



## ENVIRO PROTECT NR 988 AR MR CERAMITECH FLAKELINE<sup>®</sup> CHEMICAL and ABRASION RESISTANT FLAKE COATING

November 2016

### NR 988 AR MR Ceramitech Flakeline

Enviro Protect 988 AR MR Ceramitech is a novolac-based epoxy vinyl ester lining, reinforced with abrasion resistant micro alumina ceramic beaded base coat and, with ECR glass mat intermediate layer to provide crack free and joint cut free lining. It's top coat formulation has wear resistant nano silicone and nano flake ingredients which have exceptional chemical and mechanical properties at higher temperatures. 988 AR MR resin offers a high resistance to solvents and chemicals, good retention of strength and toughness at elevated temperatures, and excellent resistance to acidic oxidizing environments between Ph 0 and PH 14. For extreme chemical resistance it is formulated with ECR Glass Flake.

Property	Value
Density, 25°C/77°F	2 g/mL
Dynamic Viscosity, 25°C/77°F	30.000 mPa.s
Kinematic Viscosity	10.250 cSt
Styrene Content	5%
Shelf Life 21°C/69°F	12 months (between 10°C and 21°C)

**Epoxy Novolac  
Based Chemical  
and Abrasion  
Resistant Glass  
Flake Coating**

**Typical Liquid  
Resin  
Properties**

**Applications Areas  
and Benefits**

- High abrasion and thickness requirements for **all FGD System Applications** such as raw gas channel floors, absorber tower floors, washed gas channel floors, SGH Unit floors, and many other high performance requirements.
- **FGD System** emergency storage tanks, gypsum storage tanks, lime stone slurry feed tank, mill recycle sump, mile scale preparation tanks, gypsum and limestone slurry preparation areas, trench areas.
- Ideal solution for power plant water treatment areas.
- Suitable for such applications as high temperature chlorination or caustic scrubbing and storage, industrial waste treatment facilities and solvent/extraction processes used in all industry **such as gold mining, phosphate mining and all other chemical process areas.**
- Used for hydrochloric acid transport, tank, truck and railcar linings and gasohol storage.
- Resists solvents, chemicals, and acidic oxidizing environments to provide long lasting, reliable equipment for corrosive materials.
- Retains strength and toughness at elevated temperatures which enables users to operate the equipment in a variety of applications.
- Contains only %5 weight percent styrene, resulting in reduced styrene emissions and allows fabricators to meet California's South Coast Air Quality Management District Rule 1162.
- 988 AR MR Ceramitech can be applied with glass veil for MR VEIL systems up to un limited thickness.
- 988 AR MR Ceramitech can also be top coated with 990 S flake or 990 nano flake to form non-sticky abrasion resistant surfaces
- 988 AR MR Ceramitech also adheres to rubber surfaces very well. This makes the 988 ideal product to repair the rubber linings.
- Adjustable summer and winter time cure schedule
- 988 AR MR Ceramitech does not promote the fire, in case of fire on FGD system
- **Temperature Resistance:** Continuous dry temperature resistance is 220°C, intermittent temperature resistance is 250°C and continuous wet temperature resistance is 150°C
- ASTM D – 6137 Test for %20 [H<sub>2</sub>SO<sub>4</sub>] Sulfuric Acid Resistance at 93°C Wet and 177°C dry for FGD Environment-----PASS



**Surface  
Preparation and  
Detailed  
Application**

**Product Properties**

**Please refer to Enviro Protect 988 AR MR Flakeline Application Guideline**

**Typical Properties 988 AR MR Resin with ECR Glass Flake**

Property	SI	US Standard	Test Method
Comprehensive Strength	100 MPa	14.504 psi	ASTM C - 579
Tensile Strength	95 MPa	13.779 psi	ASTM D-638/ISO 527
Tensile Modulus	3.9 GPa	5.6x 10 <sup>5</sup> psi	ASTM D-638/ISO 527
Tensile Elongation, Yield	1,5-2%	1,5-2%	ASTM D-638/ISO 527
Coefficient of Expansion		3.7x10 <sup>-5</sup> cm/cm/°C	ASTM C - 531
Coefficient of Expansion		12- 14x10 <sup>-6</sup> in/in/°F	ASTM D - 696
Flexural Strength	150 MPa	21.756 psi	ASTM D-790/ISO 178
Flexural Modulus	3.8 GPa	5.5 x 10 <sup>5</sup> psi	ASTM D-790/ISO 178
Elongation at Break	%1.5	%1.5	ASTM C - 307
Density	1.8 g/cm <sup>3</sup>	1.8 g/cm <sup>3</sup>	ASTM D-792/ISO 1183
Volume Shrinkage	8.3%	8.3%	ASTM C 1241
Heat Distortion Temperature	280°C	536°F	ASTM D-648 Method A/ISO 75
Glass Transition Temperature,	300°C	572°F	ASTM D-3419/ISO 11359-2
Ceramic Alumina flake Content	%85	%85	
Barcol Hardness	45	45	ASTM D-2583/EN59
Shore D Hardness	80-85	80-85	ASTM D-2240
Sulfuric Acid Resistance for FGD SYSTEM %20 H <sub>2</sub> SO <sub>4</sub> Concentration at 93°C and 177°C	PASS	PASS	ASTMD-6137
Adhesion to steel	17,23	2500 PSI	ASTM D-4541
Taber Abrasion cs 17 wheel 1000 gram load	15 mg with Nano Flakeline	15 mg with Nano Flakeline	ASTMD -4060
%33 Hydrochloric Acid (HCl) resistance for tank coating concentration at 93°C and 177°C	PASS	PASS	ASTMD-5499
<p><b>NOTE:</b> This product contains Styrene Monomer which has 30°C Flash Point (<b>Flammable</b>) product. Styrene Monomer is also heavier than air and <b>toxic</b>. Because of this styrene vapour is collected on the ground. To avoid its <b>flammability</b> and <b>toxicity</b>, during the application full face styrene mask must be worn, and working area must be ventilated well, and all spark sources must be eliminated.</p> <p>Please refer to product MSDS for further information.</p>			

## Application Properties

MR Flakeline application shall be applied by the Applicator Company using employees trained in the appropriate application procedures. It is strongly advised that both supervisory and application personnel on site shall have attended a Flakeline Applicator Training Program.

Surface temperature must always be a minimum of 3°C (5°F) above dew point. The relative humidity during application and curing should not exceed 80%. This product will cure up to -5°C adequately. But, below 10°C (50°F) for maximum performance winter accelerator must be added. Without winter accelerator ambient curing temperatures should be above 10°C (50°F). Dehumidification (DH) air conditioning and/or heating equipment may be necessary to control environmental conditions.

For summer time above 30°C the application shall be made under good ventilation, if necessary, summer decelerator shall be used.

**For detailed surface preparation and application, please refer to product application guideline**

## PRODUCT CHARACTERISTIC

APPLICATION	ENVIRO PROTECT 988 AR MR GLASS FLAKE
Colour	White and grey
Solid Volume	%95
Density	1,8 gr/cm3
Flash Point	Part A 30°C, Part B 50°C, Mixed 30°C
VOC (EPA Method 24)	150 gram/Litre
Gloss level	Top Coat is Very Glossy
Application Thickness	From 1500 microns up to unlimited thickness depends on working condition of system
Average Application Thickness	For general Applications minimum two coats total 2500 microns average is recommended
Min Base Coat Application	1500 microns (for base coat with towel ), 1000 microns (for Glass mat 450 gram) and, 700 microns ( for Top Coat )
Max Base Coat Application	Unlimited for base coat and glass mat, 1000 microns for top coat
Mix Ratio	Part A / Part B: 100/1 ( For trowel applied base coat), 50/1 for glass mat and top coat
Method of Application	<b>For Main Coat:</b> Trowel <b>For Glass Mat:</b> Fiber crushing roll <b>For Top Coat:</b> Roller, brush or airless: NozzleTip Range 0.7-1.0 mm ( 28-40 thou). Total output pressure at spray tip is not less than 150 kg/cm2
Thinner Smoothing Liquid	Enviro T Sol Diluent <b>Smoothing Liquid:</b> Styrene Monomer
Working Pot Life	60 minute (10°C), 30 minute (20°C), (15 minute 30°C) Above 30°C we provide slowing additive free of charge Below 10°C we provide accelerator free of charge
Recoat Time (10°C)	2 hours – 5 days
Recoat Time (20°C)	2 hours – 3 day
Recoat Time (30°C)	1 hour – 2 days
Recoat Time for Outdoor Applications	Direct or indirect or cloudy outdoor applications must be recoated within 4 hours. Indoor applications taking direct or indirect sunlight must be recoated within 4 hours.
Touch Dry Time	4 hours (10°C), 2 hours ( 20°C), 1 hour (30°C)
Hard Dry Time	6 hours (10°C), 3 hours ( 20°C), 2 hours (30°C)
Time to replace for service	72 hours (10°C), 48 hours (20°C), 24 hours (10°C)

## Chemical Resistance

### CHEMICAL RESISTANCE

- 1: Long term resistant with continuous contact and immersion  
2: Short term resistant with clean up within 24 hours  
3: Not resistant

CHEMICALS	ENVIRO PROTECT 988 AR MR GLASS FLAKE
All FGD Chemicals	1
Sulfuric Acid Resistance for FGD SYSTEM %20 H <sub>2</sub> SO <sub>4</sub> Concentration at 93°C and 177°C. ASTM D-6137	1
Hydrochloric Acid(37%) [HCl]	1
Fertilizer Chemicals	1
Sulfuric Acid(98%) [H <sub>2</sub> SO <sub>4</sub> ]	2
Sulfuric Acid(85%) [H <sub>2</sub> SO <sub>4</sub> ]	1
Sulfuric Acid(50%) [H <sub>2</sub> SO <sub>4</sub> ]	1
Sulfuric Acid(10%) [H <sub>2</sub> SO <sub>4</sub> ]	1
Hidrojen Sülfür(98, 50%) [H <sub>2</sub> S]	1
Phosphoric Acid(98%) [H <sub>3</sub> PO <sub>4</sub> ]	2
Methanol [CH <sub>3</sub> OH]	3
Sea Water, Sea Water steam, vapour	1
Sodium Chloride [NaCl]	1
Sodium Hydroxide(50%) [NaOH]	1
Beer, Şugar, Glucose	1
Ammonium Sulfate[(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> ]	1
Sodium Hypochlorite(15%) [NaClO]	1
Water treatment chemicals	1
De-ionized water	1

**NOTE 1:** If you need %98 Sulfuric Acid Resistance, use Enviro Protect 4354 MR Glass Flake or Enviro Protect 1354 Glass Flake

**NOTE 2:** If you need to check more chemicals, please refer to chemical resistance chart or contact with us

**Flakeline Coating:** Many FGD Systems all over the world uses Glass Flake Lings. Because glass flake linings are very efficient concerning the high temperature and gasses. Glass Flake linings have millions of flakes in the structure. This flakes overlap with each other and form un-permeable surfaces against the chemicals and gases at high temperature.

In 2000 microns coating there should be between 750-1000 flakes which are overlapped with each other and forms very firm surface which do not permit gases and chemicals in. This overlapping flake also resist to abrasion and cracking.

**AR Flakeline:** Abrasion resistant version of flakeline

**Nano flake:** Nano sized flakes in cooperated in the structure of flakeline which forms non-stick and abrasion resistant surface.

**Nano Slip:** Nano sized silicone beads in cooperated in the structure of top coat which forms non-stick and abrasion resistant surface

**ECR Glass Flake:** Excellent Acid Resistant Glass Flake or Mat or Veil

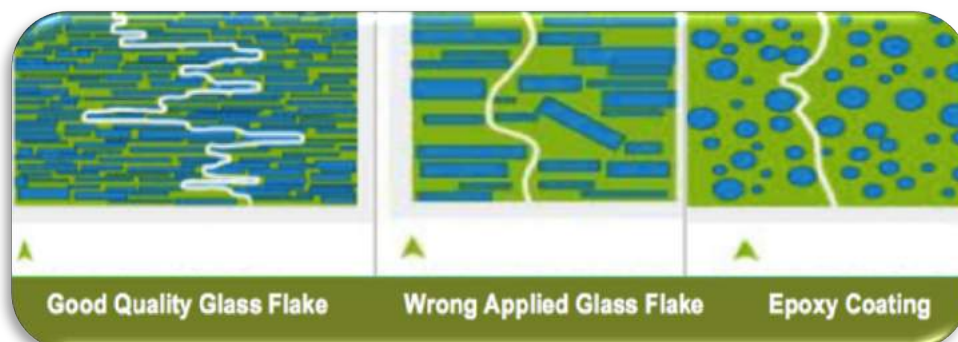
**C Glass Flake:** General Chemical Resistant Glass Flake or Mat or Veil

**E Glass Flake:** Electrical and thermal performance Glass Flake or Mat or Veil

**Mica Flakes:** Alkaline Resistant Glass Flake or Mat or Veil.

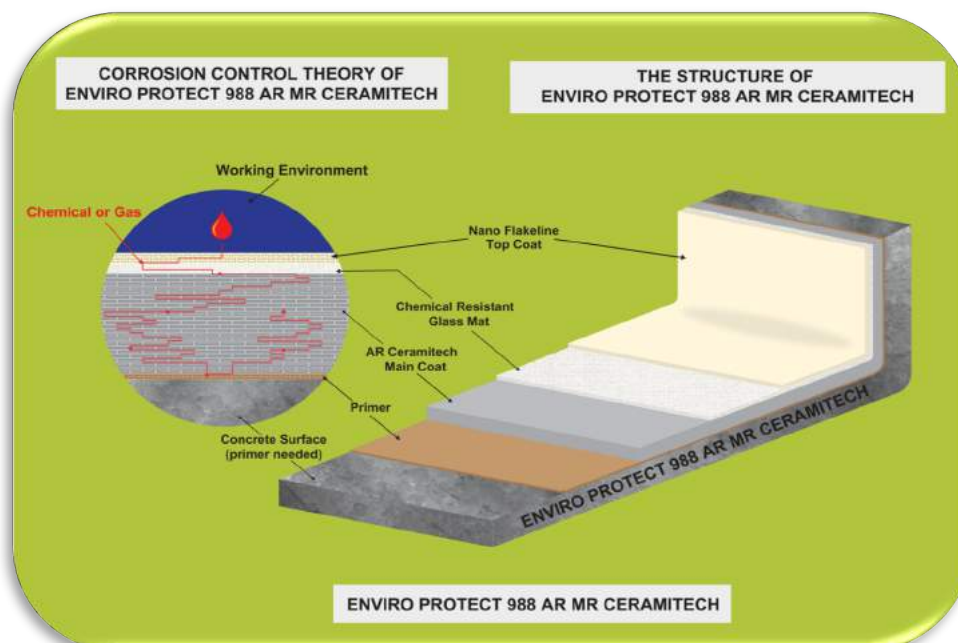
**Glass Mat:** Made from fiberglass uniformly distributed and bonded together like a cloth which absorb resins to form laminate section of MR Coating

**Glass Veil:** Made from fiberglass uniformly distributed and bonded together like a tulle which absorb resins to improve surface quality of MR VEIL Coating





## The Corrosion Control Theory of Enviro Protect Flakeline Coating



## Safety and Handling Consideration

## Recommended Storage:

This product can be used both on metal and concrete surfaces. Both surfaces shall be blasted and cleaned. Although concrete surfaces require primer, metal surfaces do not require primer

This product contains ingredients which could be harmful if mishandled. Contact with skin and eyes should be avoided and necessary protective equipment and clothing should be worn.

Enviro Protect maintains Material Safety Data Sheets on all of its Product. Material Safety Data Sheets contain health and safety information for your development of appropriate product handling procedures to protect your employees and customers.

Our Material Safety Data Sheets should be read and understood by all of your supervisory personnel and employees before using products in your facilities.

Drums - Store at temperatures below 21°C/69°F. Storage life decreases with increasing storage temperature. Avoid exposure to heat sources such as direct sunlight or steam pipes. To avoid contamination of product with water, do not store outdoors. Keep sealed to prevent moisture pick-up and monomer loss. Rotate stock.

If stored as mentioned above; the shelf life is minimum 6 months





Gold Mining  
Chemical Plant lined  
with Enviro Protect  
AR MR Cramitech  
Flakeline



Sea Water Potash  
Absorber lined with  
Enviro Protect AR MR  
Ceramitech Flakeline



Chemical Process Area  
lined with Enviro Protect  
AR MR Ceramitech Flakeline

The Simulated and Enlarged Pictures of  
Alumina Ceramic Flakes in Enviro Flakeline

**TEDARİKCİ ve UYGULAMACI FİRMA**

**Enviro Protect Mühendislik Sanayi ve Ticaret Ltd.**

YENİŞEHİR MAH. REYHAN CAD. 44/33, PENDİK İSTANBUL. TEL: 0090 216 482 45 21, 0090 216 482 92 73,  
CEP TEL: 0090 532 245 11 75, 0090 506 344 80 86