



P-SRL

CEMENTING SERVICE BULLETIN

12/27/12

P-SRL (PETROCHEM – SYNTHETIC RETARDER LIQUID)

TECHNICAL DATA

P-SRL is a medium to high temperature synthetic retarder liquid that extends the thickening time but does not affect the slurry hydration rate. This feature provides P-SRL slurries with the following beneficial properties at BHST.

1. Rapid compressive strength development independent of the thickening time (reducing the wait-on-cement time), even with long (7 to 9 hr.) thickening times.
2. Better compressive strength development (in comparison to slurries incorporating Retarder P-UTR or (Liquid Retarder version) P-UTRL with the set-time.
3. P-SRL can provide slurries with long and predictable thickening times over the temperature and density ranges of 250 to 450°F (121 to 232°C) and 14 to 20 lbm/gal. respectively.
4. P-SRL is also compatible with: Freshwater slurries up to 450°F (232°C). Seawater slurries up to at least 350°F (177°C) and Salt slurries containing up to 25% BWOW sodium Chloride for temperatures up to 350°F (177°C).
5. P-SRL slurries are insensitive to small P-SRL concentration errors.
6. Minor variations in temperature.
7. Shear, unlike other retarder systems.
8. P-SRL systems can achieve good fluid-loss control with Liquid Fluid-Loss P-F401L above 320°F (160°C) and with Liquid Fluid-Loss additive P-F45L below this temperature.
9. P-SRL is compatible with P-1000 Gas Control additive systems up to 350°F (177°C) under conditions that depend on the cement brand and the dispersant selection.
10. P-SRL is compatible with both Liquid Additive Systems and continuous liquid additive systems.



SLURRY DESIGN & THICKENING TIME

1. P-SRL provides slurries with long and predictable thickening times at temperatures ranging from 250 to 450°F (121 to 232° C). Typical P-SRL concentrations are 0.20 gal/Sk. at 250°F and 1.25 gal/Sk. at 450°F. A right-angle set can generally be achieved with normal-density P-SRL slurries.
2. The thickening time is relatively insensitive to the P-SRL concentration. Small concentration errors do not dramatically affect the thickening time, contrary to what is generally observed with slurries containing conventional high-temperature retarders. P-SRL slurries also exhibit a low sensitivity to BHCT evaluation errors.
3. In most cases, slurries can be retarded to 7 to 9 hours, yielding an increased safety margin in terms of the pumping time without impairing the WOC time. This long retardation time is sometimes difficult to achieve above 400°F (204°C) with some cements, notably in the presence of large quantities of weighting agents (e.g., Hematite).
4. P-SRL is designed to work in conjunction with liquid fluid-loss additives P-F45L or P-F401L, depending on the anticipated BHCT and cement brand. Also P-F45L and P-F401L have a synergistic effect with P-SRL and contribute to the control of the thickening time. An additional 0.1 gal/sk P-F45L or P-F401L increases the thickening time by approximately 1.0 to 1.5 hours.
5. P-SRL is compatible with P-1000 slurries. However, higher concentrations of the appropriate dispersant (P-D88/P-D88L) are required. The dispersant selection is dependent on the cement brand.

COMPRESSIVE STRENGTH DEVELOPMENT

1. To increase the safety margin beyond the anticipated placement time or to compensate for BHCT underestimates, P-SRL can retard cement slurries from 7 to 9 hours. This extended thickening time does not compromise the onset of compressive strength development, contrary to what would happen when using conventional high-temperature retarders.
2. The relative insensitivity of P-SRL slurries to shear and temperature is a key benefit of P-SRL and has clear applications when there is a large or unknown temperature difference between the top and bottom of the cement column. It also allows the use of long liners for some applications. Thus, the use of P-SRL can enable multistage designs to be avoided or the liner length to be increased, when possible.



FLUID-LOSS CONTROL

1. Depending on the anticipated BHCT, P-F45L or P-F401L is the fluid-loss additive for P-SRL systems. Their solid forms (P-F45 and P-F401 respectively) exhibit similar properties. As a general rule, P-F45L is used for BHCTs less than 320°F (160°C) and P-F401L is recommended for higher BHCTs. If P-F45L imparts settling problems, then P-F401L is the recommended alternative.
2. The use of P-ASA is often necessary to prevent sedimentation in P-F45L slurries even at normal slurry densities.
3. For some cement brands, P-F401L is effective over the complete P-SRL temperature range (250 to 450°F [121 to 232°C]) and P-F45L controls fluid loss in P-SRL slurries at temperatures down to 200°F (93°C). Laboratory testing is recommended to determine the best choice of fluid-loss additive.
4. Fluid-loss values measured using a stirred fluid-loss cell, less than 100 mL/30 min are readily obtained using a P-F401L concentration between 0.3 and 0.5 gal/sk. High P-F45L concentrations are needed to obtain less than 150 mL/30 min in lightweight (14 lbm/gal) slurries.
5. For 16-lbm/gal slurries, fluid-loss values of 80 to 90 mL/30 min can be achieved with P-F45L. Variations in P-SRL concentration do not significantly affect the fluid-loss control in both P-F401L and P-F45L slurries.
6. Fluid-loss values obtained from a stirred fluid-loss cell are generally lower than those determined from a static cell, especially when using P-F401L or P-F401.
7. Caution must be exercised with P-F401L and P-F45L because they can impart high plastic viscosities at the mixing stage. A good compromise must be reached between slurry mix ability at surface temperature and fluid-loss control at BHCT

RHEOLOGY

1. The plastic viscosity of P-SRL slurries is primarily a function of the concentration of the fluid-loss additive and the slurry density.
2. Slurries are viscous at the mixing stage, but their viscosity significantly decreases when they are heated. P-D88L is an effective dispersant for reducing the yield value. P-SRL does not significantly affect the slurry rheology; although a slight viscosifying effect is sometimes observed when using high P-SRL concentrations that are required at temperatures above 350°F (177°C).
3. P-F45L slurries have a tendency to settle when heated. Sedimentation can be easily overcome by adding low concentrations of P-ASA. Higher quantities are needed in extended slurries.



SLURRY DENSITY

1. It is believed that the slurry density does not limit the use of P-SRL. The only possible limitations are the excessive rheologies and potential mixing problems imparted by P-F45L and P-F401L especially in high-density slurries and the fluid-loss control of low-density slurries.
2. P-SRL has not been tested in slurries extended with P-EXTL of which may change the response of cement to P-SRL, as observed when using conventional retarders with P-EXTL.

SALT TOLERANCE

P-SRL can be used in slurries containing up to 25% BWOW Sodium Chloride at temperatures ranging from 250 to 350 °F (121 to 177°C). P-F401L is used as the fluid-loss additive in these saline slurries because P-F45 and P-F45L cannot be used at salinities greater than 15% BWOW. P-SRL has not been tested at temperatures above 375°F or at mix-water salinities greater than 25% BWOW salt.

1. The sensitivity of thickening time to P-SRL concentration is minimal for slurries containing 18% and 25% BWOW salt. Thickening times of 7 to 9 hours are possible and the right-angle set is generally obtained. Data indicate that the low sensitivity to shear and temperature is comparable to that observed in freshwater slurries. Low rheology and acceptable fluid-loss control in saline slurries is achievable.
2. As observed in freshwater slurries, the efficiency of P-F401L as the fluid-loss additive could depend on the cement brand. Therefore, laboratory testing is recommended, especially at temperatures ranging from 250 to 300°F (121 to 149°C) where fluid-loss control may deteriorate.
3. P-SRL slurries can also be mixed with seawater and compared with those obtained in salt systems. Thus, low concentrations of divalent cations such as magnesium do not seem to have a detrimental effect.



P-1000 GAS CONTROL APPLICATION

1. P-SRL is compatible with P-1000 under conditions that primarily depend on the cement brand and the choice of dispersant. For some cement brands, Regular dispersant are unable to fully disperse the slurry and P-D88L must be used instead. When slurries are properly dispersed, good fluid-loss control can be achieved at temperatures up to 300°F (149 °C). With some cements, this temperature limit can be extended up to 330 to 350°F (166 to 177°C).
2. P-SRL is compatible with P-1000 at temperatures less than 250°F (121°C). This however is to be confirmed by laboratory testing.

FIELD MIXING PROCEDURES

1. The viscosity of P-SRL is close to that of water and no mixing difficulties are anticipated. It disperses rapidly in water with moderate agitation.
2. When batch mixing, the low-viscosity additives should first be added to the mix water P-AFAL (Petrochem-Anti Foam Agent Liquid) or P-DAL (Petrochem-Defoamer Antifoam Liquid), P-D88L (Petrochem Dispersant Liquid), P-SRL, and then followed by the fluid-loss additives P-F401L or P-F45L which are much more viscous. Care must be taken to provide a sufficient mixing energy to efficiently disperse the fluid-loss additive in the mix water. It is suitable to pour the additives into an agitated zone of the mixing tank and then to circulate the mix water for a few minutes. If the mixture is left un-agitated for any period of time, then stir the mix-water with circulation for a few minutes before commencing the cement mixing operation.
3. For P-1000 applications, the mix water containing all the liquid additives except P-SRL should first be prepared and circulated for a few minutes prior to the P-SRL addition.
4. If micro fine solid additives are added to the mix water, and they settle out for any reason, then drastic changes in the thickening time may be experienced.
5. P-SRL is an aqueous concentrated solution of organic and inorganic salts. Therefore, P-SRL drums should be stored at a temperature above 32°F (0°C) in order to avoid the possible precipitation of these salts. If drums have been stored at lower temperature for any period of time, then they must be placed in a warm room for at least one day and regularly agitated to ensure that any precipitate is re-dissolved before using the P-SRL solution.



PROPERTIES

<u>PRODUCT</u>	<u>FORM</u>	<u>S.G</u>	<u>PACKAGING</u>
P-SRL	Amber Liquid	1.1-1.2	55 gals. /Drums

SAFETY:

Before handling and/or using this product be sure to read the Safety Data Sheet.