

PREMIUM STIMULATION FLUIDS

Acidizing Sandstones with Green Solution

For treating an oil well in Germany, we employed a combination of the biodegradable acid systems SSB-007 and SFB-007 with great success.

Fluid Systems

Advantages of SSB-007:

- WGK-1 classified formulation with low toxicity to aquatic life
- Based upon a strong organic acid with an optimized reaction rate
- Low fluid corrosivity and excellent compatibility with clay minerals
- Odor-free / evolves no dangerous volatiles for safe handling on location

Advantages of SFB-007:

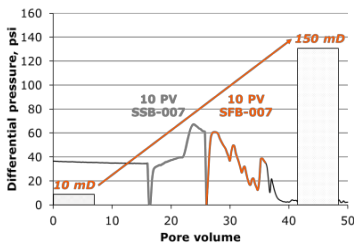
- Based upon SSB-007 including component for dissolving clay minerals



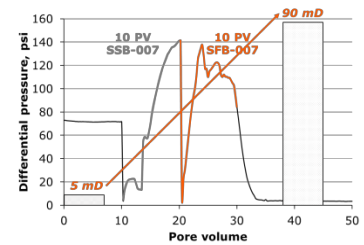
Recipe Optimization

Intensive lab testing included:

- Core flooding with bunter sandstone



Core flooding at 140°C and 2,000 psi CP				
Core	Initial Ap, psi	Final Ap, psi	Initial K, mD	Final K, mD
1	2	2	120	120
2	35	2	10	150
3	58	35	4	7
4	72	4	5	90
5	29	16	9	17
6	155	11	1	10
7	141	3	3	150
8	162	3	2	130
9	275	6	<0.2	10



- Corrosion testing with metal coupons



After 6 hours at 140°C and 1,000 psi N ₂				
Material	Fluid	Weight loss, g	Weight loss, %	Corrosion, lbs./ft ²
CT	SSB-007	0.227	0.861	0.02
	SFB-007	0.234	0.880	0.02
L-80	SSB-007	0.433	0.936	0.03
	SFB-007	0.499	1.067	0.03
C-95	SSB-007	0.529	0.910	0.03
	SFB-007	0.576	0.980	0.03

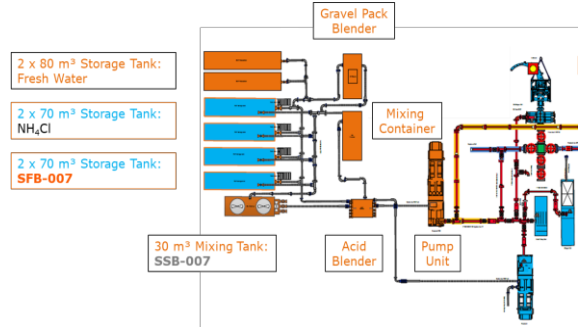


- Compatibility with oil sample
- Controlled neutralization

Field Trial on a German Oil Well

After acidizing the open section of the bunter sandstone via coil tubing, oil production was noticeably increased.

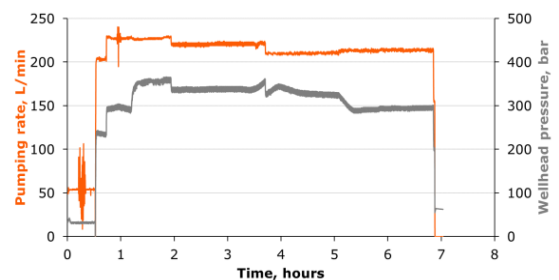
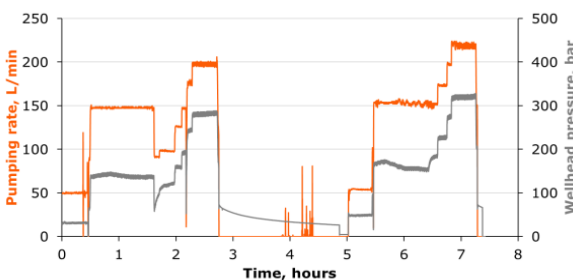
Equipment on Site



Pumping Schedule

Steps	Description of 1. Acid Step
1	Fill coil tubing with NH ₄ Cl and exchange downhole fluids with NH ₄ Cl
2	Fill coil tubing with SSB-007 and displace 10 m ³ of acid with NH ₄ Cl
3	Reaction time: 1 hour
4	Fill coil tubing with SFB-007 and displace 10 m ³ of acid with NH ₄ Cl
5	Reaction time: 4 hours
6	Nitrogen-lift

Steps	Description of 2. Acid Step
1	Fill coil tubing with NH ₄ Cl and exchange downhole fluids with NH ₄ Cl
2	Fill coil tubing with acid systems and displace 4 m ³ of SSB-007
3	Displace 60 m ³ of SFB-007 with NH ₄ Cl
4	Reaction time: 4 hours
5	Nitrogen-lift



Benefits

- ✓ Well-established treatment fluid for dissolving carbonates in sandstone and granite formations
- ✓ Low corrosion tendency at high temperature, even in the presence of H₂S
- ✓ Premium "green" solution for dissolving clay minerals in sandstones

READY FOR SERVICE

Dr. Nils Recalde Lummer

New Technologies & Business Development

+49 4471 980 08 25

+49 151 41 42 58 82

nlummer@fangmannngroup.com

fangmannenergyservices.com

