

Chemical Resistance (STAR® Anhydride, Aliphatic Amine and Aromatic Amine)

CHEMICAL	CONCENTRATION	STAR ANHYDRIDE		STARALIPHATIC AMINE		STAR AROMATIC AMINE		
		° F	° C	° F	° C	° F	° C	
ACIDS								
MAXIMUM RECOMMENDED TEMPERATURE								
Acetic Acid	Any	NR	NR	NR	NR	150	66	
Citric Acid	<25%	150	65	200	93	210	99	
Hydrochloric Acid,	<i>Refer to Product Data for Acidizing Procedures</i>	75	25	150	65	75	24	
Hydrochloric Acid		4-15%	NR	NR	150	65	NR	NR
Hydrochloric Acid		16-36%	NR	NR	75	25	NR	NR
Hydrofluoric Acid	Any	NR	NR	NR	NR	NR	NR	
Mud Acid, (containing HF)		NR	NR	NR	NR	NR	NR	
Sulfuric Acid	1-3%	75	25	75	25	75	24	
Sulfuric Acid	4-10%	NR	NR	75	25	NR	NR	
Sulfuric Acid	>10%	NR	NR	NR	NR	NR	NR	
ALCOHOLS								
Ethanol	100%	75	25	150	65	120	49	
Ethylene Glycol		150	65	150	65	210	99	
Isopropanol	10%	100	38	200	93	150	66	
Methanol	20%	100	38	200	93	100	38	
CAUSTICS								
Ammonium Hydroxide	28%	NR	NR	75	25	100	38	
Sodium Hydroxide	<50%	NR	NR	150	65	100	38	
Sodium Hydroxide	>50%	NR	NR	NR	NR	NR	NR	
GASES								
Air, wet or dry		150	65	200	93	210	99	
Carbon Dioxide, dry, <800 psi		150	65	175	80	175	99	
Carbon Dioxide, dry, >800 psi		NR	NR	150	65	150	66	
Carbon Dioxide, wet, <800 psi		150	65	175	80	175	99	
Carbon Dioxide, wet, >800 psi		NR	NR	150	65	150	66	
Hydrogen Sulfide, dry		150	65	175	80	175	66	
Methane, Natural Gas		150	65	200	93	210	99	
Sour Gas (w/H ₂ S), wet, <500 psi	<5% H ₂ S	125	50	150	65	150	66	
Sour Gas (w/H ₂ S), wet, >500 psi	>5% H ₂ S	NR	NR	NR	NR	NR	NR	
HYDROCARBONS								
Crude Oil, sweet (CO ₂) or sour (H ₂ S)		150	65	200	93	210	99	
Diesel Fuel		150	65	200	93	210	99	
Fuel Oil		150	65	200	93	210	99	
Gasoline, all types		150	65	200	93	210	99	
Jet Fuels		150	65	200	93	150	66	
Kerosene		150	65	200	93	210	99	
Naphtha		100	38	200	93	210	99	
SOLVENTS								
Benzene	<10%	75	25	75	25	120	49	
Heptane		125	50	150	65	200	93	
Hexane		75	25	150	65	150	66	
Methylene Chloride		NR	NR	NR	NR	NR	NR	
Toluene		100	38	150	65	100	38	
Xylene		NR	NR	150	65	150	66	
WATERS								
Water, Brine / Salt / KCl / Hard		150	65	200	93	210	99	
Water, Chlorinated	100 ppm	100	38	150	65	150	66	
Water, Demineralized / Distilled		100	38	200	93	200	93	
Water, Produced, sweet (CO ₂) or sour (H ₂ S)		150	65	200	93	210	99	
Water, Sea		150	65	200	93	210	99	

NR-Not Recommended

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 **NOV Fiber Glass Systems**

ACID TREATMENT OF LINE PIPE OR TUBING

Introduction

- Never use hydrofluoric acid in fiberglass tubulars since it will permanently damage the product.
- Typical acid treatment of fiberglass tubulars includes up to 15% hydrochloric acid and in some instances up to 5% total solvents such as Xylene or Toluene and a surfactant are added for paraffin removal.
- Other acid treatment formulations should be reviewed by NOV Fiber Glass Systems.

Acidizing Procedure

- Hook up the acid truck to the well/line.
- Check to see that the tubing annulus is full to the surface, fill to the surface if necessary.
- The acid in the pump truck must be between 60° F and 100° F.
- Pump the acid at the minimum pressure necessary to force the fluid into the formation or through the line.
- The well head pressure must not exceed 75% of the rated pressure.
- The exposure time shall not exceed 4 hours.
- If the acid pumping is interrupted, immediately flush the line pipe or tubing.

Caution: The acid must not be left sitting in the fiberglass pipe. Line pipe will require pigging the line to avoid leaving traces of acid in valleys, low spots, or bends in the line.

- Once the required amount of acid is pumped, immediately flush the well/line with water or BRINE until a minimum of five times the volume of the pipe has been injected.
- Do not leave the acid sitting in the fiberglass pipe.

Tubing Precautions

- Extremely hot wells ($\geq 175^{\circ}$ F) require cooling down prior to acidizing, contact NOV Fiber Glass Systems for specific considerations.

Line Pipe Precautions

- Avoid over-bending pipe during installation (see catalog product data for minimum bending radius). Exceeding the minimum bending radius can cause stress cracking which could lead to acid attack during acid treatment for scale build-up.
- Flush the line using a pig ahead of the flush water.
- The volume of flush water through each branch of the line must be calculated to meet the minimum requirement of five times the volume of the line.

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The logo for NOV Fiber Glass Systems, featuring the letters 'NOV' in a stylized font followed by the words 'Fiber Glass Systems' in a bold, sans-serif font.

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E5620 Issued July 2009 - Supersedes June 2004