Stepan
OILFIELD SOLUTIONS

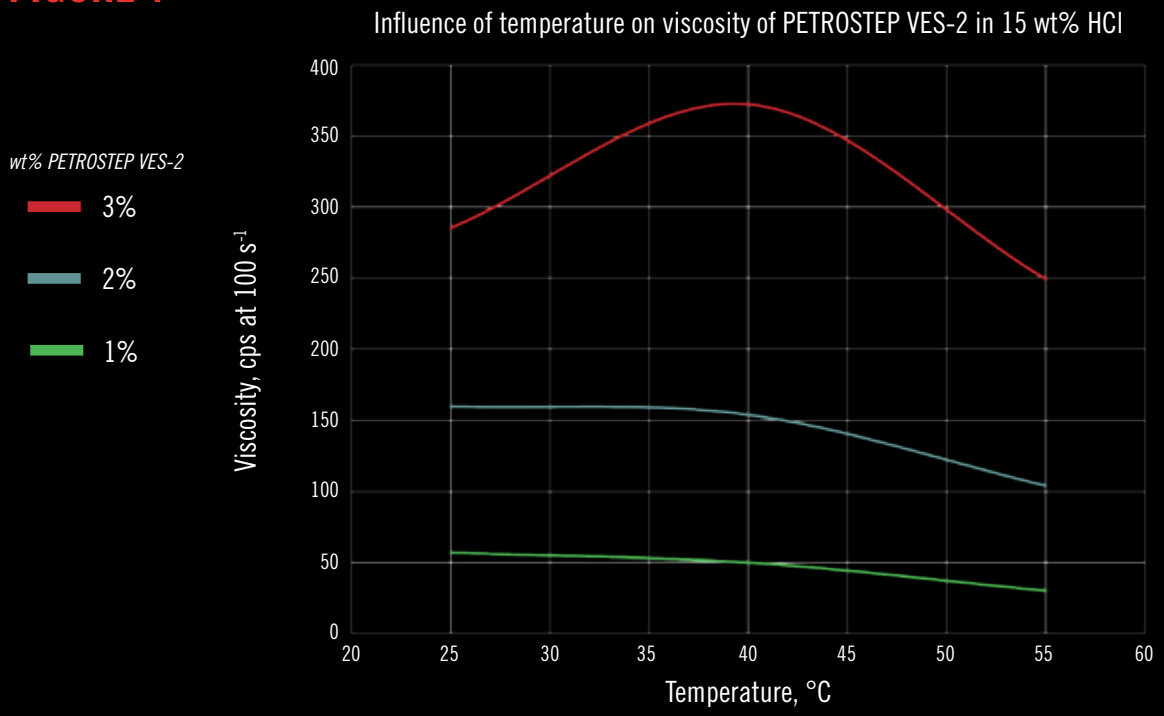
PETROSTEP® VES-2

Acid Viscosifier

In some oilfield applications, it is beneficial to deliver hydrochloric acid in a thickened form. Viscosified acids can reduce fluid loss into the formation and improve suspension of solid particles. The addition of small amounts of Stepan Oilfield Solutions' PETROSTEP VES-2 (1 – 3 wt%) can greatly increase the viscosity of hydrochloric acid (HCl), eliminating the need for solid diverting agents and promoting the formation of conductive channels to enhance oil and gas production.

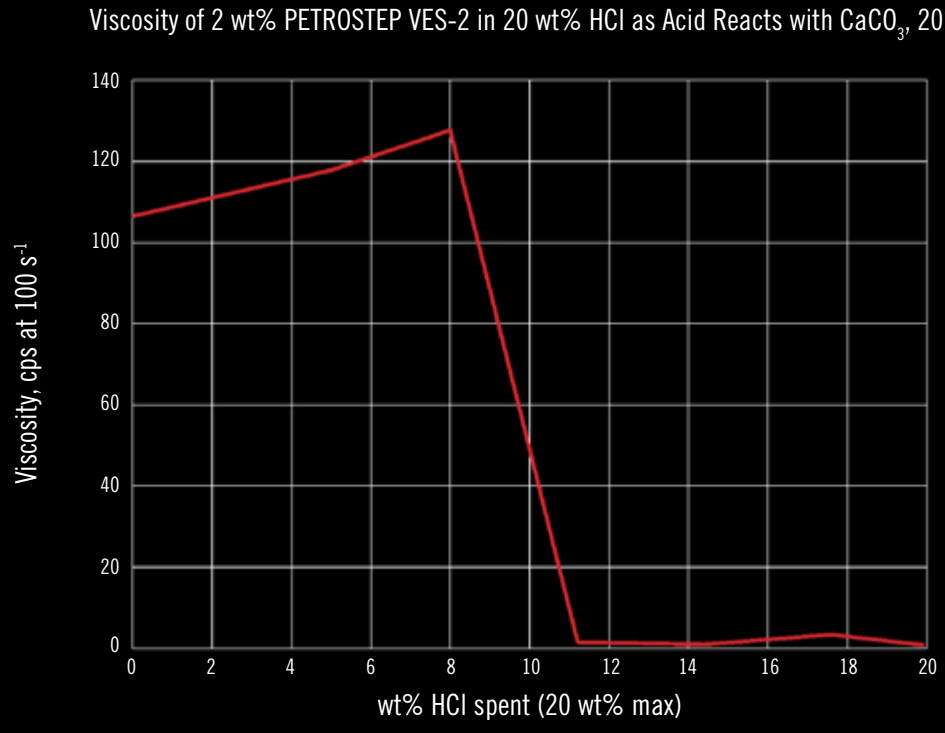
Figure 1 shows the effect of temperature on the viscosity of PETROSTEP VES-2 solutions in 15 wt% HCl, demonstrating that acid viscosities over 200 cps (at 100 s^{-1}) can be achieved at temperatures up to 55°C.

FIGURE 1



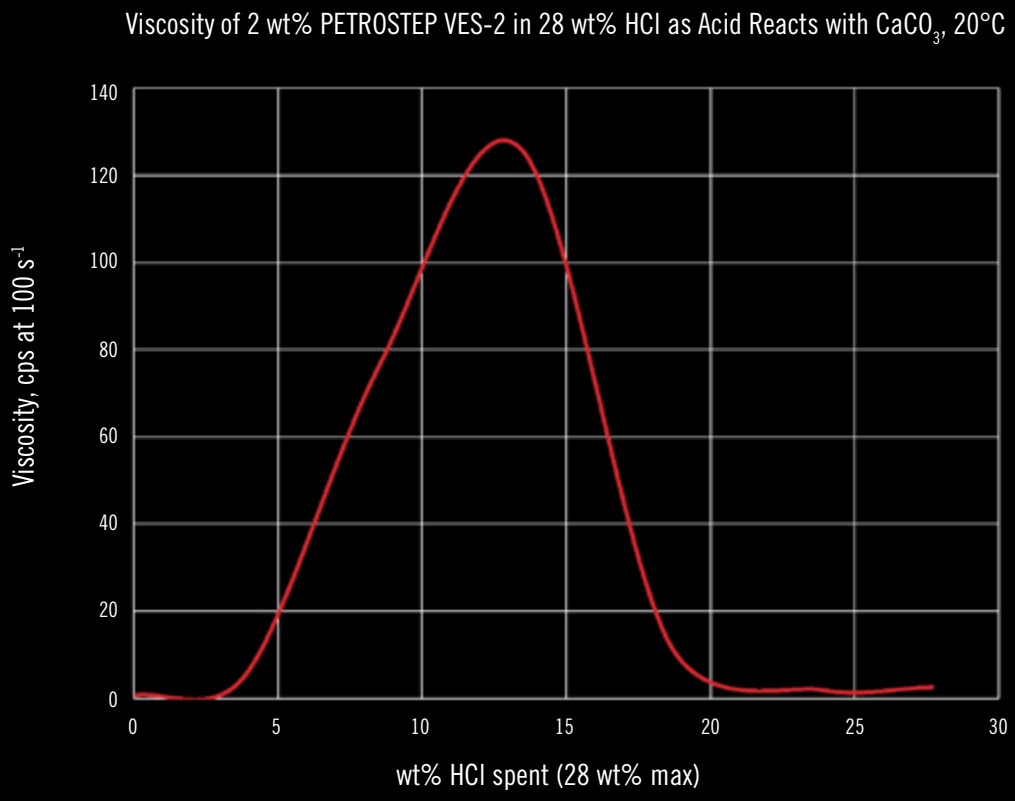
In addition to reducing fluid loss into the formation, viscosified acid solutions formed with PETROSTEP VES-2 slow the dissolution of carbonate rock, limiting localized enlargement of the wellbore and allowing for more selective stimulation. Figure 2 shows the viscosity profile of a 2 wt% solution of PETROSTEP VES-2 in 20 wt% HCl as the acid reacts with calcium carbonate. As the acid concentration is depleted, the viscous gel breaks down to a low viscosity fluid without the need for a solvent flush — reducing the need for operator intervention and decreasing cost.

FIGURE 2



At even higher acid strengths, PETROSTEP VES-2 solutions become self-diverting, as shown in Figure 3. Solutions of PETROSTEP VES-2 in 28 wt% HCl have initial low viscosity in live acid that quickly builds upon reaction with carbonate minerals. The viscosified fluid blocks the inflow of fresh acid into high permeability zones and diverts incoming acid to less permeable or more damaged zones, providing more even stimulation across the treatment interval.

FIGURE 3



TYPICAL PROPERTIES

- pH (5% 1:1 IPA:Water): 9.8
- Viscosity at 38°C, cps: 70
- Density at 38°C, g/mL: 0.89
- Flash Point (PMCC): >93.9°C

APPLICATIONS

Viscosification of hydrochloric acid (15 – 28 wt%)

DIRECTIONS FOR USE

- Incorporate product into formulation and mix thoroughly; contact Stepan Oilfield Solutions for further guidance regarding specific applications
- Adjust pH of formulation to < 5

For more information about PETROSTEP VES-2 and other PETROSTEP products, email oilfield@stepan.com or call 713.955.8100.

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