

Enviro-Syn[®] HFR-1000[™] Mud Acid is part of the proprietary, eco-friendly Modified Acid[™] product portfolio that minimizes the hazardous exposure levels, corrosion rates and negative HSE properties of commonly used mud acids, while maintaining the positive aspects of solubilizing ability and reactivity rates. Coupled with Enviro-Syn HCR[®] Modified Acid, the hydrofluoric acid (HF) can be generated directly at the wellhead and yields a high-performance mud acid system. Unlike traditional mud acid, un-activated Enviro-Syn HFR-1000 Mud Acid is dermally non-toxic and non-corrosive, providing a high level of safety to people and the environment.

FEATURES & BENEFITS

- ✓ Neutralized until activated downhole by the addition of HCR Modified Acid
- ✓ Low viscosity mud acid; does not need gelation by a polymer or surfactant, or emulsification by diesel to achieve retarded reaction rate
- ✓ HF concentration can be adjusted on the fly by regulating the amount of activating acid, enabling operational flexibility
- ✓ Minimizes reprecipitation of aluminum compounds compared with conventional mud acid systems
- ✓ Ultra-low, long-term corrosion effects
- ✓ Compatible with typical elastomers used in oil and gas (e.g., Viton, Nitrile and EPDM)
- ✓ High stability in solution
- ✓ High thermal stability up to 170°C (338°F)

APPLICATIONS

- ✓ High-performance, safe mud acid alternative
- ✓ Sandstone and carbonate formation acidizing
- ✓ Readily reacts with quartz, silicates and clay to increase formation permeability

PHYSICAL PROPERTIES (UN-ACTIVATED)

Appearance:	Amber liquid
Specific Gravity:	1.185
Freezing Point:	≈ -27°C (-16°F)
Boiling Point:	> 100°C (212°F)
Thermal Stability:	170°C (338°F)
Un-activated Viscosity:	453 cP at 20°C (68°F)
Activated Viscosity:	< 5 cP at 20°C (68°F)
pH:	9.0
Solubility:	Soluble in water
Shelf Life:	> 1 year

Outstanding HSE profile

- Dermally non-toxic
- Non-corrosive to skin
- Low fuming
- Biodegradable
- Non-regulated for ground transport (USDOT)

ENVIRO-SYN HFR-1000 MUD ACID BLENDING RATIOS

Enviro-Syn HFR-1000 Mud Acid is a 2-part system, activated using HCR liberating free HF off surface, either at the wellhead, downhole during coiled tubing or jointed pipe operations.

Table 1. HCR-7000: HFR-1000

HCR-1000 HF Concentration (wt %)	HCR-7000 HCl Concentration (wt %)	HCR-7000: HFR-1000 (mixing ratio)
3.0	5.75	5.6: 1
2.5	7.25	6.9: 1
2	8.50	8.9: 1
1.5	10.00	12.3: 1
1	11.25	18.8: 1
0.5	12.75	39.0: 1

Activation of Enviro-Syn HFR-1000 with HCR restores the quartz dissolving ability (Table 2). By itself, Enviro-Syn HFR-1000 dissolve essentially no quartz; however, in combination it performs on par with a standard mud acid (HF with HCl). In addition, Enviro-Syn HFR-1000 activated with Enviro-Syn HCR blends match or exceed the performance of a traditional mud acid.

Table 2. Dissolution of quartz with various mud acid blends. Testing was performed at 75°C (167°F) for 4 hours.

Acid Blend	Free HCl (%)	kg/m ³	lb/gal
HCl	12	0.095	0.0008
HFR-1000	–	0.036	0.0003
HF with HCl	12	3.8	2.68
HFR-1000 with HCl	12	3.95	2.78
HFR-1000 with Enviro-Syn HCR-7000 [®]	6	4.49	3.16
HFR-1000 with Enviro-Syn HCR-7000FRAC+ [®]	12	5.76	4.06

CORROSION RATES

Enviro-Syn HCR-7000 provides adequate downhole corrosion protection for common oilfield alloys.

Table 3. Corrosion rates of various mud acid systems.

Blend	HCR (% HCl equivalent)	HFR (% HF equivalent)	Temp (°C / °F)	Coupon	Time (hr)	Corrosion (lb/ft ²)
HFR-1000 NEAT	–	–	55 / 131	1018CS	168	0.015
HCR-7000-WL / HFR-1000	8.50	2.0	90 / 195	316SS	6	0.001
HCR-7000N / HFR-1000	7.25	2.5	93 / 200	L80	6	0.007
HCR-7000N / HFR-1000	7.25	2.5	93 / 200	L80-13Cr	6	0.011
HCR-7000N / HFR-1000	7.25	2.5	93 / 200	Duplex 2205	6	0.020

NOTE: Oilfield industry typically accepts a corrosion rate less than 0.050 lb/ft² at 6 hours. Coiled tubing typically accepts a corrosion rate less than 0.020 lb/ft² at 6 hours.

SAFETY, STORAGE & HANDLING

- ✓ Stored in sealed containers, such as plastic pails, lined drums and HDPE IBC totes
- ✓ Fitting and valves should be HDPE, brass or stainless steel
- ✓ Do not use containers or fittings made of aluminum, copper, zinc or their alloys
- ✓ If heating, use a stainless-steel heat exchanger or tank steam coils, keeping the temperature below 65°C (150°F)
- ✓ Recommended shelf life of 1 year
- ✓ Consult SDS for additional information and PPE requirements
- ✓ Once activated by HCR, live HF is generated, and appropriate safety measures must be taken.

Hydrofluoric Acid is:

- Toxic by Inhalation
- Highly Toxic by Ingestion
- Highly Toxic by skin absorption
- Corrosive

NOTE: Activated HFR-1000 is acute dermal toxin – exercise caution

Talk to us today about our revolutionary products available globally.

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