Kuo-Lon®

The Next Generation

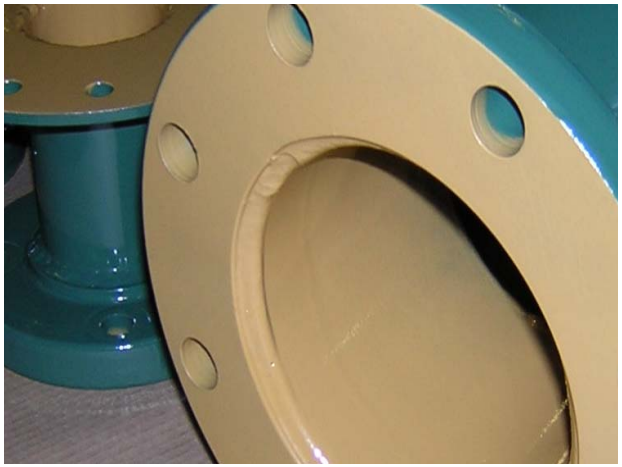
What is Kuo-Lon?

Kuo-Lon is a *"next generation" thermosetting modified epoxy* coating that combines *full-range chemical resistance* with *exceptional physical properties* in a thermally cured tank lining system. It is specifically formulated for holding such products as sour crude oil, petroleum products, potable water, wastewater, sewage, brines and chemicals where its inertness and corrosion resistance are advantageous. It meets FDA requirements for food contact surfaces and NSF requirements for drinking water contact surfaces.

What is Kuo-Lon?

- Performance Enhanced “Modified Epoxy”
- Proprietary To CST Industries
- 5 Years Of Research & Development
- Powder Based – 100% Solids – No Solvents
- Electrostatic Application For Precise Uniformity And Process Control
- Micro Bonded To The Steel Substrate
- Thermoset Plastic-Like Bonded Coating

Kuo-Lon – Full Coverage

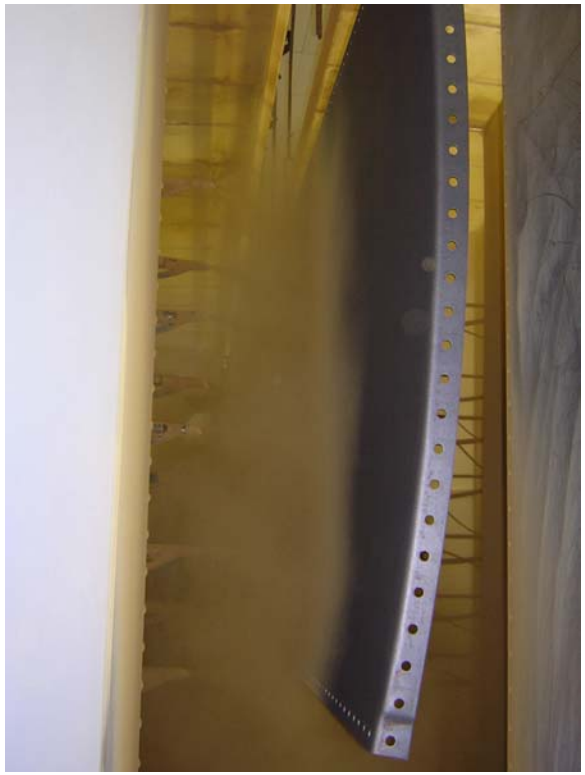


- Every Edge
- Every Hole
- Every Corner
- Every Surface

Kuo-Lon (TecStore) Sheet Process

- Fabricate
- Edge Bevel
- De-grease Wash
- Rinse
- Dry
- Blast
- Sheet Pre-coat Treatment
- Kuo-Lon Application
- Kuo-Lon Thermo-set Bake
- Exterior Topcoat
  - Choice Of Colors
  - Performance Urethane
  - Extended UV Resistance
- Topcoat Bake
- Part Mark
- Pack

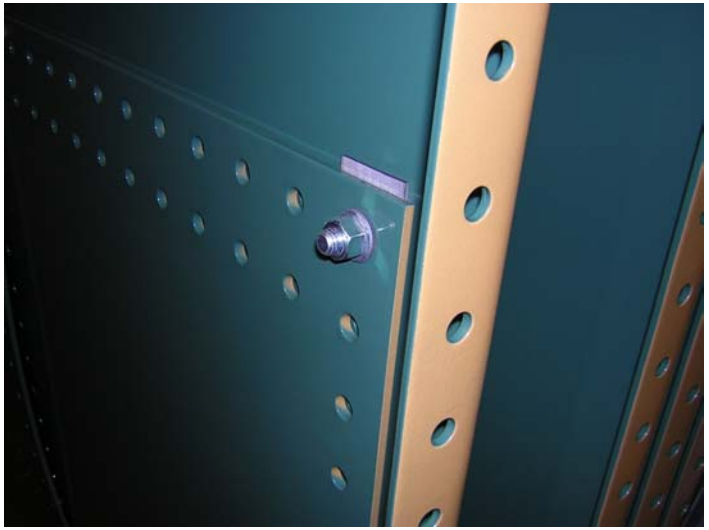
Kuo-Lon Application



Kuo-Lon Powder
Application Booth

Performance Urethane Application

Performance Urethane
Exterior Topcoat Application



Finished Application – All
Edges & Bolt Holes Protected

Kuo-Lon Physical Properties

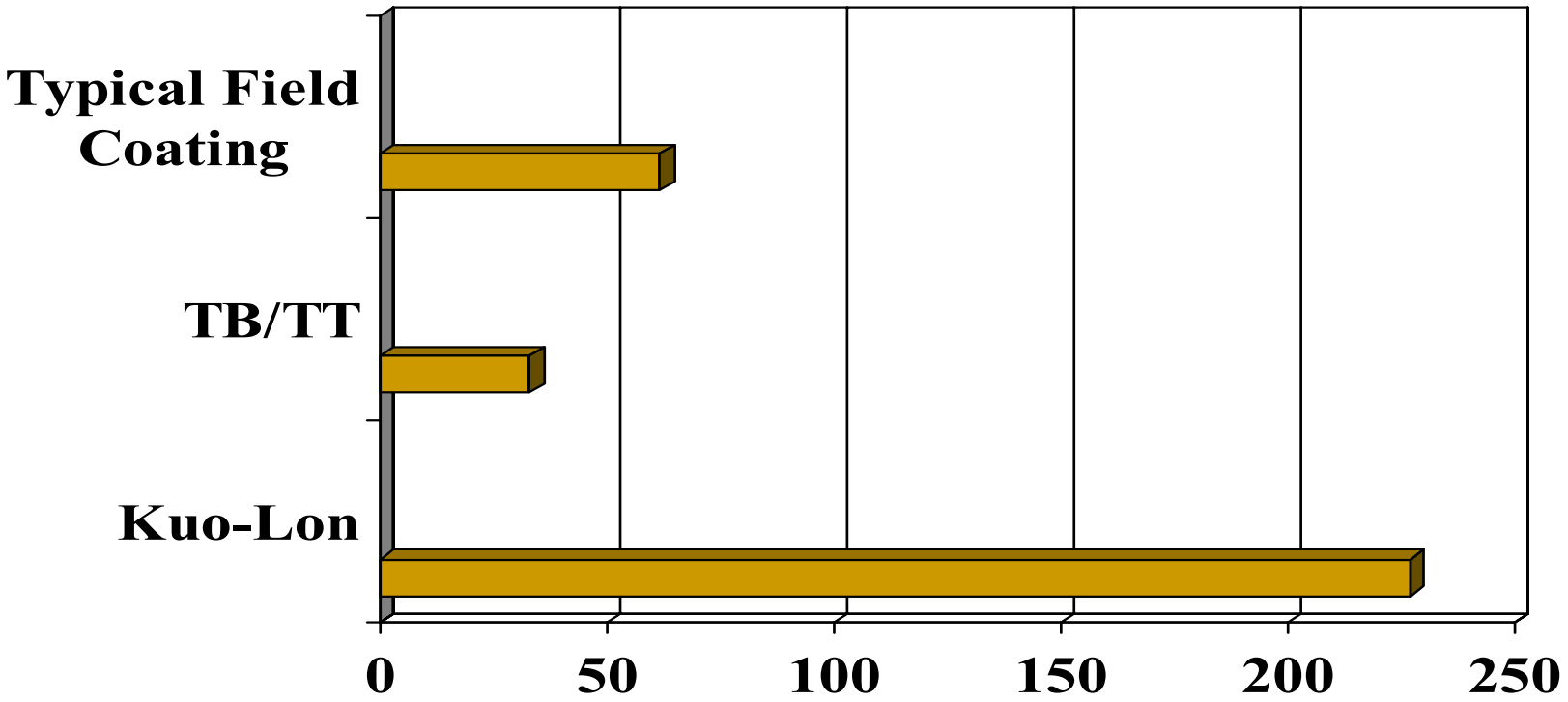
Application	Factory applied electrostatic thermosetting	
Dry Film Thickness	Average Interior DFT (3 grades)	125 µ, 175 µ, and 225 µ
Limiting Temperature	Dry Heat Immersed	150^0 C (300^0 F) 60^0 C (140^0 F)*
Corrosion Resistance	Salt Spray – ASTM B117 Cyclic Corrosion – ASTM D5894	Passes 9000 hours Passes 7 cycles
Impact Resistance	ASTM D2794	160 in-lbs direct & reverse
Abrasion Resistance	Falling Sand – ASTM D968	227 l/mil (9 l/µ)
Hardness	ASTM D3363	H
Chemical Immersion	10% NaOH, 10% H_2SO_4	Passes 9000 hours @ 60^0 C (140^0 F)
Holiday Test	Factory Holiday Free	Passes 67.5 volts
* General limit – subject to products stored		

Comparative Testing Results

- Kuo-Lon Has Been Extensively Tested Against Other Coating Systems
- Typical Field Applied Coatings
  - AWWA D102 – Standard For Painting Steel Water Storage Tanks – Section 3 - Inside Paint System No. 1 – Catalyzed Epoxy – DFT 8 Mils (200 µ)
- TB/TT – Trico-bond 478 And Thermo-Thane 7000 – Prior Generation Thermosetting Liquid Suspension Epoxies

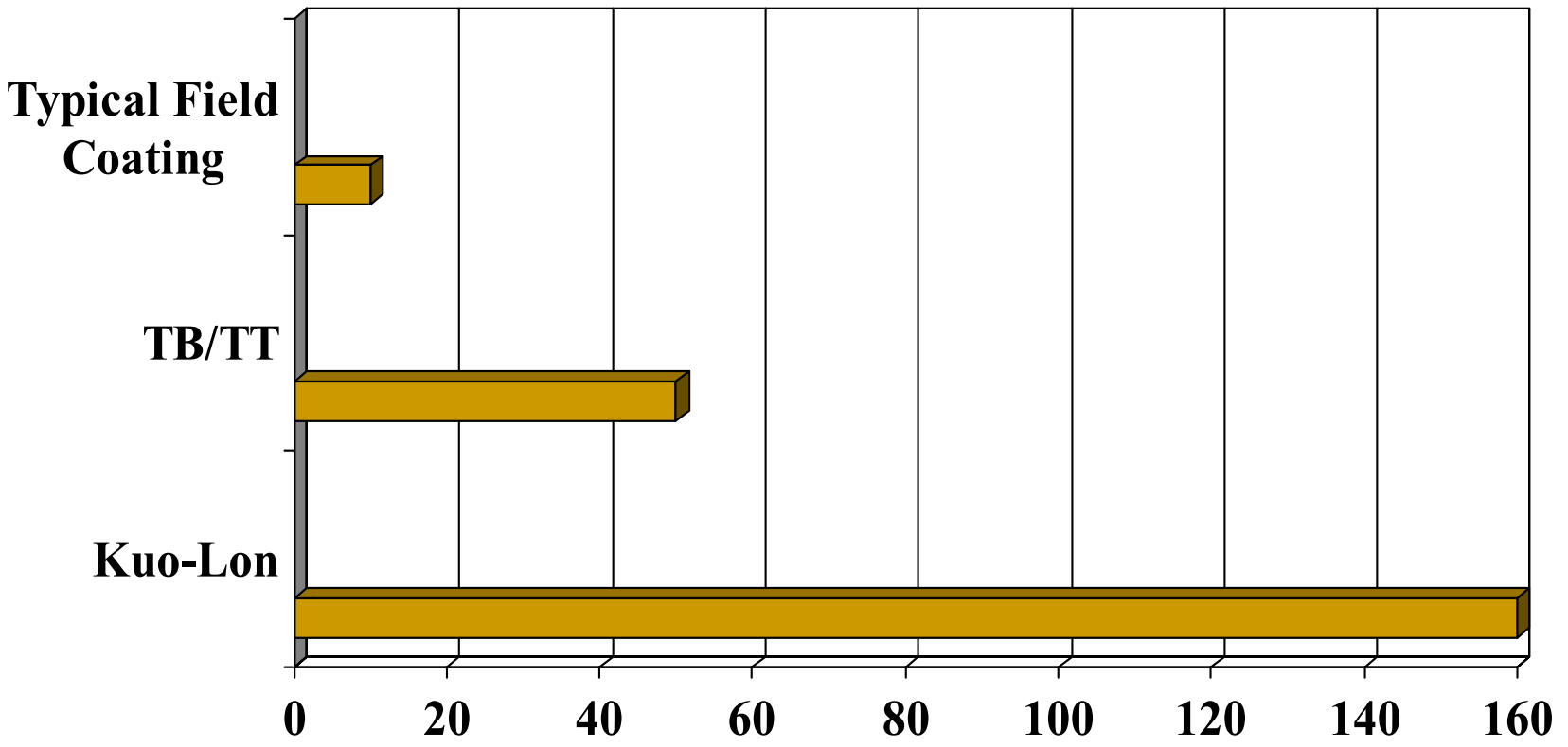
Abrasion Resistance

Falling Sand- ASTM D968 – liters of sand / mil of erosion



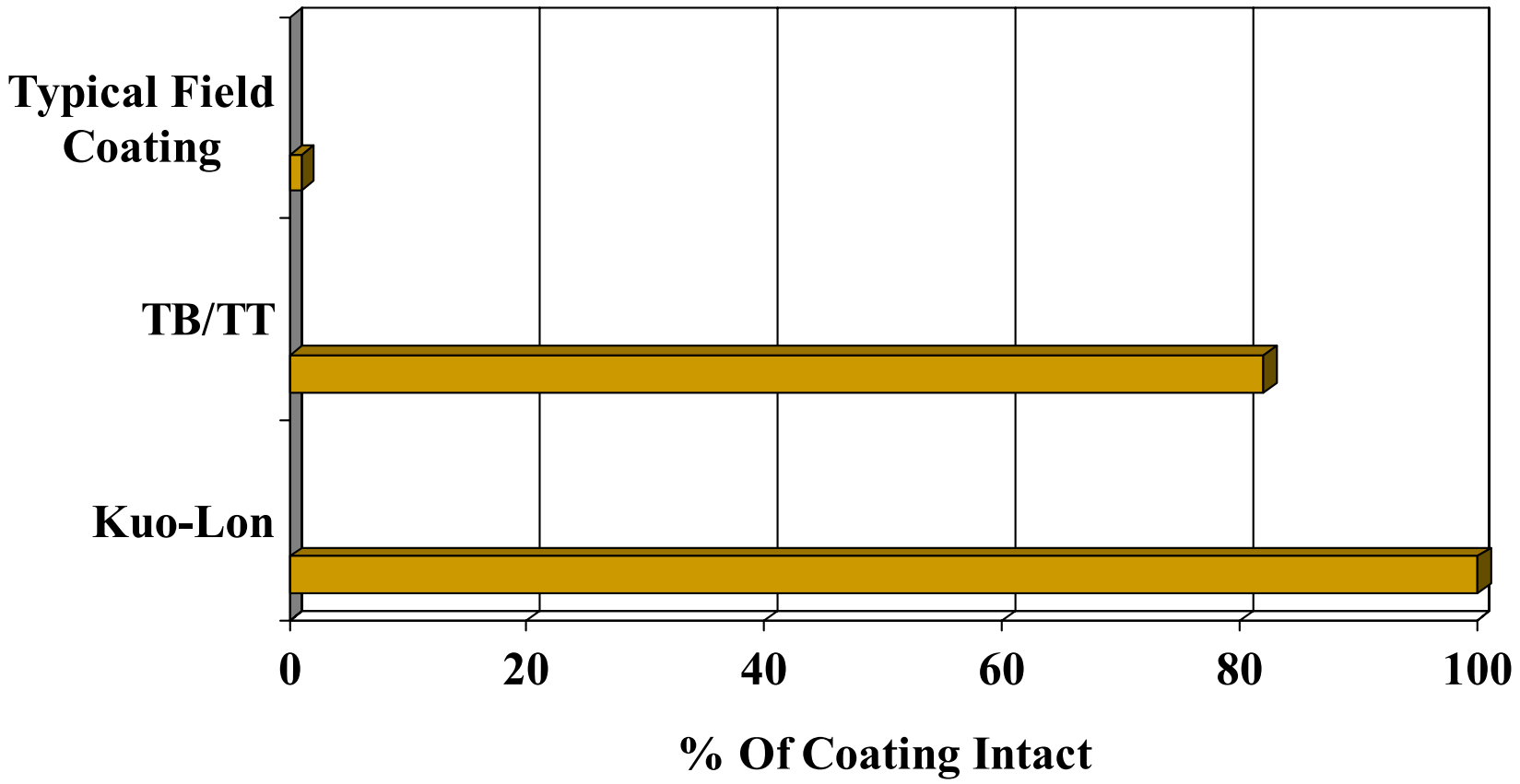
Durability

Impact Resistance (ASTM D2794- in lb)

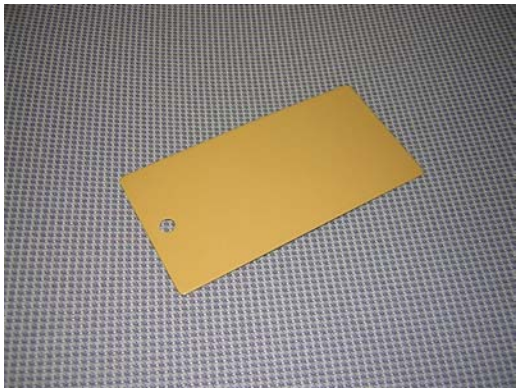


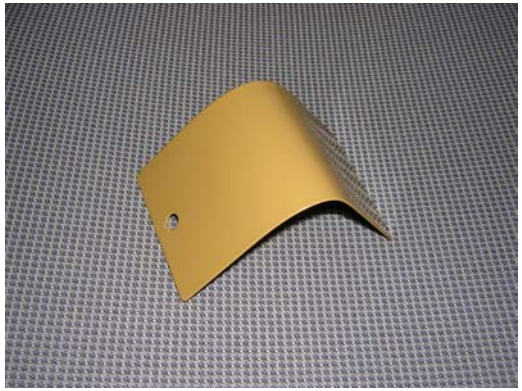
Flexibility

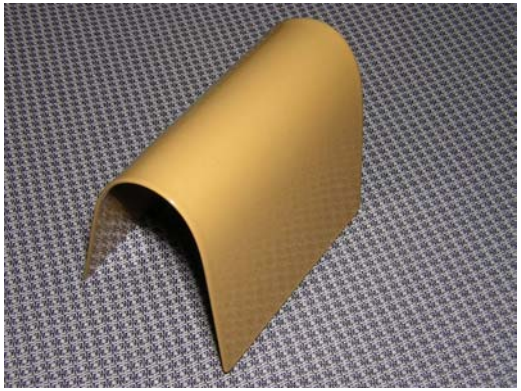
ASTM D522- % Intact After Bending Over a 1/8" Mandrel



Kuo-Lon Flexibility



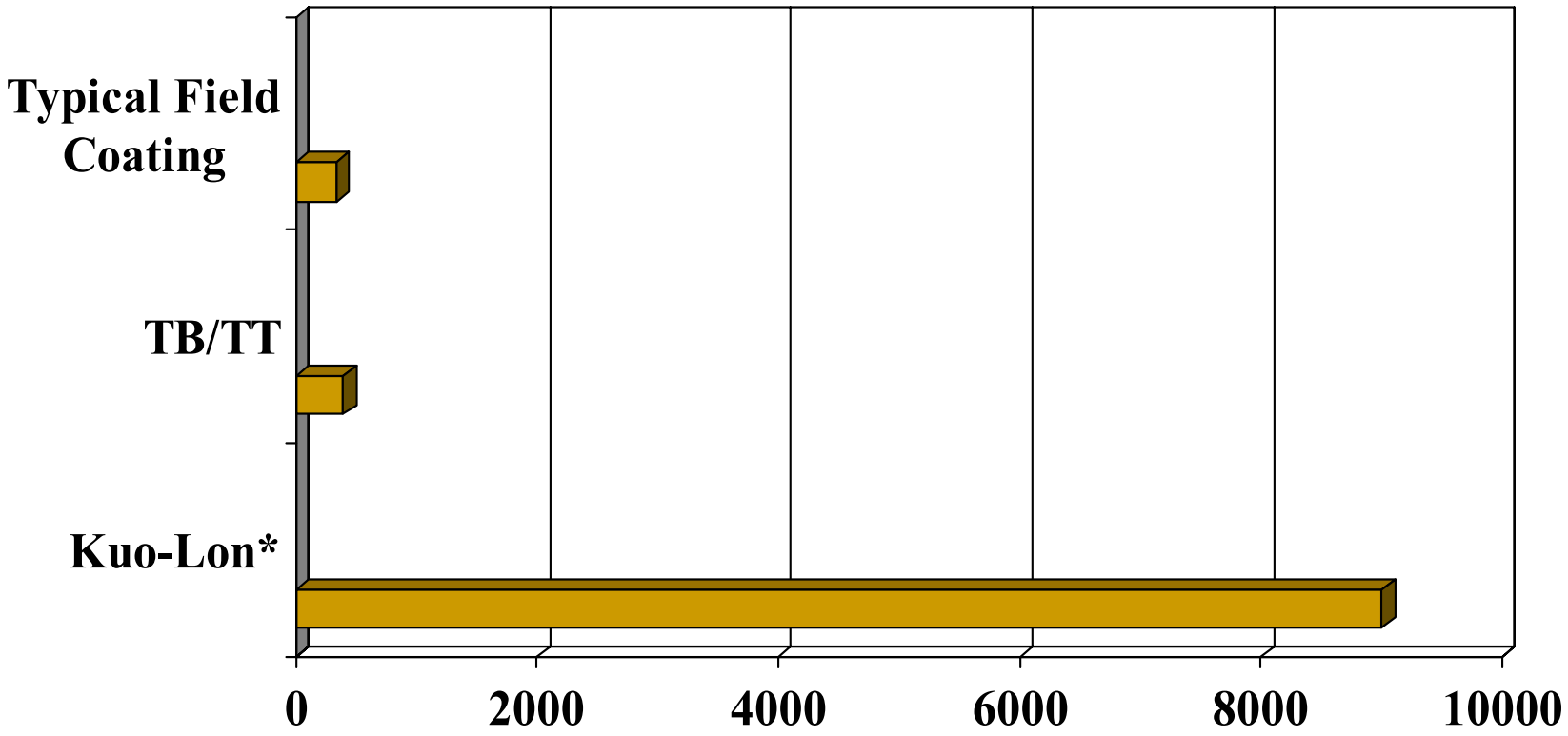




Kuo-Lon flexibility is demonstrated here by taking a 15 mm x 8 mm panel and simply bending it in half. The unique combination of steel surface preparation, pre-coating steel treatment, oven curing and Kuo-Lon physical characteristics results in a phenomenal ability to resist damage under extreme conditions.

High pH (Alkaline) Resistance

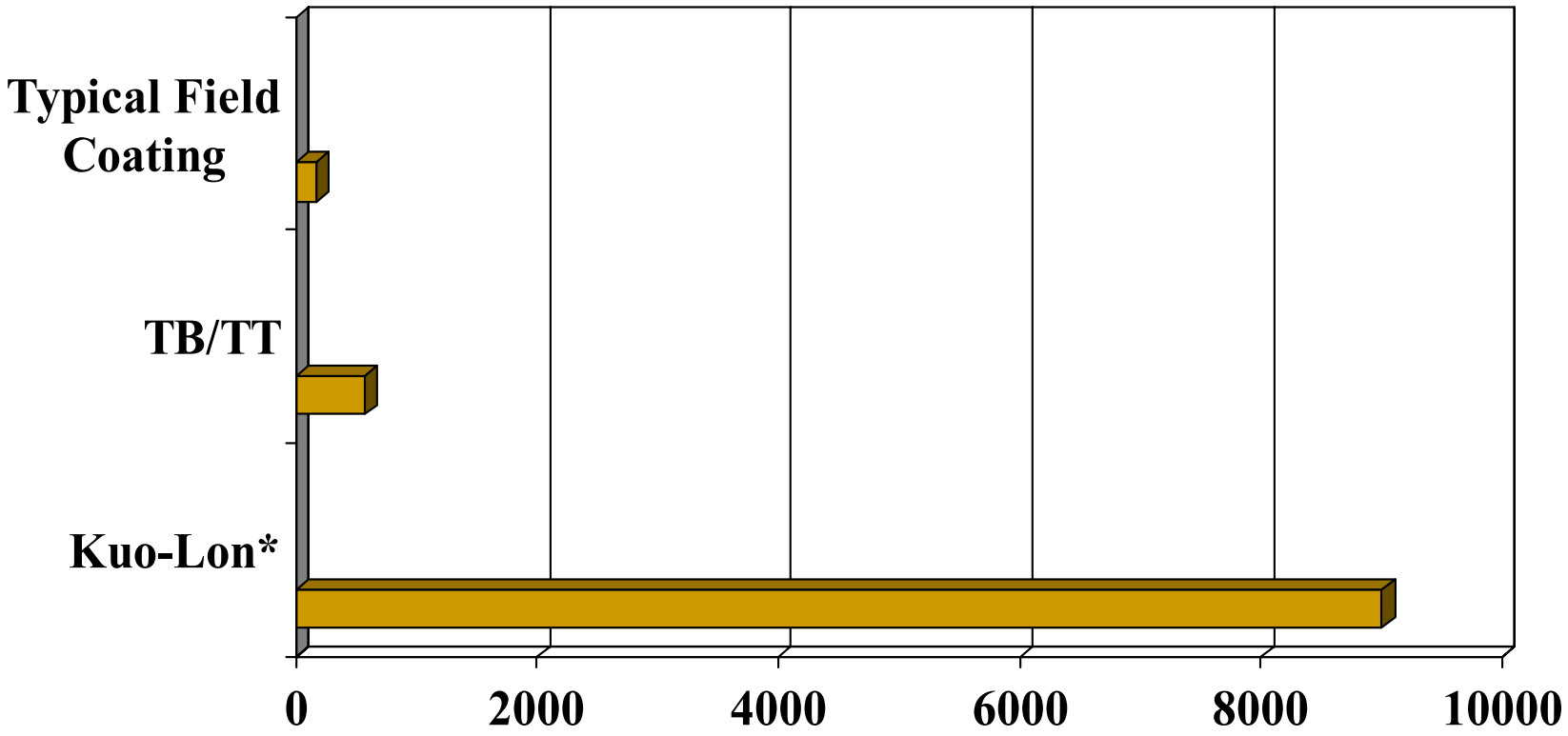
10% NaOH- 140°F (60° C)- Hours to Failure



* Kuo-Lon test terminated without failure

Low pH (Acid) Resistance

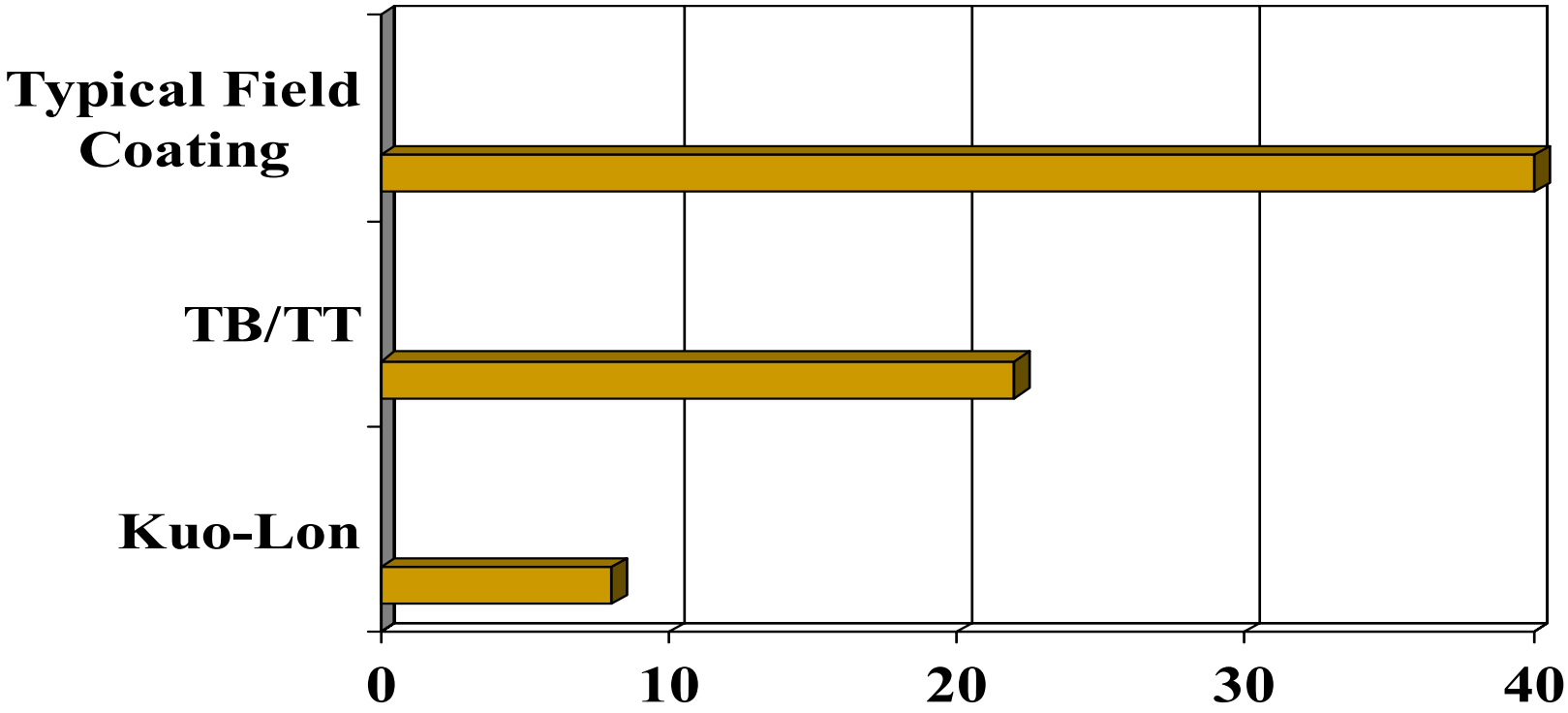
10% H_2SO_4- 140°F (60° C) Hours to Failure



* Kuo-Lon test terminated without failure

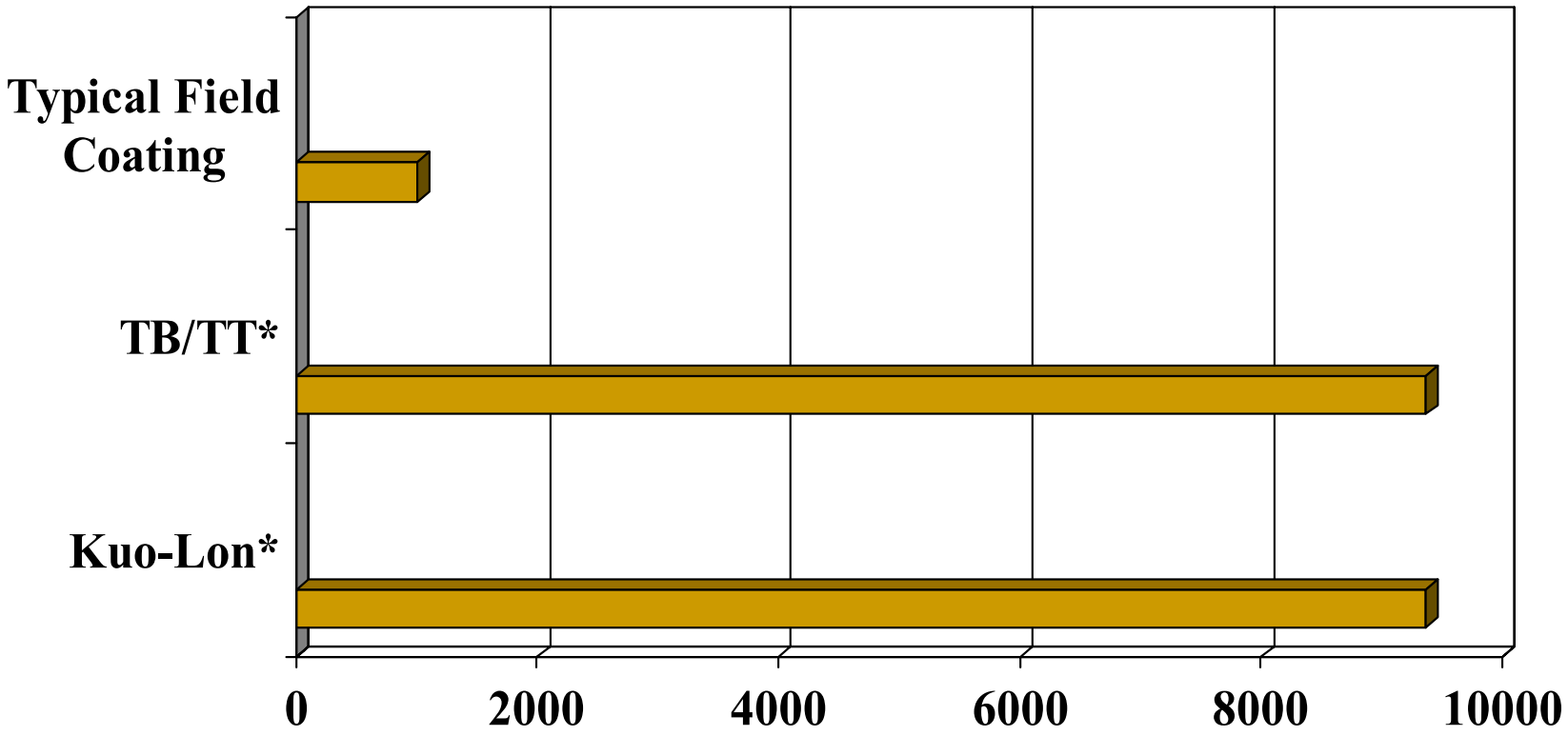
Cathodic Disbonding

ASTM G95- mm Creepage @ 90 days @ 77F, 3% NaCl



Solvent Resistance

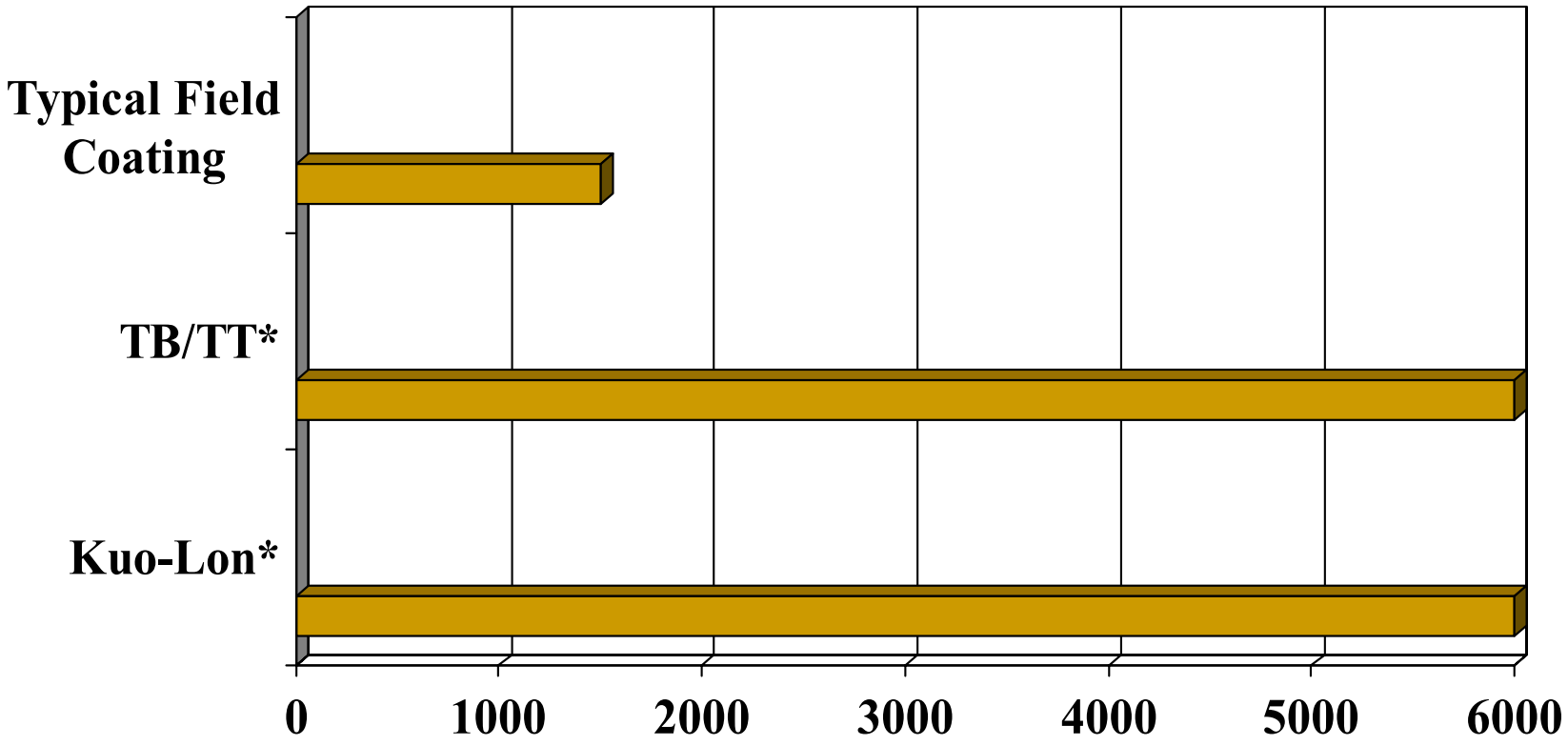
Xylene, MEK, Methylene Chloride- Avg Hours To Failure



* TB/TT and Kuo-Lon test terminated without failure

Water Immersion

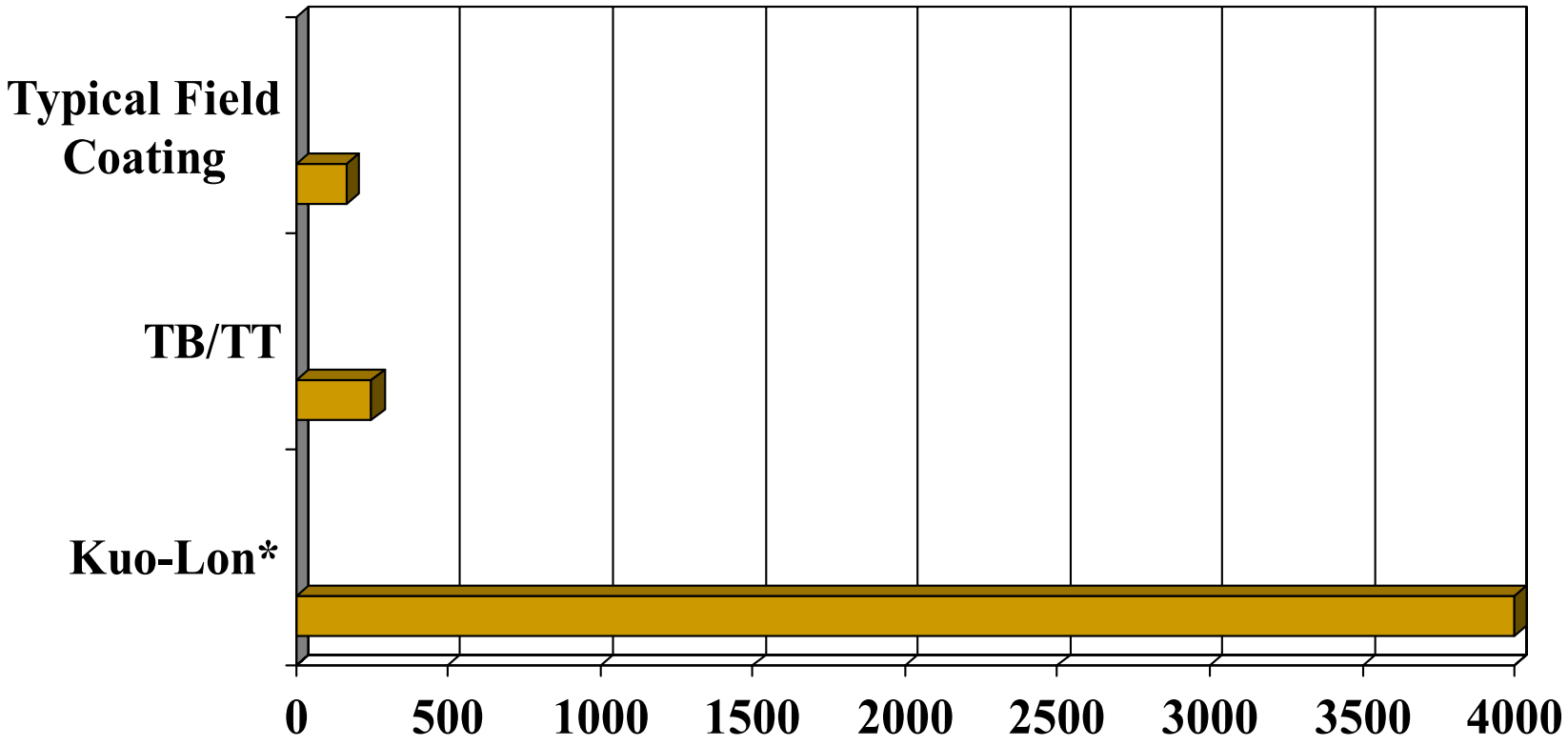
ASTM 1308- 205°F (96° C)- Hours to Blistering



* TB/TT and Kuo-Lon test terminated without failure

Chlorine (Oxidizing Agent) Resistance

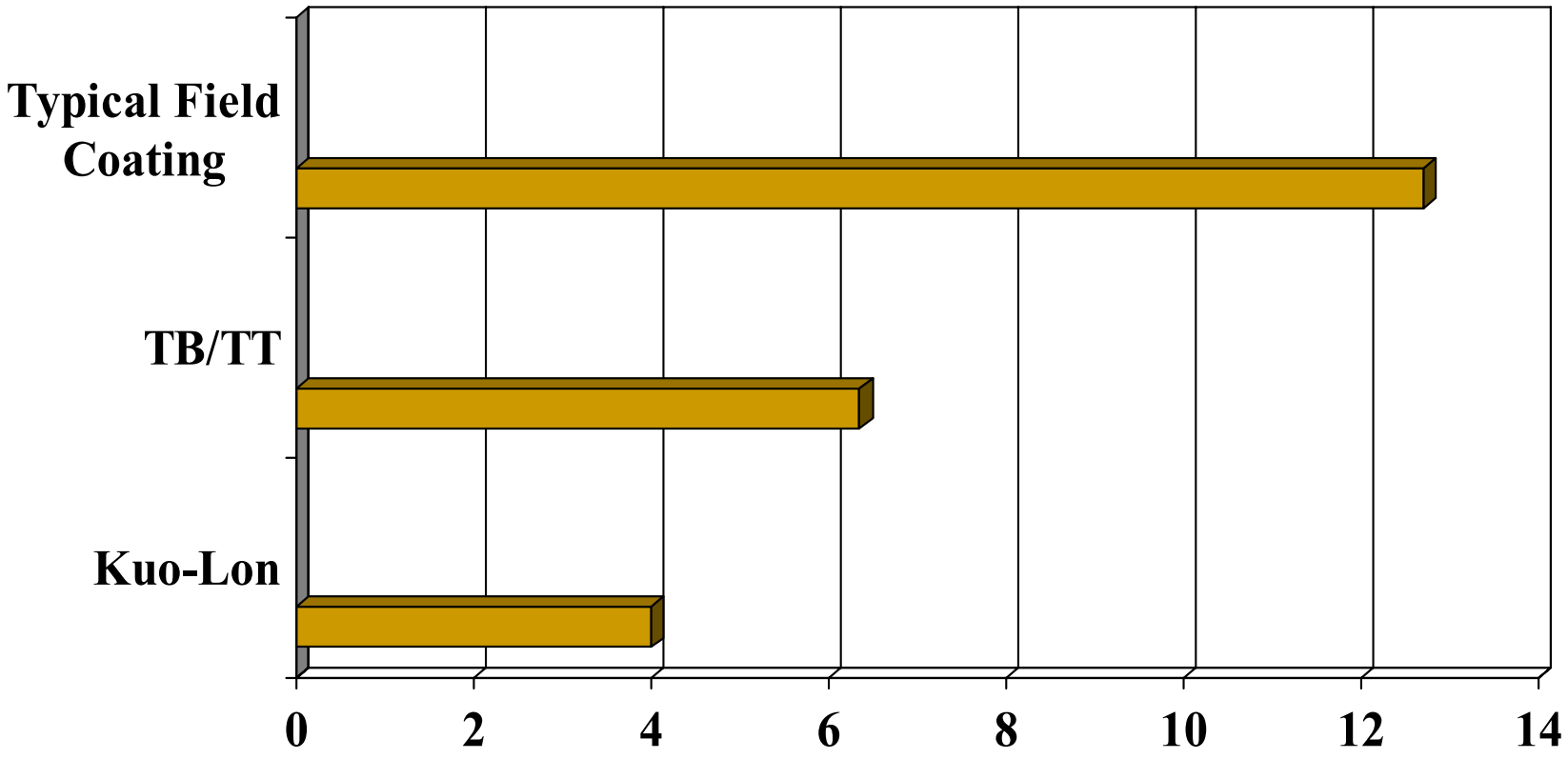
72°F (22° C)- 525 ppm Chlorine Bleach Solution- Hours to Failure



* Kuo-Lon test terminated without failure

Salt Spray Resistance

ASTM B117 – mm Creepage From Scribe at 9000 Hours



Kuo-Lon ® – The New Standard

Kuo-Lon	**Applications**: Potable water, Municipal sewage treatment, Industrial waste treatment, Fire water, Bulk Solids, Livestock effluent tanks **pH range** 1 – 14 (Depending on products and temperatures) **Coats**: Multiple **Color**: Sahara Gold **Thickness**: 125 µ (5 mils) Average Dry Film Thickness **Test regime**: Zero discontinuities at 67.5v wet sponge test per ASTM D 5162-91 Method A – 100% inspection.
Kuo-Lon H	**Applications**: Severe Industrial effluents, Deionized/Demineralized water, Ultra-pure water **pH range** 1 – 14 (Depending on products and temperatures) **Coats**: Multiple **Color**: Sahara Gold **Thickness**: 175 µ (7 mils) Average Dry Film Thickness **Test regime**: Zero discontinuities – Low voltage wet sponge test per ASTM D 5162-91 Method A – 100% inspection.
Kuo-Lon S	**Applications**: Extreme industrial applications **pH range** 1 – 14 (Depending on products and temperatures) **Coats**: Multiple **Color**: Sahara Gold **Thickness**: 225 µ (9 mils) Average Dry Film Thickness **Test regime**: Zero discontinuities – Low voltage wet sponge test per ASTM D 5162-91 Method A – 100% inspection.

ENGINEERED STORAGE PRODUCTS COMPANY

345 Harvestore Drive | DeKalb, IL 60115 | (815) 756-1551 | Fax (815) 756-7821
www.aquastore.com – Email: espinfo@engstorage.com

COATING DATA SHEET

DESCRIPTION KUO-LON™

Prepared by: PBV Date: 10/03

Kuo-Lon is a next generation thermosetting epoxy coating that combines full-range chemical resistance with exceptional physical properties in a thermally cured tank lining system. It is formulated specifically for service as a tank lining for holding such products as sour crude oil, petroleum products, potable water, wastewater, sewage, brines, and chemicals where its inertness and corrosion resistance are advantageous. It meets FDA requirements for food contact surfaces and NSF requirements for drinking water contact surfaces.

PHYSICAL PROPERTIES

Application		Factory-applied, thermally cured
Dry Film Thickness*	Average DFT	5.0 mils interior/ 3.0 mils exterior
Limiting Temperature	Dry Heat	300°F
	Immersed	140°F** to 300°F
Corrosion Resistance	Salt Spray - ASTM B117	Pass 9000 hours
	Cyclic Corrosion – ASTM D5894	Pass 7 Cycles
Impact Resistance	ASTM D2794	160 in-lbs direct/160 in-lbs reverse
Abrasion Resistance	Falling Sand - ASTM D968	227 L/mil
Hardness	ASTM D3363	H
Chemical Immersion (at 180 degrees F – 82 degrees C)		
	10% Sodium Hydroxide	Pass 9000 hours
	10% Sulfuric Acid	Pass 9000 hours
Holiday Test		Passes 67 volts
Color		Sahara Gold

* Higher DFT is available for selected applications. Consult factory for details.
** This is a general limit. Specific immersants may have higher limits. For example, laboratory tests show that Kuo-Lon is unaffected in boiling deionized water.

CHEMICAL RESISTANCE

Kuo-Lon, when applied and cured at elevated temperatures, has been tested and is suitable for immersion in a wide range of solutions including, but not restricted to, those listed below:

Crude Oil	Sodium Chloride	Wastewater
Demineralized Water	Sodium Hydroxide	Xylene
Sewage	Sulfuric Acid	

Columbian TecTank Company
Demineralized Water Experience List
(Representative List)

YEAR	CUSTOMER	DIA (M)	HT (M)	DIA (FT)	HT (FT)	STATE/COUNTRY
1996	NOT DISCLOSED	6.4	7.3	21	24	SINGAPORE
1996	NOT DISCLOSED	6.4	9.8	21	32	NEW ZEALAND
1996	RENDERTECH LTD.	3.7	7.6	12	25	NEW ZEALAND
1997	B.H. TANK WORKS	5.5	4.3	18	14	GEORGIA, U.S.A.
1997	B.H. TANK WORKS	6.1	4.3	20	14	GEORGIA, U.S.A.
1998	COLMAC ENERGY	7.9	4.9	26	16	CALIFORNIA, U.S.A.
1998	EDELEANU	6.1	9.8	20	32	THAILAND
1998	EDELEANU	6.1	9.8	20	32	THAILAND
1998	COLMAC ENERGY	7.9	4.9	26	16	CALIFORNIA, U.S.A.
1998	GREAT LAKES AQUA SALES & SERV	7.9	7.9	26	26	MISSOURI, U.S.A.
1998	ENRON CAPITAL & TRADE %NEPCO	22.6	14.6	74	48	TENNESSEE, U.S.A.
1998	ENRON CAPITAL & TRADE %NEPCO	8.8	13.4	29	44	TENNESSEE, U.S.A.
1998	ENRON CAPITAL & TRADE CO.	14.3	12.2	47	40	MISSISSIPPI, U.S.A.
2000	BECON CONSTRUCTION	14.3	9.8	47	32	OKLAHOMA, U.S.A.
2000	BECHTEL POWER CORPORATION	12.5	12.5	41	41	CALIFORNIA, U.S.A.
2000	INDUSTRIAL STORAGE SYSTEMS B.V.	10.4	12.2	34	40	THE NETHERLANDS
2000	EDELEANU	6.1	11.3	20	37	THAILAND
2000	KVAERNER INDUSTRIAL CONSTRUCTION	11.6	9.8	38	32	U.S.A.
2000	BECHTEL POWER CORPORATION	9.1	9.8	30	32	GEORGIA, U.S.A.
2000	BECHTEL POWER CORPORATION	9.1	9.8	30	32	CALIFORNIA, U.S.A.
2000	RENDERTECH, LTD.	5.5	8.2	18	27	NEW ZEALAND
2000	INDUSTRIAL STORAGE SYSTEMS B.V.	10.4	12.2	34	40	THE NETHERLANDS
2000	RENDERTECH LTD	5.5	8.2	18	27	NEW ZEALAND
2000	INDUSTRIAL STORAGE SYSTEMS B.V.	7.9	6.1	26	20	THE NETHERLANDS
2000	INDUSTRIAL STORAGE SYSTEMS B.V.	7.9	9.8	26	32	THE NETHERLANDS
2000	BECHTEL POWER CORPORATION	12.5	9.8	41	32	CALIFORNIA, U.S.A.
2000	BECON CONSTRUCTION	14.3	9.8	47	32	TEXAS, U.S.A
2001	GRUPO CYDSA, S.A. DE C.V.	8.8	9.8	29	32	MEXICO
2001	CALVERT CLIFFS NUCLEAR POWER	4.6	1.5	15	5	MARYLAND, U.S.A.
2001	GRUPO CYDSA, S.A. DE C.V.	8.8	9.8	29	32	TEXAS, U.S.A
2001	STONE & WEBSTER, INC.	12.5	7.3	41	24	WASHINGTON, U.S.A.
2001	RENDERTECH, LTD.	3.7	7.6	12	25	NEW ZEALAND
2002	DILLINGHAM CONSTRUCTION, INC.	7.9	4.9	26	16	CALIFORNIA, U.S.A.
2002	NOT DISCLOSED	6.4	7.3	21	24	JAPAN
2002	T.I.C.	16.8	12.2	55	40	U.S.A.
2002	UNIVERSITY MARELICH MECHANICAL	7.9	7.3	26	24	U.S.A.
2002	T.I.C.	14.3	12.2	47	40	U.S.A.
2002	NOT DISCLOSED	6.4	7.3	21	24	JAPAN
2002	MADISON GAS & ELECTRIC CO	8.8	15.2	29	50	WISCONSIN, U.S.A.
2002	T.I.C.	14.3	12.2	47	40	MONTANA, U.S.A.
2002	T.I.C.	14.3	12.2	47	40	SOUTH CAROLINA, U.S.A.
2002	NOT DISCLOSED	6.4	7.3	21	24	JAPAN
2002	BLACK & VEATCH	14.3	12.2	47	40	GEORGIA, U.S.A.
2002	CALPINE CORP.	18.0	12.2	59	40	CALIFORNIA, U.S.A.
2002	T.I.C.	9.8	17.7	32	58	MONTANA, U.S.A.
2002	NOT DISCLOSED	6.4	7.3	21	24	JAPAN
2002	UNIVERSITY MARELICH MECHANICAL	7.9	7.3	26	24	U.S.A.
2002	UNIVERSITY MARELICH MECHANICAL	7.9	7.3	26	24	U.S.A.
2002	U.S. FILTER CO.	8.8	9.8	29	32	TEXAS, U.S.A
2002	T.I.C. - THE INDUSTRIAL CO.	14.3	12.2	47	40	MONTANA, U.S.A.
2002	B.H. TANK WORKS	9.8	9.8	32	32	CALIFORNIA, U.S.A.
2002	T.I.C.	14.3	12.2	47	40	SOUTH CAROLINA, U.S.A.
2002	NOT DISCLOSED	6.4	7.3	21	24	JAPAN
2003	CONECTIV ENERGY	14.3	9.8	47	32	U.S.A.
2003	CALPINE CORPORATION	12.5	11.0	41	36	CALIFORNIA, U.S.A.
2003	KVAERNER SONGER, INC.	11.6	7.3	38	24	CALIFORNIA, U.S.A.

YEAR	CUSTOMER	DIA (M)	HT (M)	DIA (FT)	HT (FT)	STATE/COUNTRY
2003	FOX ENERGY CENTER	9.8	10.4	32	34	WISCONSIN, U.S.A.
2003	CONECTIV ENERGY	16.8	7.3	55	24	NEW JERSEY, U.S.A.
2003	G.F.S. LLC	9.8	7.3	32	24	NEW YORK, U.S.A.
2003	UNIVERSITY MARELICH MECHANICAL	3.7	7.3	12	24	CALIFORNIA, U.S.A.
2003	T.I.C.	12.5	9.8	41	32	TEXAS, U.S.A
2003	AQUATECH INTERNATIONAL CORP	5.5	3.4	18	11	CALIFORNIA, U.S.A.
2004	NOT DISCLOSED	5.5	9.8	18	32	JAPAN
2004	USA TANK SALES	7.9	7.3	26	24	VIRGINIA, U.S.A.
2004	CONECTIV ENERGY	11.6	7.3	38	24	NEW JERSEY, U.S.A.
2004	SEGA, INC.	7.9	7.3	26	24	CALIFORNIA, U.S.A.
2004	CALPINE CONSTRUCTION	7.3	9.8	24	32	NEW YORK, U.S.A.
2004	TURLOCK IRRIGATION DISTRICT	16.8	9.8	55	32	CALIFORNIA, U.S.A.
2004	PLAZA CONSTRUCTION	12.8	9.1	42	30	NEW YORK, U.S.A.
2004	CALPINE CONSTRUCTION MGMT	11.6	9.1	38	30	MINNESOTA, U.S.A.
2004	ROCKY MOUNTAIN POWER	6.4	9.8	21	32	MONTANA, U.S.A.
2004	FOX ENERGY CENTER	9.8	10.4	32	34	WISCONSIN, U.S.A.
2004	NOT DISCLOSED	3.7	9.8	12	32	JAPAN
2004	NOT DISCLOSED	5.5	9.8	18	32	JAPAN
2004	MARTIN-MANATEE POWER PARTNERS	21.9	10.4	72	34	FLORIDA, U.S.A.
2004	NOT DISCLOSED	3.7	9.8	12	32	JAPAN
2004	ROCKY MOUNTAIN POWER	21.9	7.9	72	26	MONTANA, U.S.A.
2004	NOT DISCLOSED	5.5	4.9	18	16	JAPAN
2004	BECHTEL CONSTRUCTION CO.	9.8	7.9	32	26	U.S.A.
2004	CONECTIV ENERGY	11.6	12.8	38	42	NEW JERSEY, U.S.A.
2004	NOT DISCLOSED	3.7	9.8	12	32	JAPAN
2004	NOT DISCLOSED	5.5	4.9	18	16	JAPAN
2004	TURLOCK IRRIGATION DISTRICT	9.8	12.2	32	40	CALIFORNIA, U.S.A.
2005	DESERT POWER L.P.	22.3	10.4	73	34	UTAH, U.S.A.
2005	NOT DISCLOSED	5.5	9.8	18	32	JAPAN
2005	HIDROSISTEMAS BAJA SRL DE CV	6.4	5.5	21	18	MEXICO
2005	SALCON PTE. LTD.	7.9	7.9	26	26	JAPAN
2005	HIDROSISTEMAS BAJA SRL DE CV	5.5	5.5	18	18	MEXICO
2005	NOT DISCLOSED	6.4	7.3	21	24	JAPAN
2005	NOT DISCLOSED	5.5	7.3	18	24	JAPAN
2005	SNC LAVALIN POWER INC.	7.0	6.1	23	20	MINNESOTA, U.S.A.
2005	SNC LAVALIN POWER INC.	7.0	6.1	23	20	MINNESOTA, U.S.A.
2005	TOSHIBA INTERNATIONAL CORP	12.5	9.8	41	32	MEXICO
2005	SNC LAVALIN POWER INC.	7.0	6.1	23	20	MINNESOTA, U.S.A.
2005	NOT DISCLOSED	5.5	9.8	18	32	JAPAN