HE® 300 Polymer

Drilling Specialties' HE® 300 Polymer is one member of a family of synthetic, water-soluble polymers of varying composition and molecular weight developed for high temperature oilfield applications. This polymer is available as a powder and is an efficient thickener for a wide variety of fluid types including fresh water, seawater, brines and acids. It is designed to provide higher thermal stability than other water-soluble polymers

Applications

- As an acid viscosifier, for reducing fluid loss, extending acid spending time and improving stimulation results by increasing live acid penetration
- As a thickener for Slick Water Fracturing
- As a thickener for fresh water or brines in workover and completion operations
- In conformance control applications, HE® 300 Polymer provides superior high temperature stability. It is generally reserved for application where reservoir temperatures exceed 240 °F. It can be readily cross-linked with various organic systems, including phenol formaldehyde, resorcinol-formaldehyde, phenyl acetate-HMTA or hydroquinone-HMTA. Polymer loadings as high as 14 lb/BBL may be used in order to maximize gel rigidity in water shutoff treatments.
- As a high temperature fluid loss additive in silicate drilling fluids

Advantages of HE® 300 Polymer

- Hydrates rapidly in most aqueous systems
- Resists thermally induced hydrolysis
- Maintains solubility at high temperatures
- Thickens brines of various compositions
- Improves carrying capacity of fluids
- Gel able with various organic cross-linkers
- High tolerance to changes in pH

Cost
The cost of using HE® 300 Polymer is often less than using less effective polymers at higher concentrations

Water/brine Types
- Fresh water
- Seawater
- Potassium Chloride
- Potassium Bromide
- Sodium Chloride
- Sodium Chloride – Sodium Carbonate
- Sodium Bromide
- Alkali Metal Formates
- Calcium Chloride
- Calcium Bromide (up to 330 °F)166 °C
- Zinc Bromide (up to 330 °F) 166 °C

Mixing Requirements

Mix through a standard mud hopper

Handling

For specific instruction on handling, refer to the MSDS

Packaging

50lb sacks 40 sacks to the pallet

Polymer Cleanup

HE® 300 Polymer is an inherently clean thickener, posing very little risk of formation damage under normal usage conditions. The HE® 300 Polymer is readily soluble in normal wellbore cleanup type acids. The polymer is degradable using oxidizing agents, such as sodium hypochlorite (bleach) or ammonium persulfate. The activity of the oxidizer is generally enhanced by using fluid with a basic pH. Degradation by oxidizers is also enhanced at temperatures above 125 °F.

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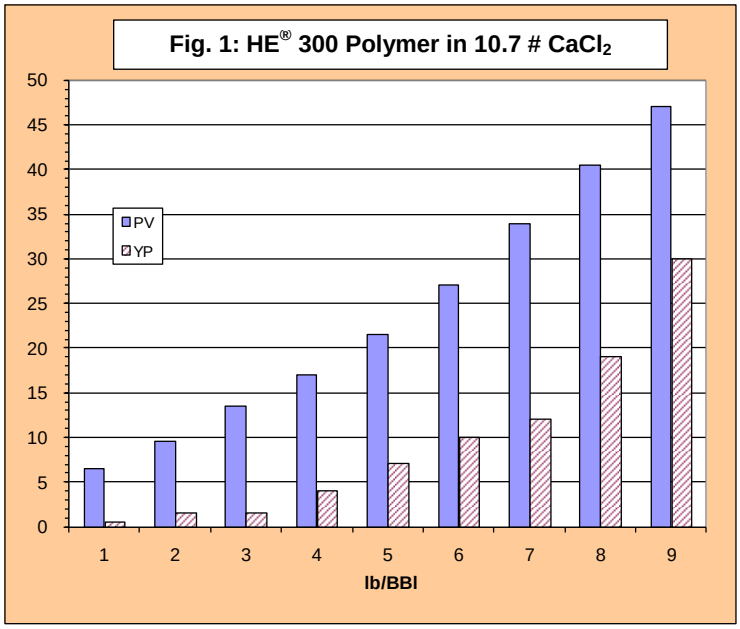
HE® 300 Polymer has been utilized as a thickener for various brines in drilling and completions applications. The HE® 300 Polymer powder is readily dissolved in most brines, yielding rheological properties similar to that shown in (Table 1 and Figure 1) which describes the polymers performance in a 10.7 lb/gal calcium chloride brine at 70 °F.

Table 1

HE 300® Polymer in 10.7 # $CaCl_2$

rpm	1	2	3	4	5	6	7	8	9	lb/BBl (active)
3	0	0	0	0	0	0	0	0.5	2	
6	0	0	0	0	0	0	0.5	1	3	
100	1.5	3	5	7	10	14	18	24	33	
200	4	7	10	15	20	27	34	44	57	
300	7	11	15	21	29	37	46	60	77	
600	14	21	29	38	50	64	80	100	124	
n' =	0.9470	0.8976	0.9255	0.8551	0.8105	0.7901	0.7979	0.7486	0.6870	
K' =	0.0002	0.0004	0.0005	0.0011	0.0019	0.0029	0.0034	0.0060	0.0113	$lbf{\cdot}sec^{n'}/ft^2$
Viscosity =	**7**	**12**	**16**	**25**	**35**	**47**	**57**	**79**	**109**	cP (170 sec^{-1})
PV =	**7**	**10**	**14**	**17**	**22**	**27**	**34**	**41**	**47**	cp
YP =	**1**	**2**	**2**	**4**	**7**	**10**	**12**	**19**	**30**	$lb/100ft^2$

Figure 1



In the very heavy brines, such as calcium bromide and zinc bromides, there may be insufficient free water to allow hydration of the dry polymer.

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Stability

The composition of HE® 300 Polymer provides protection against thermal hydrolysis, which allows the polymer to maintain its solubility in high temperature use and to resist precipitation in the presence of multivalent cations. In this Fan 50 test (Figure 2), the thickened calcium chloride brine was heated incrementally to 300 °F. The fluid was kept at each temperature for one hour before proceeding to the next stage. There was very little change in viscosity during that one-hour period, which demonstrates the polymer stability at high temperatures. Almost all the original viscosity was regained upon cool-down, again indicating no polymer degradation, hydrolysis or loss due to precipitation. In most high temperature applications, the polymer may benefit from the use of oxygen scavengers (e.g. sodium sulfite 0.5 to 4.0 lb/bbl) and a buffer like the sodium bicarbonate/carbonate system. For calcium systems calcium hydroxide is preferred.

Figure 2

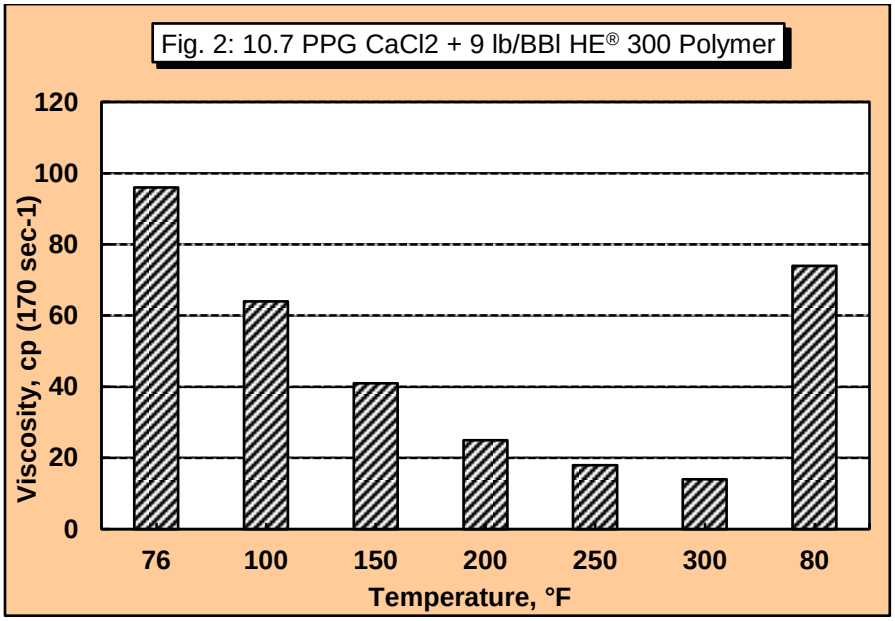

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Figure 3