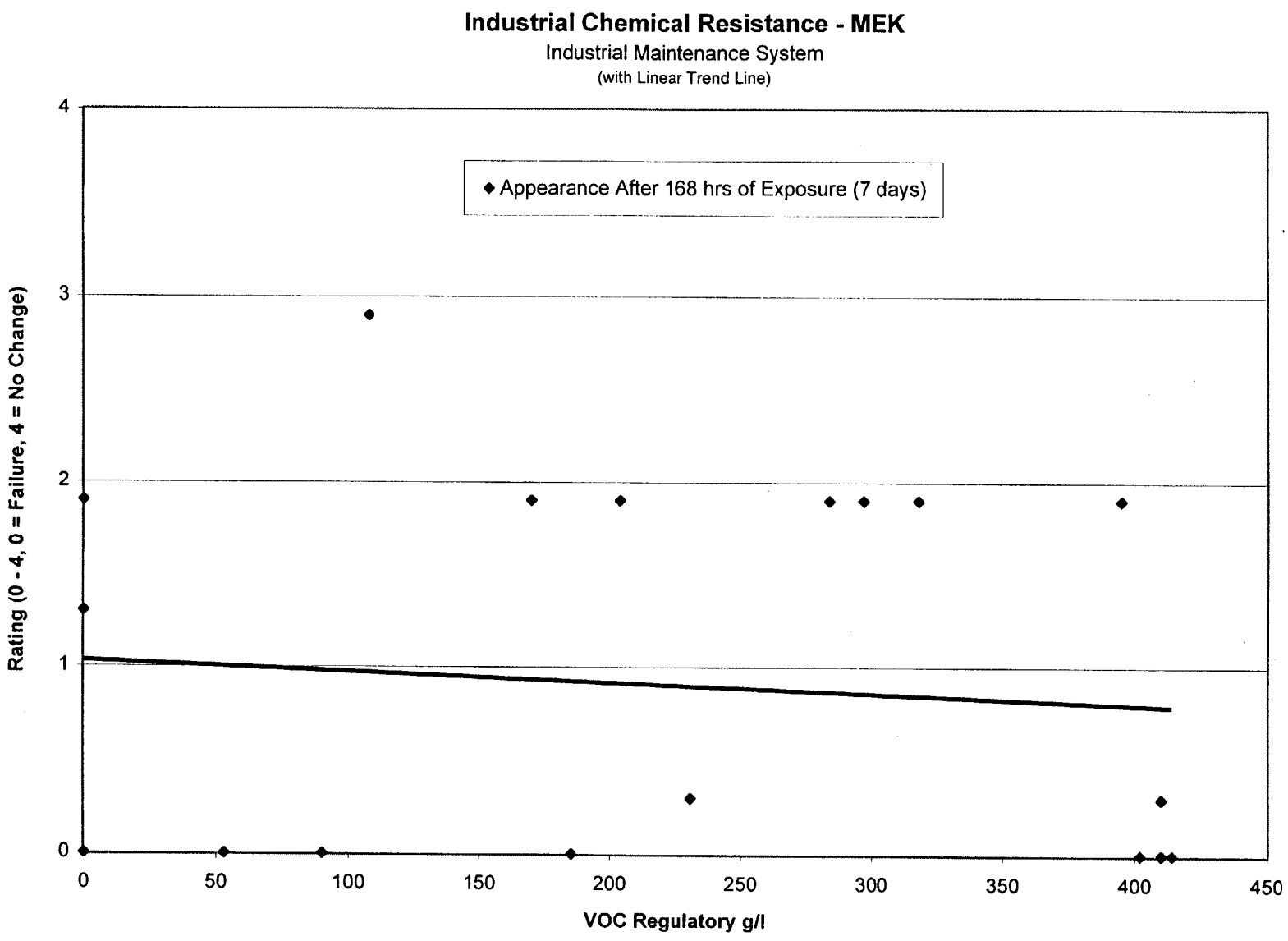

Dry Film Thickness
Industrial Maintenance System
(with Linear Trend Line)
Dry Film Thickness, Metal
Dry Film Thickness (mils)
35
30
25
20
15
10
5
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

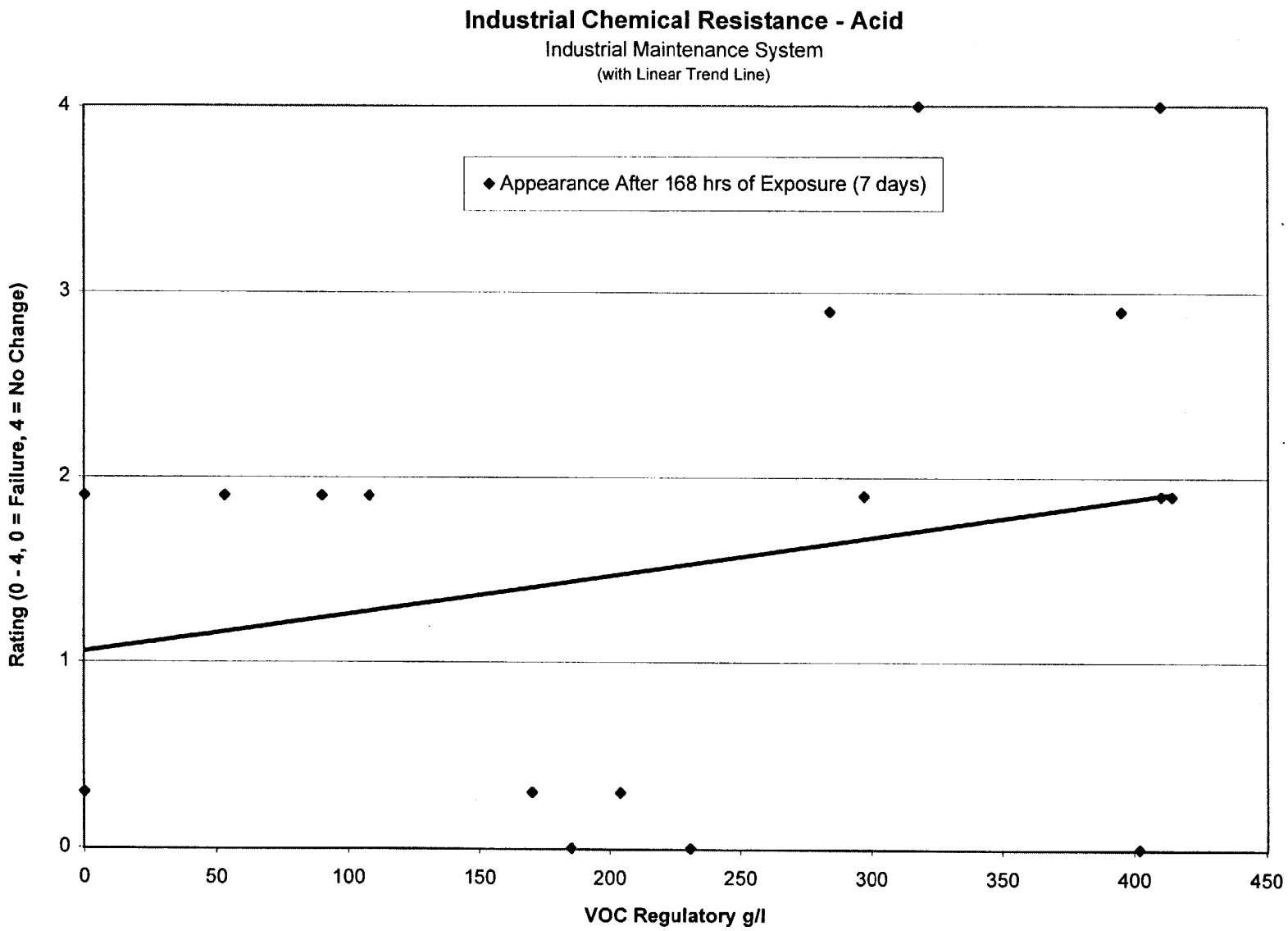

Water Resistance (100 °F & 100% RH) - Scratch after two week exposure
Industrial Maintenance System
(with Linear Trend Line)
Scratch: after 2 week exposure
Scratch: after 2 week exposure + 24 hour dry
Harder
Softer
Pencil Hardness Needed to Scratch
9H
8H
7H
6H
5H
4H
3H
2H
H
F
HB
B
2B
3B
4B
5B
6B
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

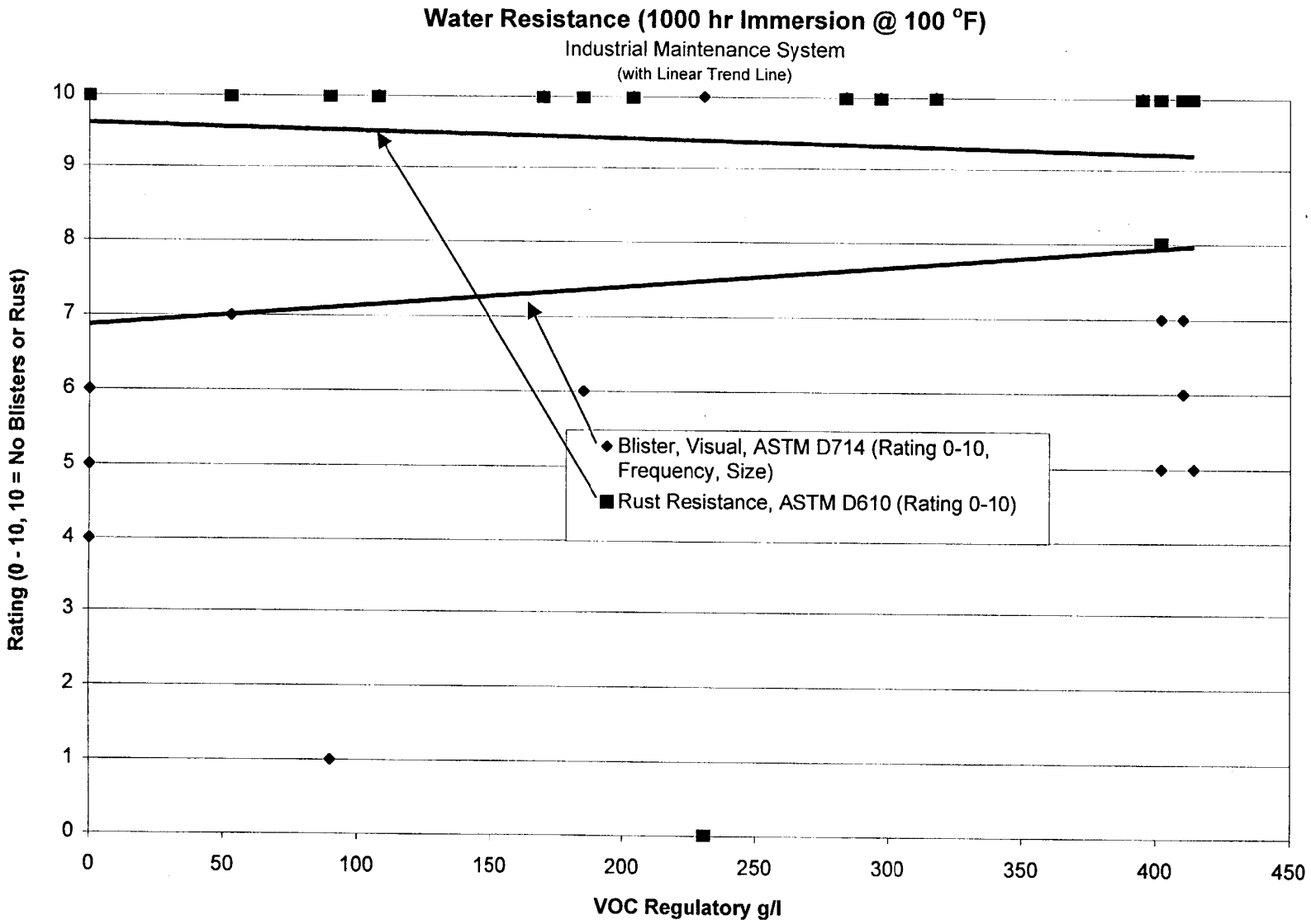

Water Resistance (100 °F & 100% RH) - Gouge after two week exposure
Industrial Maintenance System
(with Linear Trend Line)
Gouge: after 2 week exposure
Gouge: after 2 week exposure + 24 hour Dry
Harder
Softer
Pencil Hardness Needed to Gouge
9H
8H
7H
6H
5H
4H
3H
2H
H
F
HB
B
2B
3B
4B
5B
6B
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

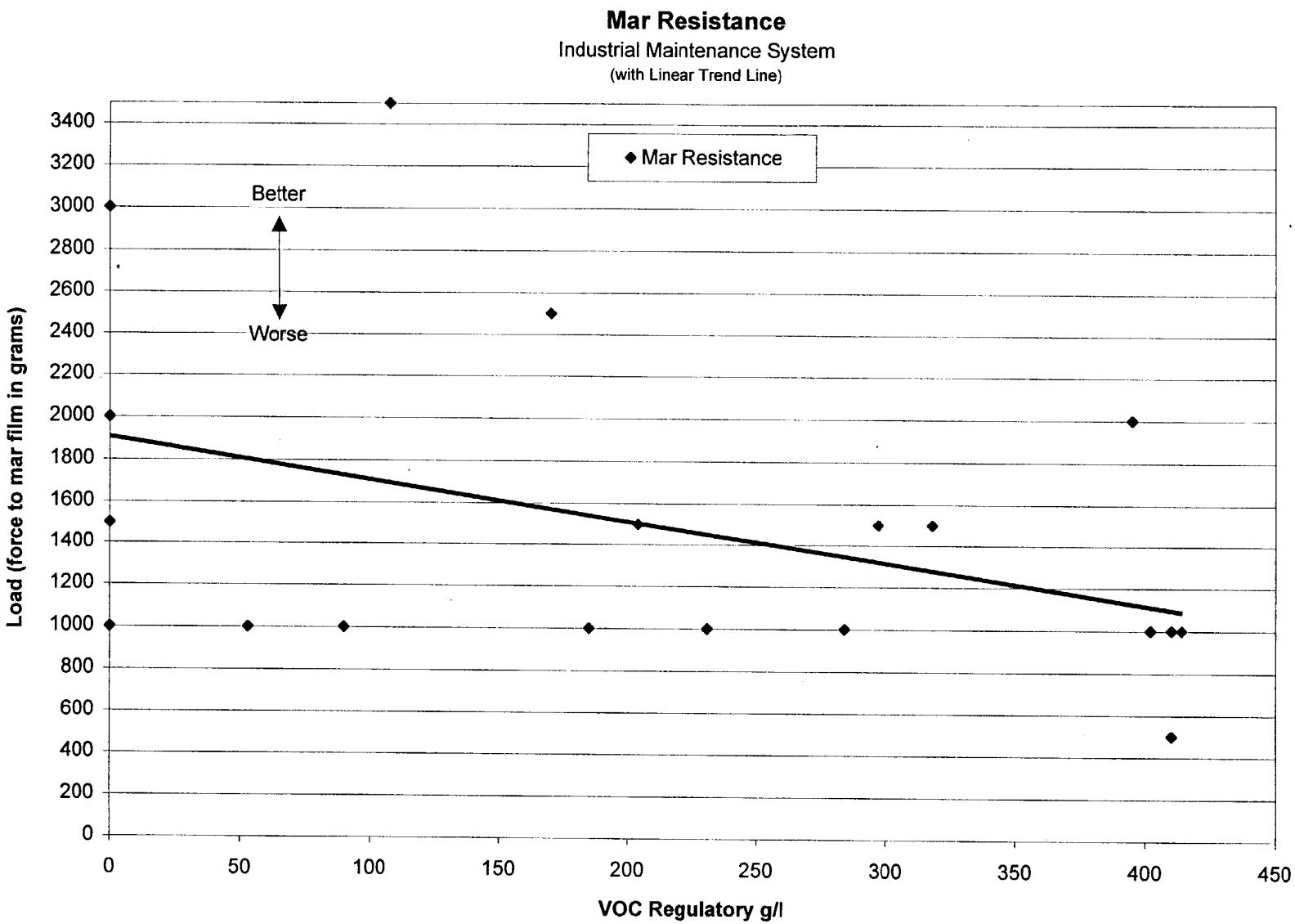

Water Resistance (100 °F & 100% RH) - Adhesion tape test after two week exposure
Industrial Maintenance System
(with Linear Trend Line)
Percent Removed
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l
After 2 week Exposure (% removed)
After 2 week Exposure + 24 hour Dry (% removed)


Industrial Chemical Resistance - Bleach
Industrial Maintenance System
(with Linear Trend Line)
Appearance After 168 hrs of Exposure (7 days)
Rating (0 - 4, 0 = Failure, 4 = No Change)
0
1
2
3
4
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Industrial Chemical Resistance - MEK
Industrial Maintenance System
(with Linear Trend Line)
Appearance After 168 hrs of Exposure (7 days)
Rating (0 - 4, 0 = Failure, 4 = No Change)
4
3
2
1
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Industrial Chemical Resistance - Acid
Industrial Maintenance System
(with Linear Trend Line)
Appearance After 168 hrs of Exposure (7 days)
Rating (0 - 4, 0 = Failure, 4 = No Change)
0
1
2
3
4
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Water Resistance (1000 hr Immersion @ 100 °F)
Industrial Maintenance System
(with Linear Trend Line)
Rating (0 - 10, 10 = No Blisters or Rust)
10
9
8
7
6
5
4
3
2
1
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l
Blister, Visual, ASTM D714 (Rating 0-10, Frequency, Size)
Rust Resistance, ASTM D610 (Rating 0-10)


Mar Resistance
Industrial Maintenance System
(with Linear Trend Line)
Mar Resistance
Better
Worse
Load (force to mar film in grams)
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

Industrial Maintenance Coating System (IMCS) Data Table

Protocol Test Number					3.1b	3.2	3.5					
System Reference Designator	System Reference Numbers	Polymer Class	VOC Content	Reference VOC or average	Adhesion to Substrate, PATTI	Appearance and Finish, Coted Panels	Corrosion Resistance: Prohesion (2000 hr. exposure)					
							Blistering (evaluated IAW ASTM D714) Averaged Values				Filiform Corrosion - IAW ASTM D2803 Averaged Values	
Units			g/l		psi		Scribeline Rating (1-10, 10 Ideal)	Scribeline Frequency (0-4, 0 Ideal)	Central Region Rating (1-10, 10 Ideal)	Central Region Frequency (0-4, 0 Ideal)	At Scribeline Length	At Scribeline Frequency (0-4, 0 Ideal)
IMCS-06	910-911	Epoxy/Urethane	0/0	0	1564	rough, semigloss	2.7	3.7	10.0	0.0	12.0	3.0
IMCS-07	912-913-913	Novolac/Novolac/Novolac	0/0/0	0	1535	uniform, satin	8.7	0.2	10.0	0.0	0.0	0.0
IMCS-08	914-915-915	Butadiene-epoxy/Urethane	0/0/0	0	1628	particles, satin	4.0	2.7	10.0	0.0	0.0	0.0
IMCS-09	914-916-916	Butadiene-epoxy/Epoxy	0/0/0	0	1482	uniform, satin	5.3	3.0	6.7	2.3	0.0	0.0
IMCS-03	904-905-905	Epoxy-Polyamide, Zinc-rich/Water-based polyester-urethane	49/55/55	53	1099	glossy, particles	10.0	0.0	10.0	0.0	0.0	0.0
IMCS-05	908-909	Acrylic/Acrylic	60/120	90	1197	non-uniform, semigloss	8.0	1.0	9.3	0.7	0.0	0.0
IMCS-01	901-901	Siloxirane/Siloxirane	108/108	108	1600	glossy off-white	10.0	0.0	10.0	0.0	0.0	0.0
IMCS-11	919-919	Epoxy/Epoxy	170/170	170	1514	uniform, satin-flat	8.0	2.0	10.0	0.0	0.0	0.0
IMCS-04	906-907-907	Water-based polyester-urethane	138/208/208	185	1092	uniform, satin	3.7	2.5	10.0	0.0	22.0	3.7
IMCS-12	920-921	Epoxy/Siloxane	288/120	204	968	uniform, high-gloss	10.0	0.0	10.0	0.0	0.0	0.0
IMCS-13	922-922	Acrylic/Acrylic	231/231	231	986	eggshell, rust spots	3.3	3.3	8.7	0.3	0.0	0.0
IMCS-18	932-932	Epoxy/Epoxy	284/284	284	2105	uniform, satin	8.7	0.3	10.0	0.0	7.0	2.0
IMCS-16	927-928-929	Epoxy/Epoxy/Urethane	320/275/295	297	2136	uniform, satin-gloss	10.0	0.0	10.0	0.0	0.0	0.0
IMCS-19	933-932-934	Inorganic Zinc Silicate/Epoxy/Urethane	282/284/388	318	1129	uniform, high gloss	8.7	0.7	10.0	0.0	0.0	0.0
IMCS-15	925-925	Epoxy/Epoxy	395/395	395	1861	uniform, satin-flat	6.0	1.3	10.0	0.0	5.7	1.0
IMCS-14	923-924	Alkyd/Alkyd	383/422	402	985	ridged, satin-gloss	8.0	1.7	9.3	0.3	0.5	0.2
IMCS-17	930-931	Alkyd/Alkyd	419/385	402	735	uniform, satin-flat	3.3	3.3	10.0	0.0	4.0	0.1
IMCS-20	902-10	Epoxy Ester/Urethane	400/420	410	603	uniform, high gloss	6.7	1.7	10.0	0.0	8.6	1.8
IMCS-02	902-903	Epoxy Ester/Silicone Alkyd	400/420	410	1131	uniform, semigloss	7.3	1.7	10.0	0.0	7.7	2.0
IMCS-10	917-918	Alkyd/Urethane Alkyd	417/411	414	895	uniform, glossy	10.0	0.0	10.0	0.0	11.8	1.7

Industrial Maintenance Coating System (IMCS) Data Table

Protocol Test Number					3.6	3.10	3.8					
System Reference Designator	System Reference Numbers	Rust Resistance - IAW ASTM D610 - Averaged Values		Undercutting, ASTM D1654	Dirt Resistance: Dry	Dry Film Thickness, Metal	Environmental Resistance					
							Delta Gloss, Pretest-2 weeks (+ = Decrease, - = Increase)			Delta Gloss, Pretest-2 weeks + 24 hours (+ = Decrease, - = Increase)		
Units		Rating (0-10, 10 Ideal)	% of Area (1 = 100%)	Rating 0 - 10		mils	20 degrees	60 degrees	85 degrees	20 degrees	60 degrees	85 degrees
IMCS-06	910-911	9.0	0.03	4.00		10.5	-0.4	-6.2	-12.9	1	-1.2	0.7
IMCS-07	912-913-913	9.0	0.03	10.00		29.1	13.7	50.9	43.1	13.2	50.3	40.9
IMCS-08	914-915-915	9.0	0.03	5.70		5.3	28.7	48.2	43.3	29.1	49.8	46.5
IMCS-09	914-916-916	7.0	0.30	3.80		6.6	1.5	-0.4	2.8	0.5	0.7	-0.2
IMCS-03	904-905-905	9.0	0.03	9.00		6.3	18.9	2	5.7	23.5	3.5	5.8
IMCS-05	908-909	10.0	0.00	8.10		4	4.5	6.8	-3.5	-8.3	14.7	8.7
IMCS-01	901-901	10.0	0	9.5		17.1	20	2.3	5.9	6.1	6.1	-0.6
IMCS-11	919-919	10.0	0.00	5.30		7.5	-0.2	-1.7	-3.7	-0.3	-2.6	-3.8
IMCS-04	906-907-907	9.0	0.03	4.30		8.6	8.8	10	-9.6	11	15.7	-1.1
IMCS-12	920-921	10.0	0.00	9.50		7.1	9.2	-2.8	-0.3	4.3	-1.3	-0.7
IMCS-13	922-922	1.0	>0.5	1.30		3.5	0.8	0.9	0.8	-0.1	0.2	1
IMCS-18	932-932	10.0	0.00	6.70		7	7.1	12.2	4.6	7.6	13.3	5.6
IMCS-16	927-928-929	10.0	0.00	7.00		9.2	-2.3	-0.5	-6.3	-0.5	0.6	-5.6
IMCS-19	933-932-934	10.0	0.00	7.20		8.5	-4.8	-1.4	-4.4	-4.7	-1.3	-1.7
IMCS-15	925-925	9.0	0.03	3.80		6	1	1.8	1	1.4	2.9	2.3
IMCS-14	923-924	9.0	0.03	5.80		3.7	18.5	8.8	7.2	23.6	15.1	10.6
IMCS-17	930-931	8.7	0.03	3.90		4.4	3.3	5.1	-6.8	5.9	12.2	1.5
IMCS-20	902-10	10.0	0.00	4.80		4.5	10.1	-0.2	-4.4	2.7	0.1	-9.2
IMCS-02	902-903	9.0	0.10	8.10		3.9	3.1	2.5	-4.3	5.9	5.9	-0.4
IMCS-10	917-918	8.7	0.03	5.50		3.4	37.4	11.4	15.6	24.2	7.4	12

Industrial Maintenance Coating System (IMCS) Data Table

Protocol Test Number		3.8									
System Reference Designator	System Reference Numbers	Reflectance Delta CIE (+ = Decrease, - = Increase)		Delta E313 Yellow (+ = Decrease, - = Increase)		Hardness				Adhesion, Tape	
Units		pretest-2 week	pretest-2 week+ 24 hour dry	pretest-2 week	pretest-2 week+ 24 hour dry	Scratch: after 2 week exposure	Scratch: after 2 week exposure + 24 hour dry	Gouge: after 2 week exposure	Gouge: after 2 week exposure + 24 hour Dry	After 2 week Exposure (% removed)	After 2 week Exposure + 24 hour Dry (% removed)
IMCS-06	910-911	4.81	5.89	-1.30	-1.35	B	B	F	F	2B, 35%	5B, 0%
IMCS-07	912-913-913	1.97	2.17	-0.91	-0.96	2H	6H	3H	9H	5B, 0%	5B, 0%
IMCS-08	914-915-915	2.14	3.63	-0.65	-0.86	6B	3B	<6H	3H	3B, 5-15%	5B, 0%
IMCS-09	914-916-916	4.20	5.09	-0.63	-3.43	B	2B	F	F	5B, 0%	5B, 0%
IMCS-03	904-905-905	-0.04	0.49	-0.04	0.07	4B	2B	3B	3H	1B, 50% of topcoat	4B, <5%
IMCS-05	908-909	-1.30	0.58	-0.08	0.10	3B	2B	F	F	4B, <5%	5B, 0%
IMCS-01	901-901	3.17	3.47	-1.03	-0.96	3H	3H	9H	9H	5B, 0%	5B, 0%
IMCS-11	919-919	-1.85	-1.14	0.97	0.92	3H	2H	4H	4H	5B, 0%	5B, 0%
IMCS-04	906-907-907	-1.81	-0.51	0.52	-0.43	6B	4B	6B	HB	0B, 80% of topcoat	4B, <5%
IMCS-12	920-921	5.27	2.91	-1.54	-0.94	2H	2H	6H	6H	5B, 0%	5B, 0%
IMCS-13	922-922	-10.62	-9.60	-28.37	-28.49	F	H	H	3H	4B, <5%	4B, <5%
IMCS-18	932-932	3.52	4.22	-1.03	-0.96	F	H	H	3H	4B, <5%	5B, 0%
IMCS-16	927-928-929	-0.25	-0.26	0.04	0.17	2B	H	2H	2H	5B, 0%	5B, 0%
IMCS-19	933-932-934	-0.10	-0.11	-0.04	0.02	F	F	3H	3H	5B, 0%	5B, 0%
IMCS-15	925-925	3.40	3.95	-1.31	-1.43	H	H	3H	4H	5B, 0%	5B, 0%
IMCS-14	923-924	10.19	7.96	-2.97	-2.00	5B	3B	3B	H	3B, 10%	3B, 10%
IMCS-17	930-931	2.22	1.32	-0.67	-0.12	4B	2B	3B	2H	3B, 15%	3B, 15%
IMCS-20	902-10	2.23	1.77	-0.35	-0.23	3B	2B	F	F	5B, 0%	5B, 0%
IMCS-02	902-903	-1.21	-3.04	0.24	1.16	4B	2B	2B	B	2B, 35%	4B, <5%
IMCS-10	917-918	19.34	15.68	-5.49	-4.29	3B	2B	HB	F	0B, 100%	5B, 0%

Above values converted to numeric value only (6B=1, ...9H=17)

Industrial Maintenance Coating System (IMCS) Data Table

Protocol Test Number		3.4						
System Reference Designator	System Reference Numbers	Industrial Chemical Resistance						
		Bleach	Bleach	Methyl Ethyl Ketone (MEK)		Acid		Visual
Units		Appearance After 168 hrs of Exposure (7 days)	Rating per Tnemc Method 59	Appearance After 168 hrs of Exposure (7 days)	Rating per Tnemc Method 59	Appearance After 168 hrs of Exposure (7 days)	Rating per Tnemc Method 59	
IMCS-06	910-911	slightly softened and slightly dulled	2S,3VS	softened and slightly dulled	2X,3VS	Softened, swollen, delaminated (adhesive delam of primer)	2S,3VS	as follows
IMCS-07	912-913-913	softened and slightly dulled	3X,2S	Softened, swollen, delaminated (adhesive delam of primer)	2VS,3S,2S	softened and dulled	3X,2S	no visual change
IMCS-08	914-915-915	ened, swollen, delaminated (adhesive delam of pri	2S,3VS,1S	softened and dulled	1X,0X	softened, slightly whitened, blistered, medium-dense #6	3VS,2S,1X	darkened
IMCS-09	914-916-916	softened and dulled	2S,3VS	softened, slightly whitened, blistered, medium-dense #6	1X,0X	Softened, swollen, delaminated (cohesive delam of topcoat)	2S,3VS,1X	whitened
IMCS-03	904-905-905	Dull, slightly raised	2S,3VS	Slightly softened	2S,0S	raised; blistered, dense #4	2S,3VS	as follows
IMCS-05	908-909	raised; blistered, dense #4	2S,3S	slightly softened and slightly dulled	2X,0X	softened and slightly dulled	2S	as follows
IMCS-01	901-901	Severally Yellowed	3X	slightly dulled	3VS	Dull, slightly raised	3S,2S	no visual change
IMCS-11	919-919	ned, swollen, delaminated (cohesive delam of top	3X	dulled, softened and slightly raised	2S,3X	softened, slightly whitened	2S,1X	no visual change
IMCS-04	906-907-907	Slightly softened	2S,3S,1X	raised; blistered, dense #4	2S,0X	slightly softened and slightly dulled	3VS,2S,0VS	as follows
IMCS-12	920-921	dulled, softened and slightly raised	4	softened, slightly whitened	2S,3X	raised, severely softened, "crinkled" appearance and cohesive delam of topcoat only	2S,1X	no visual change
IMCS-13	922-922	softened, slightly whitened	3S,2S	raised, severely softened, "crinkled" appearance and cohesive delam of topcoat only	2X,1X	slightly softened	0X	covered with rust
IMCS-18	932-932	slightly raised and slightly dulled	3S,2S	severely yellowed and slightly softened	3S,2S	slightly raised, increased dulled appearance and softened	3VS	no visual change
IMCS-16	927-928-929	slightly raised and dulled	4	severely raised, softened , dulled	3VS,2X	slightly raised and slightly dulled	2S,3VS	no visual change
IMCS-19	933-932-934	severely yellowed and slightly softened	4	slightly raised, increased dulled appearance and softened	2S	discolored medium pink/blue, moderately raised	4	no visual change
IMCS-15	925-925	slightly softened	3X	slightly raised and dulled	2S	severely raised, softened , dulled	3VS	no visual change
IMCS-14	923-924	raised, severely softened, "crinkled" appearance and cohesive delam of topcoat only	2S,3VS,1X	slightly softened	2X,1X,0X	slightly raised and dulled	2S,0X	slightly darkened
IMCS-17	930-931	severely raised, softened , dulled	2S,3VS	slightly raised and slightly dulled	2S,1X,0X	severely yellowed and slightly softened	2S,1X,0X	yellowed, with some rust spots around blisters
IMCS-20	902-10	htly raised, increased dulled appearance and softe	4	discolored medium pink/blue, moderately raised	2S,0X	softened, dulled and blistered, medium #4	4	as follows
IMCS-02	902-903	slightly dulled	2S	Dull, slightly raised	2S,1X	Slightly softened	2S,3VS	yellowed
IMCS-10	917-918	ftened, slightly whitened, blistered, medium-dense	2S	Softened, swollen, delaminated (cohesive delam of topcoat)	1X,0X	dulled, softened and slightly raised	2S	yellowed

Industrial Maintenance Coating System (IMCS) Data Table

Protocol Test Number		3.23		3.24b	3.25b	3.25c
System Reference Designator	System Reference Numbers	Water Resistance		Mar Resistance	Weathering Resistance, Outdoor, Steel	Weathering Resistance, Accelerated, Outdoor
		Blister, Visual, ASTM D714 (Rating 0-10, Frequency, Size)	Rust Resistance, ASTM D610 (Rating 0-10)			
Units				Load in grams		
IMCS-06	910-911	5, medium-dense, #4	10-no rusting or less than 0.01% of surface rusted	2000		
IMCS-07	912-913-913	10, None	10-no rusting or less than 0.01% of surface rusted	3000		
IMCS-08	914-915-915	4, medium-dense, #2	10-no rusting or less than 0.01% of surface rusted	1500		
IMCS-09	914-916-916	6, medium-dense, #6	10-no rusting or less than 0.01% of surface rusted	1000		
IMCS-03	904-905-905	7, few, #4	10-no rusting or less than 0.01% of surface rusted	1000		
IMCS-05	908-909	1, dense, #2	10-no rusting or less than 0.01% of surface rusted	1000		
IMCS-01	901-901	10, None	10-no rusting or less than 0.01% of surface rusted	3500		
IMCS-11	919-919	10, None	10-no rusting or less than 0.01% of surface rusted	2500		
IMCS-04	906-907-907	6, medium, #4	10-no rusting or less than 0.01% of surface rusted	1000		
IMCS-12	920-921	10, none	10-no rusting or less than 0.01% of surface rusted	1500		
IMCS-13	922-922	10, None	0-approximately 100% of surface rusted	1000		
IMCS-18	932-932	10, None	10-no rusting or less than 0.01% of surface rusted	1000		
IMCS-16	927-928-929	10, None	10-no rusting or less than 0.01% of surface rusted	1500		
IMCS-19	933-932-934	10, None	10-no rusting or less than 0.01% of surface rusted	1500		
IMCS-15	925-925	10, None	10-no rusting or less than 0.01% of surface rusted	2000		
IMCS-14	923-924	5, medium-dense, #4 or #6	10-no rusting or less than 0.01% of surface rusted	1000		
IMCS-17	930-931	7, few, #4 or #2	8-less than 0.1% of surface rusted	1000		
IMCS-20	902-10	7, dense, #8	10-no rusting or less than 0.01% of surface rusted	1000		
IMCS-02	902-903	6, medium, #4	10-no rusting or less than 0.01% of surface rusted	500		
IMCS-10	917-918	5, medium-dense, #4	10-no rusting or less than 0.01% of surface rusted	1000		

Section 4: Nonflat Primer, Quick Dry Primer, and Primer Sealer Undercoater - Interior

Total # manufactuers or brands	12
Single component coatings	10
Multi-component coatings	1
Total # coatings	17

Note: Six coatings part status (single or multi-component) not available.

Test Summary

Brushing Properties Wet:

- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings. One high VOC coating exhibited excellent performance.

Brushing Properties Dry:

- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings. One high VOC coating exhibited excellent performance.

Dry Time - Dry To Touch:

- Low VOC coatings exhibited similar dry times at 50 °F and 90% RH, but exhibited slightly lower dry times at 90 °F and 30% RH compared to high VOC coatings.

Dry Time - Dry Hard:

- Low VOC coatings exhibited similar performance compared to high VOC coatings

Contrast Ratio (Hiding Power):

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Spreading Rate:

- Low VOC coatings exhibited lower performance compared to high VOC coatings.

Leveling:

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Sag Resistance:

- Low VOC coatings exhibited slightly higher performance compared to high VOC coatings.

Hiding Wet to Dry Changes:

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Dry Film Thickness:

- Low VOC coatings exhibited slightly lower dry film thicknesses compared to high VOC coatings.

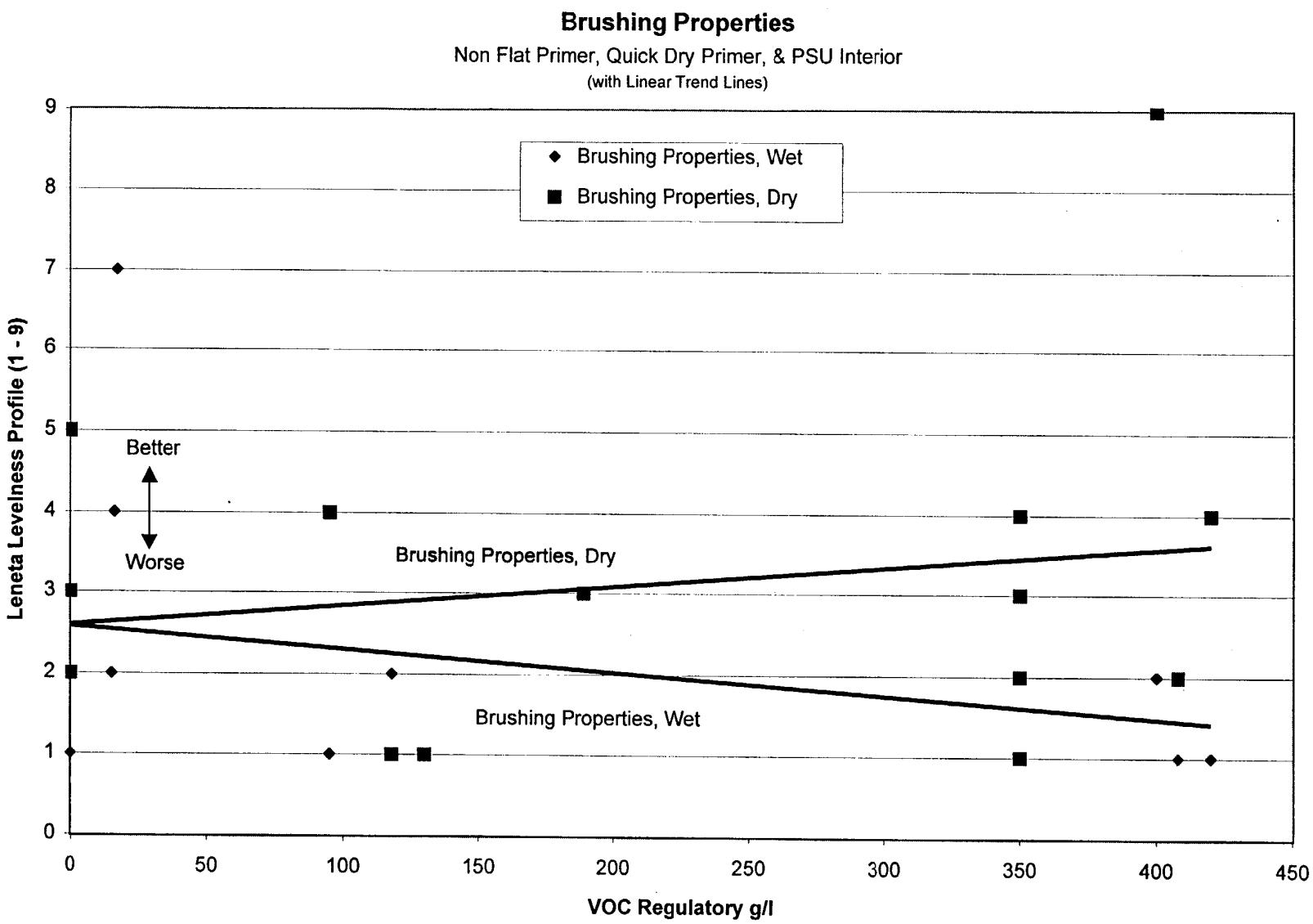
Comments:

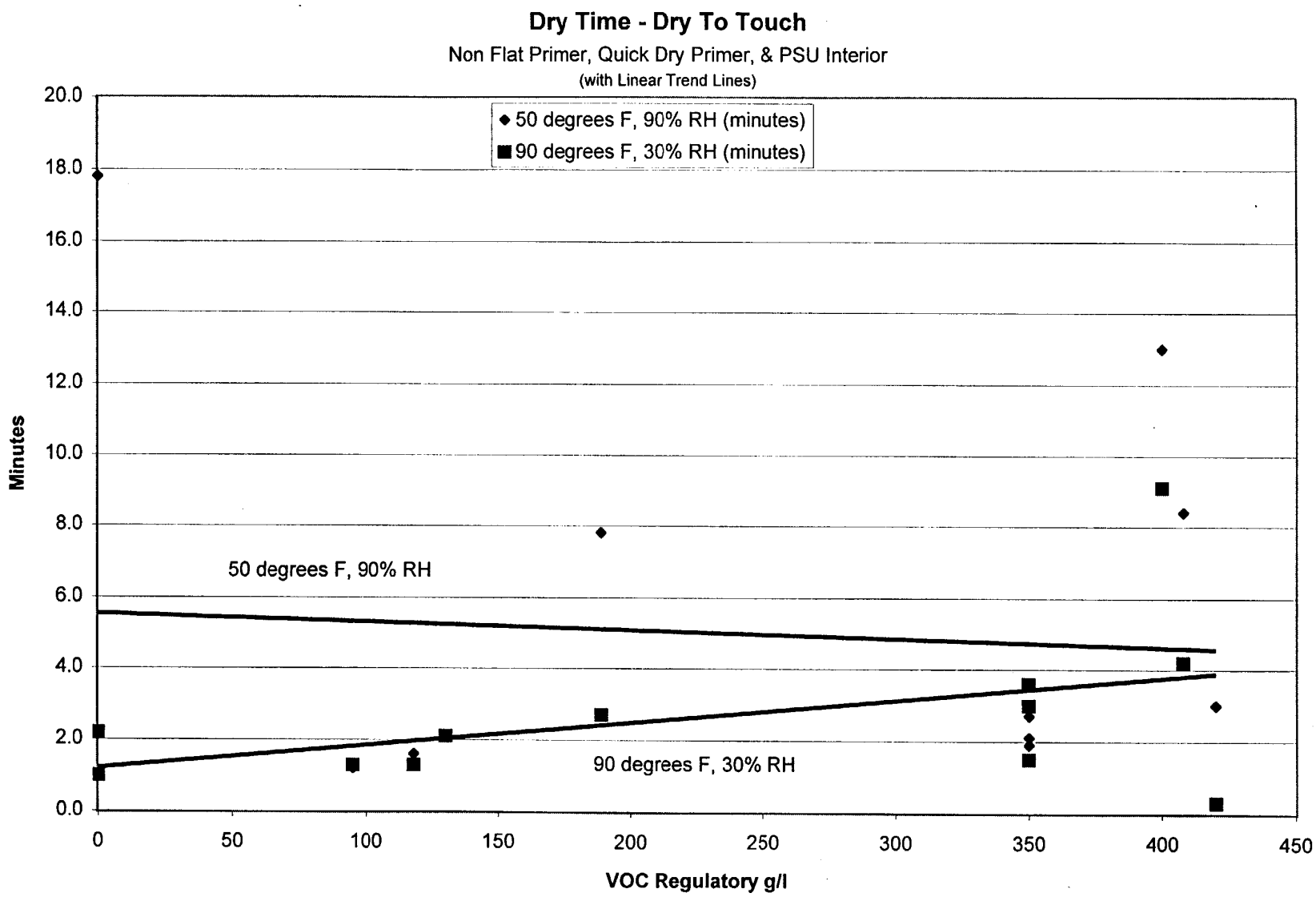
Overall, low VOC coatings exhibited similar performance to high VOC coatings.

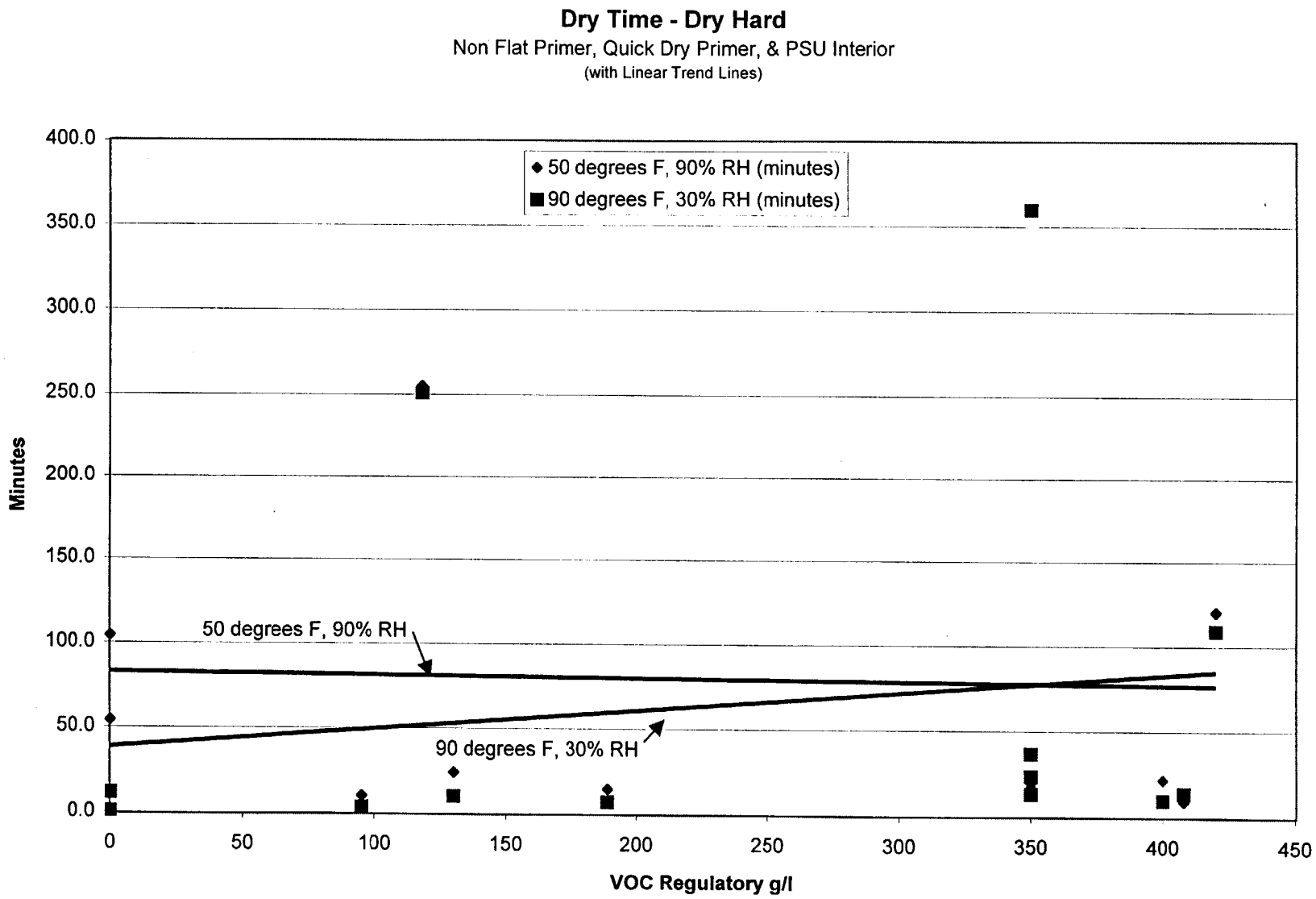
Nonflat Primer, Quickdry Primer, and Primer Sealer Undercoater - Interior

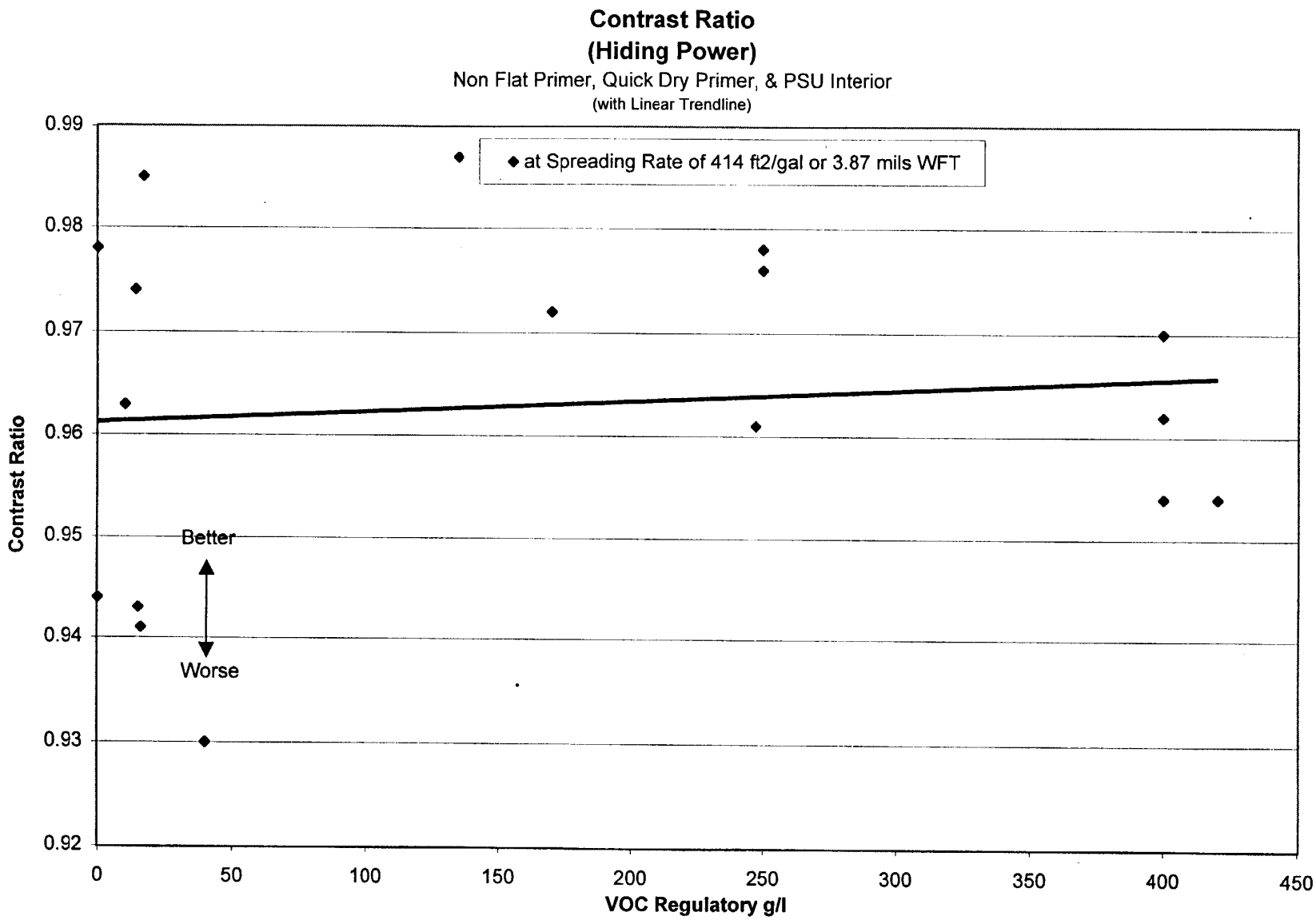
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
333	189	(blank)	(blank)	P	1
327	0	1	Acrylic latex	P	1
103	408	1	Alkyd	P	1
320	350	1	Alkyd	P	1
10	420	2	Urethane	T	1
321	130	1	Acrylic latex	P	1
329	0	(blank)	(blank)	P	1
330	350	(blank)	(blank)	P	1
334	0	(blank)	Acrylic latex	P	1
326	0	(blank)	(blank)	P	1
313	118	1	Acrylic emulsion	S	1
111	400	1	Alkyd	P	1
315	0	1	Acrylic emulsion	P	1
303	0	1	(blank)	S	1
324	350	1	Alkyd	P	1
323	35	(blank)	(blank)	U	1
308	95	1	(blank)	S	1
Grand Total					17

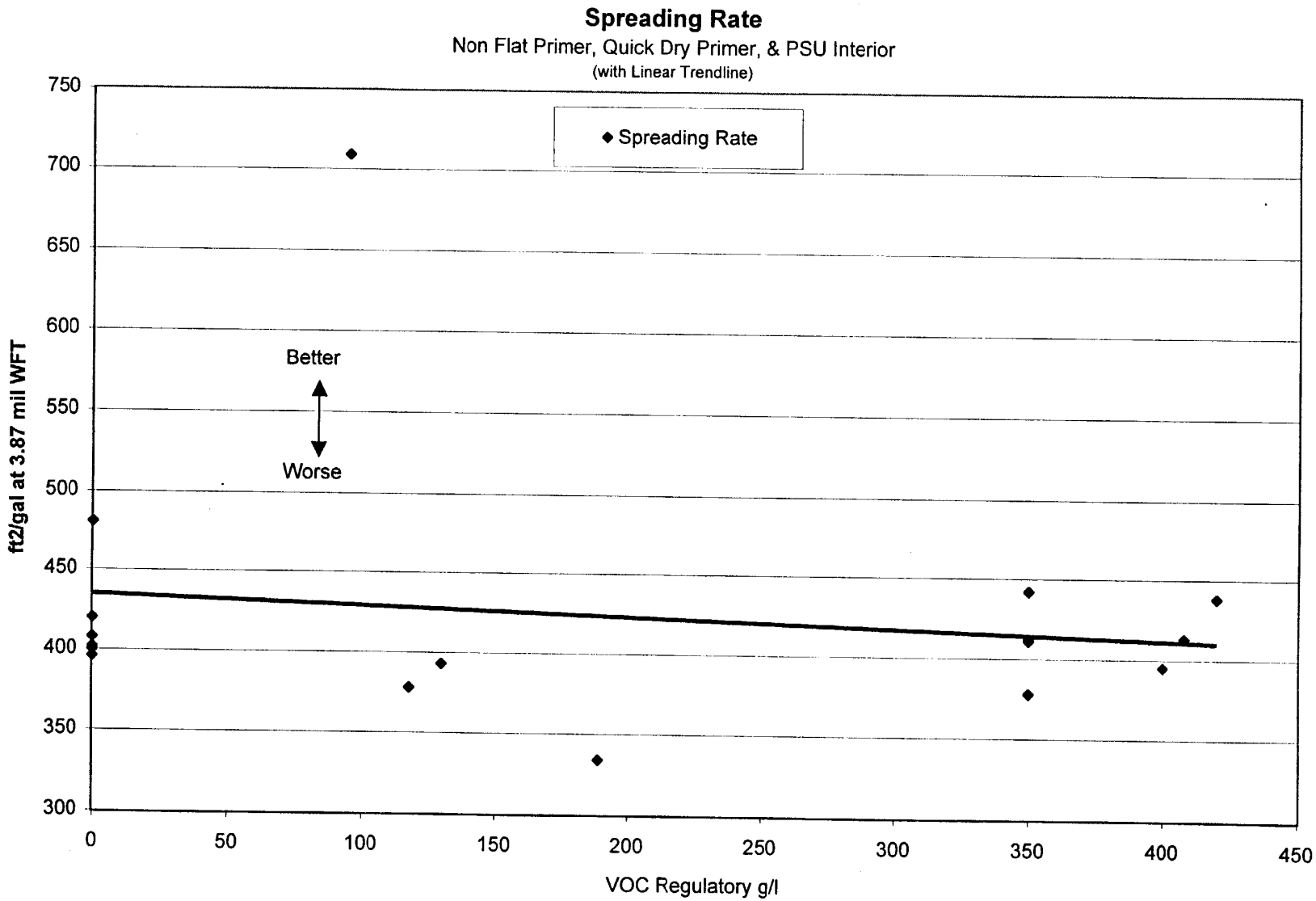
Single component coatings = 10 Multi-component coatings = 1

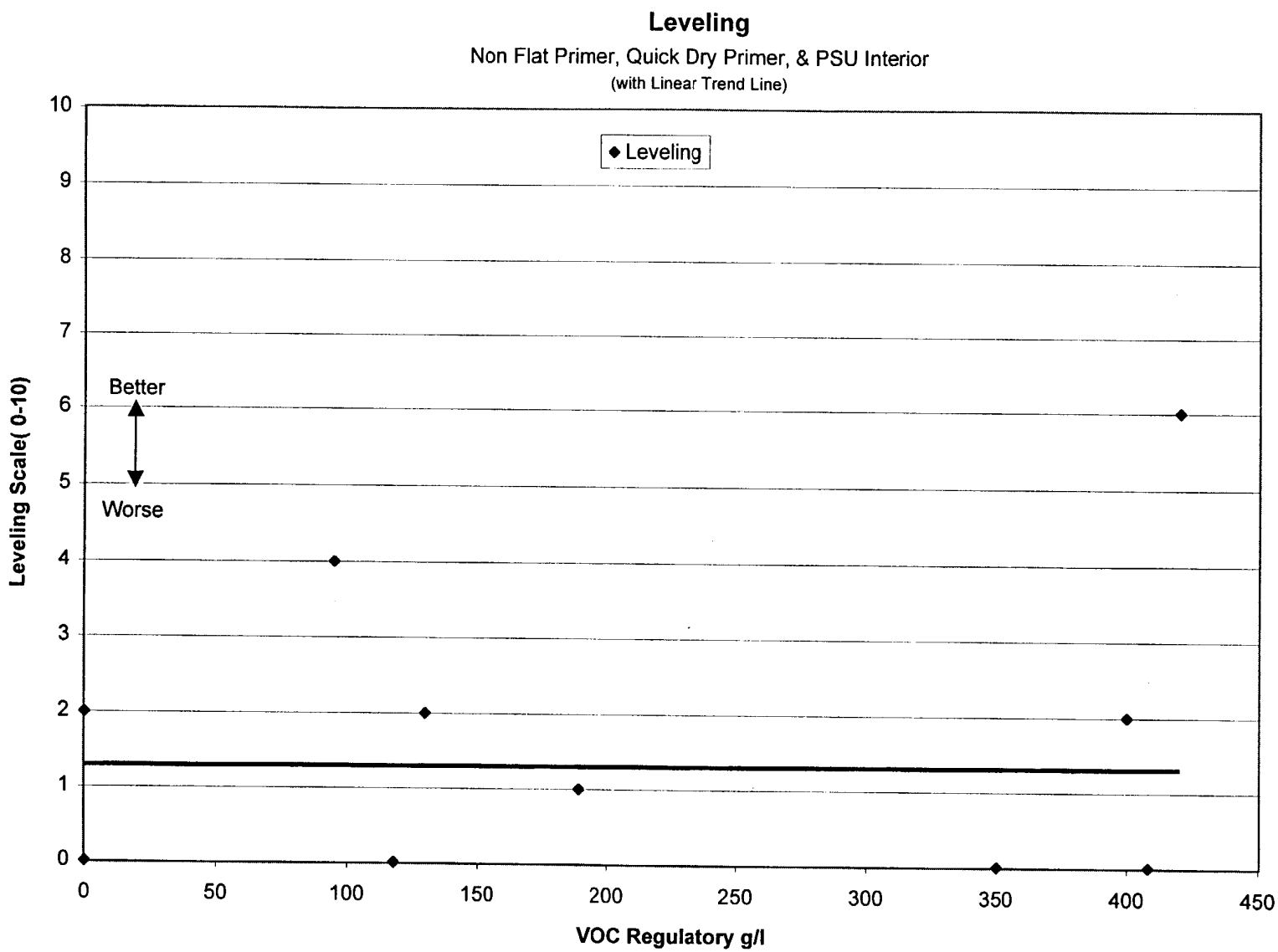

Brushing Properties
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trend Lines)
Brushing Properties, Wet
Brushing Properties, Dry
Better
Worse
Brushing Properties, Dry
Brushing Properties, Wet
Leneta Levelness Profile (1 - 9)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
0
50
100
150
200
250
300
350
400
450

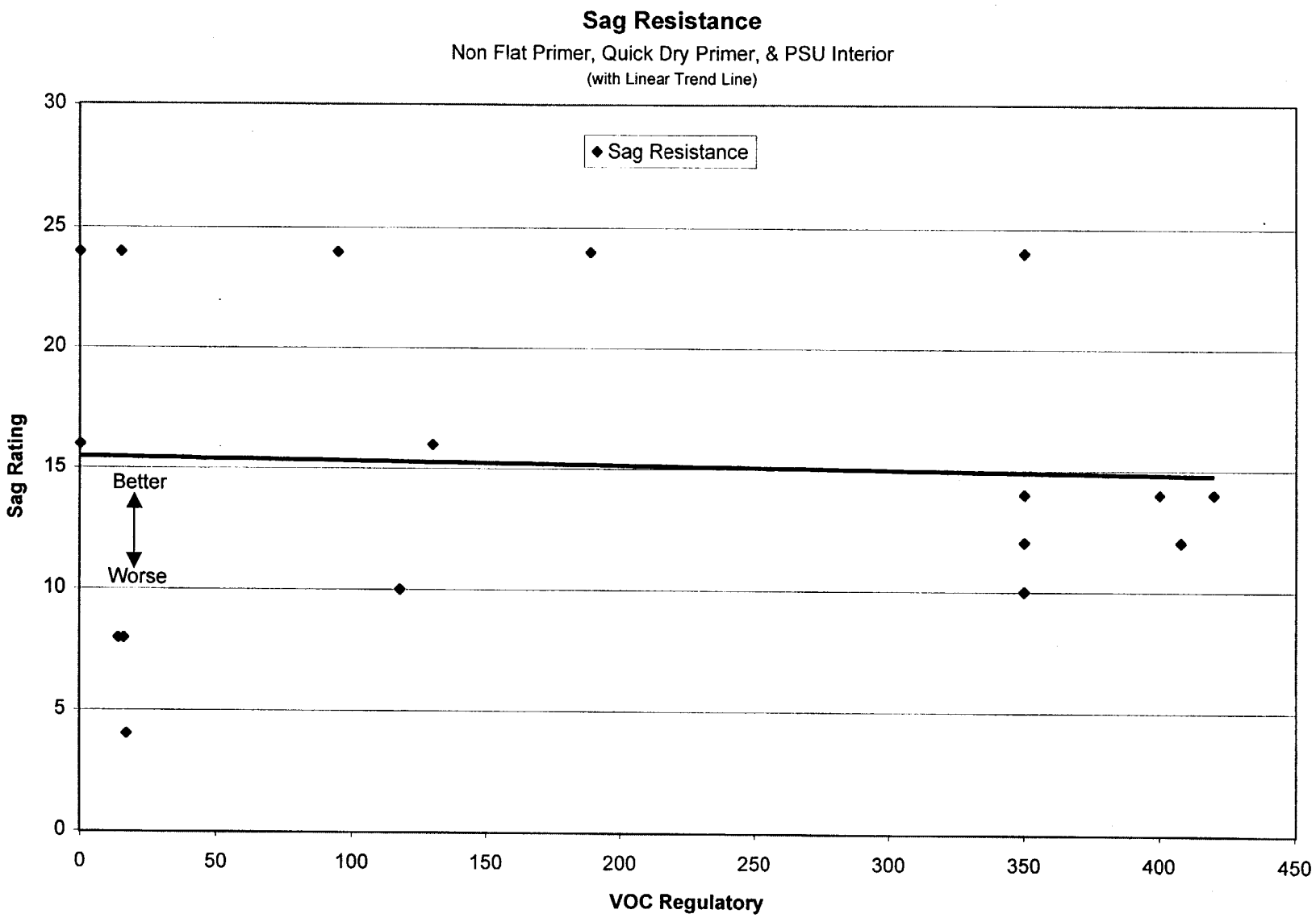

Dry Time - Dry To Touch
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
VOC Regulatory g/l
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
50
100
150
200
250
300
350
400
450

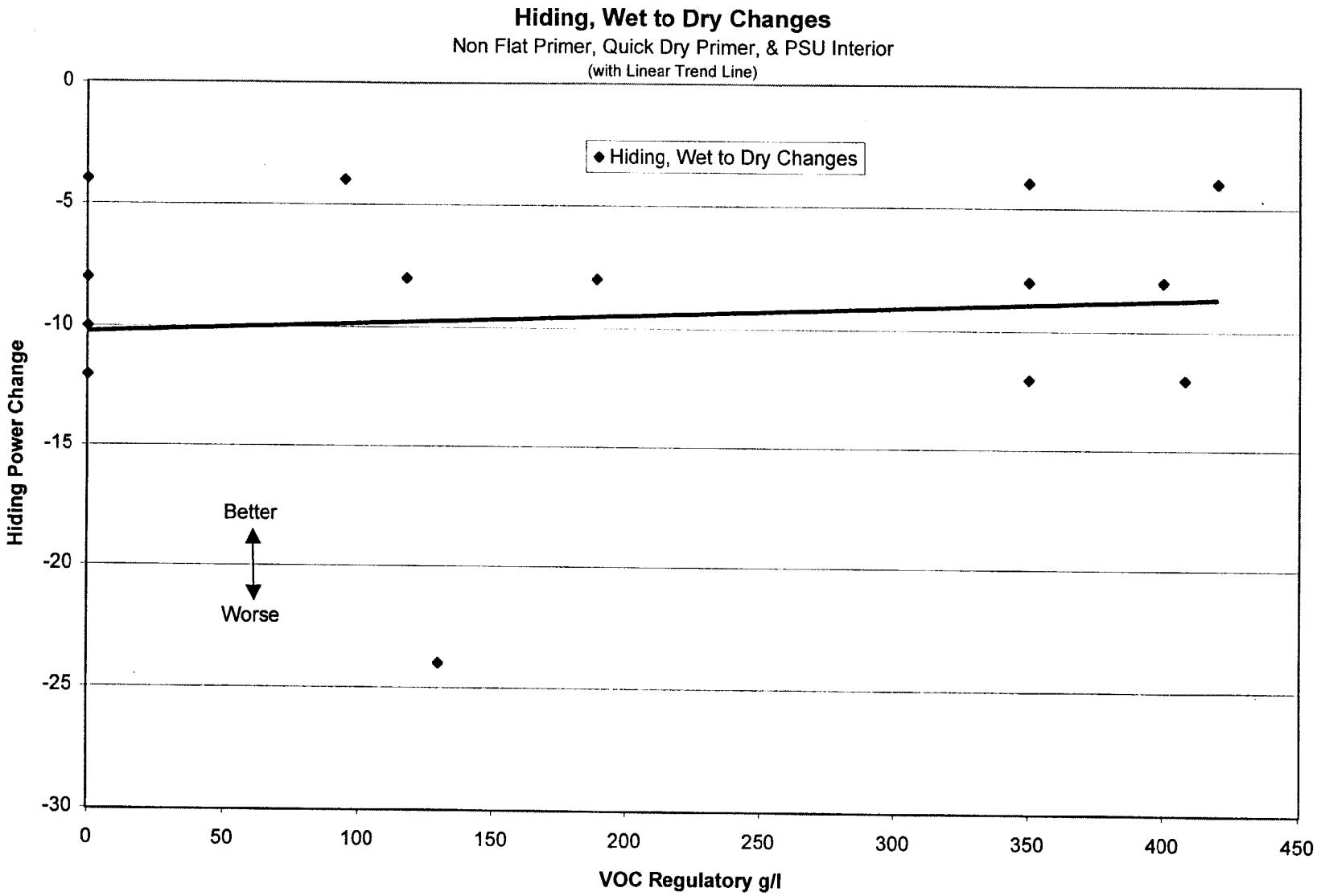

Dry Time - Dry Hard
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

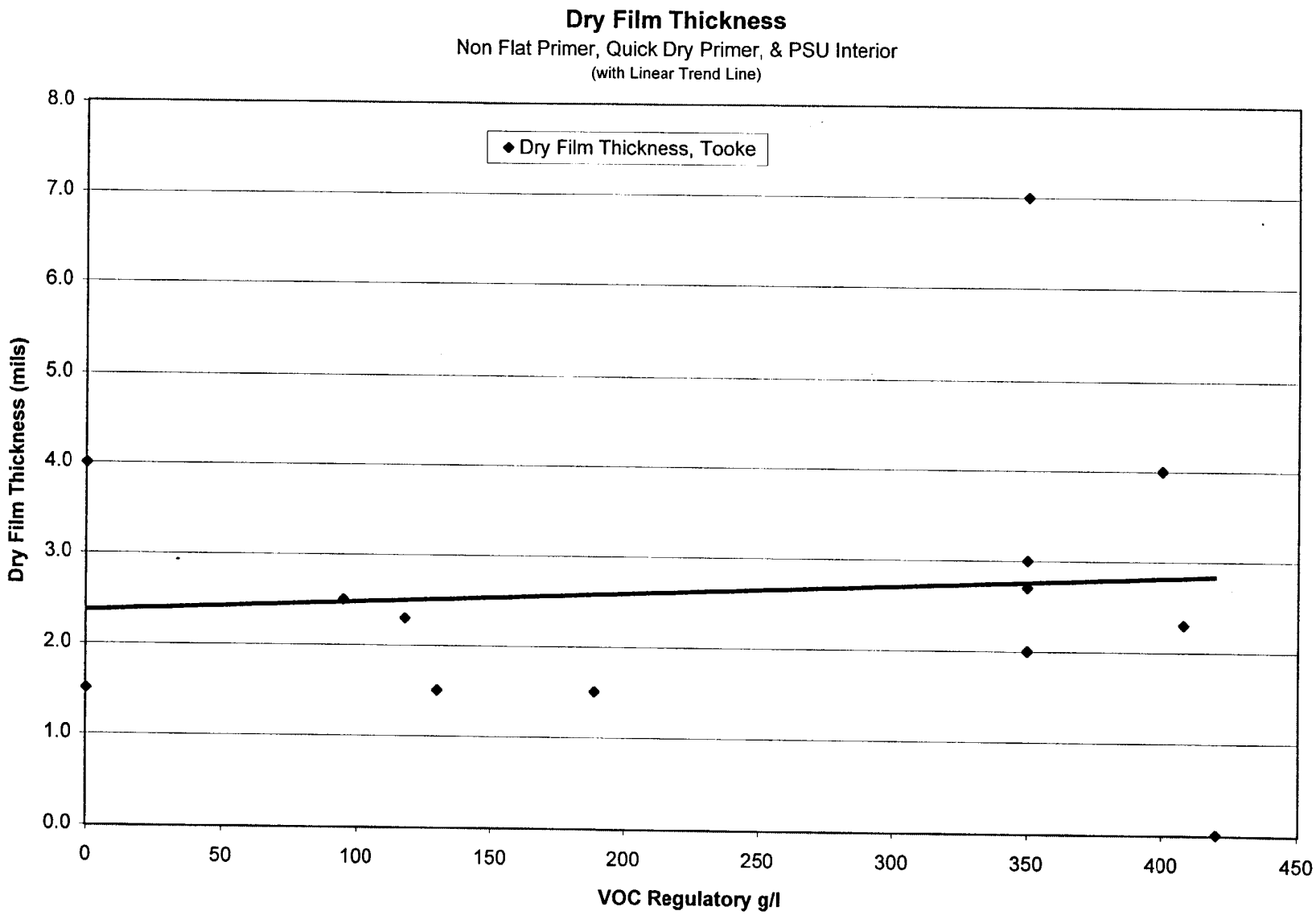

Contrast Ratio
(Hiding Power)
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trendline)
at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
Better
Worse
Contrast Ratio
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Spreading Rate
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trendline)
Spreading Rate
Better
Worse
ft2/gal at 3.87 mil WFT
750
700
650
600
550
500
450
400
350
300
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Leveling
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trend Line)
Leveling
Better
Worse
Leveling Scale(0-10)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
300
350
400
450


Sag Resistance
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trend Line)
Sag Resistance
Better
Worse
Sag Rating
VOC Regulatory
0
5
10
15
20
25
30
0
50
100
150
200
250
300
350
400
450


Hiding, Wet to Dry Changes
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trend Line)
Hiding, Wet to Dry Changes
Better
Worse
Hiding Power Change
VOC Regulatory g/l
0
-5
-10
-15
-20
-25
-30
0
50
100
150
200
250
300
350
400
450


Dry Film Thickness
Non Flat Primer, Quick Dry Primer, & PSU Interior
(with Linear Trend Line)
Dry Film Thickness, Tooke
Dry Film Thickness (mils)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

Nonflat Primer (NFP), Quick Dry Primer (QDP), and Primer Sealer Undercoater (PSU) INTERIOR Data Table

Protocol Test Number							2.1	2.1	2.2		2.2		3.14	3.14
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Nonvolatile by Weight	Coarse Particles	Density	Brushing Properties, Wet	Brushing Properties, Dry	Dry time, Dry to Touch - One Part Coatings		Dry time, Dry Hard - One Part Coatings		Contrast Ratio (Cw) Hiding Power	Spreading Rate
Units		g/l		%	Size in Microns	lbs/gal	Leneta Levelness Profile, 1 - 9	Leneta Levelness Profile, 1 - 9	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	at Spreading Rate of 414 ft2/gal or 3.87 mils WFT	ft2/gal at 3.87 mil WFT
326	NFP10	0	Acrylic Latex	48.1	40	10.79	1	2	9.9	1.9	16.5	3.4	0.944	402
327	NFP11	0	Acrylic Latex	39.1	48	10.01	2	3	2.7	2.4	7.5	7.8	0.978	400
329	NFP13	0	Acrylic Latex	56.8	60	11.32	1	3	1.3	1.0	17.8	11.8	0.963	408
334	NFP18	0	Acrylic Latex	57.6	100	11.67	1	2	1.6	0.3	5.8	3.9	0.93	396
303	PSU1	0	Vinyl Polymer Latex	43.5	36	10.7	2	4	17.8	1.0	54.1	1.0	0.987	420
315	NFP3	0	Acrylic	56.1	100	11.18	<1	3	1.0	2.2	104.2	11.8	0.972	481
308	PSU2	95	Acrylic Latex	50.7	40	10.95	3	5	1.2	1.3	10.2	3.7	0.961	709
313	PSU3	118	Acrylic Emulsion	52.8	20	11.3	1	1	1.6	1.3	255.1	250.9	0.978	378
321	NFP5	130	Acrylic Latex	59.8	36	12.08	2	3	2.1	2.1	24.0	10.2	0.976	393
333	NFP17	189	Acrylic Latex	39.6	28	10.55	2	4	7.8	2.7	14.6	7.2	0.954	334
320	NFP4	350	Alkyd	74.9	44	12.11	2	3	2.1	1.5	17.1	23.7	0.97	412
323	NFP7	350	Alkyd	76.5	40	11.67	2	3	2.1	3.0	19.8	13.2	0.962	442
324	NFP8	350	Alkyd	71.2	100	11.58	<1	<1	1.9	3.6	359.2	360.0	0.954	378
330	NFP14	350	Alkyd	75.2	33	12.5	1	2	2.7	3.6	20.7	36.9	0.974	411
111	QDP4	400	Alkyd	64.5	40	10.34	2	3	13.0	9.1	21.7	9.7	0.943	395
103	QDP2	408	Alkyd	66.1	28	11.2	4	6	8.4	4.2	9.0	13.8	0.941	413
10	REF	420	Urethane	73.6	none	11.1	7	9	3.0	0.3	120.3	109.2	0.985	438

Nonflat Primer (NFP), Quick Dry Primer (QDP), and Primer Sealer Undercoater (PSU) INTERIOR Data Table

Protocol Test Number		2.4	2.7	2.10							3.2	3.2	3.10-
Coating Reference Number	Coating Reference Designator	Leveling	Sag Resistance	Hiding, Wet to Dry Changes	Wet Film Thickness			Wet Film/Dry Film/WW & Bar Applicator Gap Relationships			Appearance and Finish, Drawdown Charts	Appearance and Finish, Coated Wood Panels	Dry Film Thickness, Tooke
					WW Rod #30	WW Rod #48	WW Rod #80	WW Rod #30	WW Rod #48	WW Rod #80			
Units		Scale, 0-10	Notch Clearance In mils	Wet-Dry Hiding Change (WDHC) Factor	mils	mils	mils	mils	mils	mils			mils
326	NFP10	2	16	-12	5.5	6.5	10.5	1.4	2.3	3.3	uniform, flat	uniform, flat	2.0
327	NFP11	1	>24	-8	4.5	5.5	9.0	1.3	1.5	2.1	smooth, flat	uniform, flat	2.0
329	NFP13	0	>24	-12	4.5	5.5	7.5	1.6	2.1	2.6	smooth, flat	uniform, flat	2.5
334	NFP18	1	10	-12	4.5	5.0	8.5	2.0	2.4	2.8	smooth, flat	uniform, eggshell	5.0
303	PSU1	2	16	-4	4.5	4.5	7.5	1.4	2.1	2.1	smooth, flat	uniform, flat	1.5
315	NFP3	0	>24	-10	4.5	7.5	7.5	1.7	2.4	3.1	semi-rough, flat matte	uniform, flat	4.0
308	PSU2	4	12	-4	5.5	5.5	7.5	1.6	1.9	2.5	slightly crinkled, flat	uniform, flat	2.5
313	PSU3	0	>24	-8	5.5	7.5	9.5	1.5	2.7	2.5	even, satin-flat	smooth, satin-flat	2.3
321	NFP5	2	14	-24	4.5	5.5	7.5	2.0	2.2	2.3	smooth, flat	uniform, eggshell	1.5
333	NFP17	1	10	-8	5.5	6.5	7.5	1.6	1.9	2.4	smooth, flat	even, flat/thin	1.5
320	NFP4	0	14	-12	3.5	5.5	8.5	1.2	2.3	3.8	smooth, matte	uniform, flat-matte	3.0
323	NFP7	0	12	-8	4.5	5.5	8.5	2.4	3.3	3.4	smooth, flat	uniform, flat	7.0
324	NFP8	0	14	-4	3.5	7.5	10.5	2.0	2.4	4.2	smooth, eggshell	smooth satin-flat	2.0
330	NFP14	0	8	-12	5.5	6.5	7.5	1.9	2.1	3.4	smooth, matte	uniform, flat	2.7
111	QDP4	2	>24	<-8	5.5	6.5	8.5	2.4	2.3	3.0	smooth, matte	eggshell	4.0
103	QDP2	0	8	<-12	4.5	5.5	8.5	2.6	2.2	2.3	smooth, eggshell	uniform, eggshell	2.3
10	REF	6	<4	-4	4.5	6.5	8.5	1.2	2.5	3.4	smooth, high gloss	N/A	N/A

Section 5: Nonflat Primer, Quick Dry Primer, and Primer Sealer Undercoater - Exterior

Total # manufactuers or brands	11
Single component coatings	9
Multi-component coatings	1
Total # coatings	14

Note: Four coatings part status (single or multi-component) not available.

Test Summary

Brushing Properties Wet:
- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings. One high VOC coatings exhibited excellent performance.

Brushing Properties Dry:
- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings. One high VOC coatings exhibited excellent performance.

Dry Time - Dry To Touch:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Dry Time - Dry Hard:
- Low VOC coatings exhibited faster dry times at 50 °F and 90% RH, and at 90 °F and 30% RH compared to high VOC coatings.

Contrast Ratio (Hiding Power):
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Spreading Rate:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Leveling:
- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings.

Sag Resistance:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Hiding Wet to Dry Changes:
- Low VOC coatings exhibited slightly better performance compared to high VOC coatings.

Dry Film Thickness:
- Low VOC coatings exhibited similar dry film thicknesses compared to high VOC coatings.

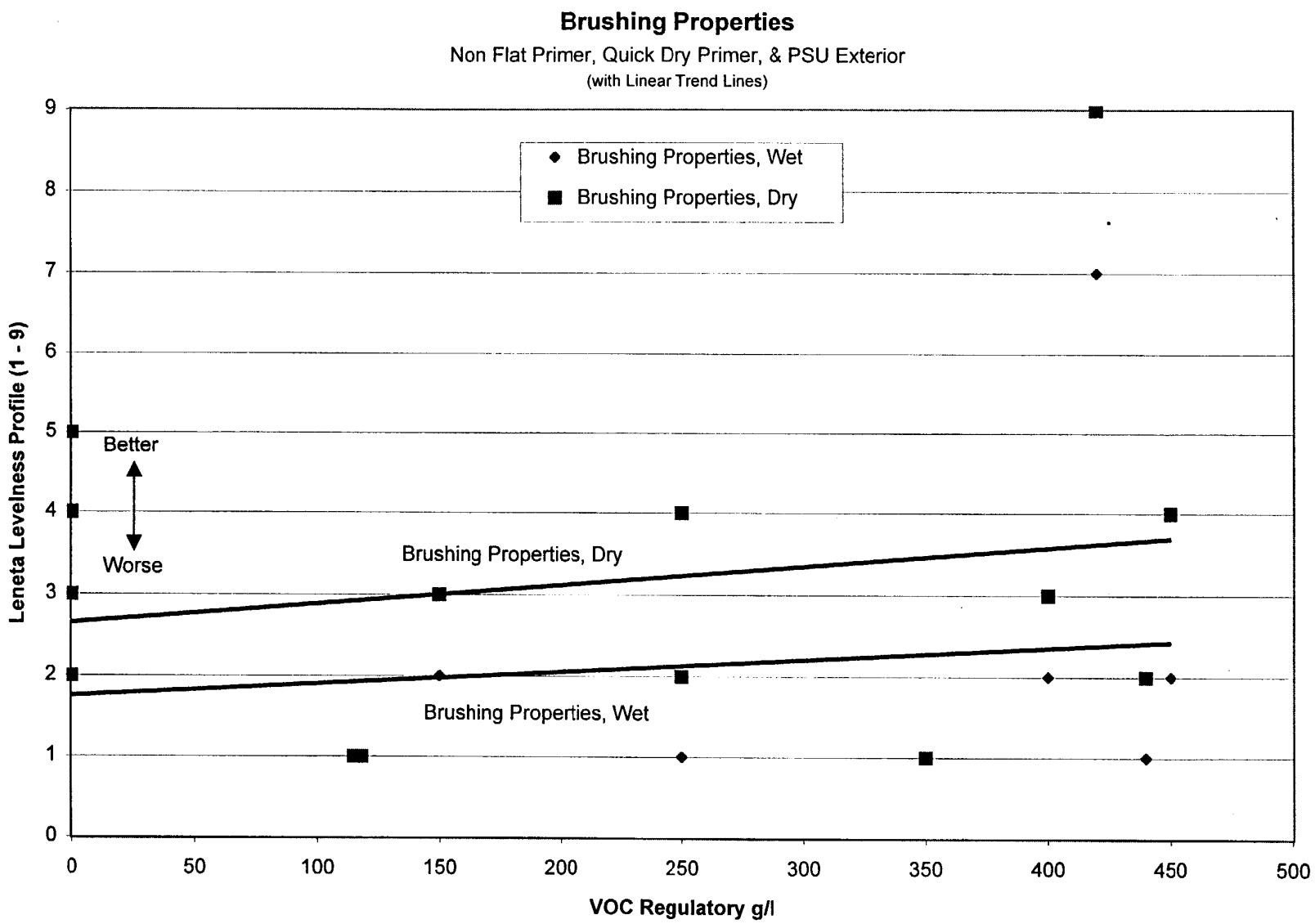
Comments:

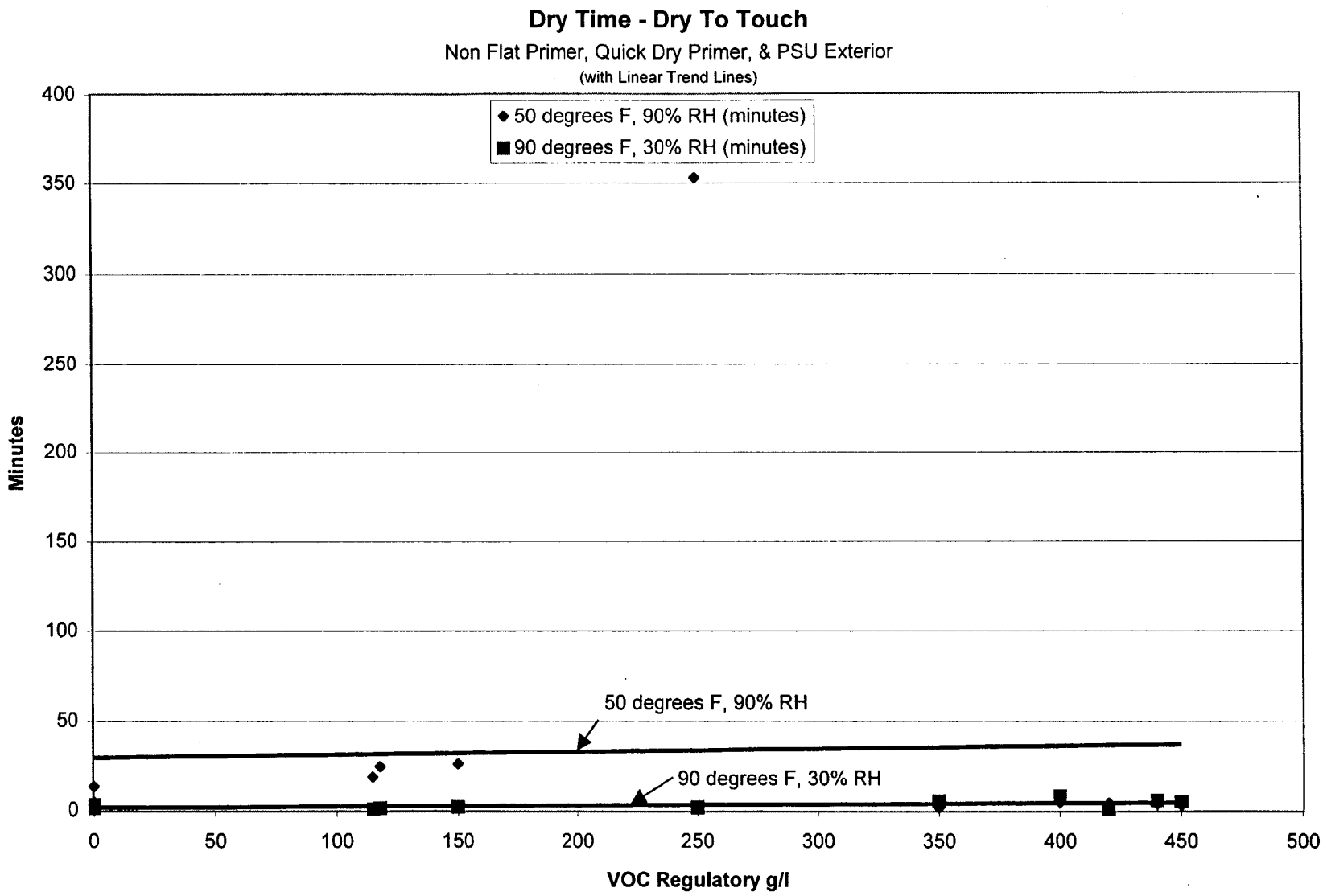
Overall, low VOC coatings exhibited similar performance to high VOC coatings.

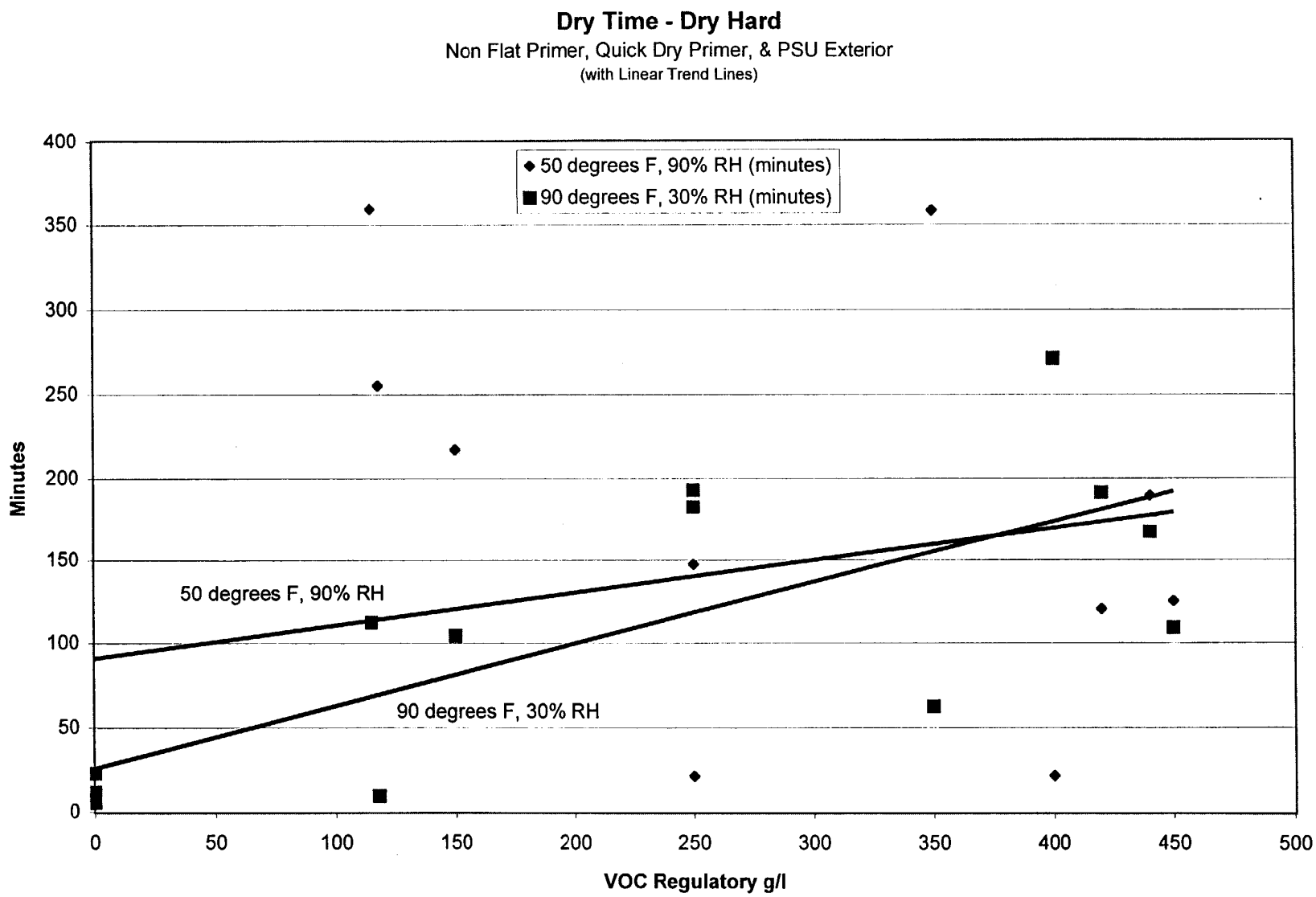
Nonflat Primer, Quickdry Primer, and Primer Sealer Undercoater - Exterior

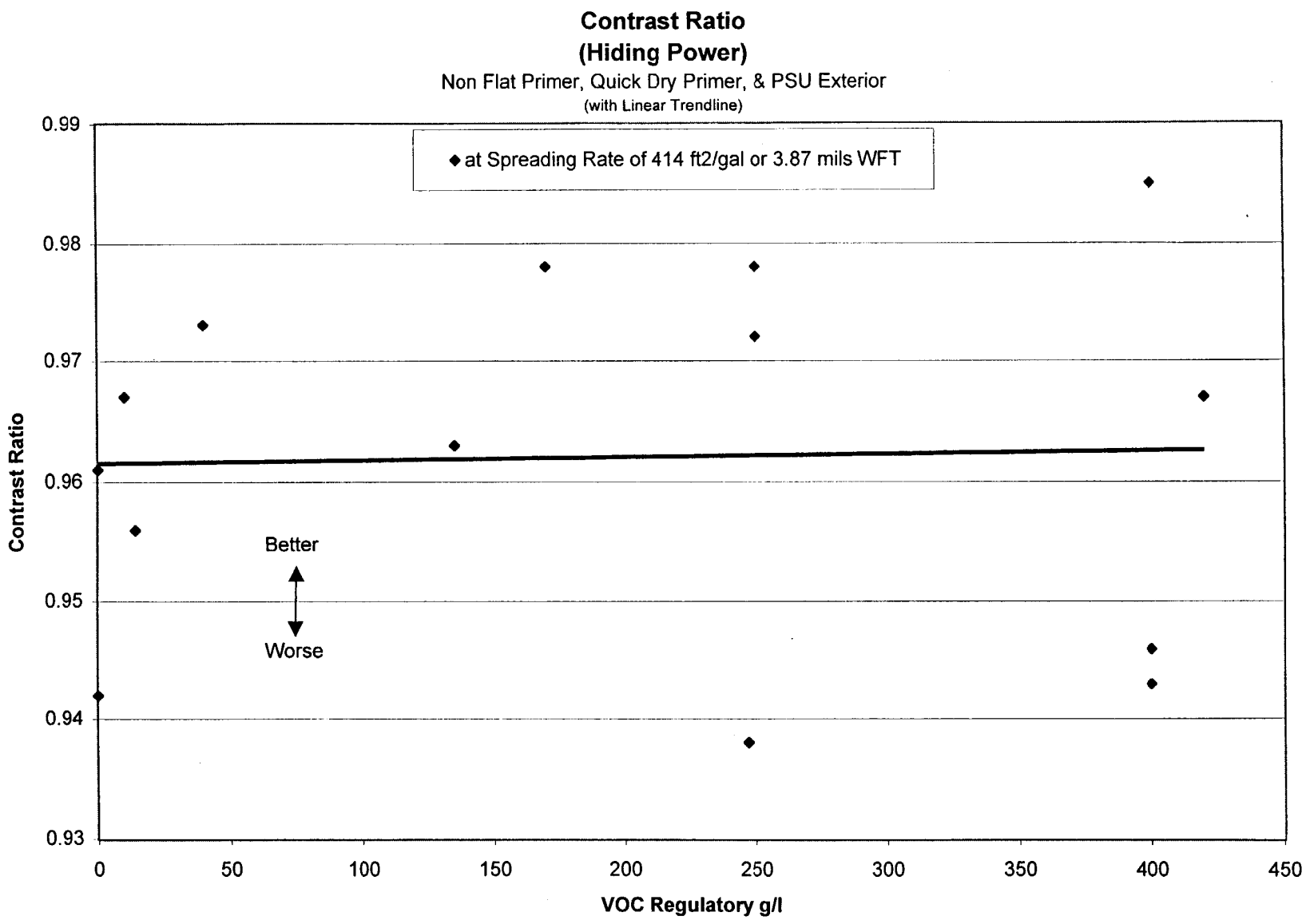
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
328	350	1	Alkyd	P	1
322	115	1	Acrylic latex	P	1
101	440	1	Alkyd	P	1
10	420	2	Urethane	T	1
331	250	(blank)	(blank)	P	1
301	1	1	Copolymer Latex	P	1
325	0	(blank)	(blank)	P	1
313	118	1	Acrylic emulsion	S	1
111	400	1	Alkyd	P	1
332	250	(blank)	(blank)	P	1
319	150	(blank)	(blank)	P	1
308	95	1	(blank)	S	1
109	450	1	Oil base	P	1
310	0	1	Acrylic latex	P	1
Grand Total					14

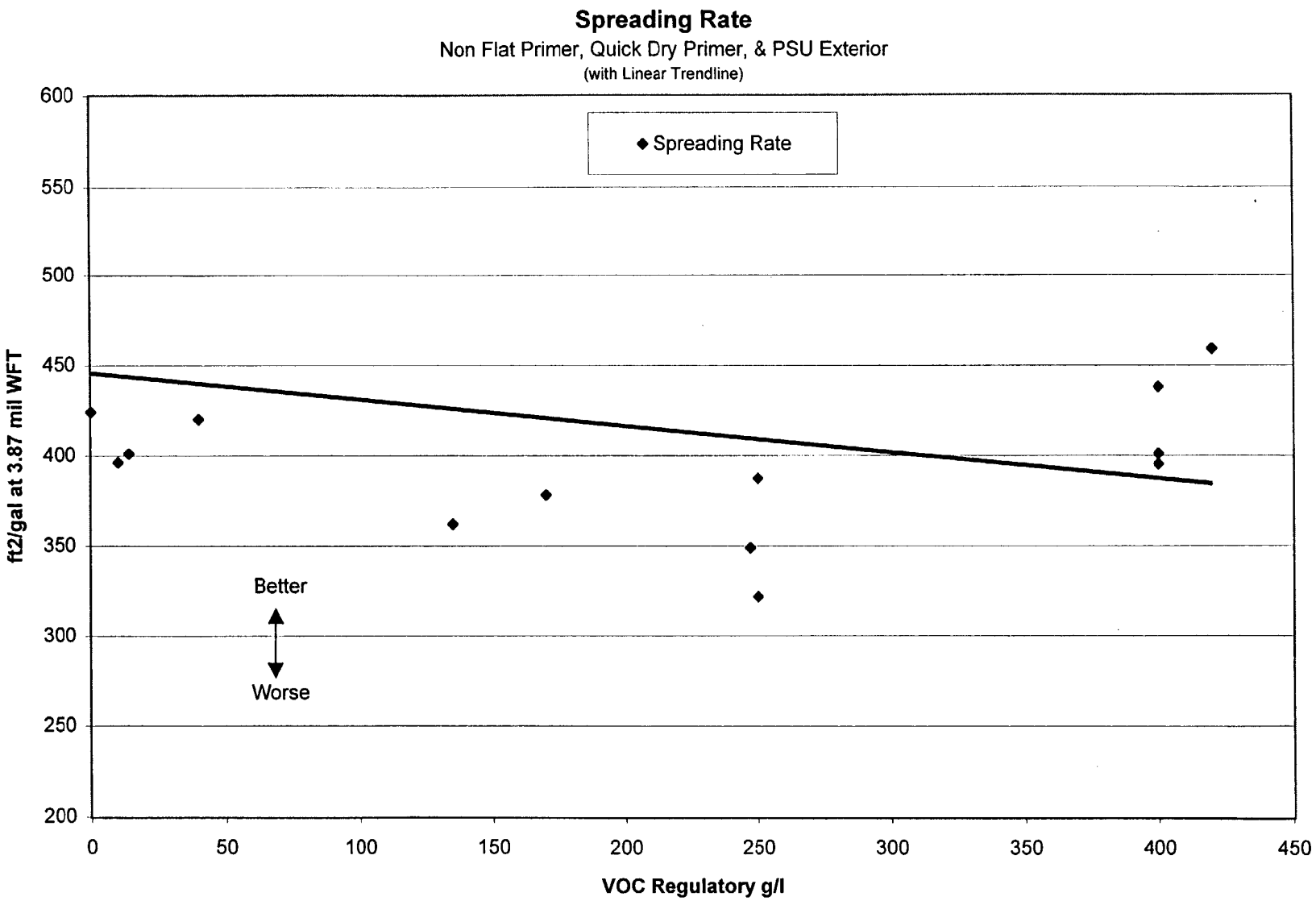
Single component coatings = 9 Multi-component coatings = 1

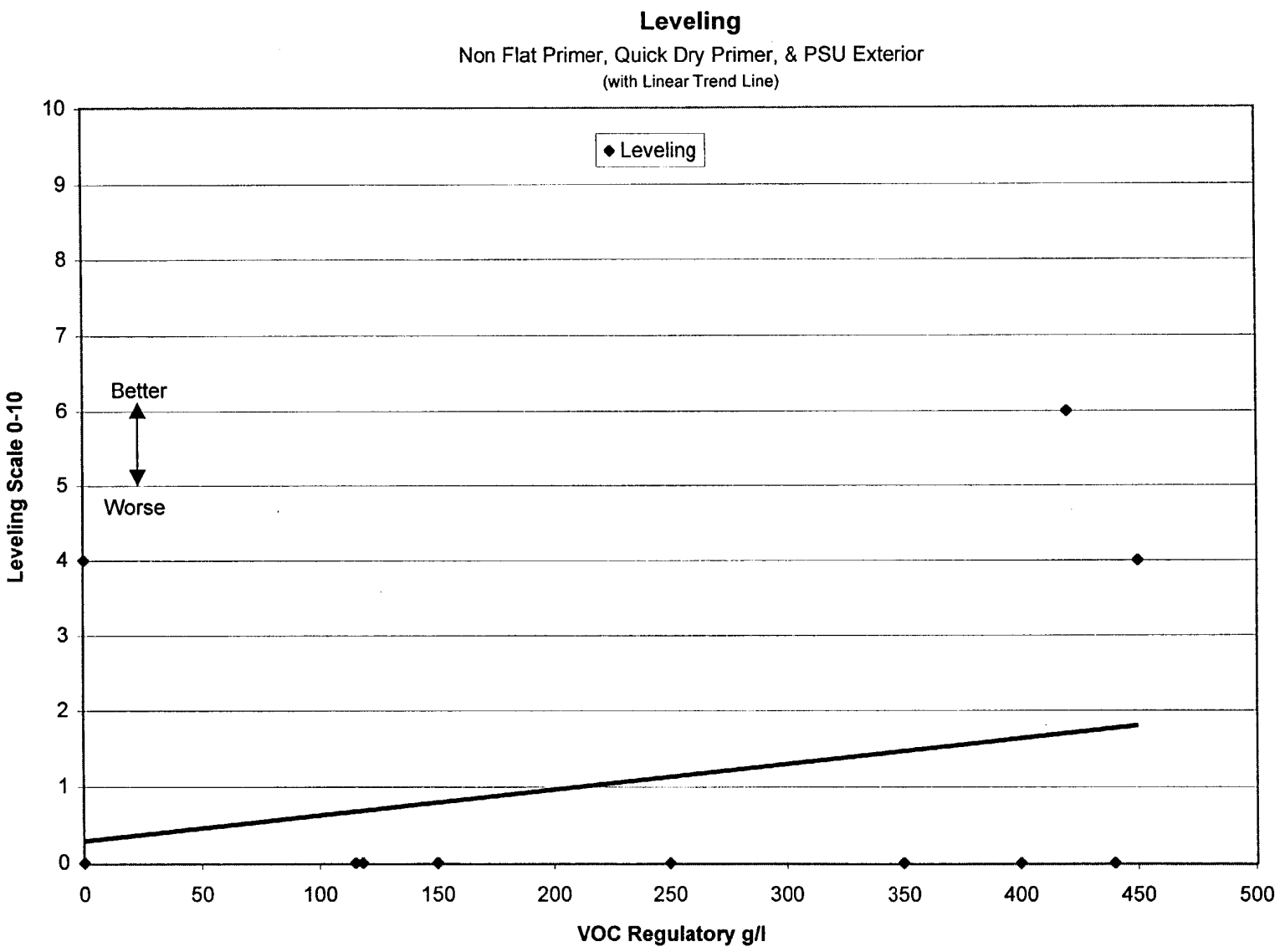

Brushing Properties
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trend Lines)
Brushing Properties, Wet
Brushing Properties, Dry
Better
Worse
Brushing Properties, Dry
Brushing Properties, Wet
Leneta Levelness Profile (1 - 9)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
0
50
100
150
200
250
300
350
400
450
500

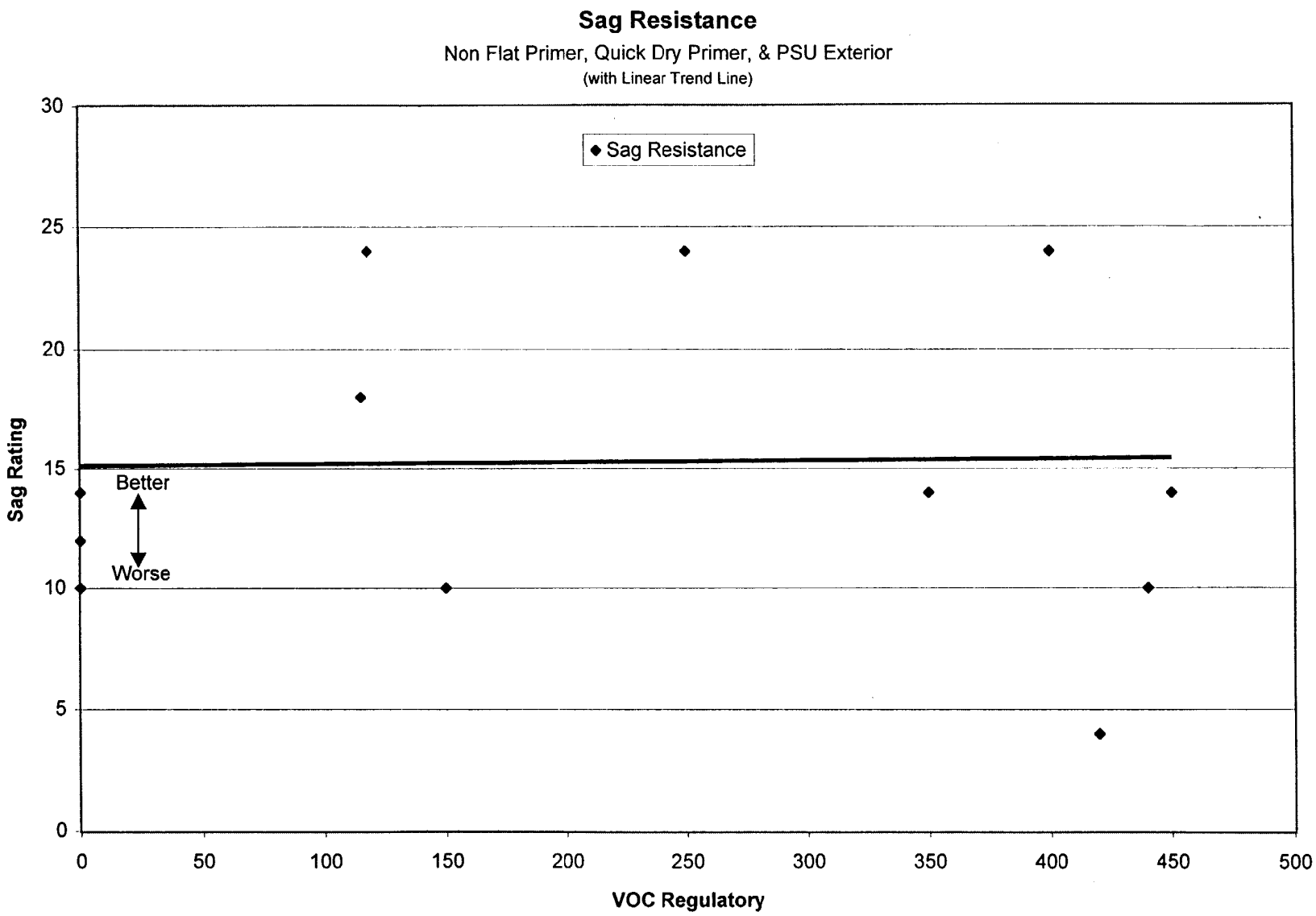

Dry Time - Dry To Touch
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
VOC Regulatory g/l
0
50
100
150
200
250
300
350
400
450
500

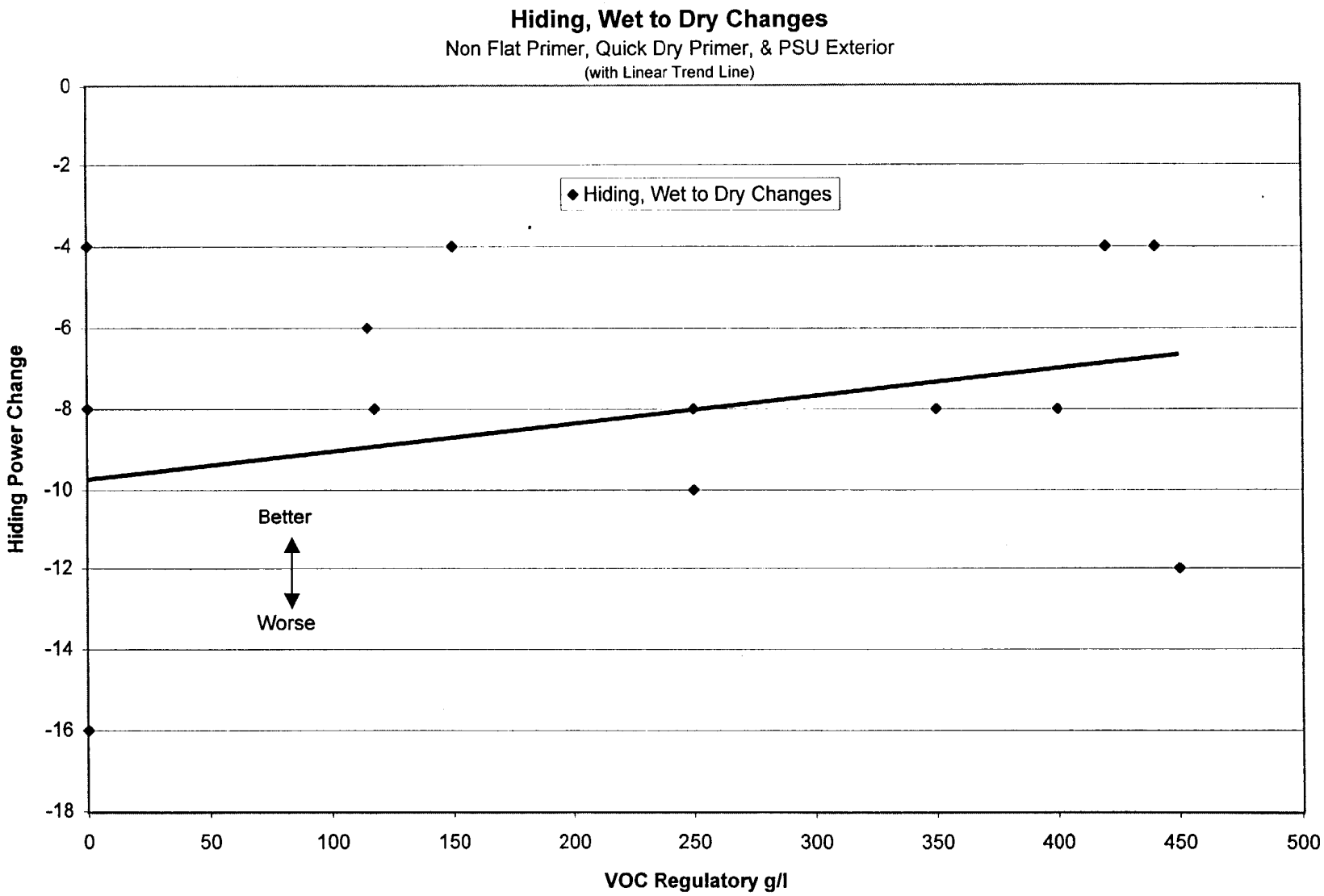

Dry Time - Dry Hard
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
VOC Regulatory g/l
0
50
100
150
200
250
300
350
400
450
500

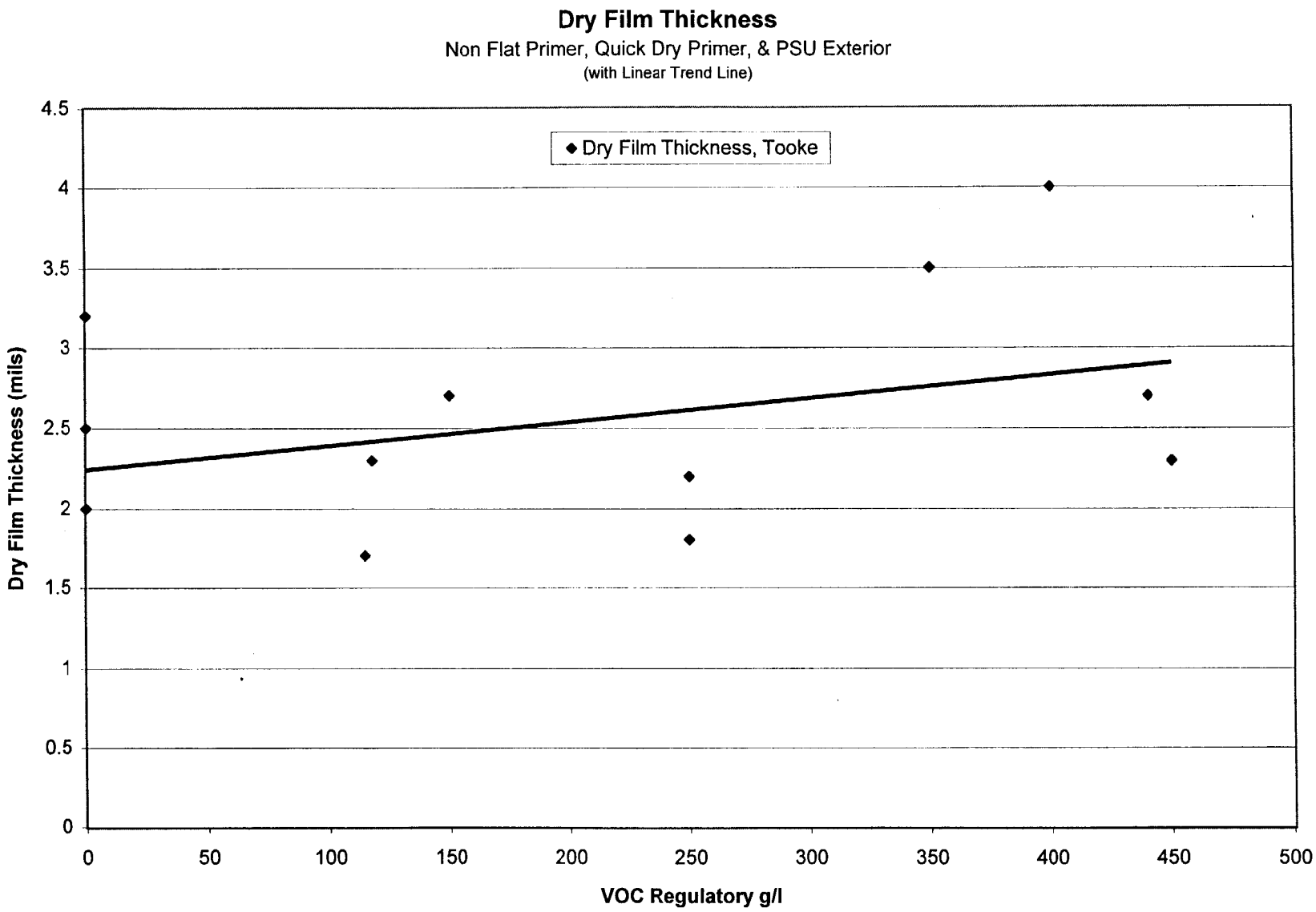

Contrast Ratio
(Hiding Power)
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trendline)
◆ at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
Contrast Ratio
0.99
0.98
0.97
0.96
0.95
0.94
0.93
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Spreading Rate
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trendline)
Spreading Rate
ft2/gal at 3.87 mil WFT
600
550
500
450
400
350
300
250
200
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l
Better
Worse


Leveling
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trend Line)
Leveling
Better
Worse
Leveling Scale 0-10
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
300
350
400
450
500


Sag Resistance
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trend Line)
Sag Resistance
Better
Worse
Sag Rating
VOC Regulatory
0
5
10
15
20
25
30
0
50
100
150
200
250
300
350
400
450
500


Hiding, Wet to Dry Changes
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trend Line)
Hiding, Wet to Dry Changes
Better
Worse
Hiding Power Change
VOC Regulatory g/l
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
0
50
100
150
200
250
300
350
400
450
500


Dry Film Thickness
Non Flat Primer, Quick Dry Primer, & PSU Exterior
(with Linear Trend Line)
Dry Film Thickness, Tooke
Dry Film Thickness (mils)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
50
100
150
200
250
300
350
400
450
500
VOC Regulatory g/l

Nonflat Prmer (NFP), Quick Dry Primer (QDP) and Primer Sealer Undercoater (PSU) - EXTERIOR Data Table

Protocol Test Number							2.1	2.1	2.2		2.2		3.14
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Nonvolatile by Weight	Coarse Particles	Density	Brushing Properties, Wet	Brushing Properties, Dry	Dry time, Dry to Touch - One Part Coatings		Dry time, Dry Hard - One Part Coatings		Contrast Ratio (Cw) Hiding Power
Units		g/l		%	Size in Microns	lbs/gal	Leneta Levelness Profile, 1 - 9	Leneta Levelness Profile, 1 - 9	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
301	NFP1	0	Vinyl Polymer Latex	55.7	92	11.21	2	3	3.3	2.7	7.5	3.6	0.942
308	PSU2	0	Acrylic Latex	50.7	40	10.95	3	5	1.2	1.3	10.2	3.7	0.961
325	NFP9	0	Acrylic Latex	59.0	80	11.20	2	2	2.7	3.3	10.5	4.2	0.967
310	NFP2	0	Acrylic Emulsion	51.2	24	10.73	2	4	5.7	2.1	9.6	2.1	0.973
322	NFP6	115	Acrylic Latex	48.7	80	10.08	>1	>1	11.1	1.0	359.1	39.7	0.963
313	PSU3	118	Acrylic Emulsion	52.8	20	11.30	1	1	1.6	1.3	255.1	250.9	0.978
319	PSU4	150	Acrylic	51.3	60	10.42	2	3	2.1	2.1	217.2	3.7	0.938
331	NFP15	250	Acrylic Latex	59.2	76	10.65	1	2	17.8	1.6	21.4	5.2	0.978
332	NFP16	250	Acrylic Latex	47.9	52	10.41	2	4	3.3	2.1	147.4	17.7	0.972
328	NFP12	350	Alkyd	78.6	40	12.10	1	1	22.5	5.5	358.2	355.0	0.946
111	QDP4	400	Alkyd	64.5	40	10.34	2	3	3.7	8.2	21.7	9.7	0.943
10	REF	420	Urethane	73.6	none	11.10	7	9	3.0	0.3	120.3	109.2	0.985
101	QDP1	440	Alkyd	66.5	48	10.82	1	2	9.0	5.8	189.6	40.0	0.967
109	QDP3	450	Oil Base	64.0	60	10.85	2	4	4.5	5.1	125.1	6.9	0.956

Nonflat Prmer (NFP), Quick Dry Primer (QDP) and Primer Sealer Undercoater (PSU) - EXTERIOR Data Table

Protocol Test Number		3.14	2.4	2.7	2.10						
Coating Reference Number	Coating Reference Designator	Spreading Rate	Leveling	Sag Resistance	Hiding, Wet to Dry Changes	Wet Film Thickness			Wet Film/Dry Film/WW & Bar Applicator Gap Relationships		
						WW Rod #30	WW Rod #48	WW Rod #80	WW Rod #30	WW Rod #48	WW Rod #80
Units		ft2/gal at 3.87 mil WFT	Scale, 0-10	Notch Clearance in mils		mils	mils	mils	mils	mils	mils
301	NFP1	424	0	10	-8	4.5	4.5	7.5	1.4	2.1	2.6
308	PSU2	709	4	12	-4	5.5	5.5	7.5	1.6	1.9	2.5
325	NFP9	396	0	14	-16	3.5	5.5	7.5	1.8	2.6	3.5
310	NFP2	420	0	12	-16	3.5	5.5	7.5	1.5	2.1	2.8
322	NFP6	362	0	18	-6	4.5	5.5	7.5	2.1	2.2	2.8
313	PSU3	378	0	>24	-8	5.5	7.5	9.5	1.5	2.7	2.5
319	PSU4	349	0	10	-4	4.5	6.5	7.5	2.3	2.8	3.5
331	NFP15	322	0	>24	-8	3.5	5.5	8.5	1.7	2.4	3.6
332	NFP16	387	0	>24	-10	5.5	5.5	7.5	1.8	1.9	2.6
328	NFP12	401	0	14	-8	3.5	4.5	10.5	2.3	3.5	5.9
111	QDP4	395	0	>24	<-8	5.5	6.5	8.5	2.4	2.3	3.0
10	REF	438	6	<4	-4	4.5	6.5	8.5	1.2	2.5	3.4
101	QDP1	459	0	10	-4	4.5	7.5	8.5	1.5	1.5	3.6
109	QDP3	401	4	14	<-12	6.5	7.5	9.5	2.3	2.3	2.7

Nonflat Prmer (NFP), Quick Dry Primer (QDP) and Primer Sealer Undercoater (PSU) - EXTERIOR Data Table

Protocol Test Number		3.2	3.2	3.10
Coating Reference Number	Coating Reference Designator	Appearance and Finish, Drawdown Charts	Appearance and Finish, Coted Panels	Dry Film Thickness, Tooke
Units				mils
301	NFP1	smooth, flat	smooth, flat	2.0
308	PSU2	slightly crinkled	uniform, flat	2.5
325	NFP9	flat, uniform	uniform, flat-satin	3.2
310	NFP2	smooth, matte	smooth, satin	2.0
322	NFP6	flat, matte	flat, matte	1.7
313	PSU3	even, satin-flat	smooth, satin-flat	2.3
319	PSU4	smooth, eggshell	smooth, flat	2.7
331	NFP15	smooth, flat	smooth, satin-flat	2.2
332	NFP16	smooth, satin	smooth, satin-flat	1.8
328	NFP12	smooth, eggshell	smooth, eggshell	3.5
111	QDP4	smooth, matte	eggshell	4.0
10	REF	smooth, high gloss	N/A	N/A
101	QDP1	smooth, matte	smooth, matte	2.7
109	QDP3	smooth, matte	uniform, flat	2.3

Section 6: Nonflat Topcoat and Quickdry Topcoat - Interior

Total # manufactuers or brands	10
Single component coatings	13
Multi-component coatings	1
Total # coatings	14

Test Summary

Brushing Properties Wet:
- Low VOC coatings exhibited lower performance compared to high VOC coatings. One high VOC coatings exhibited excellent performance.

Brushing Properties Dry:
- Low VOC coatings exhibited lower performance compared to high VOC coatings. One high VOC coatings exhibited excellent performance.

Dry Time - Dry To Touch:
- Low VOC coatings exhibited similar dry times at 50 °F and 90% RH and at 90 °F and 30% RH compared to high VOC coatings. Two coatings at 150 g/l and 250 g/l exhibited significantly longer dry times.

Dry Time - Dry Hard:
- Low VOC coatings exhibited faster dry times at 50 °F and 90% RH and at 90 °F and 30% RH compared to high VOC coatings.

Contrast Ratio (Hiding Power):
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Spreading Rate:
- Low VOC coatings exhibited lower performance compared to high VOC coatings.

Leveling:
- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings.

Sag Resistance:
- Low VOC coatings exhibited slightly higher performance compared to high VOC coatings.

Hiding Wet to Dry Changes:
- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings.

Blocking Resistance:
- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Dry Film Thickness:
- Low VOC coatings exhibited similar dry film thickness compared to high VOC coatings.

Dirt Removal Ability:

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Scrub Abrasion Resistance:

- Low VOC coatings exhibited lower performance compared to high VOC coatings.

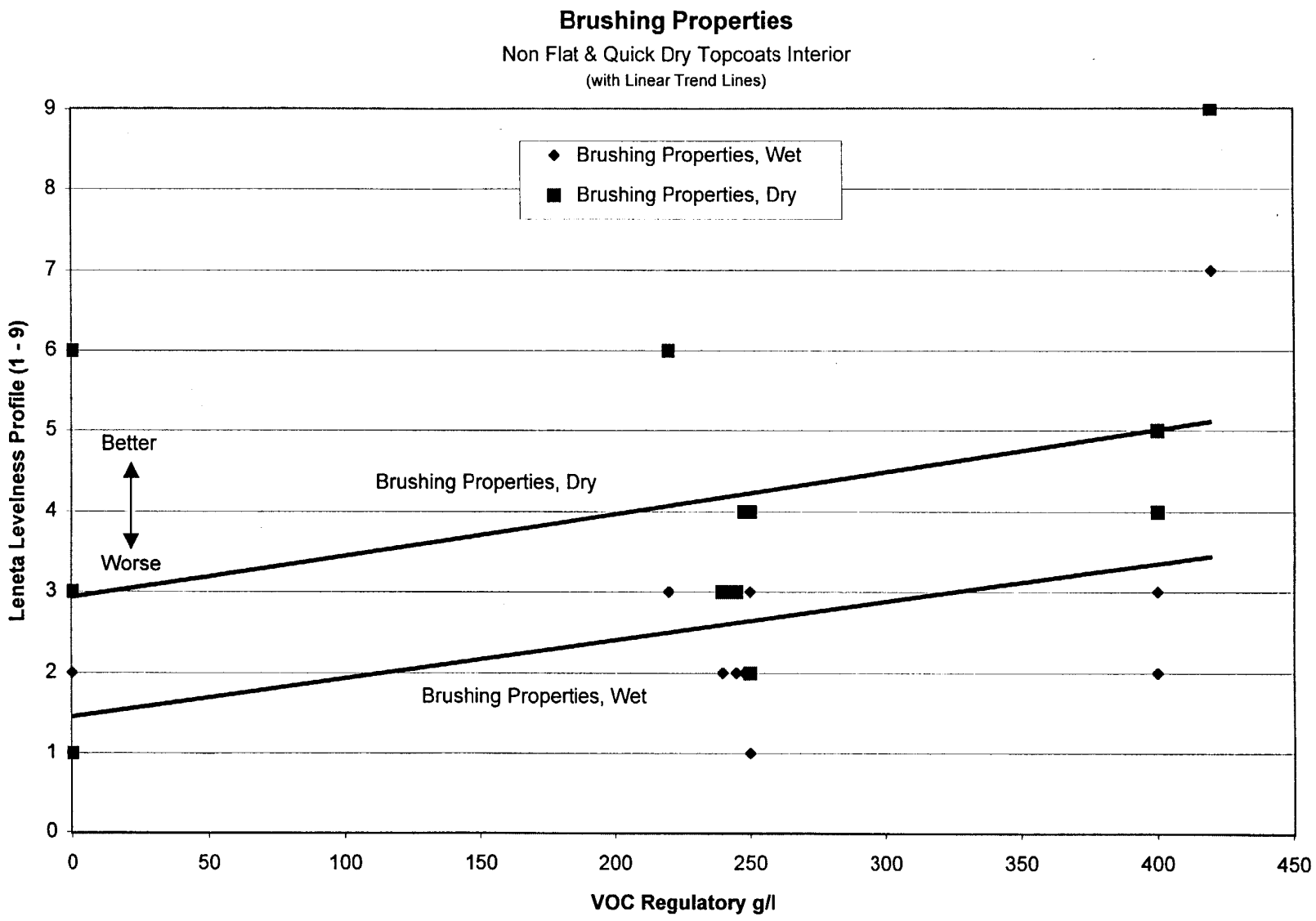
Comments:

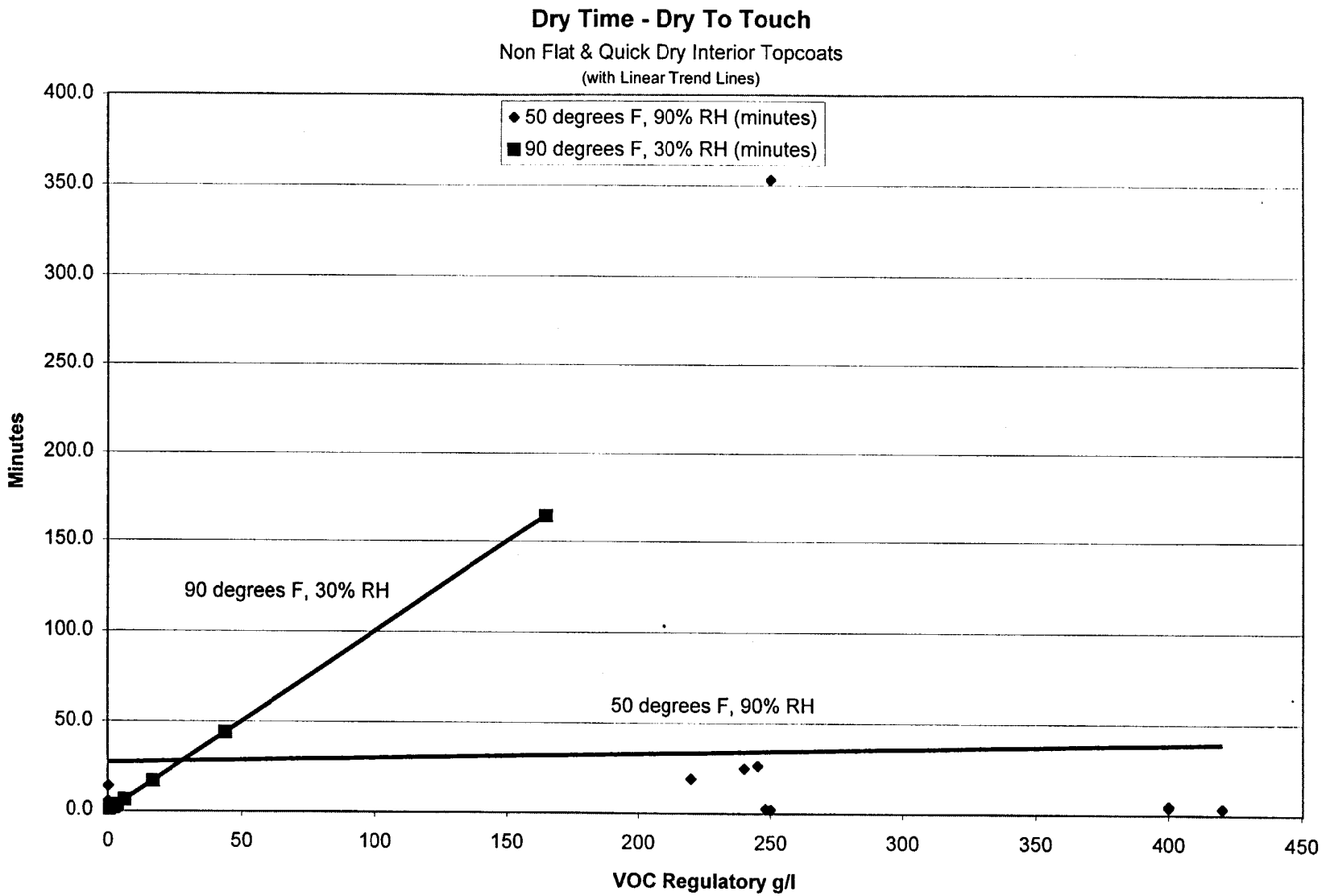
Overall, low VOC coatings exhibited similar performance to high VOC coatings. Low VOC coatings did exhibit faster dry hard times while high VOC coatings exhibited higher scrub abrasion resistance.

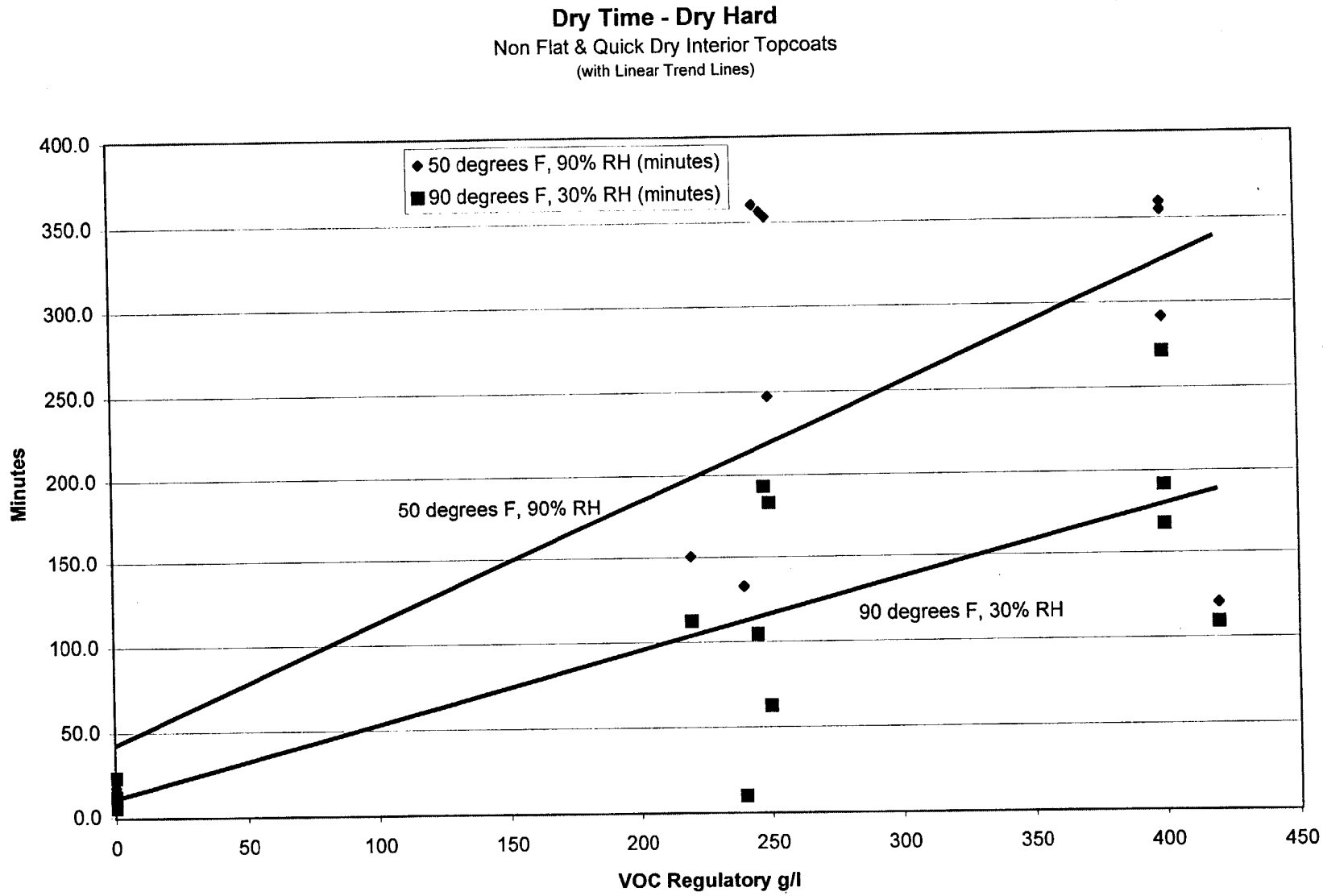
Nonflat Topcoat and Quickdry Topcoat - Interior

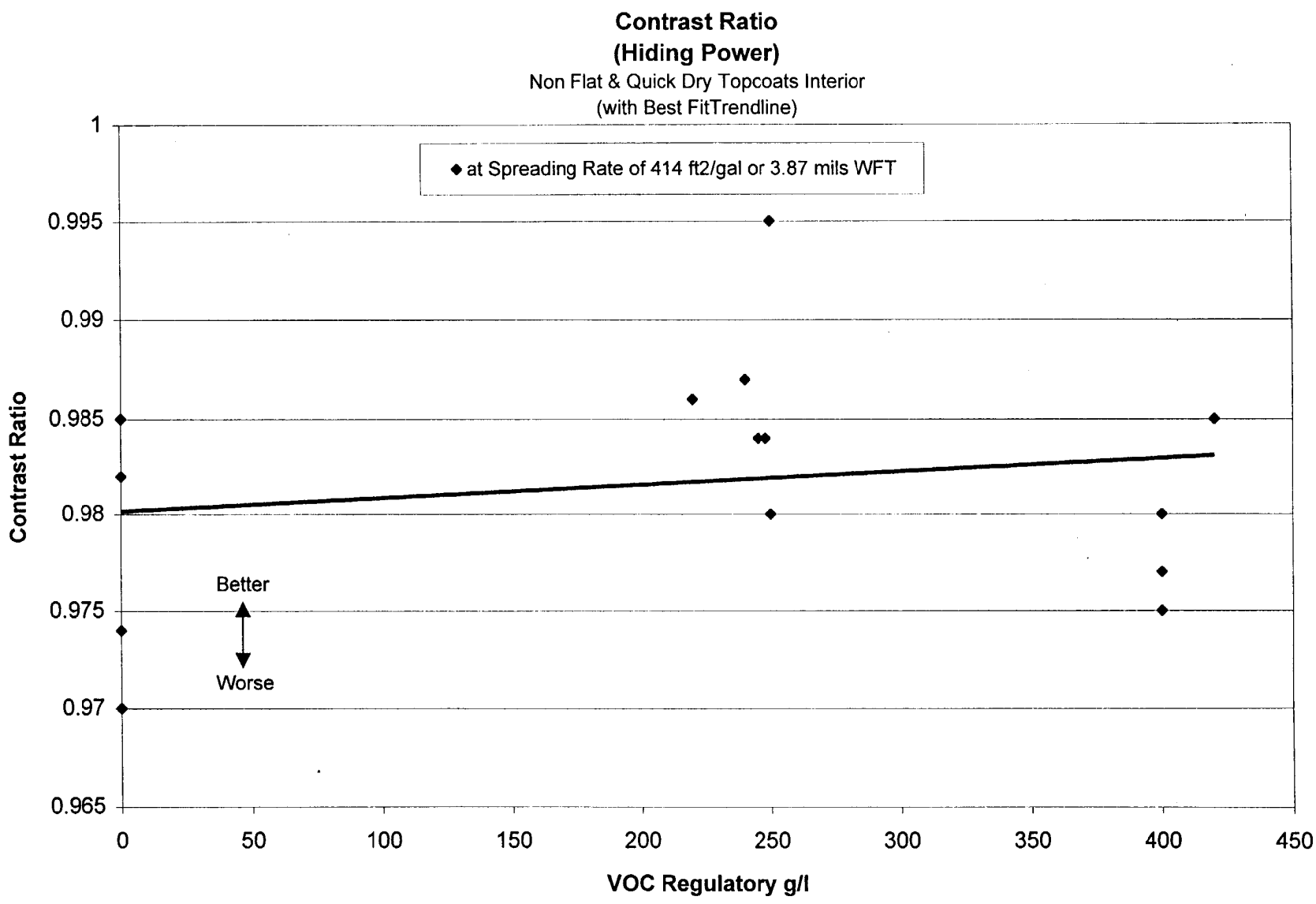
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
219	245	1	Acrylic Latex	I	1
212	240	1	PWP Latex	I	1
104	400	1	Alkyd	I	1
205	220	1	Acrylic Latex	I	1
204	250	1	Acrylic Latex	I	1
10	420	2	Urethane	I	1
235	0	1	(blank)	I	1
214	250	1	Alkyd	I	1
238	0	1	(blank)	I	1
211	0	1	Acrylic Emulsion	I	1
112	<400	1	Alkyd	I	1
203	0	1	Acrylic Emulsion	I	1
208	250	1	Vinyl Acrylic Latex	I	1
207	400	1	(blank)	I	1
Grand Total					14

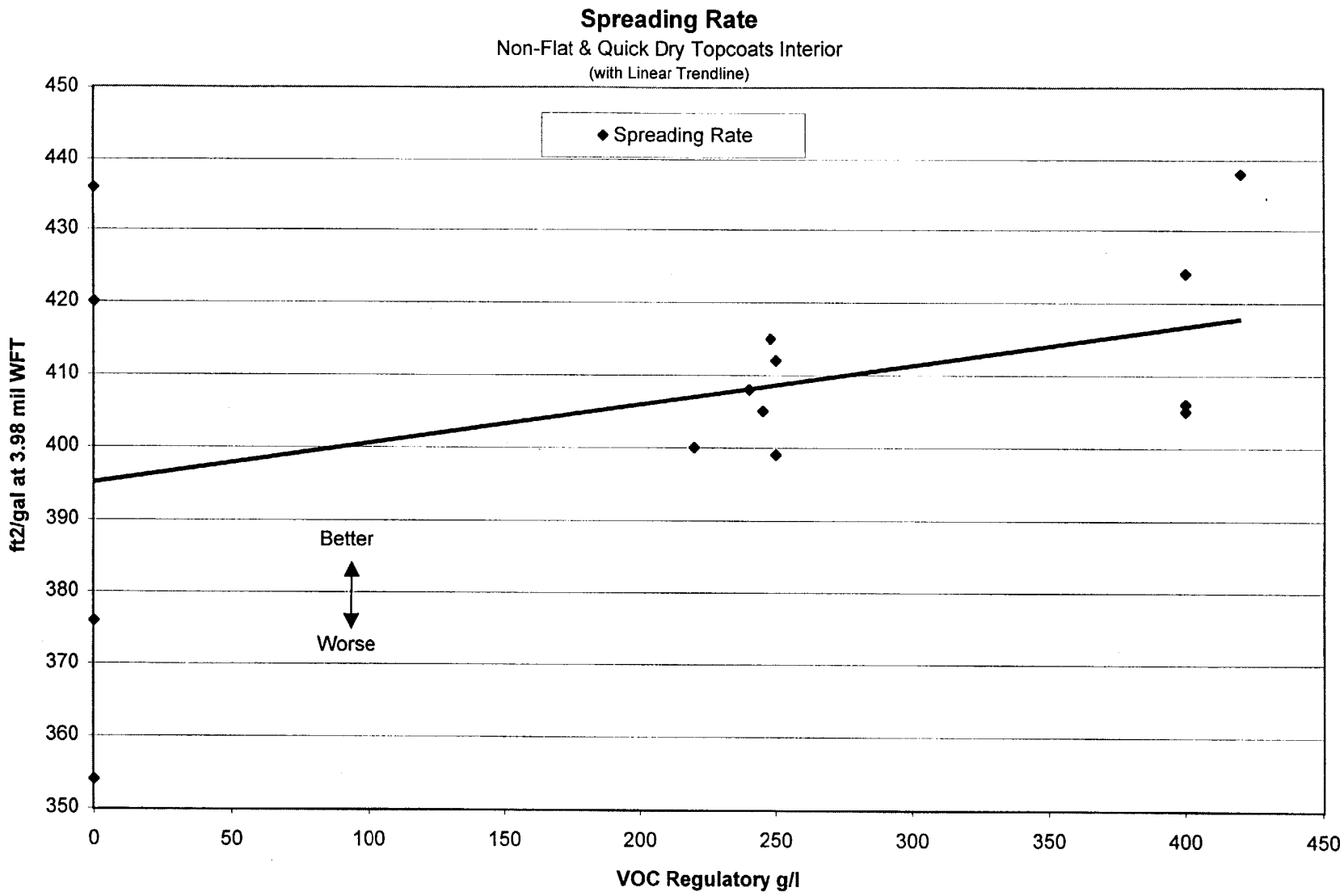
Single component coatings = 13 Multi-component coatings = 1

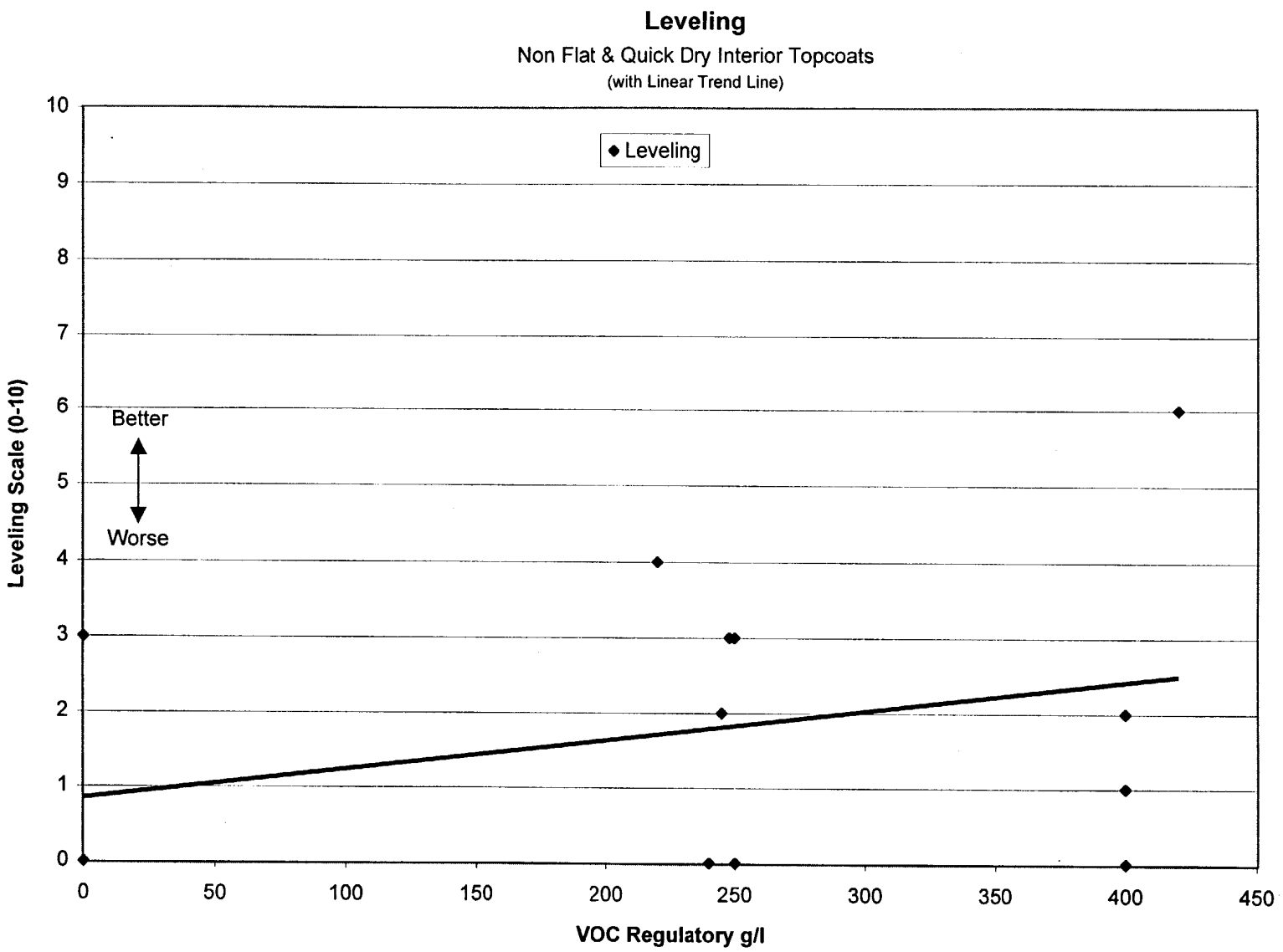

Brushing Properties
Non Flat & Quick Dry Topcoats Interior
(with Linear Trend Lines)
Brushing Properties, Wet
Brushing Properties, Dry
Better
Worse
Brushing Properties, Dry
Brushing Properties, Wet
Leneta Levelness Profile (1 - 9)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
0
50
100
150
200
250
300
350
400
450

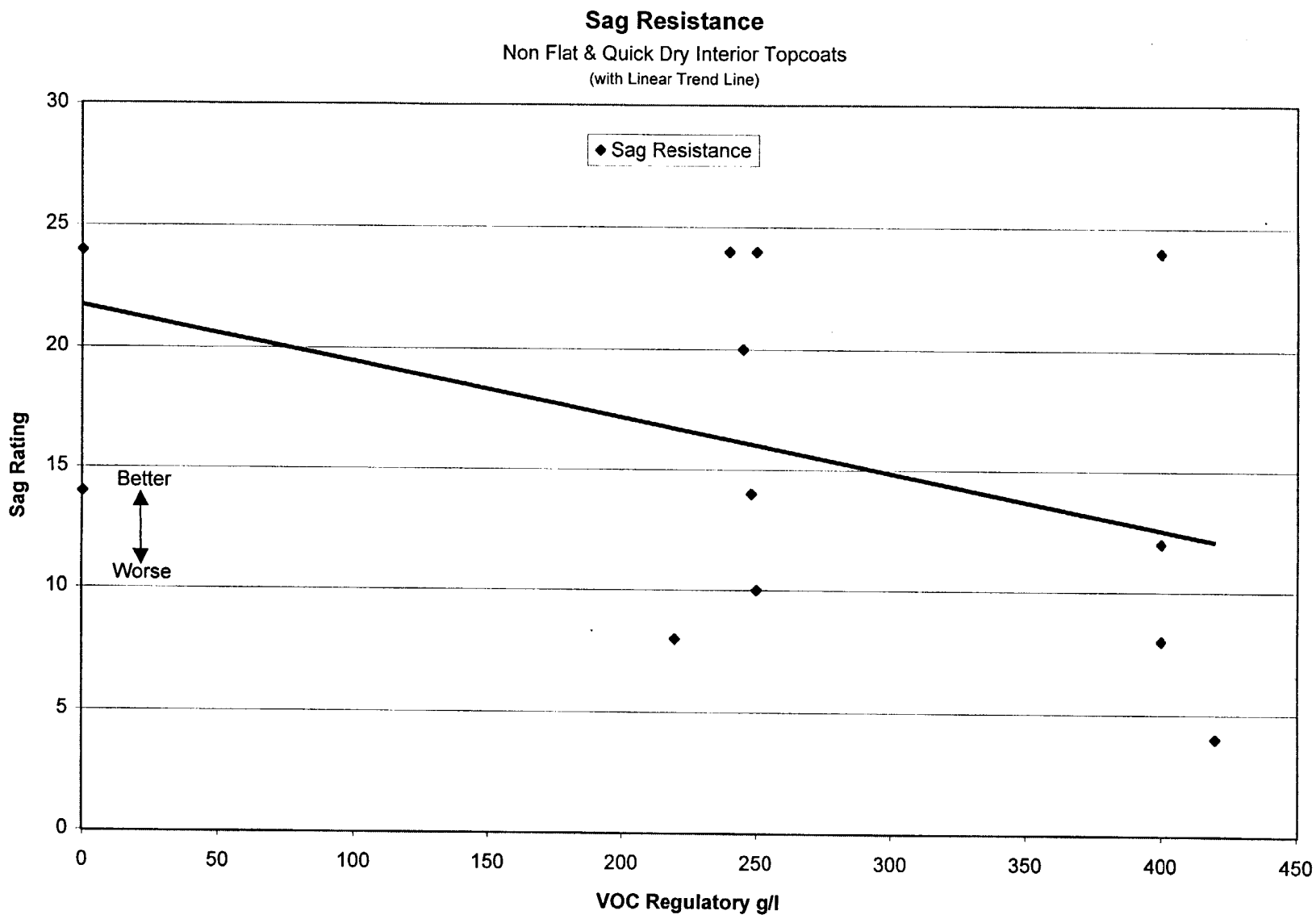

Dry Time - Dry To Touch
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
90 degrees F, 30% RH
50 degrees F, 90% RH
Minutes
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

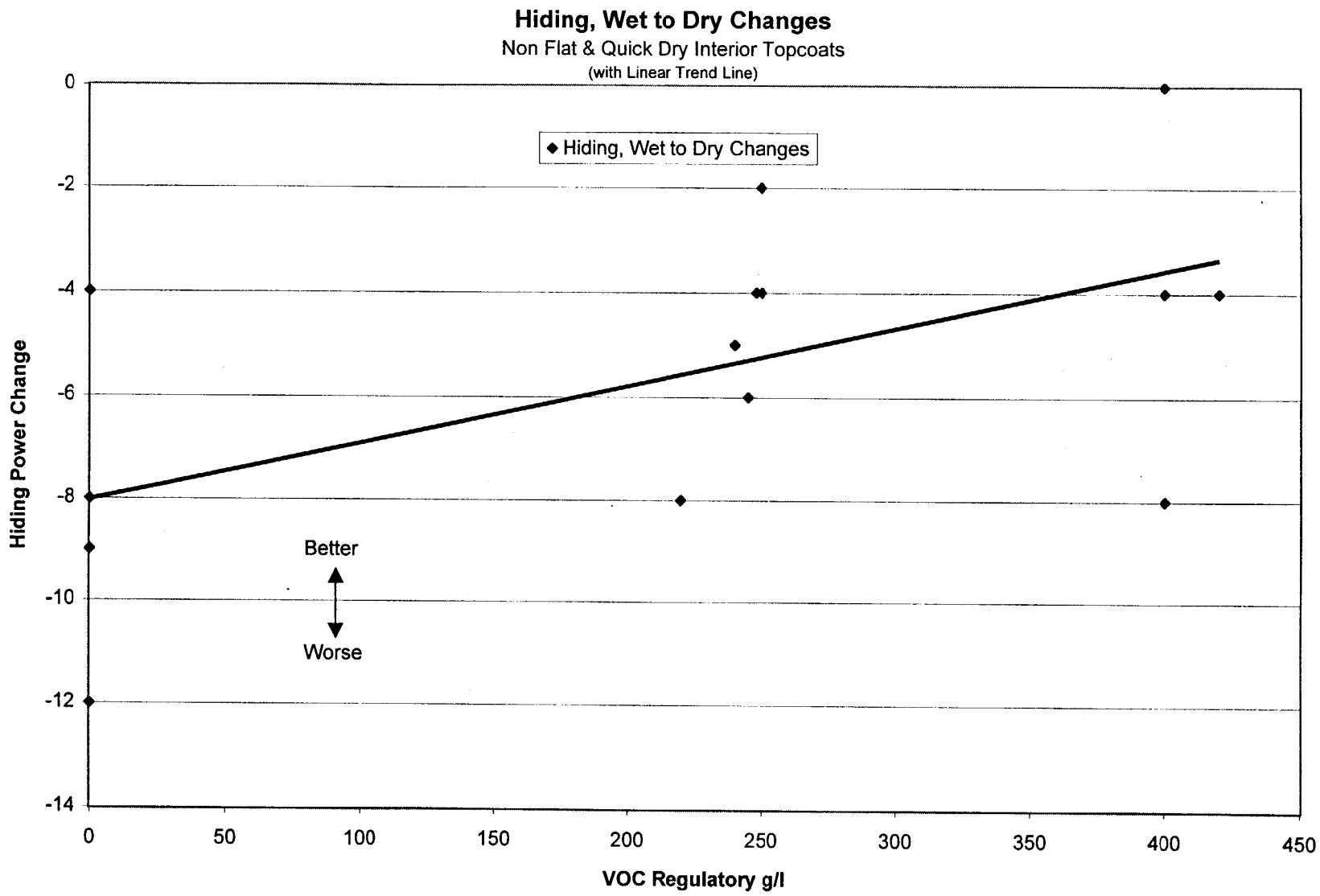

Dry Time - Dry Hard
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

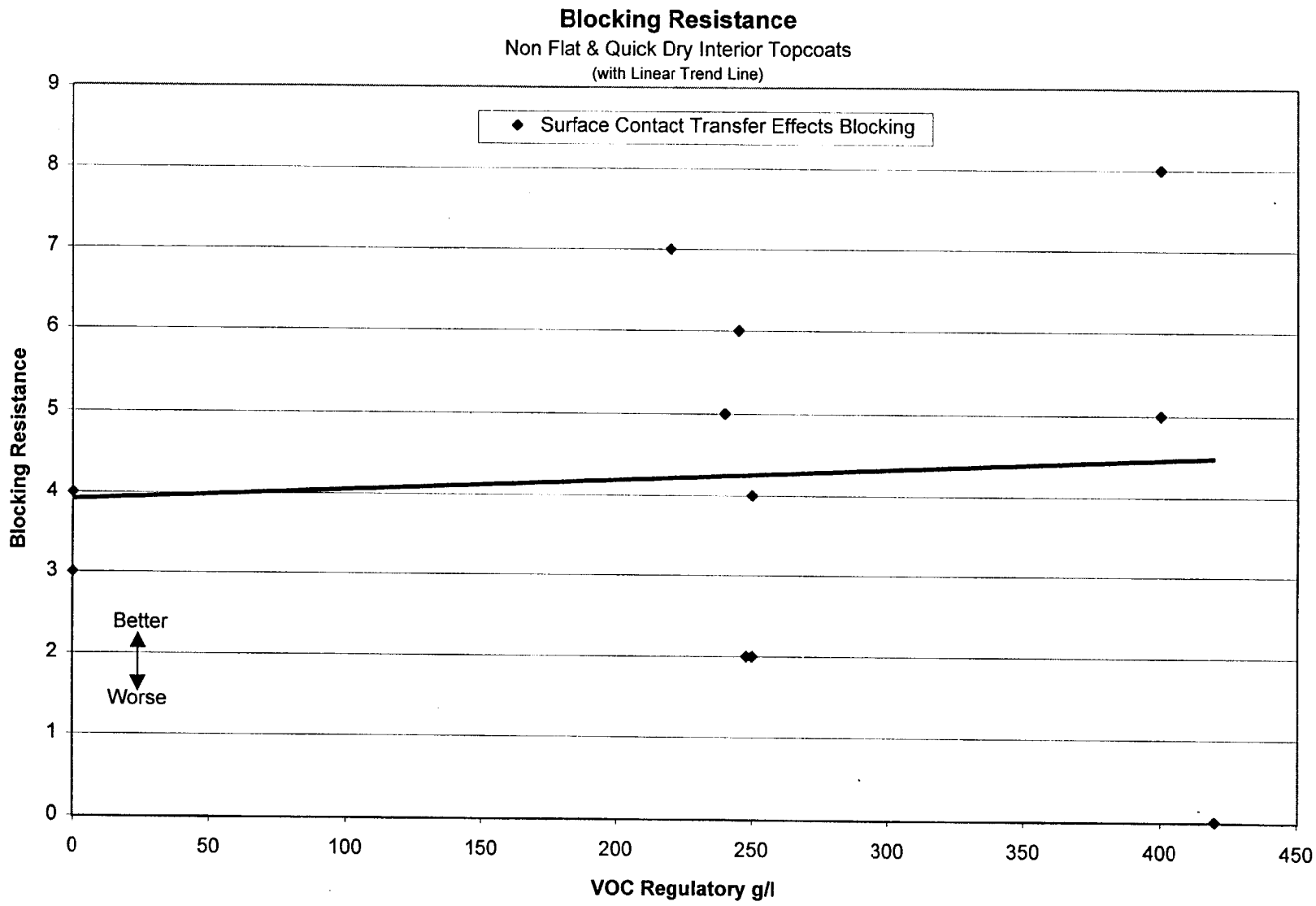

Contrast Ratio
(Hiding Power)
Non Flat & Quick Dry Topcoats Interior
(with Best FitTrendline)
at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
Contrast Ratio
1
0.995
0.99
0.985
0.98
0.975
0.97
0.965
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

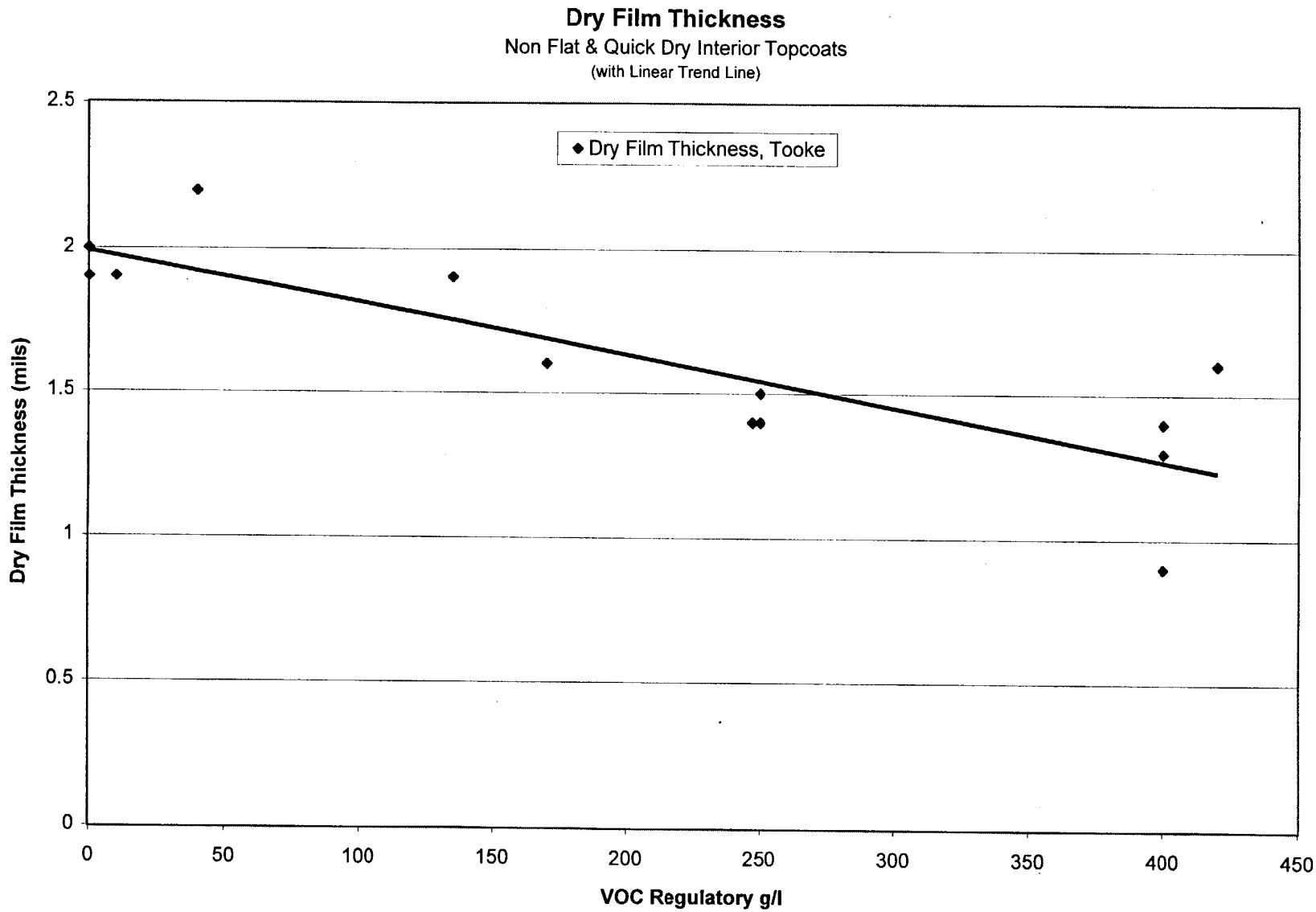

Spreading Rate
Non-Flat & Quick Dry Topcoats Interior
(with Linear Trendline)
Spreading Rate
ft2/gal at 3.98 mil WFT
450
440
430
420
410
400
390
380
370
360
350
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

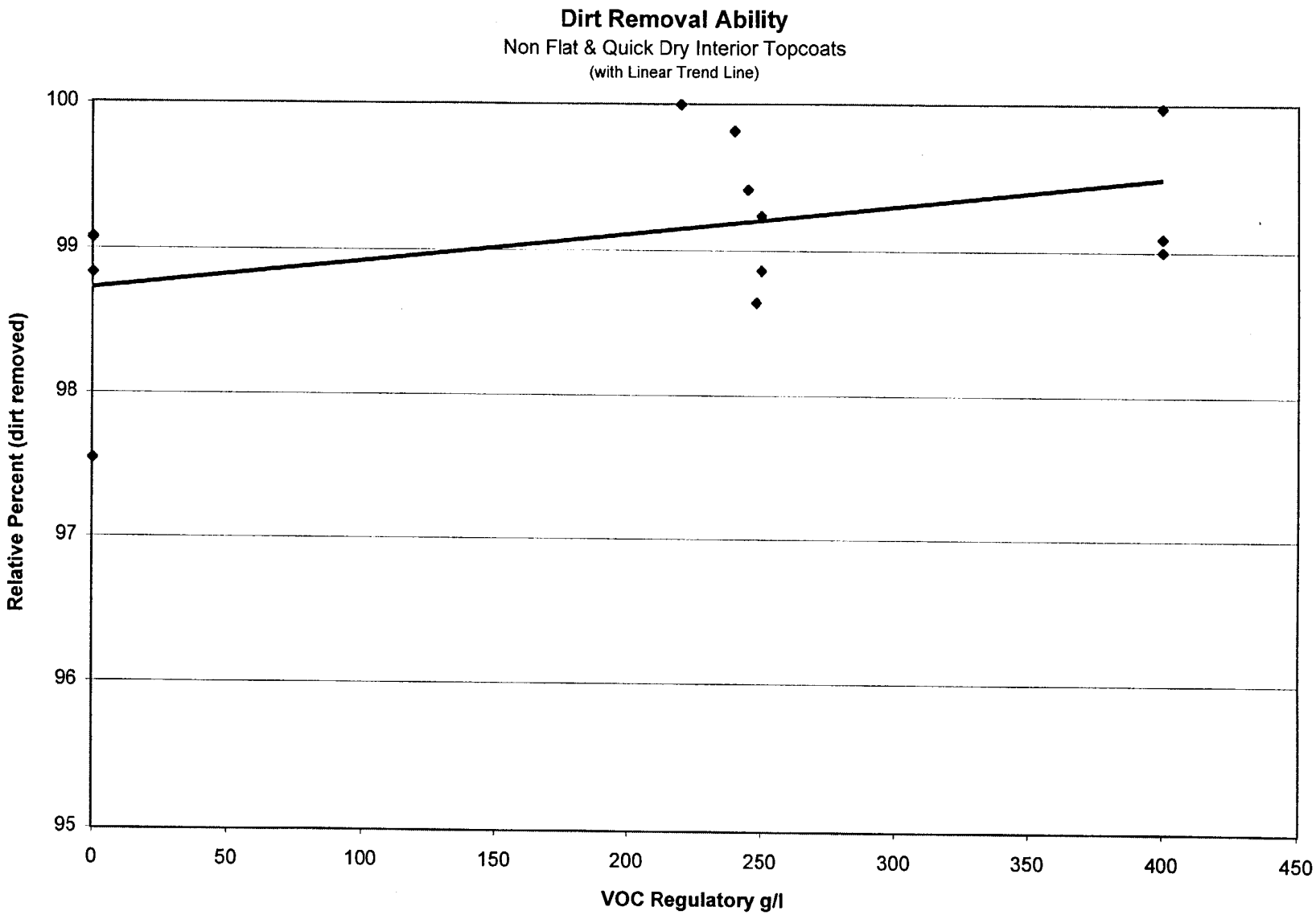

Leveling
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Line)
Leveling
Better
Worse
Leveling Scale (0-10)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
300
350
400
450

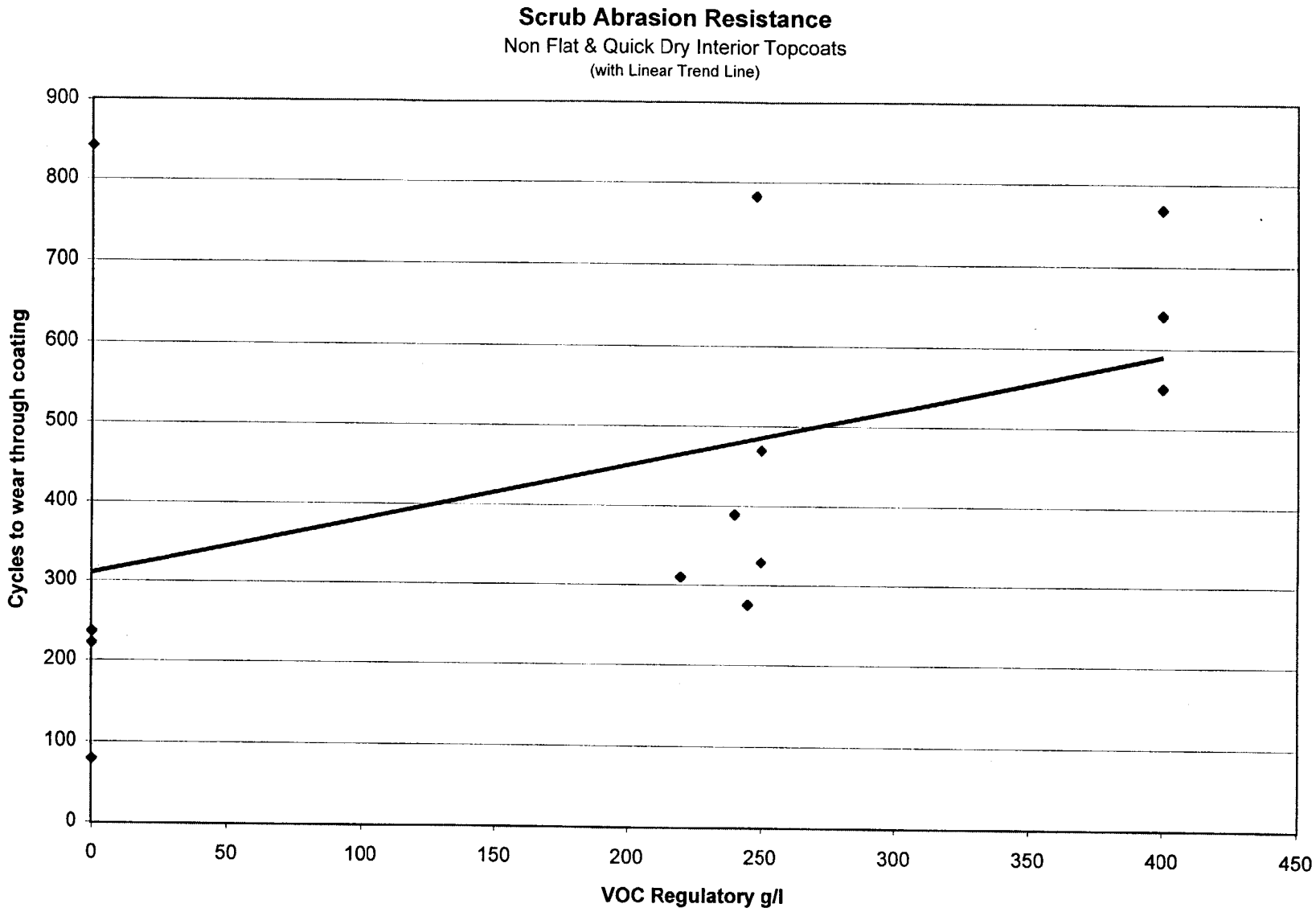

Sag Resistance
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Line)
Sag Resistance
Better
Worse
Sag Rating
VOC Regulatory g/l
0
5
10
15
20
25
30
0
50
100
150
200
250
300
350
400
450


Hiding, Wet to Dry Changes
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Line)
Hiding, Wet to Dry Changes
Better
Worse
Hiding Power Change
VOC Regulatory g/l
0
-2
-4
-6
-8
-10
-12
-14
0
50
100
150
200
250
300
350
400
450


Blocking Resistance
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Line)
Surface Contact Transfer Effects Blocking
Blocking Resistance
VOC Regulatory g/l
Better
Worse
0
1
2
3
4
5
6
7
8
9
0
50
100
150
200
250
300
350
400
450


Dry Film Thickness
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Line)
Dry Film Thickness, Tooke
Dry Film Thickness (mils)
2.5
2
1.5
1
0.5
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Dirt Removal Ability
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Line)
Relative Percent (dirt removed)
100
99
98
97
96
95
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Scrub Abrasion Resistance
Non Flat & Quick Dry Interior Topcoats
(with Linear Trend Line)
Cycles to wear through coating
900
800
700
600
500
400
300
200
100
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

Nonflat Topcoat (NFT) and Quick Dry Topcoat (QDT) - INTERIOR Data Table

Protocol Test Number							2.1	2.1	2.2		2.2		3.14
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Nonvolatile by Weight	Coarse Particles	Density	Brushing Properties, Wet	Brushing Properties, Dry	Dry time, Dry to Touch - One Part Coatings		Dry time, Dry Hard - One Part Coatings		Contrast Ratio (Cw) Hiding Power
Units		g/l		%	Size in Microns	lbs/gal	Leneta Levelness Profile, 1 - 9	Leneta Levelness Profile, 1 - 9	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
203	NFT2	0	Acrylic Emulsion	54.7	100	10.96	2	3	3.0	2.2	8.1	12.1	0.974
211	NFT9	0	Acrylic Emulsion	50.4	30	10.51	2	6	5.1	2.5	10.2	5.5	0.985
235	NFT18	0	Acrylic Latex	48.2	56	10.63	2	3	2.8	6.1	8.8	7.0	0.97
238	NFT20	0	Copolymer Latex	53.5	100	10.34	1	1	13.5	2.2	17.4	23.2	0.982
205	NFT4	220	Acrylic Latex	48.5	20	10.60	3	6	18.7	16.7	150.5	112.4	0.986
212	NFT10	240	Acrylic	43.5	32	10.12	2	3	24.6	2.4	132.6	9.6	0.987
219	NFT17	245	Acrylic Latex	47.7	6	10.47	2	3	26.1	43.9	360.0	104.5	0.984
214	NFT12	248	Alkyd	80.6	28	11.75	2	4	2.1	2.1	356.1	192.9	0.984
204	NFT3	250	Acrylic Latex	82.6	24	12.57	3	4	353.1	164.6	353.1	182.8	0.995
208	NFT7	250	Vinyl Acrylic Latex	50.1	56	10.55	1	2	1.6	1.6	247.0	62.5	0.98
104	QDT2	400	Alkyd	65.6	20	9.96	3	4	4.2	2.7	354.6	271.2	0.977
112	QDT4	400	Alkyd	64.5	20	10.23	3	5	4.2	3.3	291.3	191.4	0.975
207	NFT6	400	Alkyd	66.3	16	9.98	2	4	3.6	1.6	359.1	167.5	0.98
10	REF	420	Urethane	73.6	none	11.10	7	9	3.0	0.3	120.3	109.2	0.985

Nonflat Topcoat (NFT) and Quick Dry Topcoat (QDT) - INTERIOR Data Table

Protocol Test Number		3.14	2.4	2.7	2.10	3.21						
Coating Reference Number	Coating Reference Designator	Spreading Rate	Leveling	Sag Resistance	Hiding, Wet to Dry Changes	Surface Contact Transfer Effects Blocking	Wet Film Thickness			Wet Film/Dry Film/WW & Bar Applicator Gap Relationships		
							WW Rod #30	WW Rod #48	WW Rod #80	WW Rod #30	WW Rod #48	WW Rod #80
Units		ft2/gal at 3.87 mil WFT	Scale, 0-10	Notch Clearance in mils	Hiding Indes Change between the Wet and Dry State		mils	mils	mils	mils	mils	mils
203	NFT2	354	0	>24	-12	3	4.5	5.5	7.5	1.8	2.1	2.8
211	NFT9	420	3	>24	-9	4	5.5	6.5	9.5	1.5	1.6	2.5
235	NFT18	436	0	14	-4	4	4.5	5.5	7.5	1.5	1.7	2.2
238	NFT20	376	0	>24	-8	4	4.5	4.5	7.5	1.8	2.0	3.2
205	NFT4	400	4	8	-8	7	5.5	6.5	8.5	1.6	2.1	2.6
212	NFT10	408	0	24	-5	5	4.5	5.0	8.0	1.2	1.4	1.9
219	NFT17	405	2	20	-6	6	3.5	6.5	8.5	1.2	1.5	2.6
214	NFT12	415	3	14	-4	2	4.5	5.0	8.5	2.2	2.6	2.9
204	NFT3	412	3	10	-4	4	5.5	6.5	9.5	2.1	2.8	5.2
208	NFT7	399	0	>24	-2	2	4.5	5.5	7.5	1.8	2.0	2.4
104	QDT2	424	2	8	0	8	4.5	6.5	10.5	1.2	2.0	2.9
112	QDT4	405	1	12	-4	5	5.5	6.5	8.5	1.7	2.2	3.7
207	NFT6	406	0	>24	-8	5	5.5	5.8	8.5	1.9	2.2	2.9
10	REF	438	6	<4	-4	N/A	4.5	6.5	8.5	1.2	2.5	3.4

Nonflat Topcoat (NFT) and Quick Dry Topcoat (QDT) - INTERIOR Data Table

Protocol Test Number		3.2	3.2	3.7	3.10	3.9	3.24a
Coating Reference Number	Coating Reference Designator	Appearance and Finish, Drawdown Charts	Appearance and Finish, Coted Panels	Dirt Removal Ability	Dry Film Thickness, Chart; 4 mil drawdown	Film Flexibility	Scrub Abrasion Resistance
Units				Relative Percent	mils		cycles to wear thruogh coating w/shim
203	NFT2	smooth, flat	smooth, flat	97.54	1.6	pass	842
211	NFT9	uniform, satin-flat	smooth, satin	99.07	1.6	pass	222
235	NFT18	smooth, flat	smooth, flat	99.08	2.1	pass	236
238	NFT20	rough, shiny	rough, satin	98.83	1.1	pass	79
205	NFT4	smooth, glossy	smooth, semi-gloss	100	1.8	pass	310
212	NFT10	smooth, glossy	smooth, satin	99.82	1.4	pass	389
219	NFT17	smooth, glossy	smooth, semi-gloss	99.42	1.7	pass	275
214	NFT12	smooth, glossy	smooth semi-gloss	98.64	1.9	pass	782
204	NFT3	smooth, semi-gloss	smooth, satin	98.86	1.8	pass	469
208	NFT7	smooth, flat	smooth, eggshell	99.24	2.1	pass	329
104	QDT2	uniform, semi-gloss	smooth, semi-gloss	99.09	1.1	pass	768
112	QDT4	smooth, semi-gloss	smooth, semi-gloss	99.98	1.4	pass	640
207	NFT6	smooth, semi-gloss	smooth, satin	99	1.2	pass	551
10	REF	smooth, high-gloss	smooth, gloss	N/A	N/A	pass	N/A

Section 7: Nonflat Topcoat and Quickdry Topcoat - Exterior

Total # manufactuers or brands	10
Single component coatings	11
Multi-component coatings	2
Total # coatings	13

Test Summary

Brushing Properties Wet:

- Low VOC coatings exhibited lower performance compared to high VOC coatings. One high VOC coatings exhibited excellent performance.

Brushing Properties Dry:

- Low VOC coatings exhibited lower performance compared to high VOC coatings. One high VOC coatings exhibited excellent performance.

Dry Time - Dry To Touch:

- Low VOC coatings exhibited similar dry times at 50 °F and 90% RH and at 90 °F and 30% RH compared to high VOC coatings. Two coatings in the 125 to 175 g/l range exhibited significantly longer dry times.

Dry Time - Dry Hard:

- Low VOC coatings exhibited faster dry times at 50 °F and 90% RH and at 90 °F and 30% RH compared to high VOC coatings. Several mid to low VOC coatings exhibited dry times similar to the high VOC coatings.

Contrast Ratio (Hiding Power):

- Low VOC coatings exhibited slightly lower performance compared to high VOC coatings.

Spreading Rate:

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Leveling:

- Low VOC coatings exhibited lower performance compared to high VOC coatings.

Sag Resistance:

- Low VOC coatings exhibited higher performance compared to high VOC coatings.

Hiding Wet to Dry Changes:

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Blocking Resistance:

- Low VOC coatings exhibited slightly higher performance compared to high VOC coatings.

Dry Film Thickness:

- Low VOC coatings exhibited slightly higher dry film thickness compared to high VOC coatings.

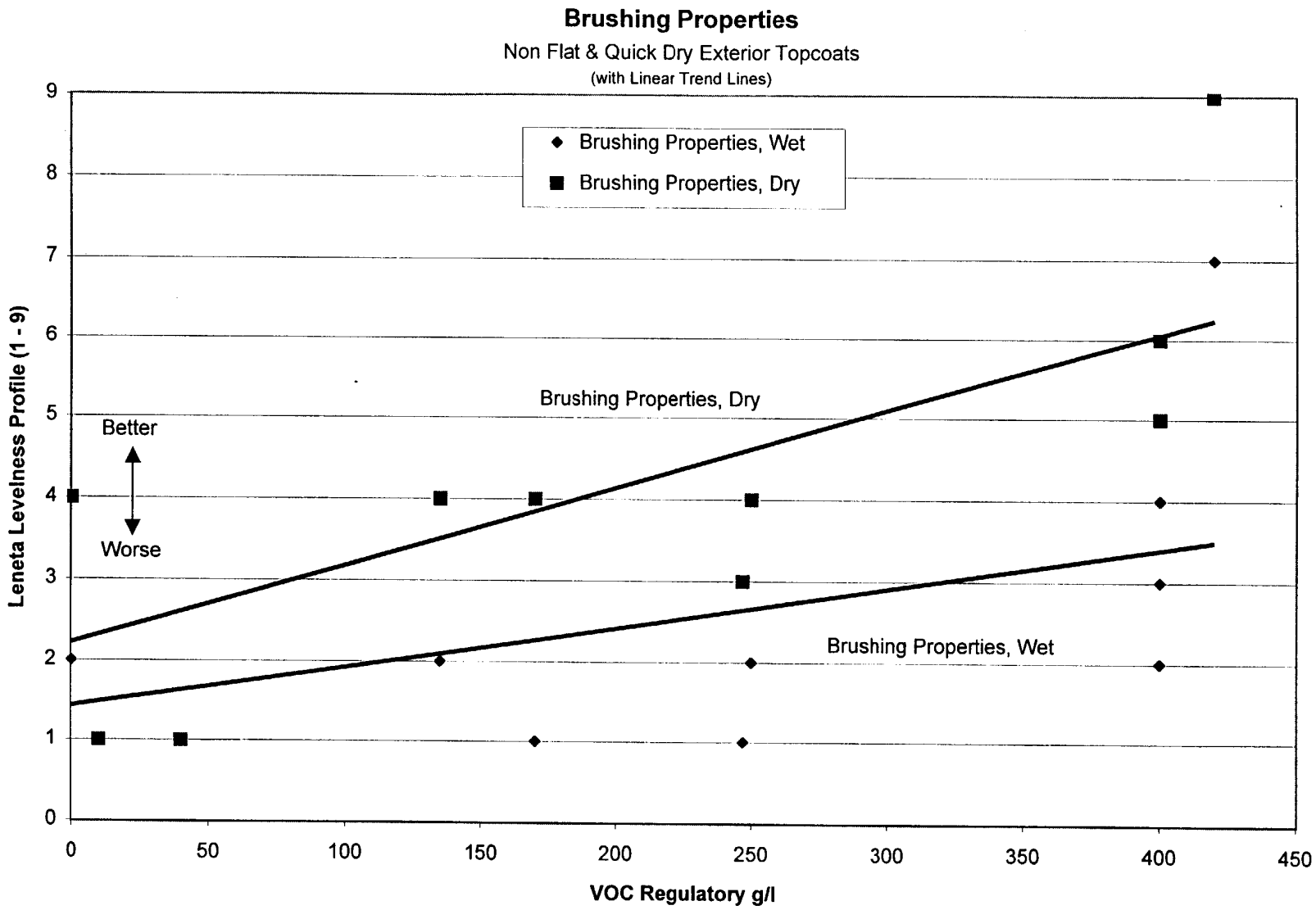
Comments:

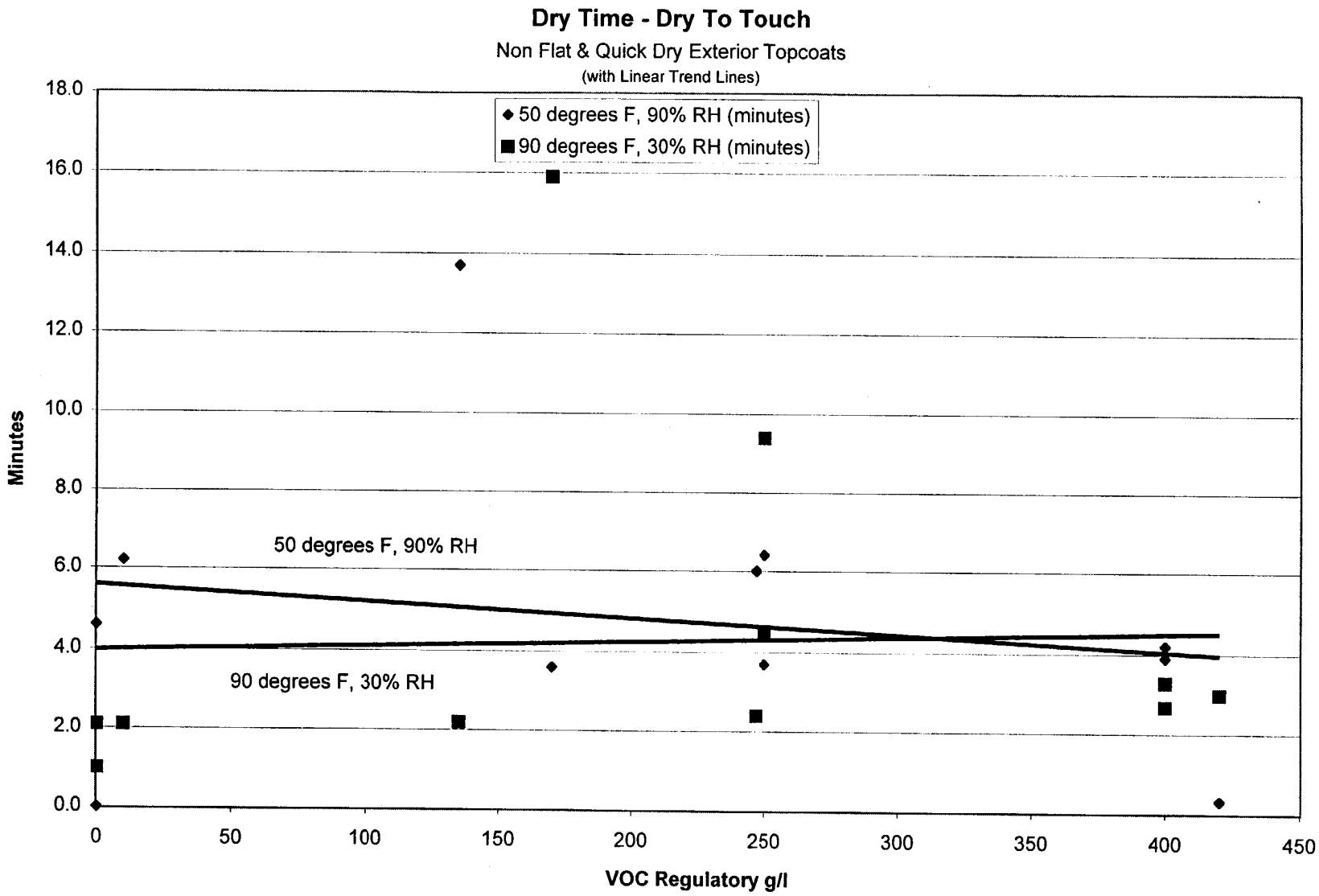
Overall, low VOC coatings exhibited similar performance to high VOC coatings. Low VOC coatings did exhibit significantly lower performance for leveling compared to high VOC coatings.

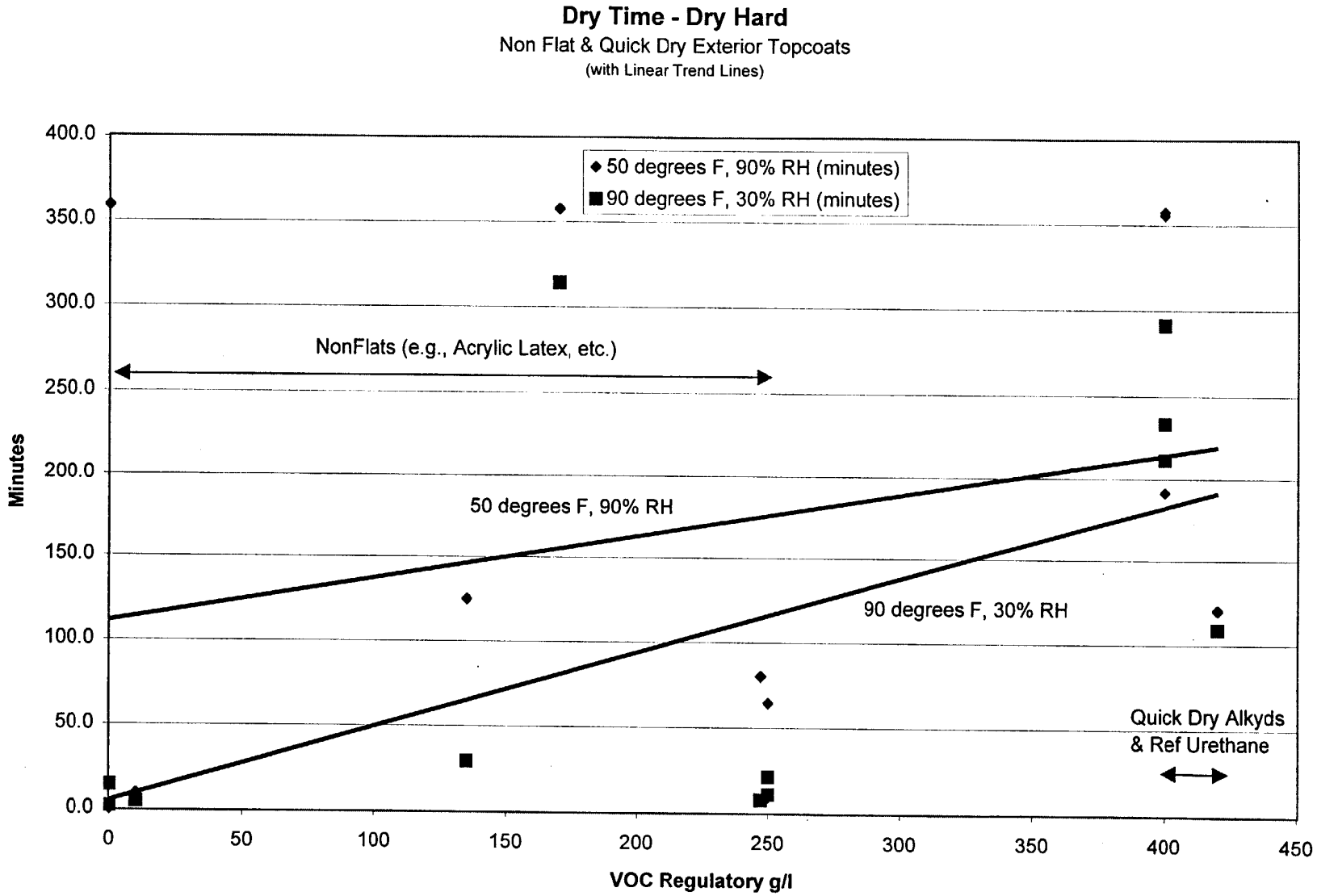
Nonflat Topcoat and Quickdry Topcoat - Exterior

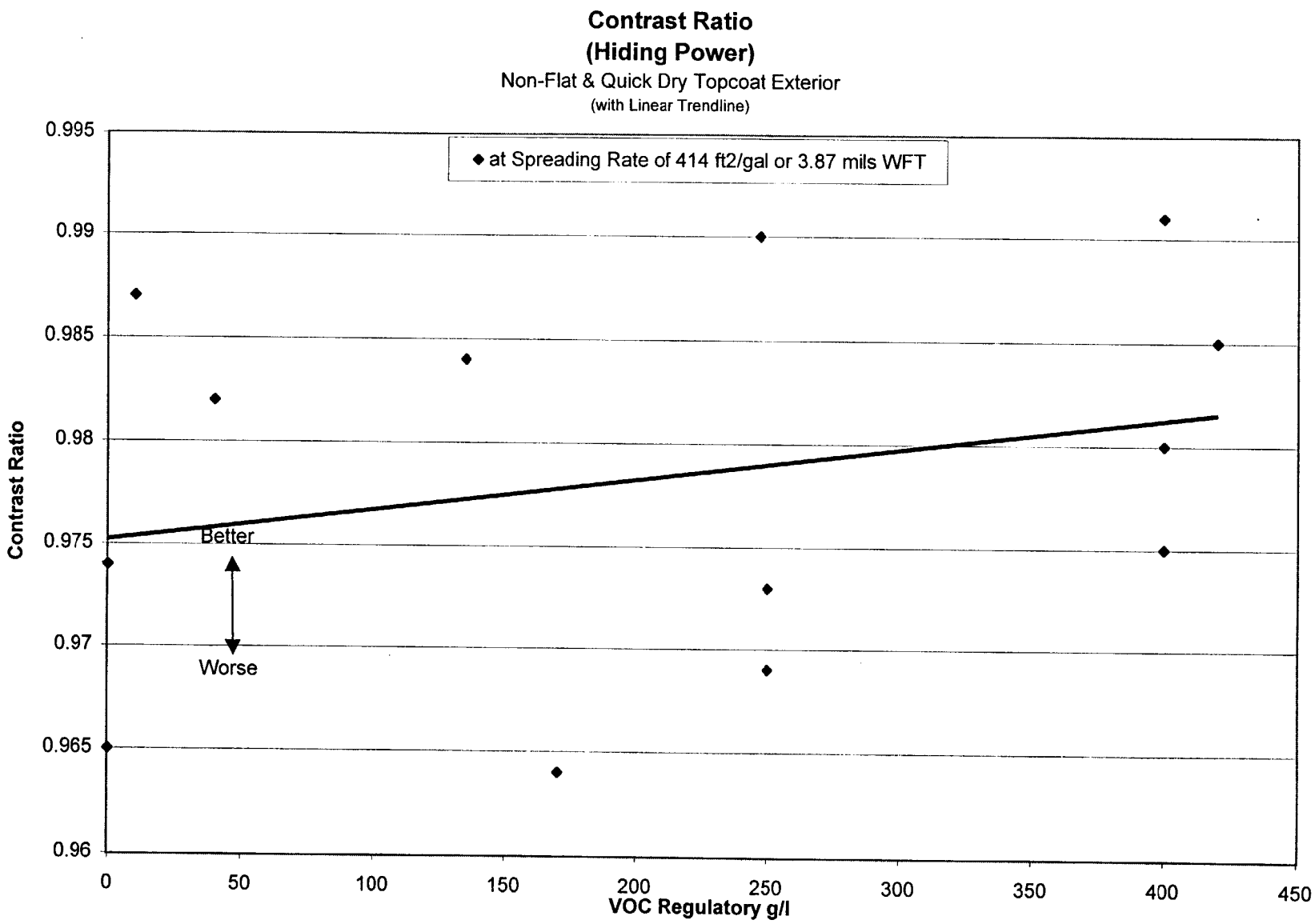
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
215	30	2	Urethane	T	1
213	247	1	Acrylic Latex	T	1
206	135	1	Acrylic	T	1
102	400	1	Alkyd	T	1
10	420	2	Urethane	T	1
218	100	1	(blank)	T	1
237	250	1	(blank)	T	1
201	0	1	Acrylic Latex	T	1
210	0	1	Acrylic emulsion	T	1
217	<250	1	Acrylic emulsion	T	1
112	<400	1	Alkyd	T	1
216	<10	1	?Copolymer latex	T	1
110	400	1	Alkyd	T	1
Grand Total					13

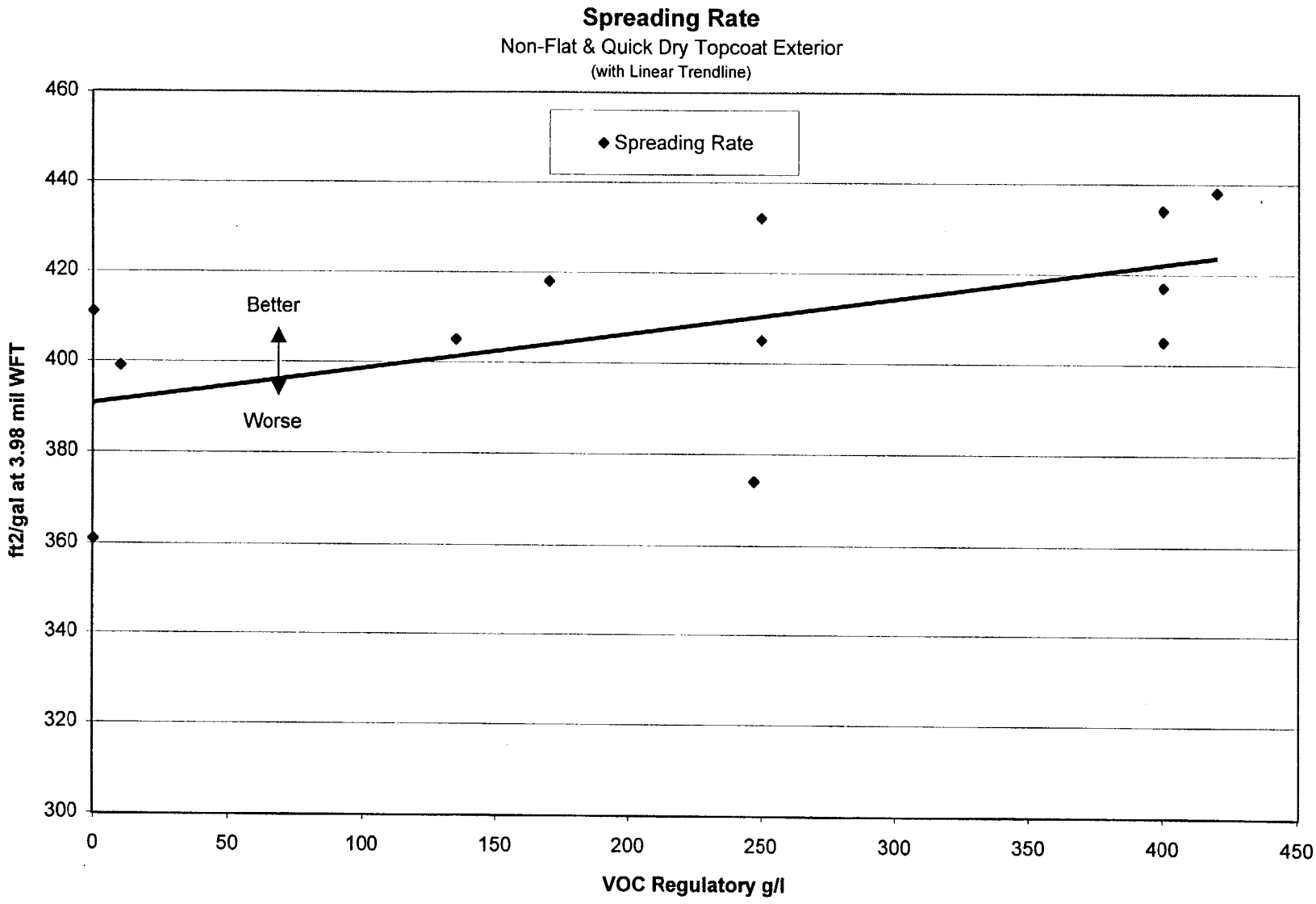
Single component coatings = 11 Multi-component coatings = 2

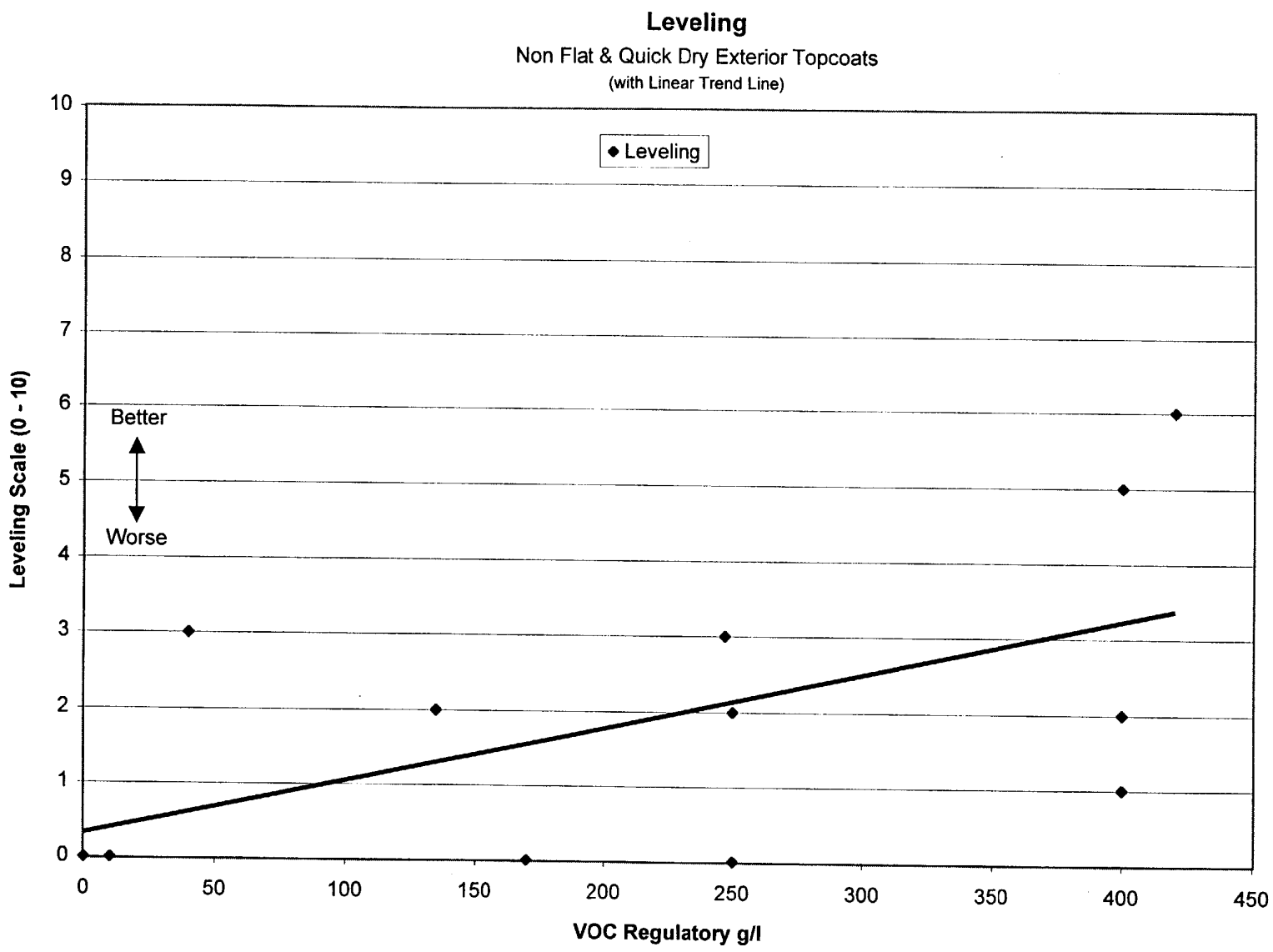

Brushing Properties
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Lines)
Brushing Properties, Wet
Brushing Properties, Dry
Brushing Properties, Dry
Brushing Properties, Wet
Better
Worse
Leneta Levelness Profile (1 - 9)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
0
50
100
150
200
250
300
350
400
450

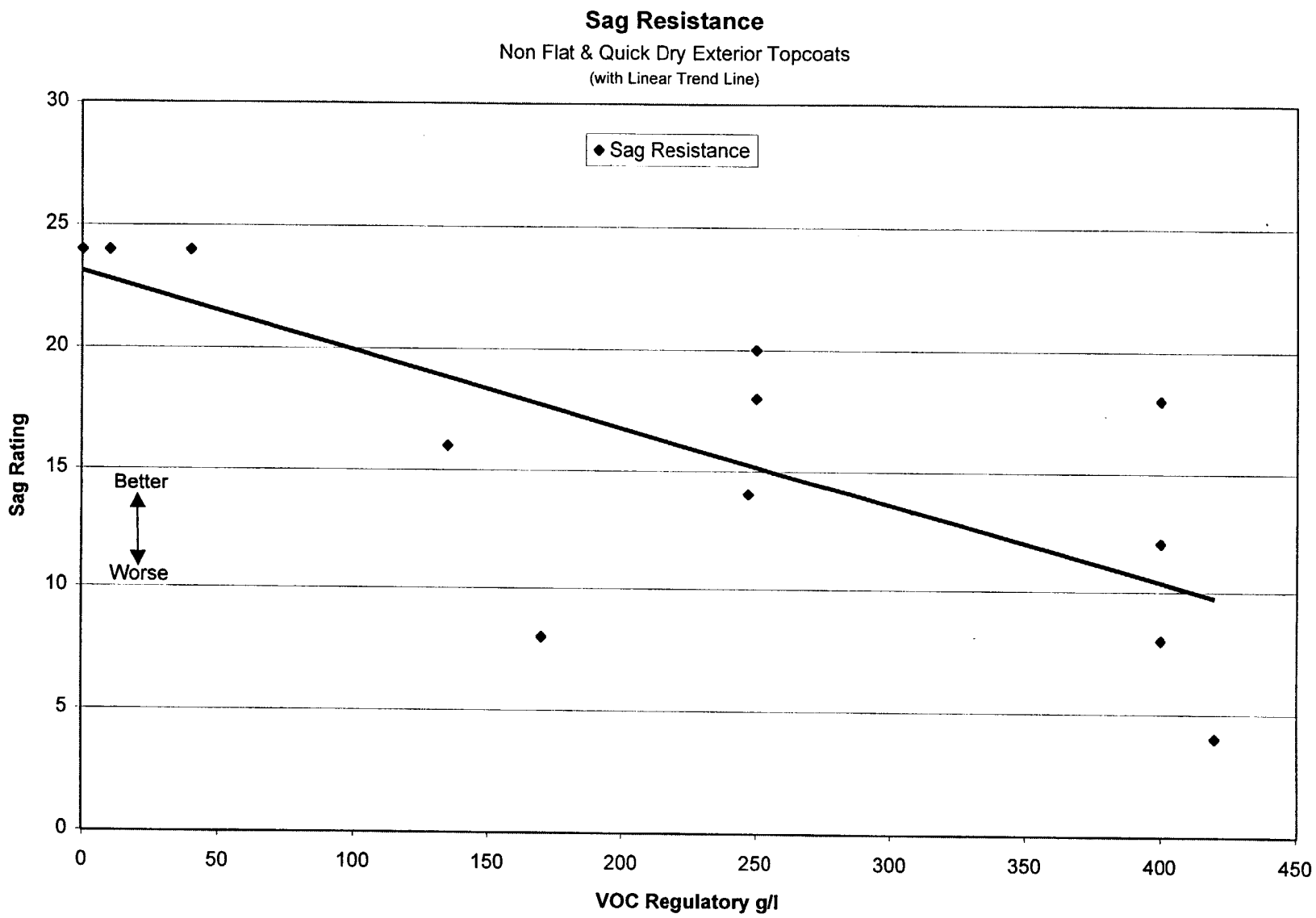

Dry Time - Dry To Touch
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
50 degrees F, 90% RH
90 degrees F, 30% RH
Minutes
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

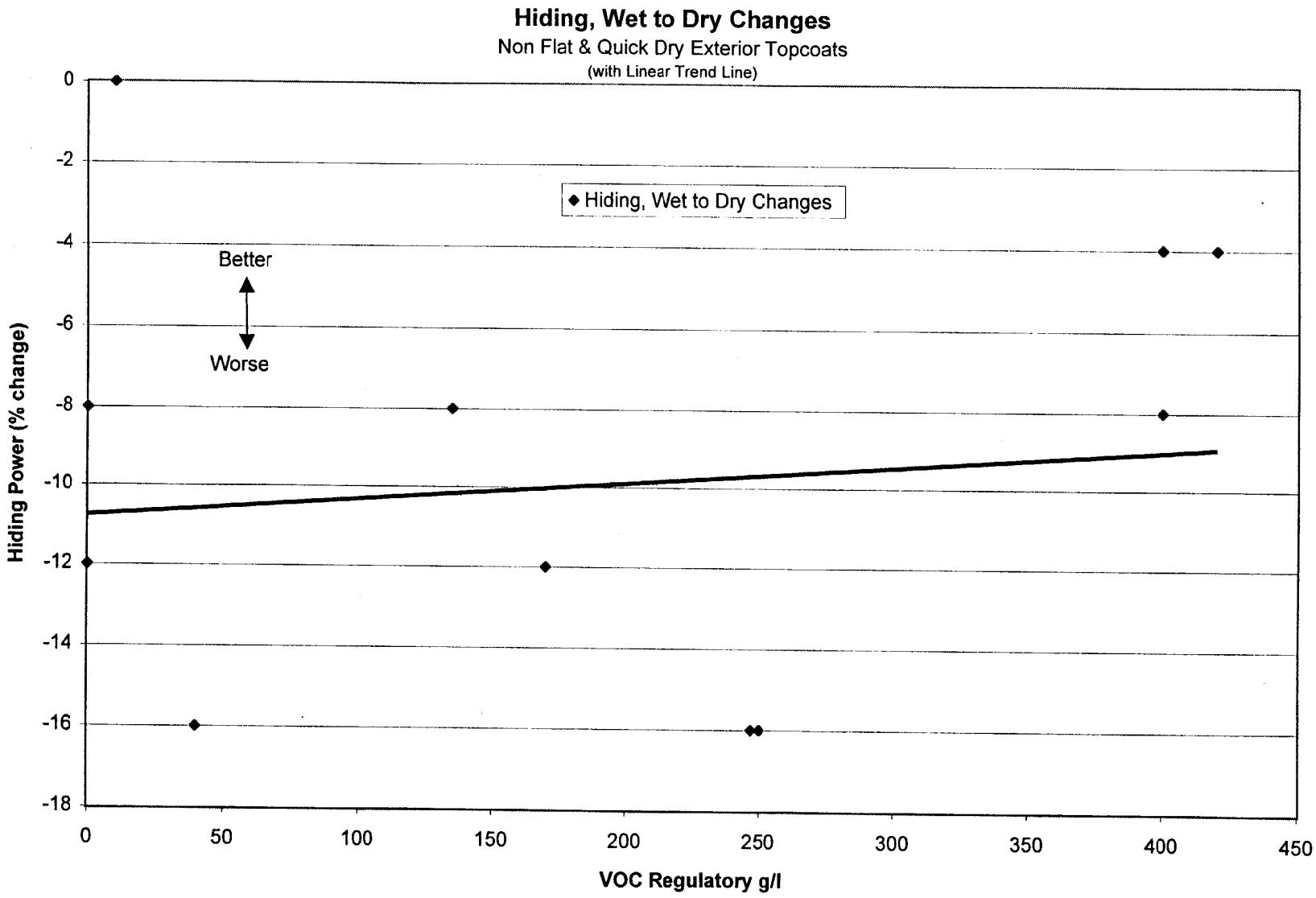

Dry Time - Dry Hard
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Lines)
50 degrees F, 90% RH (minutes)
90 degrees F, 30% RH (minutes)
NonFlats (e.g., Acrylic Latex, etc.)
50 degrees F, 90% RH
90 degrees F, 30% RH
Quick Dry Alkyds
& Ref Urethane
Minutes
VOC Regulatory g/l
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
0
50
100
150
200
250
300
350
400
450

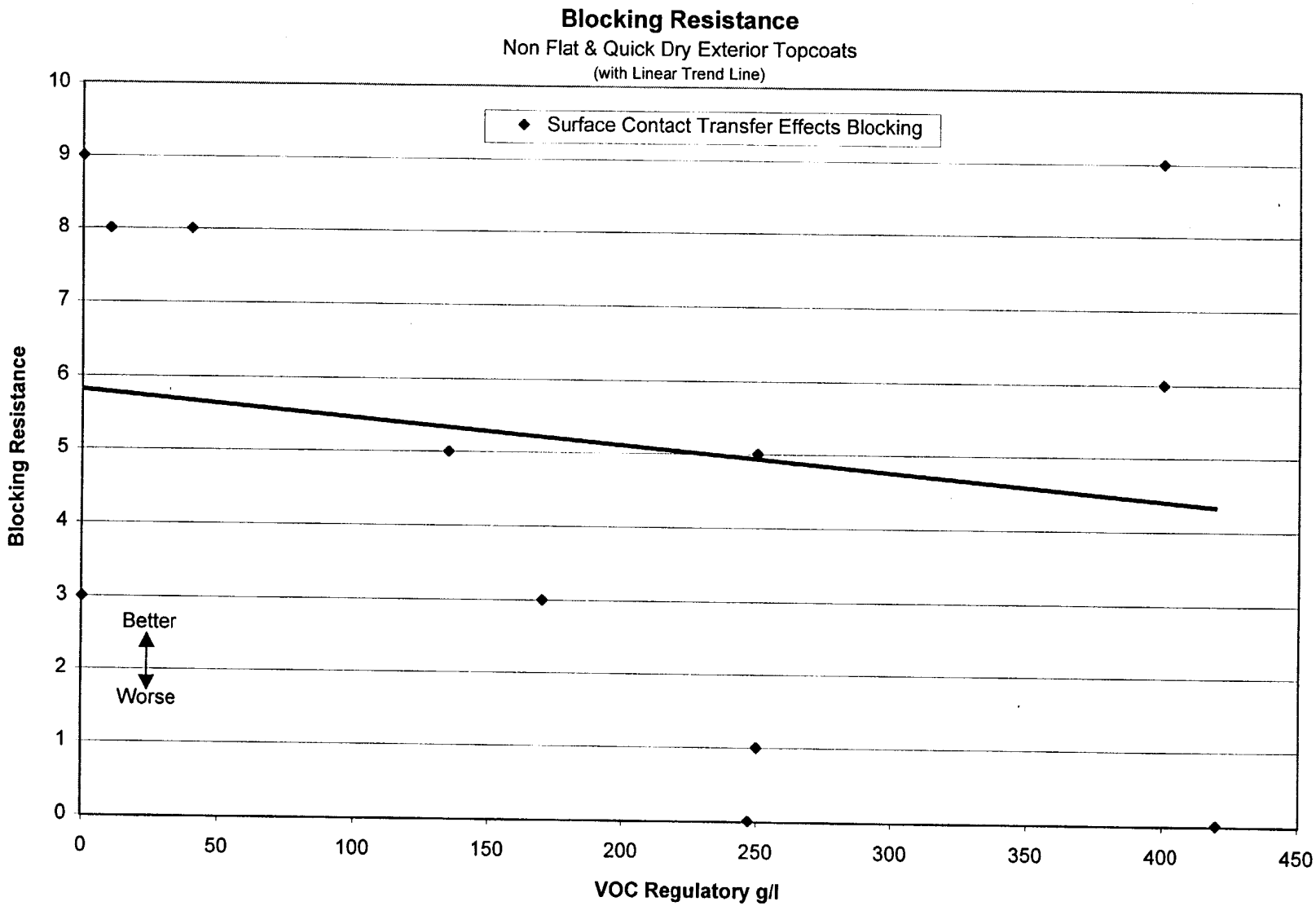

Contrast Ratio
(Hiding Power)
Non-Flat & Quick Dry Topcoat Exterior
(with Linear Trendline)
at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
Better
Worse
Contrast Ratio
0.995
0.99
0.985
0.98
0.975
0.97
0.965
0.96
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

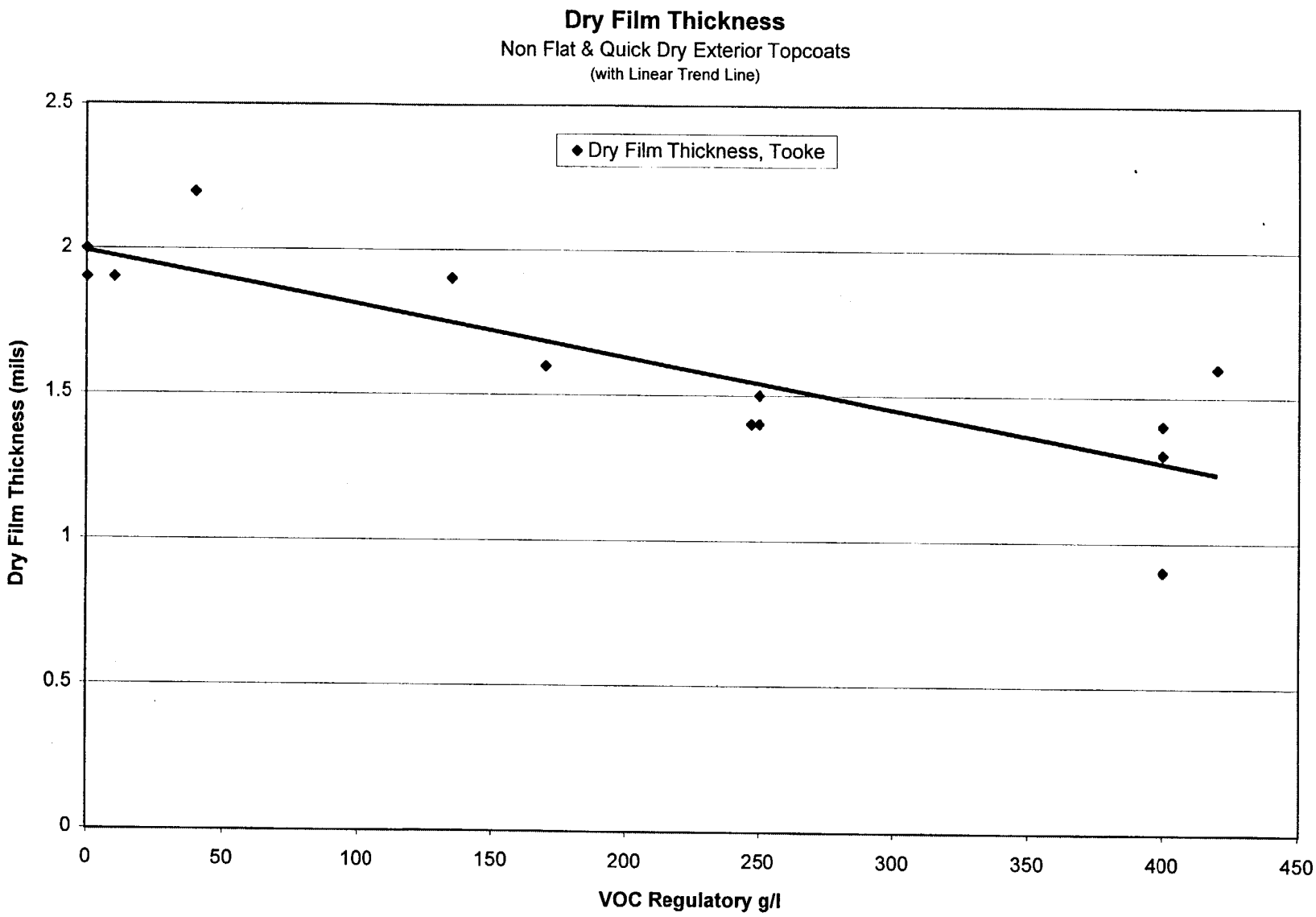

Spreading Rate
Non-Flat & Quick Dry Topcoat Exterior
(with Linear Trendline)
Spreading Rate
Better
Worse
ft2/gal at 3.98 mil WFT
460
440
420
400
380
360
340
320
300
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Leveling
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Line)
Leveling
Better
Worse
Leveling Scale (0 - 10)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
300
350
400
450


Sag Resistance
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Line)
Sag Resistance
Better
Worse
Sag Rating
VOC Regulatory g/l
0
5
10
15
20
25
30
0
50
100
150
200
250
300
350
400
450


Hiding, Wet to Dry Changes
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Line)
Hiding, Wet to Dry Changes
Better
Worse
Hiding Power (% change)
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Blocking Resistance
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Line)
Surface Contact Transfer Effects Blocking
Blocking Resistance
10
9
8
7
6
5
4
3
2
1
0
Better
Worse
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Dry Film Thickness
Non Flat & Quick Dry Exterior Topcoats
(with Linear Trend Line)
Dry Film Thickness, Tooke
Dry Film Thickness (mils)
2.5
2
1.5
1
0.5
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

Nonflat Topcoat (NFT) and Quick Dry Topcoat (QDT) - EXTERIOR Data table

Protocol Test Number							3.1c	2.1	2.1	2.2		2.2		3.14
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Nonvolatile by Weight	Coarse Particles	Density	Wet Penetration test (Gordon)	Brushing Properties, Wet	Brushing Properties, Dry	Dry time, Dry to Touch - One Part Coatings		Dry time, Dry Hard - One Part Coatings		Contrast Ratio (Cw) Hiding Power
Units		g/l		%	Size in Microns	lbs/gal	Halo Ring, 2r mm	Leneta Levelness Profile, 1 - 9	Leneta Levelness Profile, 1 - 9	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	50 degrees F, 90% RH (minutes)	90 degrees F, 30% RH (minutes)	at Spreading Rate of 414 ft2/gal or 3.87 mils WFT
201	NFT1	0	Acrylic Latex	53.1	88	10.31	no halo	4	4	0.0	2.1	0.0	2.1	0.974
210	NFT8	0	Acrylic Emulsion	46.4	40	10.74	no halo	2	4	4.6	1.0	358.9	14.7	0.965
216	NFT14	10	Copolymer Latex	55.1	100	10.83	2	1	1	6.2	2.1	9.5	4.8	0.987
215	NFT13	40	Two-Part Urethane	59.2	80	10.93	no halo	1	1	[1]	[1]	[1]	[1]	0.982
206	NFT5	135	Acrylic Latex/Emulsion	54.0	30	11.12	3	2	4	13.7	2.2	124.7	29.5	0.984
218	NFT16	170	Alkyd, Epoxied Drying Oils	85.7	36	9.74	no halo	1	4	3.6	15.9	357.6	314.1	0.964
213	NFT11	247	Acrylic Latex	43.9	50	10.14	no halo	1	3	6.0	2.4	80.1	7.8	0.99
217	NFT15	250	Acrylic Emulsion	41.8	12	9.82	2	2	4	3.7	4.5	64.3	21.3	0.973
237	NFT19	250	Acrylic Latex	43.5	60	10.24	0.5	2	4	6.4	9.4	9.1	10.9	0.969
102	QDT1	400	Alkyd	64.4	16	9.63	no halo	2	6	4.2	2.7	355.5	212.1	0.991
110	QDT3	400	Alkyd	64.6	36	9.78	no halo	4	6	3.9	2.7	357.6	233.7	0.98
112	QDT4	400	Alkyd	64.5	20	10.23	no halo	3	5	4.2	3.3	291.3	191.4	0.975
10	REF	420	Urethane	73.6	none	11.10	N/A	7	9	3.0	0.3	120.3	109.2	0.985

[1] Insufficient amount of coating to test

Nonflat Topcoat (NFT) and Quick Dry Topcoat (QDT) - EXTERIOR Data table

Protocol Test Number		3.14	2.4	2.7	2.10	3.21						
Coating Reference Number	Coating Reference Designator	Spreading Rate	Leveling	Sag Resistance	Hiding, Wet to Dry Changes	Surface Contact Transfer Effects Blocking	Wet Film Thickness			Wet Film/Dry Film/WW & Bar Applicator Gap Relationships		
							WW Rod #30	WW Rod #48	WW Rod #80	WW Rod #30	WW Rod #48	WW Rod #80
Units		ft2/gal at 3.87 mil WFT	Scale, 0-10	Notch Clearance in mils	Hiding Indes Change between the Wet and Dry State		mils	mils	mils	mils	mils	mils
201	NFT1	411	0	>24	-12	3	4.5	5.5	7.5	1.6	2.2	2.9
210	NFT8	361	0	>24	-8	9	3.5	5.5	7.5	1.5	2.0	2.4
216	NFT14	399	0	>24	0	8	4.5	6.5	7.5	2.0	3.1	3.3
215	NFT13	[1]	3	>24	-16	8	5.5	6.5	7.5	1.6	2.2	3.3
206	NFT5	405	2	16	-8	5	4.5	6.5	7.5	2.0	2.3	3.2
218	NFT16	418	0	8	-12	3	4.5	5.5	7.5	2.4	3.6	4.4
213	NFT11	374	3	14	-16	0	4.5	4.5	8.5	1.5	1.5	2.6
217	NFT15	405	0	18	-16	5	4.5	6.5	8.5	1.7	1.7	2.1
237	NFT19	432	2	20	-16	1	4.5	5.5	7.5	1.0	1.1	1.7
102	QDT1	434	5	8	-8	6	5.5	5.5	8.5	1.5	1.5	3.6
110	QDT3	417	2	18	-8	9	4.5	5.5	11.5	1.8	2.1	4.3
112	QDT4	405	1	12	-4	9	5.5	6.5	8.5	1.7	2.2	3.7
10	REF	438	6	<4	-4	N/A	4.5	6.5	8.5	1.2	2.5	3.4

[1] Insufficient amount of coating to test

Nonflat Topcoat (NFT) and Quick Dry Topcoat (QDT) - EXTERIOR Data table

Protocol Test Number		3.2	3.2	3.10	3.9
Coating Reference Number	Coating Reference Designator	Appearance and Finish, Drawdown Charts	Appearance and Finish, Coated Panels	Dry Film Thickness, Tooke	Film Flexibility
Units				mils	
201	NFT1	smooth, gloss	smooth, semi-gloss	1.9	pass
210	NFT8	smooth, flat	smooth, flat	2	pass
216	NFT14	rough, flat	rough, satin-flat	1.9	pass
215	NFT13	uneven, semi-gloss	no paint	2.2	no paint
206	NFT5	smooth, flat	smooth, satin-flat	1.9	pass
218	NFT16	smooth, semi-gloss	wrinkled, semi-gloss	1.6	pass
213	NFT11	smooth, gloss	smooth, semi-gloss	1.4	pass
217	NFT15	smooth, gloss	smooth, satin	1.5	pass
237	NFT19	smooth, gloss	smooth, satin	1.4	pass
102	QDT1	smooth, gloss	smooth, gloss	0.9	pass
110	QDT3	smooth, gloss	smooth, semi-gloss	1.3	pass
112	QDT4	smooth, semi-gloss	smooth, semi-gloss	1.4	pass
10	REF	smooth, gloss	smooth, gloss	1.6	pass

Section 8: Nonflat System and Quick Dry System - Interior

	1st Coat	2nd Coat	3rd Coat
Total # manufactuers or brands	10	10	2
Single component coatings	7	14	2
Multi-component coatings	?	0	0
Total # coatings	14	14	2

Test Summary

Dry Film Thickness:

- Low VOC coatings exhibited lower dry film thicknesses compared to high VOC coatings.

Adhesion of Topcoats (Tape applied over X-cut):

- Low VOC coatings (<250 g/l) exhibited a higher failure rate compared to high VOC coatings.

Household Chemical Resistance (Exposure to 409 for 30 minutes at 75 °F & 50% RH):

- Softening - Low VOC coatings (<250 g/l) exhibited moderate softening compared to high VOC coatings with only slight softening.
- Swelling - Low VOC coatings exhibited similar performance.
- Adhesion - Low VOC coatings (<250 g/l) exhibited a higher failure rate compared to high VOC coatings.

Comments:

Low VOC coatings exhibited higher failure rates compared to higher VOC coatings for adhesion and softening tests performed. Low VOC coatings did exhibit similar performance in resistance to swelling.

Nonflat System and Quickdry System - Interior - 1st Coat / Primer

Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
333	189	(blank)	(blank)	P	1
327	0	1	Acrylic Latex	P	1
103	408	1	Alkyd	P	1
320	350	1	Alkyd	P	1
321	130	1	Acrylic Latex	P	1
329	0	(blank)	(blank)	P	1
330	350	(blank)	(blank)	P	1
334	0	(blank)	Acrylic Latex	P	1
326	0	(blank)	(blank)	P	1
111	400	1	Alkyd	P	1
315	0	1	Acrylic emulsion	P	2
324	350	1	Alkyd	P	1
323	350	(blank)	(blank)	U	1
Grand Total					14

Single component coatings = 7 Multi-component coatings = ?

Nonflat System and Quickdry System - Interior - 2nd Coat / Midcoat or Topcoat

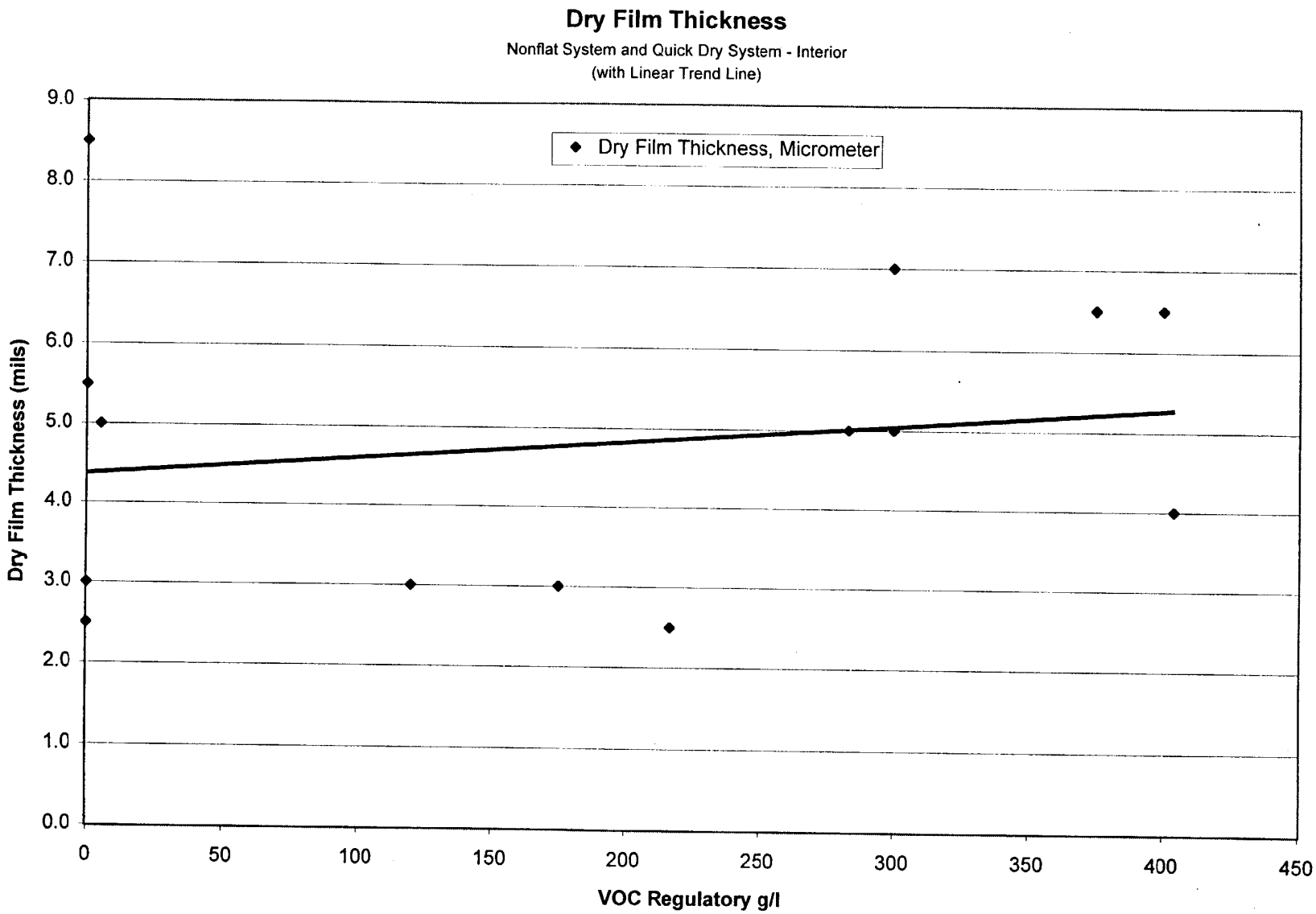
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
219	245	1	Acrylic Latex	T	1
212	240	1	PWP Latex	T	1
104	400	1	Alkyd	T	1
205	220	1	Acrylic Latex	T	1
204	250	1	Acrylic Latex	T	1
235	0	1	(blank)	T	1
214	250	1	Alkyd	T	1
238	0	1	(blank)	T	1
211	0	1	Acrylic Emulsion	T	1
111	400	1	Alkyd	P	1
216	<10	1	?Copolymer latex	T	1
203	0	1	Acrylic Emulsion	T	1
208	250	1	Vinyl Acrylic Latex	T	1
207	400	1	(blank)	T	1
Grand Total					14

Single component coatings = 14 Multi-component coatings = 0

Nonflat System and Quickdry System - Interior - 3rd Coat / Topcoat

Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
112	<400	1	Alkyd	T	1
208	250	1	Vinyl Acrylic Latex	T	1
Grand Total					2

Single component coatings = 2 Multi-component coatings = 0


Dry Film Thickness
Nonflat System and Quick Dry System - Interior
(with Linear Trend Line)
Dry Film Thickness, Micrometer
Dry Film Thickness (mils)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l

Nonflat System (NFS) and Quickdry System (QDS) - INTERIOR Data Table

Protocol Test Number					3.2	3.10	3.1a
System Reference Designator	Coating Reference Designators	Polymer Class	VOC Content	Reference VOC or average	Appearance and Finish, Coted Panels	Dry Film Thickness, Micrometer	Adhesion of Topcoats over New Suraces (Tape)
		Units	g/l	g/l		mils	pass/fail
NFS-02	334-238	Acrylic Latex/Copolymer Latex	0/0	0	ridged, semi-gloss	8.5	pass
NFS-03	315-203	Acrylic Latex/Acrylic Emulsion	0/0	0	uniform, flat	5.5	pass
NFS-10	326-211	Acrylic Latex/Acrylic Emulsion	0/0	0	unifrom, satin	2.5	failed to substrate
NFS-13	329-235	Acrylic Latex/Acrylic Latex	0/0	0	uniform, eggshell	3.0	test not possible
NFS-17	315-216	Acrylic/Copolymer Latex	0/10	5	ridged, satin-flat	5.0	pass
NFS-11	327-212	Acrylic Latex/PWP Latex	0/240	120	unifrom, satin-flat	3.0	failed to topcaot
NFS-06	321-205	Acrylic Latex/Acrylic Latex	130/220	175	uniform, semi-gloss	3.0	failed to substrate
NFS-19	333-219	Acrylic Latex/Acrylic Latex	189/245	217	uniform, satin	2.5	pass
NFS-08	324-208-208	Alkyd/Vinyl Acrylic Latex/Vinyl Acrylic Latex	350/250/250	283	unifrom, falt	5.0	test not possible
NFS-04	320-204	Alkyd/Acrylic Latex	350/250	300	unifrom, satin	5.0	pass
NFS-14	330-214	Alkyd/Alkyd	350/250	300	uniform, semi-gloss	7.0	pass
NFS-07	323-207	Alkyd/Alkyd	350/400	375	uniform, semi-gloss	6.5	pass
QDS-04	111-111-112	Alkyd/Alkyd/Alkyd	400/400/400	400	uniform, semi-gloss	6.5	pass
QDS-02	103-104	Alkyd/Alkyd	408/400	404	uniform, semi-gloss	4.0	pass

[1] Insufficient amount of coating to test

Nonflat System (NFS) and Quickdry System (QDS) - INTERIOR Data Table

Protocol Test Number		3.3								3.15
System Reference Designator	Coating Reference Designators	Household Chemical Resistance								Mildew and Fungus Resistance
		Delta CIE	Delta E313 Yellow	softening	swelling	Adhesion, Tape	Delta Gloss 20 degrees	Delta Gloss 60 degrees	Delta Gloss 85 degrees	
NFS-02	334-238	-0.98	0.28	moderate	slight	pass	-0.50	-1.00	1.60	10
NFS-03	315-203	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	10
NFS-10	326-211	-0.56	0.06	moderate	none	failure of topcaot	0.20	-1.60	-1.20	10
NFS-13	329-235	-1.32	-0.41	slight	none	pass	0.10	0.70	-1.00	10
NFS-17	315-216	-4.08	1.66	moderate	none	pass	0.20	1.80	6.70	10
NFS-11	327-212	-3.53	0.53	moderate	very slight	test not possible	3.30	14.10	11.50	10
NFS-06	321-205	4.72	2.79	slight	slight	failed to substrate	-3.10	-13.70	-14.80	10
NFS-19	333-219	-0.21	0.01	moderate	slight	pass	-3.70	-6.60	17.30	10
NFS-08	324-208-208	-9.57	1.86	moderate	none	test not possible	0.20	1.90	5.40	10
NFS-04	320-204	16.26	4.95	none	none	failed to substrate	6.20	10.60	6.60	10
NFS-14	330-214	21.61	-6.40	slight	slight	pass	-0.60	-1.50	0.70	10
NFS-07	323-207	15.05	4.46	slight	none	pass	0.60	0.00	1.00	10
QDS-04	111-111-112	17.11	5.08	slight	none	pass	2.20	4.40	3.60	10
QDS-02	103-104	22.67	6.65	none	none	pass	-0.50	-1.00	1.60	10

[1] Insufficient amount of coating to test

Section 9: Nonflat System and Quick Dry System - Exterior

	1st Coat	2nd Coat	3rd Coat
Total # manufactuers or brands	8	11	2
Single component coatings	10	11	1
Multi-component coatings	?	1	1
Total # coatings	12	12	2

Test Summary

Dry Film Thickness:

- Low VOC coatings exhibited lower dry film thickness compared to high VOC coatings.

Water Resistance (100 °F & 100% RH) - Scratch after two week exposure:

- Low VOC coatings exhibited similar performance to high VOC coatings.

Water Resistance (100 °F & 100% RH) - Gouge after two week exposure:

- Low VOC coatings exhibited similar performance to high VOC coatings.

Water Resistance (100 °F & 100% RH) - Adhesion tape test after two week exposure:

- Low and high VOC coatings exhibited poor performance after exposure. If the coatings were allowed a 24 hour dry time after exposure the low VOC coatings exhibited similar performance compared to high VOC coatings.

Comments:

Low VOC coatings exhibited similar performance to high VOC coatings.

Nonflat System and Quickdry System - Exterior - 1st Coat / Primer

Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
328	350	1	Alkyd	P	1
322	115	1	Acrylic Latex	P	2
101	440	1	Alkyd	P	1
331	250	(blank)	(blank)	P	1
301	1	1	Copolymer Latex	P	1
325	0	(blank)	(blank)	P	1
111	400	1	Alkyd	P	2
315	0	1	Acrylic emulsion	P	1
109	450	1	Oil base	P	1
310	0	1	Acrylic Latex	P	1
Grand Total					12

Single component coatings = 10 Multi-component coatings = ?

Nonflat System and Quickdry System - Exterior - 2nd Coat - Midcoat / Topcoat

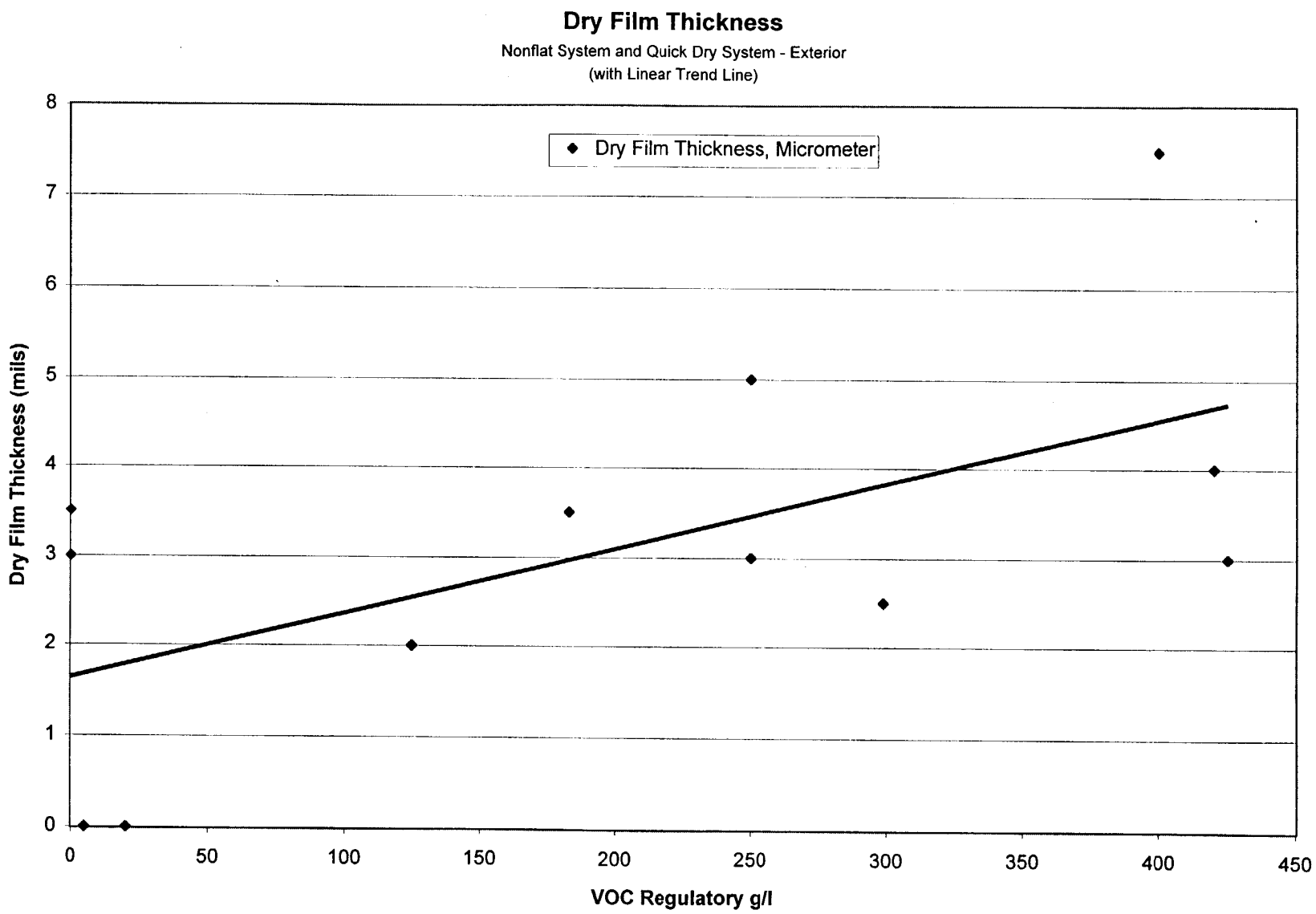
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
215	30	2	Urethane	T	1
213	247	1	Acrylic Latex	T	1
206	135	1	Acrylic	T	1
102	400	1	Alkyd	T	1
218	100	1	(blank)	T	1
237	250	1	(blank)	T	1
201	0	1	Acrylic Latex	T	1
210	0	1	Acrylic emulsion	T	1
111	400	1	Alkyd	P	1
217	<250	1	Acrylic emulsion	T	1
216	<10	1	?Copolymer latex	T	1
110	400	1	Alkyd	T	1
Grand Total					12

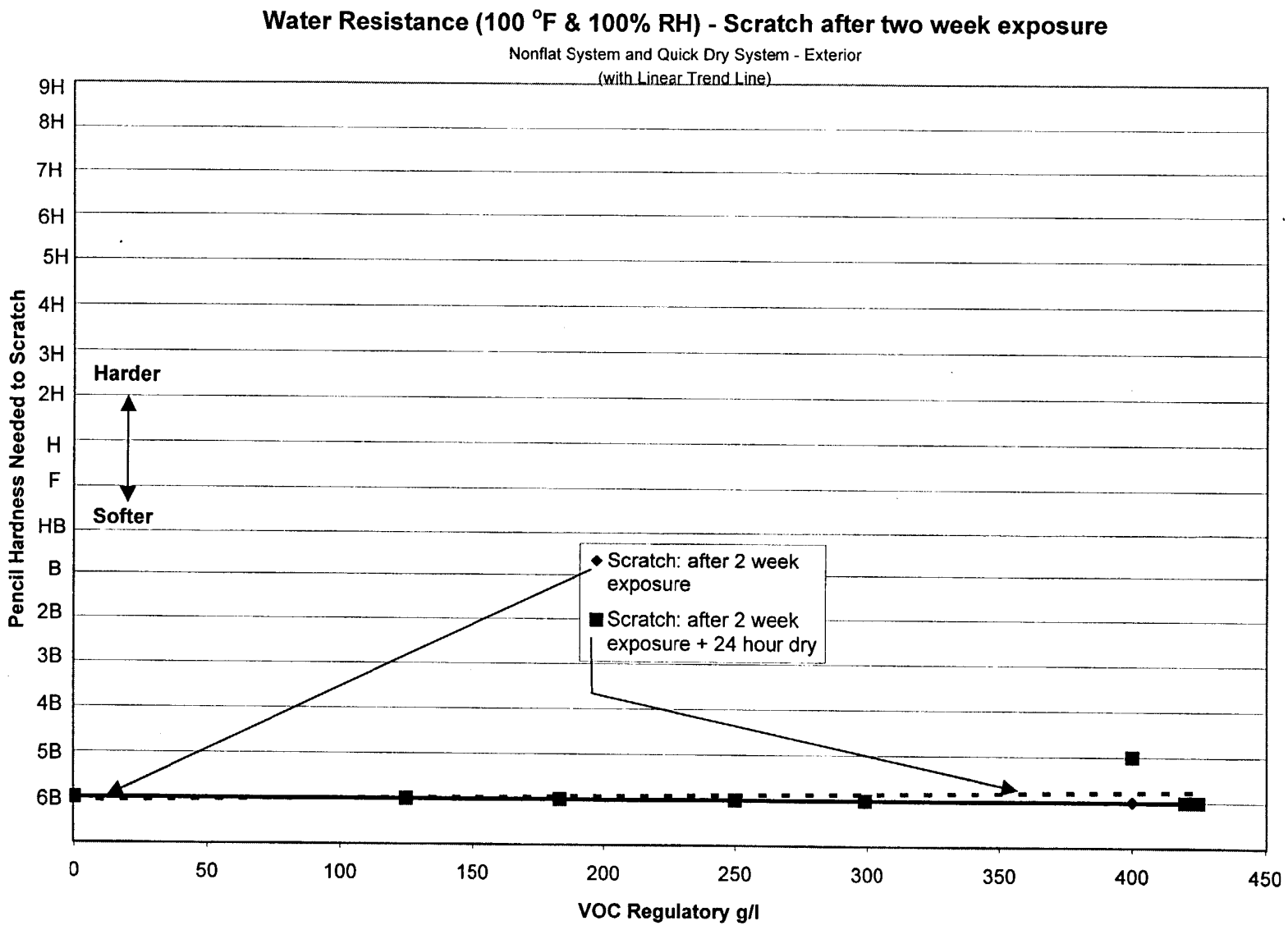
Single component coatings = 11 Multi-component coatings = 1

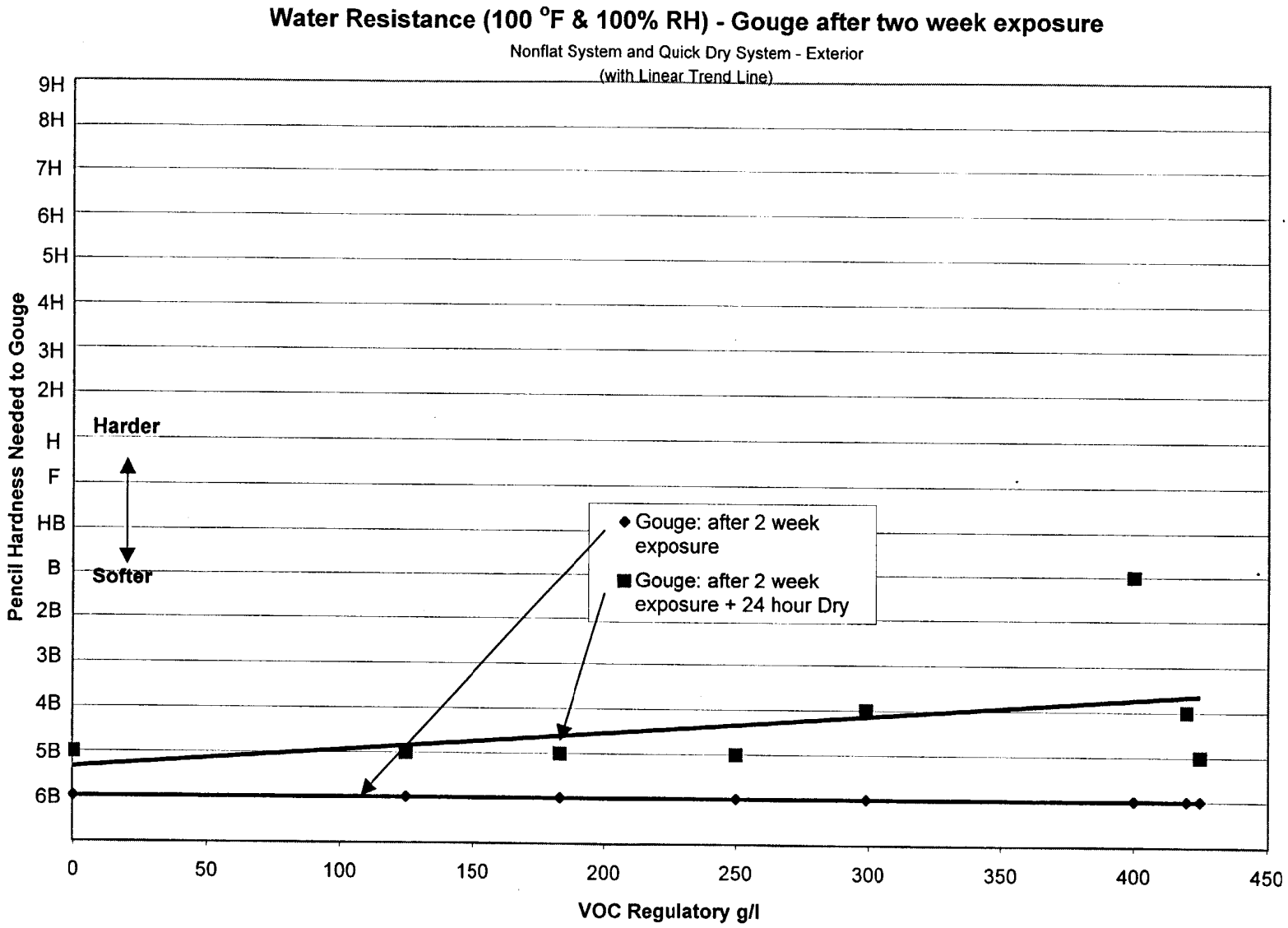
Nonflat System and Quickdry System - Exterior - 3rd Coat - Topcoat

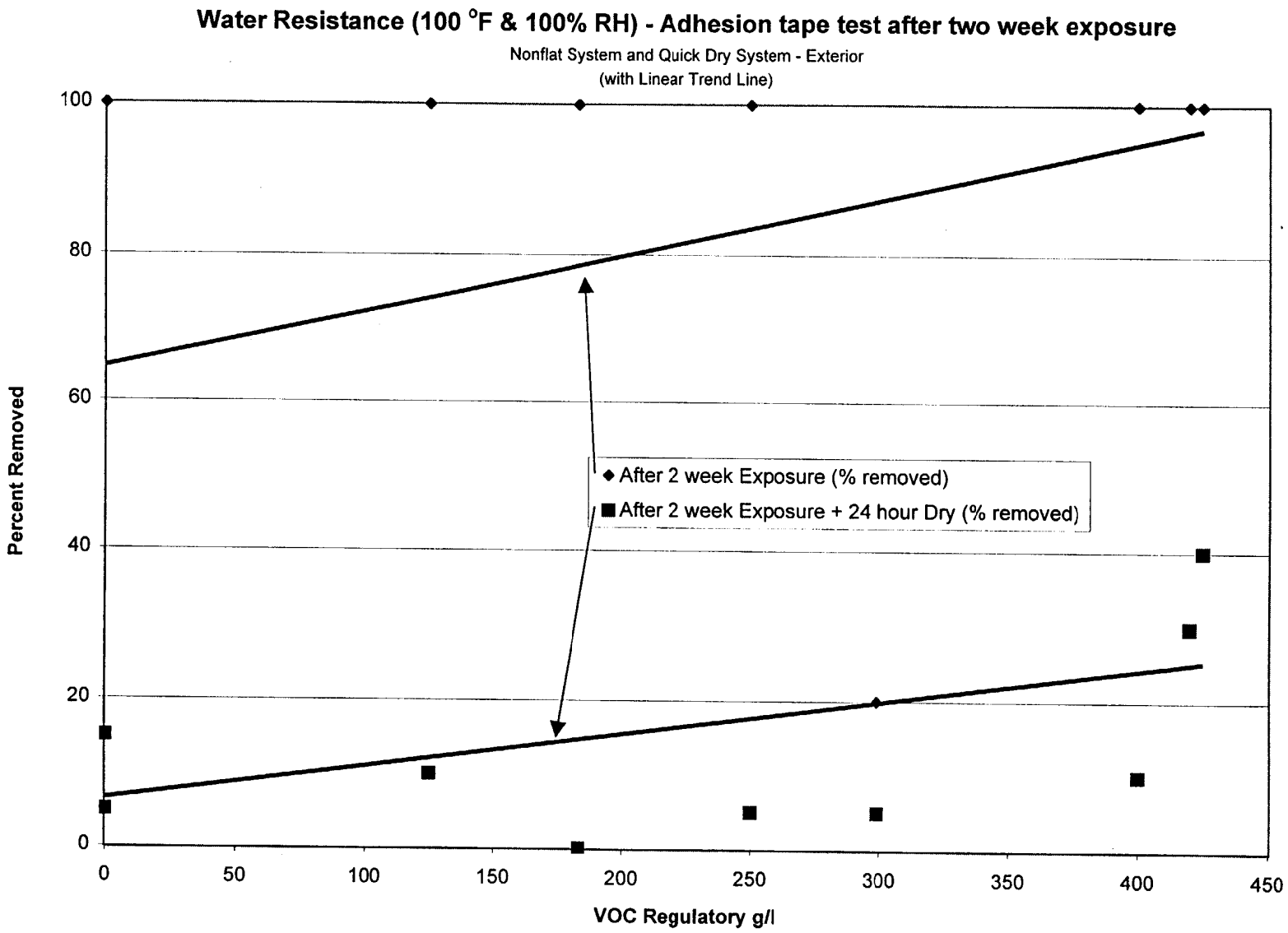
Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
215	30	2	Urethane	T	1
112	<400	1	Alkyd	T	1
Grand Total					2

Single component coatings = 1 Multi-component coatings = 1


Dry Film Thickness
Nonflat System and Quick Dry System - Exterior
(with Linear Trend Line)
Dry Film Thickness, Micrometer
Dry Film Thickness (mils)
VOC Regulatory g/l
0
1
2
3
4
5
6
7
8
0
50
100
150
200
250
300
350
400
450


Water Resistance (100 °F & 100% RH) - Scratch after two week exposure
Nonflat System and Quick Dry System - Exterior
(with Linear Trend Line)
Pencil Hardness Needed to Scratch
9H
8H
7H
6H
5H
4H
3H
2H
H
F
HB
B
2B
3B
4B
5B
6B
Harder
Softer
Scratch: after 2 week exposure
Scratch: after 2 week exposure + 24 hour dry
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Water Resistance (100 °F & 100% RH) - Gouge after two week exposure
Nonflat System and Quick Dry System - Exterior
(with Linear Trend Line)
Pencil Hardness Needed to Gouge
9H
8H
7H
6H
5H
4H
3H
2H
H
F
HB
B
2B
3B
4B
5B
6B
Harder
Softer
Gouge: after 2 week exposure
Gouge: after 2 week exposure + 24 hour Dry
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l


Water Resistance (100 °F & 100% RH) - Adhesion tape test after two week exposure
Nonflat System and Quick Dry System - Exterior
(with Linear Trend Line)
Percent Removed
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
VOC Regulatory g/l
After 2 week Exposure (% removed)
After 2 week Exposure + 24 hour Dry (% removed)

Nonflat System (NFS) and Quick Dry System (QDS) - EXTERIOR Data Table

Protocol Test Number					3.2	3.6	3.10			
System Reference Designator	Coating Reference Designators	Polymer Class	VOC Content	Reference VOC or average	Appearance and Finish, Coted Panels	Dirt Resistance, Dry	Dry Film Thickness, Micrometer	Delta gloss, Pretest-2 week		
		Units	g/l	g/l			mils	20 degrees	60 degrees	85 degrees
NFS-01	301-201	Vinyl Polymer Latex/Acrylic Latex	1/0	0	uniform, satin-flat		3	3.7	8.5	1.6
NFS-09	325-210	Acrylic Latex/Acrylic Emulsion	0/0	0	uniform, flat		3.5	0.1		
NFS-17	315-216	Acrylic/Copolymer Latex	0/10	5	smooth		N/A	[1]		
NFS-16	310-215-215	Acrylic Emulsion/Urethane/Urethane	0/30/30	20	N/A	N/A	N/A	N/A	N/A	N/A
NFS-05	322-206	Acrylic Latex/Acrylic Latex-Emulsion	115/135	125	ridged, flat		2	0	-0.5	-2.1
NFS-18	322-217	Acrylic Latex/Acrylic Emulsion	115/250	183	uniform, semigloss		3.5	10.8	10.3	6.3
NFS-15	331-237	Acrylic Latex/Acrylic Latex	250/250	250	satin-flat		3	1.2	10.4	4
QDNFS-01	111-218	Alkyd/Alkyd, Epoxied Drying Oils	400/100	250	some wrinkling at corners semigloss		5	26	33.8	10.1
NFS-12	328-213	Alkyd/Acrylic Latex	350/247	299	uniform, semi-flat		2.5	0.9	7.6	5.7
QDS-04	111-111-112	Alkyd/Alkyd/Alkyd	400/400/400	400	uniform, satin		7.5	4.7	7.4	1.7
QDS-01	101-102	Alkyd/Alkyd	440/400	420	uniform, high gloss		4	27.6	7.5	11.6
QDS-03	109-110	Oil Base/Alkyd	450/400	425	uniform, medium gloss		3	5.6	12.7	1.3

[1] Insufficient amout of coating to test

Nonflat System (NFS) and Quick Dry System (QDS) - EXTERIOR Data Table

Protocol Test Number		3.8												
System Reference Designator	Coating Reference Designators	Environmental Resistance												
		Delta gloss, Pretest-2 week + 24 hours			Delta CIE		Delta E313 Yellow		Hardness				Adhesion, Tape	
		20 degrees	60 degrees	85 degrees	pretest-2 week	pretest-2 week+ 24 hour dry	pretest-2 week	pretest-2 week+ 24 hour dry	Scratch: after 2 week exposure	Scratch: after 2 week exposure + 24 hour dry	Gouge: after 2 week exposure	Gouge: after 2 week exposure + 24 hour Dry	After 2 week Exposure (% removed).	After 2 week Exposure + 24 hour Dry (% removed)
NFS-01	301-201	4.8	11.4	5.1	1.16	0.88	0.33	0.41	<6B	<6B	<6B	5B	100%	15%
NFS-09	325-210	0.1			1.42	2.25	-0.71	-0.93	<6B	6B	<6B	5B	5%	5%
NFS-17	315-216	[1]			[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
NFS-16	310-215-215	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NFS-05	322-206	0	-0.6	-3.4	-1.57	-0.57	0.63	0.55	<6B	<6B	6B	5B	100%	10%
NFS-18	322-217	10.9	13.4	8.5	1.1	1.1	-0.16	0.05	<6B	<6B	<6B	5B	100%	0%
NFS-15	331-237	1.2	9.1	0.6	10.75	9.76	-3.15	-2.77	<6B	<6B	6B	5B	100%	5%
QDNFS-01	111-218	26.6	34.7	12.5	13.01	8.11	-4.07	-4.07	<6B	<6B	<6B	5B	100% Topcoat, 5% Primer	50% Topcoat, < 5% Primer
NFS-12	328-213	0.9	7.6	5.7	0.31	1.27	0.18	0.28	<6B	6B	<6B	4B	20%	5%
QDS-04	111-111-112	6.7	12.6	1.8	14.87	14.17	-3.95	-3.39	<6B	5B	<6B	B	100%	10%
QDS-01	101-102	33.4	8.2	8	3.52	1.62	-1.03	-0.26	<6B	<6B	<6B	4B	100% Topcoat, 5% Primer	30% Topcoat, 5% Primer
QDS-03	109-110	6.6	16.5	6.1	8.96	7.12	-2.42	-1.77	<6B	<6B	<6B	5B	100%	40%

[1] Insufficient amout of coating to test

Above values converted to numeric value only (6B=1, ...9H=17)

Nonflat System (NFS) and Quick Dry System (QDS) - EXTERIOR Data Table

Protocol Test Number		3.25c	3.25a
System Reference Designator	Coating Reference Designators	Weathering Resistance, Accelerated, Outdoor	Weathering Resistance, Outdoor, Wood
NFS-01	301-201		
NFS-09	325-210		
NFS-17	315-216		
NFS-16	310-215-215	N/A	N/A
NFS-05	322-206		
NFS-18	322-217		
NFS-15	331-237		
QDNFS-01	111-218		
NFS-12	328-213		
QDS-04	111-111-112		
QDS-01	101-102		
QDS-03	109-110		

[1] Insufficient amout of coating to test

Section 10: Water Proofing Sealer - Concrete

Total # manufactuers or brands	3
Single component coatings	4
Multi-component coatings	0
Total # coatings	4

Test Summary

Freeze / Thaw:

- Two coatings tested, one passed (208 g/l) and one failed (115 g/l).

Water Penetration (average time to leak thru face):

- Similar performance observed. One coating (208 g/l) exhibited significantly better performance compared with the other three coatings.

Water Penetration (% of face leaking after 4 hours):

- Similar performance observed. One coating (208 g/l) exhibited significantly better performance compared with the other three coatings.

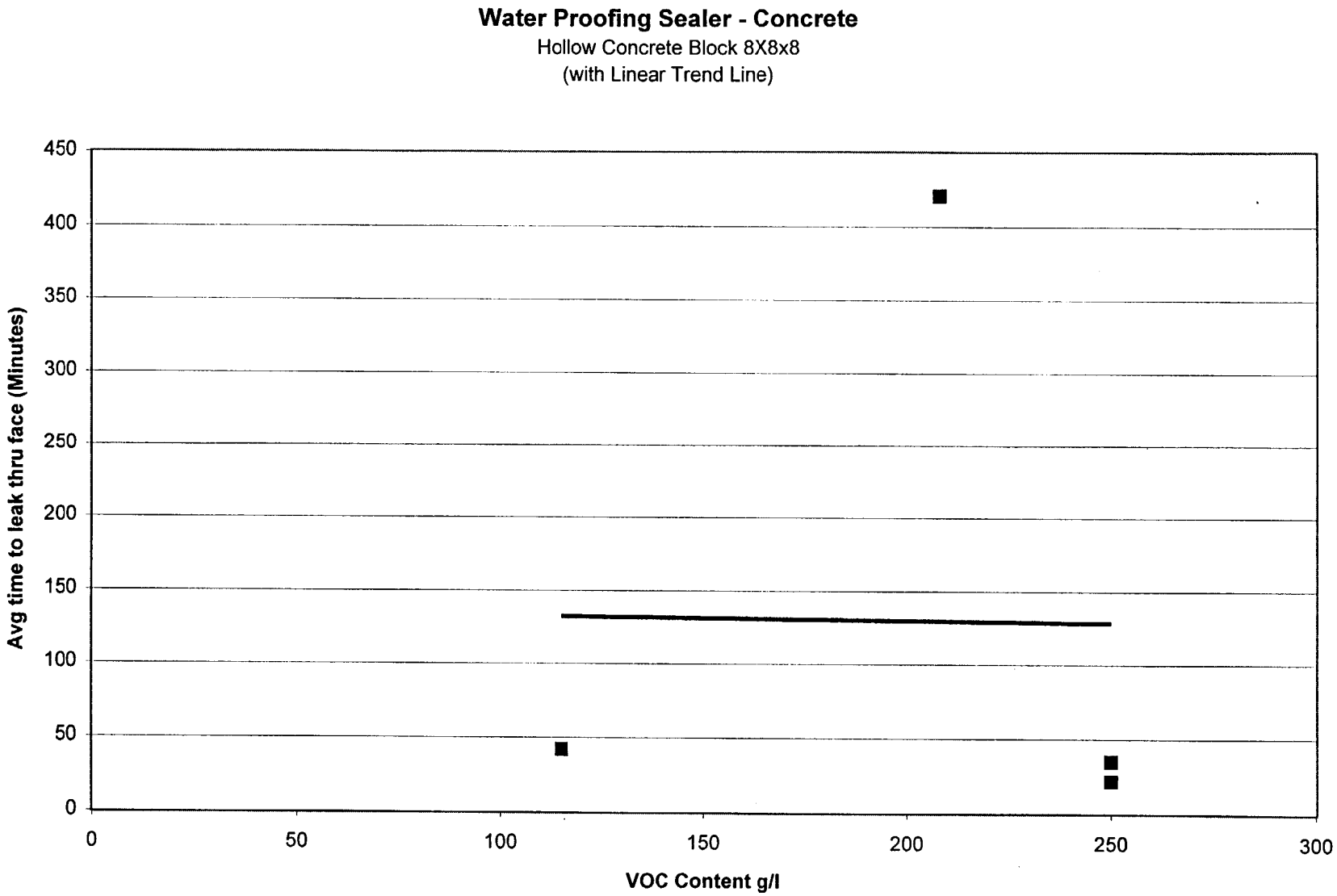
Comments:

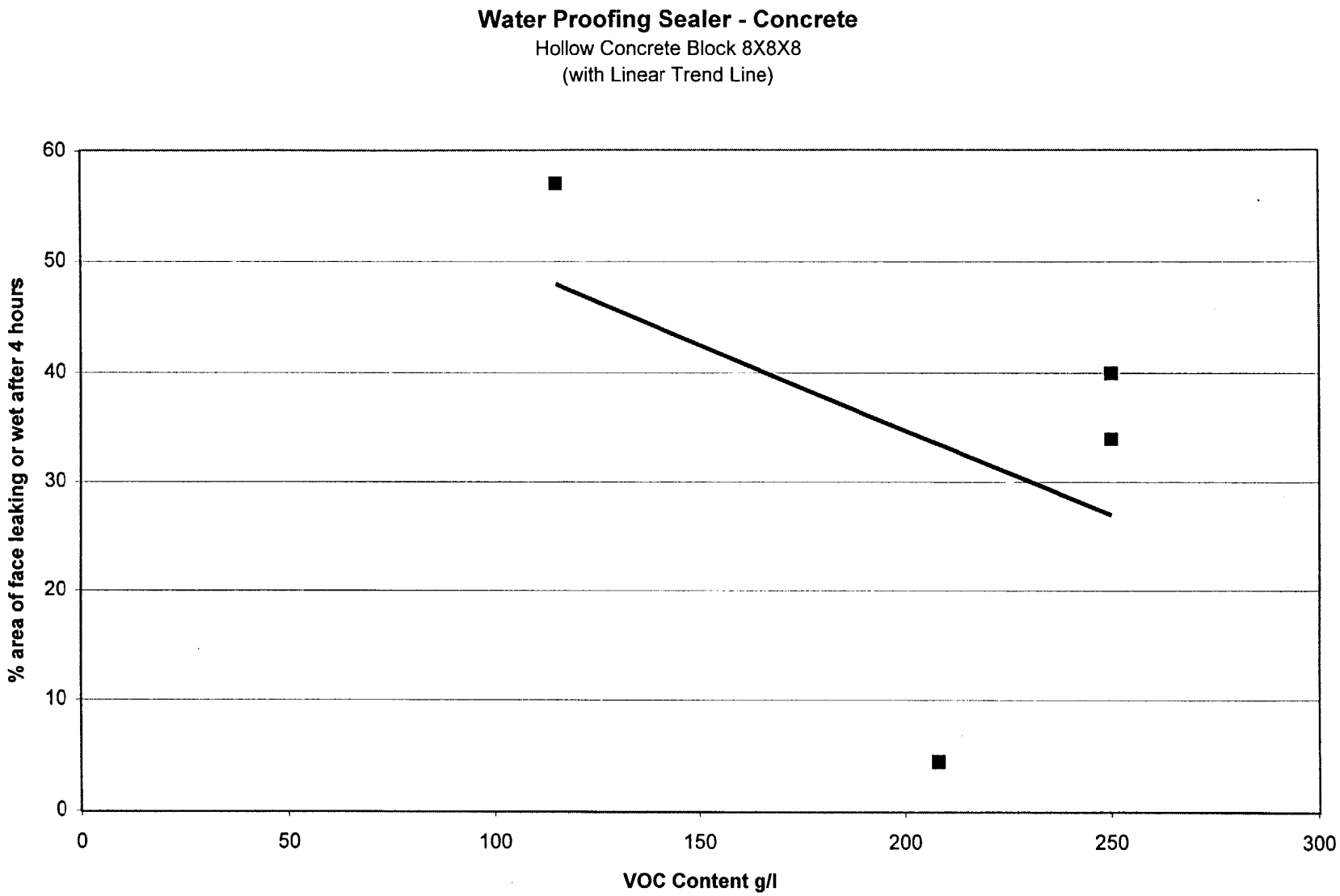
Overall, the coatings tested exhibited similar performance.

Water Proofing Sealer - Concrete

Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
413	<250	1	Acrylic Polymer	W	1
403	115	1	(blank)	W	1
404	208	1	(blank)	W	1
407	250	1	Acrylic emulsion + siloxane	W	1
Grand Total					4

Single component coatings = 4 Multi-component coatings = 0


Water Proofing Sealer - Concrete
Hollow Concrete Block 8X8x8
(with Linear Trend Line)
Avg time to leak thru face (Minutes)
450
400
350
300
250
200
150
100
50
0
0
50
100
150
200
250
300
VOC Content g/l


Water Proofing Sealer - Concrete
Hollow Concrete Block 8X8X8
(with Linear Trend Line)
% area of face leaking or wet after 4 hours
60
50
40
30
20
10
0
0
50
100
150
200
250
300
VOC Content g/l

Water Proofing Sealer Coating (WPSC) - CONCRETE Data Table

Protocol Test Number				1.3					2.3	3.2	3.16a	
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Freeze/Thaw		Nonvolatile by Weight	Percent Water by Karl fisher Method	Density	Viscosity, Brookfield, Initial	Appearance and Finish, Coted Panels	Penetration of Water Through Clear Repellant Coatings o Hollow Concrete Blocks	
Units		g/l		Overall Rating	Outcome	%	%	lbs/gal	centipoise		Average Time to Leak Through a Face (minutes)	% Area of Face Leaking or Wet at the End of Four Hours
403	WPSC2	115	Acrylic Polymer	4	fail	9	53.4	8.36	[1]	no change	42	57
404	WPSC3	208	Silicone	10	pass	5.5	92.8	8.57	10.7	no change	421	4.5
407	WPSC5	250	Acrylic Emulsion	N/A	N/A	9.7	91.7	8.37	N/A	no change	35	34
413	WPSC10	250	Acrylic Polymer	N/A	N/A	7.4	91.2	8.31	N/A	no change	22	40

[1] Too viscous to test

Section 11: Water Proofing Sealer - Wood

Total # manufactuers or brands	5
Single component coatings	6
Multi-component coatings	0
Total # coatings	6

Test Summary

Freeze / Thaw:

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

Water Repellent Efficiency:

- Low VOC coatings exhibited similar performance compared to high VOC coatings.

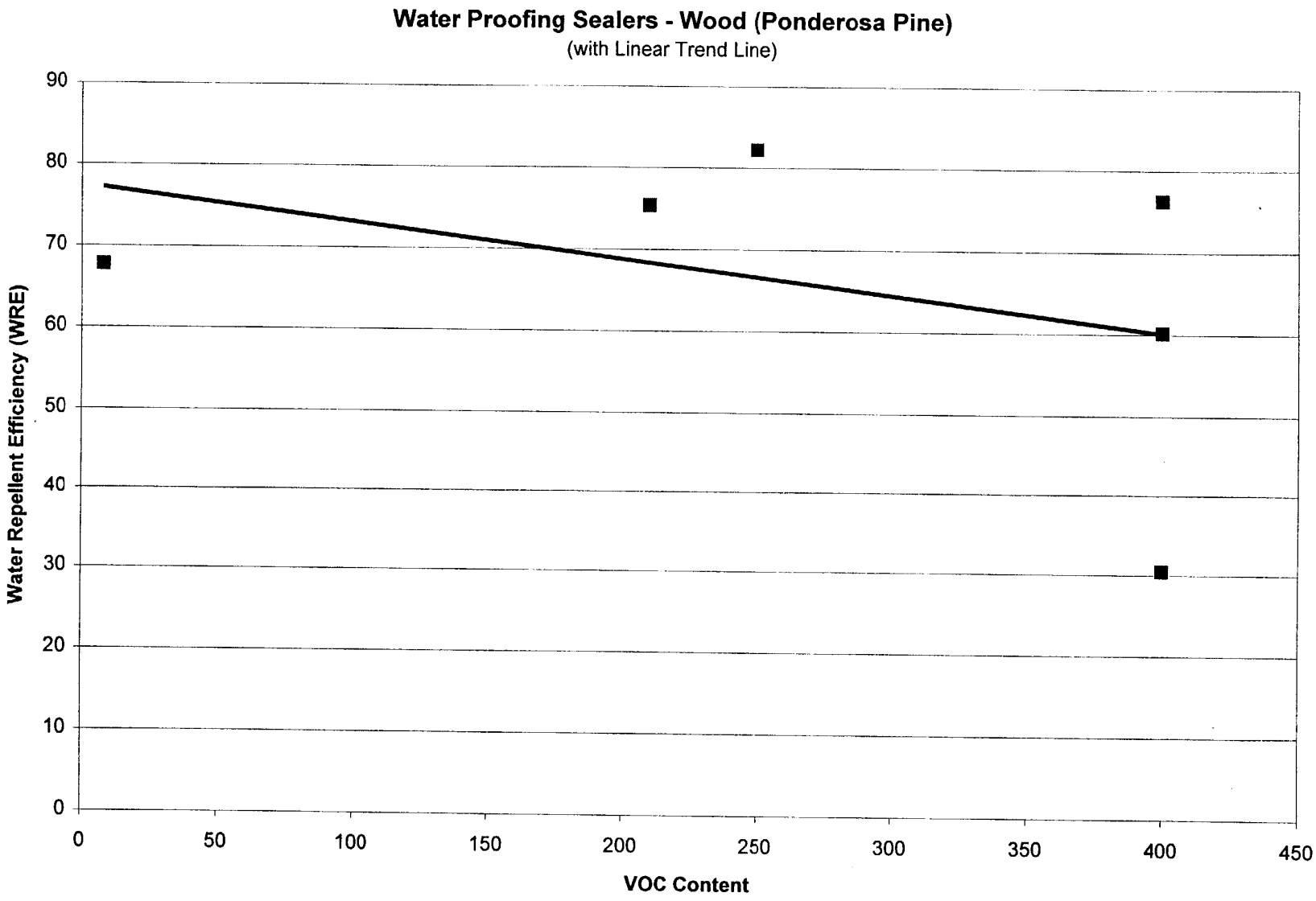
Comments:

Overall, low VOC coatings exhibited similar performance compared to high VOC coatings for the two performance tests conducted.

Water Proofing Sealer - Wood

Coating Reference Designator	VOC, g/l	Part	Polymer Class	Intended Application	Total
402	210	1	Linseed Oil	W	1
405	400	1	(blank)	W	1
408	8	1	Acrylic emulsion	W	1
410	400	1	(blank)	W	1
411	250	1	(blank)	W	1
409	400	1	(blank)	W	1
Grand Total					6

Single component coatings = 6 Multi-component coatings = 0


Water Proofing Sealers - Wood (Ponderosa Pine)
(with Linear Trend Line)
Water Repellent Efficiency (WRE)
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
450
VOC Content

Water Proofing Sealer Coating (WPSC) - WOOD Data Table

Protocol Test Number				1.3					2.3	3.2	3.16b
Coating Reference Number	Coating Reference Designator	VOC Content	Polymer Class	Freeze/Thaw		Nonvolatile by Weight	Percent Water	Density	Viscosity, Brookfield, Initial	Appearance and Finish, Coted Panels	Penetration of Water Through Clear Repellant Coatings on Wood
Units		g/l		Overall Rating	Outcome	%	%	lbs/gal	centipoise		Water Repellent Efficiency (WRE)
408	WPSC6	8	Acrylic Emulsion	10	pass	9.8	88.4	8.36	2	slightly darkened	67.8
402	WPSC1	210	Linseed Oil	10	pass	8.8	86.6	8.40	37.1	slightly darkened	75.4
411	WPSC9	250	Siloxane	N/A	N/A	13.2	N/A	6.83	N/A	slightly darkened	82.2
405	WPSC4	400	Acrylic Emulsion and Siloxane	10	pass	7.7	86.7	8.24	17	slightly darkened	30.5
409	WPSC7	400	High Carbon Resin Emulsion	10	pass	9.3	79.9	8.06	15	slightly darkened	76.3
410	WPSC8	400	Silane	N/A	N/A	6.2	N/A	6.88	N/A	slightly darkened	60.2