

# EnerFrac™ AI-4031

Acid Inhibitor

**Description:**

EnerFrac™ AI-4031 is an excellent mineral acid corrosion inhibitor for use at moderate to high temperatures. EnerFrac™ AI-4031 coats the metal with a thin film barrier to protect against the destruction by direct contact with the acid. The excellent dispensability of EnerFrac™ AI-4031 insures that the inhibitor comes into contact with the metal instead of floating out on top of the acid.

**Physical Properties:**

Form: Liquid	Chemical Family: Proprietary
Color: Amber	Solubility: Acid dispersible
Odor: Alcoholic	Wt. per Gal: 7.4 lb
Charge: Cationic in Acid	Flash Point: 55°F (13°C)

**Application:**

EnerFrac™ AI-4031 can be used in acid strengths up to 28% hydrochloric acid. It is effective to 200°F without the use of an intensifier and to 350°F when used with an intensifier such as formic acid. The tables below give **approximate** use rate guidelines. More precise dosage is determined by: (1) the acid type and strength, (2) temperature, (3) type of steel, (4) amount of other additives, and (5) contact time. The best performance is obtained by testing at the particular job conditions expected.

15% Acid Strength	
Temp. (°F)	EnerFrac™ AI-4031
150	1.0-3.0
175	2.0-4.0
200	4.0-10.0
225	8.0-10.0
250	8.0-10.0
300	10.0 + Intensifier
350	20.2 + Intensifier

28% Acid Strength	
Temp. (°F)	EnerFrac™ AI-4031
150	2.0-9.0
175	6.0-20.0
200	8.0-20.0 + Intensifier
225	10.0-15.0 + Intensifier
250	15.0-20.0 + Intensifier

**Compatibility:**

EnerFrac™ AI-4031 is cationic and as such is compatible with other cationic or nonionic materials. Caution must be exercised with anionic additives. Do not blend with any other chemical additives before use.

**Handling and Storage:**

EnerFrac™ AI-4031 is a flammable liquid. Keep away from heat, sparks and open flame. This product is toxic. Avoid contact with eyes, skin and clothing. Avoid breathing vapors. Wear rubber gloves, apron, and chemical splash goggles. If conditions warrant wear an organic vapor cartridge respirator. Refer to Material Safety Data Sheet (MSDS) for handling and hazard data.

**Packaging:**

EnerFrac™ AI-4031 is available in 55 gallon drums or 330 gallon tote tanks.

**1424 S. Hugh Wallis Road | Lafayette, LA 70508 • Tel: 337.291.2778 | Fax: 337.291.2781**  
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## EnerFrac™ AI-4031 Acid Corrosion Inhibitor Test Results

### I. Performance Test Results in 15% HCl

Test Temp. (°F)	Test Pressure (psi)	EnerFrac™ AI-4031 Conc. (gpt)	Contact Time (hrs)	Coupon (type)	Corrosion (lbs/ft²)
150	Atmospheric	1.0	6	J-55	0.0041
	"	1.0	24	"	0.0071
	"	2.0	24	"	0.0041
	"	3.0	24	"	0.0051
175	"	1.0	6	"	0.0463
	"	2.0	6	"	0.0081
	"	3.0	6	"	0.0051
	"	3.0	24	"	0.0091
	"	4.0	24	"	0.0071
	"	5.0	24	"	0.0071
200	"	3.0	6	"	0.0082
	"	4.0	6	"	0.0081
	"	5.0	6	"	0.0081
	"	6.0	24	"	0.0151
	"	8.0	24	"	0.0131
	"	10.0	24	"	0.0101
225	2,000	8.0	6	"	0.0091
	"	10.0	6	"	0.0091
250	3,000	8.0	6	"	0.0424
	"	8.0 <sup>(1)</sup>	6	"	0.0141
	"	10.0	6	"	0.0262
	"	10.0 <sup>(1)</sup>	6	"	0.0131
300	"	10.0 <sup>(2)</sup>	6	N-80	0.0282
	"	10.0 <sup>(3)</sup>	6	"	0.0242
	"	10.0 <sup>(4)</sup>	6	"	0.0222
	"	20.0 <sup>(2)</sup>	6	"	0.0262
	"	20.0 <sup>(3)</sup>	6	"	0.0242
	"	20.0 <sup>(4)</sup>	6	"	0.0232
350	4,000	20.0 <sup>(2)</sup>	3	"	0.0351
	"	20.0 <sup>(3)</sup>	3	"	0.0332
	"	20.0 <sup>(4)</sup>	3	"	0.0271

- (1) 16.7 pounds of Potassium Iodide added as an intensifier per 1,000 gallons of acid.
- (2) 100 gallons of Formic Acid added as an intensifier per 1,000 gallons of acid.
- (3) 150 gallons of Formic Acid added as an intensifier per 1,000 gallons of acid.
- (4) 200 gallons of Formic Acid added as an intensifier per 1,000 gallons of acid.

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## II. Performance Test Results in 28% HCl

Test Temp. (°F)	Test Pressure (psi)	EnerFrac™ Al-4031 Conc. (gpt)	Contact Time (hrs)	Coupon (type)	Corrosion (lbs/ft²)
150	Atmospheric	1.0	6	J-55	0.0091
	"	2.0	6	"	0.0061
	"	3.0	6	"	0.0051
	"	3.0	24	"	0.0101
	"	6.0	24	"	0.0081
	"	9.0	24	"	0.0061
175	"	4.0	6	"	0.0232
	"	6.0	6	"	0.0182
	"	8.0	6	"	0.0121
	"	10.0	24	"	0.0262
	"	15.0	24	"	0.0122
	"	20.0	24	"	0.0102
200	"	8.0	6	"	0.0292
	"	8.0 <sup>(1)</sup>	6	"	0.0071
225	2,000	10.0	6	"	0.0402
	"	10.0 <sup>(1)</sup>	6	"	0.0191
	"	15.0	6	"	0.0391
250	"	15.0 <sup>(1)</sup>	6	"	0.0161
	3,000	10.0	6	"	0.1113
	"	10.0 <sup>(1)</sup>	6	"	0.0552
	"	10.0 <sup>(2)</sup>	6	"	0.0421
	"	15.0	6	"	0.0953
	"	15.0 <sup>(1)</sup>	6	"	0.0502
	"	15.0 <sup>(2)</sup>	6	"	0.0421
	"	15.0 <sup>(3)</sup>	6	"	0.0311

(1) 16.7 pounds of Potassium Iodide added as an intensifier per 1,000 gallons of acid

(2) 33.4 pounds of Potassium Iodide added as an intensifier per 1,000 gallons of acid.

(3) 16.7 pounds of Copper Iodide added as an intensifier per 1,000 gallons of acid.

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