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APPROVAL		CXMQ								
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1. REMOTE ACIDIZING

The operations in which acid or other chemical products are pumped to the well from a Stimulation vessel through the Production Unit and not through a drilling or Workover rig is called by Petrobras technicians as remote acidizing jobs.

This section lists the fluids that can be used during special operations. These fluids will

be pumped for formation stimulation, using special purpose boats, installations on the

FPSO and subsea equipment (risers, flowlines and Wet Christmas Trees).

This list is not extensive and the use of other fluids may be evaluated by Petrobras during the operation of the field. Some commercial additive names are mentioned but similar products may be provided by different service companies.

1.1 Carbonate scale removal

Aqueous Solution I, with Acetic Acid as main product:

Example:

Aqueous Solution I – Acetic Acid As main product

Acetic acid up to 20%	Product function
Acetic acid 98%	Acid
Water	Dilution
CI-111	Isopropanol + quaternary ammonium salt surfactants
NE-18 LB	Amine-based corrosion inhibitor
Inflo-45 LB	Ethoxylate + quaternary ammonium salt surfactants

Aqueous Solution II, with Formic Acid as main product:

Formic acid up to 10%	Product function
Formic acid 85%	Acid
Water	Dilution
CI-111	Isopropanol + quaternary ammonium salt surfactants
NE-18 LB	Ethoxylate + quaternary ammonium salt surfactants
Inflo-45 LB	Ethoxylate + quaternary ammonium salt surfactants

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Aqueous Solution III, with Acetic Acid and Formic Acid as main products:					
Organic acid u	ıp to 20%	Product funct	ion		
Acetic acid 98	%	Acid			
Formic acid 58	3%	Acid			
Water		Dilution			
CI-111		Isopropanol +	- quaternary ammonium	compound	
NE-18 LB		Ethoxylate + quaternary ammonium salt surfactants			
Inflo-45 LB		Ethoxylate + quaternary ammonium salt surfactants			
Example:					
Chelating age	nt F	Product function	1		
EDTA	0	chelant, diammonium salt			
Water or c fluid	completion E	Dilution			
Ultrawet 70	E	Ethoxylate + quaternary ammonium salt surfactants			
Renex 100	V	Nettability modifier			
Aqueous Solution V, with EDTA and EGMBE as main products: Example:					
Chelant and EGMBE P		Product function	1		
EDTA	EDTA C		Chelant, diammonium salt		
Water or completion D fluid		Vilution			
Emulsion prev	venter E	Ethoxylate + quaternary ammonium salt surfactants			
Corrosion inhi	bitor A	Amine-based corrosion inhibitor			
EGMBE		Ethylene glycol monobuthyl ether			



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Aqueous Solution VI, with GLDA chelating agent as main product

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Example:

Chelating agent solution	Product function
GLDA monosodium salt	Chelant
Water	Dilution
Emulsion preventer	Ethoxylate + quaternary ammonium salt surfactants
Corrosion inhibitor	Amine-based corrosion inhibitor
EGMBE	Ethylene glycol monobuthyl ether

1.2 Sulfate scale removal

Aqueous Solution VII, with chelating agent as main product:

Example:

Chelating agent solution	Product function			
EDTA diammonium salt	Chelant			
Water or completion fluid	Dilution			
Ultrawet 70	Emulsion preventor, Ethoxylate + quaternary ammonium salt surfactants			
Renex 100	Wettability modifier			

Aqueous Solution VIII, with chelating agent as main product:

Chelating agent solution	Product function
DTPA	Chelant
Water	Dilution
Ultrawet 70	Emulsion preventer, Ethoxylate + quaternary ammonium salt surfactants
Renex 100	Wettability modifier

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1.3 Organ	1.3 Organic deposits removal						
Solvent mixtu	ure I, Xylene as main product:						
Example:							
Solvent	Product function						
Xylene	Aromatic solven	t					
Solvent mixtu Example:	Solvent mixture II, mixture with diesel:						
Solvent	Product function						
Butilglycol	Solvent						
Diesel	Aliphatic solvent						
Solvent mixtu Example:	ure III, hydrocarbon solvents n	nixture					
Solvent	Product function						
Xilene	Aromatic solven	t					
Diesel	Aliphatic solvent						
Solvent mixture IV, DBX mixture of solvents: Example:							
Solvent	Product function						
Diesel	Aliphatic solvent						
Butilglycol	Biodegradable s	olvent					
Xylene	Aromatic solven	t					
Xylene Aromatic solvent 1.4 Carbonate scale Inhibition Aqueous Solution IX, scaling inhibitor as main product:							

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Example:

Solvent	Product function
SCW-356	Scaling inhibitor
Water	Dilution
Ultrawet 70	Ethoxylate + quaternary ammonium salt surfactants

1.5 Sulfate scale Inhibition

Aqueous Solution X, scaling inhibitor as main product with pH adjuster:

Example:

Solvent	Product function
SCW-260	Scaling inhibitor
Water or completion fluid	Dilution
Ultrawet 70	Ethoxylate + quaternary ammonium salt surfactants
Sodium hydroxide	Alkali

1.6 Reservoir Stimulation Solutions

Aqueous Solution XI – Acetic Acid as main product

Acetic acid up to 20%	Product function
Acetic acid 98%	Acid
Water	Dilution
CI-111	Isopropanol + quaternary ammonium salt surfactants
NE-18 LB	Amine- based corrosion inhibitor
Inflo-45 LB	Ethoxylate + quaternary ammonium salt surfactants

Aqueous Solution XII - Formic Acid as main product:



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Example:

Formic acid up to 10%	Product function
Formic acid 85%	Acid
Water	Dilution
CI-111	Isopropanol + quaternary ammonium salt surfactants
NE-18 LB	Ethoxylate + quaternary ammonium salt surfactants
Inflo-45 LB	Ethoxylate + quaternary ammonium salt surfactants

Aqueous Solution XIII, with Acetic Acid and Formic Acid as main products:

Example:

Organic acid up to 20%	Product function
Acetic acid 98%	Acid
Formic acid 85%	Acid
Water	Dilution
CI-111	Isopropanol + quaternary ammonium salt surfactants
NE-18 LB	Ethoxylate + quaternary ammonium salt surfactants
Inflo-45 LB	Ethoxylate + quaternary ammonium salt surfactants

Aqueous Solution XIV, Hydrochloric acid as main product:

Example:

Hydrochloric acid 15%	Product function
hydrochloric acid 32%	Inorganic acid
Water	Dilution
CI-27 or similar	Corrosion Inhibitor for inorganic acids
NE-18LB or similar	Emulsion preventer

Aqueous Solution XV, HCI- based Viscoelastic diverter

Viscoelastic divergent	Product function
Divert S or similar	Viscoelastic surfactant

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Hydrochloric acid 32%	Inorganic acid
Water	Dilution
CI-27 or similar	Corrosion Inhibitor for inorganic acids
NE-18LB or similar	Emulsion preventer
Breaker-AC or similar	Additive, breaker

Aqueous Solution XVI, polymer based acid system as a diverter

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Example:

EAS (up to 5% m/m HCI)	Product function			
AG-61	Additive			
Hydrochloric acid 32%	Inorganic acid			
Water	Dilution			
CI-27	Corrosion Inhibitor for inorganic acids			
NE-18LB	Emulsion preventer			
GBW-24	Additive			
PSA-2LB	Additive, polymer			
XLA-4	Additive, crosslinker			

Aqueous Solution XVII, Emulsified acid system as main product:

Dual Phase	Product function
hydrochloric acid 32%	Inorganic acid
Water	Dilution
Diesel	Aliphatic solvent
CI-27	Corrosion Inhibitor for inorganic acids
Ferrotrol-300LB	Additive, chelating agent
E-31	Additive
FRO-18	Additive



1.7 Operation Conditions

1.7.1 Frequency and time of exposition

The presented frequency and pumping time for each kind of treatment may vary depending on well conditions. The values below must be considered as a reference based on usual Petrobras operations and/or estimates, considering an average pump rate for usual pumped volumes.

Job name	Maximum pumping time (h)	Well clean up time (h)	Frequency	Pumping Temperature (ºC)	Treating Pressure (psi)
Carbonate Scale Removal					
Sulfate scale removal					
Organic deposits removal	12	24	2 jobs / year /well	25 - 30	4000
Carbonate scale Inhibition					
Sulfate scale Inhibition					
Reservoir Stimulation Solutions	15	48	1 job each 2 years / well	25 - 30	4000

1.7.2 Pressure rate during pumping

While pumping the fluids to the well, both pressure increase and pressure decline rates depend on well conditions. The values below must be considered as references based on usual recent Petrobras operations and/or estimates.

Pressure increase (psi/min)	up to 1500
Pressure decline (psi/min)	up to 4000