P-ASA

CEMENTING SERVICE BULLETIN

4/1/06

P-ASA (PETROCHEM - ANTI-SETTLING AGENT-SALT)

TECHNICAL DATA

Introductory Summary

Complete information on health hazards, protective equipment, handling precautions, environmental hazards and disposal is listed in the current Material Safety Data Sheet (MSDS) for this product.

P-ASA is a powder additive developed to reduce free water, sedimentation, and density gradation collectively called slurry instability in cement slurries. It provides this stability improvement with varying increases in rheological values depending on the slurry design. P-ASA should have minimal effects on thickening time, fluid-loss control and compressive strength development.

P-ASA can be used at temperatures ranging from 80 to 300°F (27 to 149°C). Above 300°F (149°C), it undergoes a rapid degradation that cannot be overcome by increasing its concentration. Above this temperature P-HTAS (High Temperature Anti Settling) is required.

There is no defined slurry range for P-ASA applications, although the recommended lower density limit is 12.5 PPG (1.5 S.G.) for Class G and H cements containing extenders other than P-SL50.

P-ASA can be used in cement systems containing 0 to 37% BWOW Sodium Chloride; however, concentrations of Sodium Chloride greater than 5% BWOW must be dry blended or added to the mix water after adding the P-ASA . P-ASA can be used with seawater, although the required concentrations may be slightly higher and the results will not be as good as with freshwater or Sodium Chloride systems. P-ASA is not effective in slurries containing Calcium Chloride.

P-ASA may also be dry blended with the cement and/or other powdered additives. The normal P-ASA concentration range for correcting slurry instability is 0.1 to 1.5% BWOC which will stabilize slurries from 12 to 22 PPG. Beyond this concentration range, the slurry rheological values are affected to varying degrees.

Slurry Design
Unlike conventional cement additives, P-ASA is a remedial cement additive. It is designed to reduce slurry stability problems when the other slurry properties are close to optimum after the initial slurry design. It is used at very low concentrations and normally has very little influence on the other slurry properties.

Slurry Stability
Cement slurries are designed to provide certain performance properties under well bore conditions. These properties, Permeability, Compressive strength and zonal isolation are dependent on the slurry maintaining a stable solids-to-powder ratio throughout the well bore.

Tests to measure the stability of a cement slurry have been constantly increasing in number and complexity. These tests basically look for one piece of information; how uniform is the suspension of cement particles throughout the slurry under placement and curing conditions. P-ASA is designed to improve the slurry suspension properties, even for over dispersed cement slurries.

P-ASA
CEMENTING SERVICE BULLETIN

4/1/06

P-ASA (PETROCHEM - ANTI-SETTLING AGENT POWDER)

Free Water
In the laboratory, free water is the clear fluid that develops at the top of a static column of cement contained in a graduated cylinder. Under well bore conditions; it can take the form of channels along one side of a deviated well bore or pockets of water within a vertical column of set cement.

In some slurries, a density profile develops from the top (less than design density) to the bottom (greater than design density) of the cement column and it steadily increases as the column compresses. The quantity of this density increase with depth is referred to as the density gradation of the slurry. It is usually considered acceptable when the density difference between the top and bottom is less than or equal to 10% of the design density.

Free water is present in slurries with and without cement additives. With easily dispersed cements, the free water can increase when dispersants and fluid-loss additives are incorporated.

P-ASA only counteracts free water induced by cement additives, which exhibit dispersing properties. It is not effective in curing free water that naturally occurs in a cement slurry. Therefore, it may sometimes be necessary to add a dispersant to the cement system to increase the P-ASA effectiveness in controlling the free water.

Sedimentation
Sedimentation, which is unrelated to free water, results from over dispersed slurries following Stokes Law on suspended particles. The density profile of a severely over dispersed cement slurry shows a bed of packed cement particles at the bottom of the column having a density approaching that of bulk cement. This solids bed is referred to as slurry sedimentation. The remaining slurry in the column has a density varying from much lower than the design density just above this bed to a density very close to water at some point further up the column.

Sedimentation can and frequently does occur without the presence of clear free water. As mentioned earlier, sedimentation and free water are not related phenomena.

Fluid-loss Control

P-ASA is compatible with all Petrochem fluid-loss additives, including P-1000 when it is applied as a fluid-loss additive. At the proper concentration, P-ASA should not have any substantial effect on the fluid-loss control, except when good fluid-loss control is achieved by slurry sedimentation in the fluid-loss cell. In this case, the fluid-loss value of the unstable slurry is artificially low and improved slurry stability then results in higher fluid-loss values.

CAUTION:
If high P-ASA concentrations are used, then the fluid-loss control of some slurries may be completely eliminated. This effect is caused by the creation of a strong microstructure, which prevents the filter cake formation necessary for fluid-loss control. P-ASA is particularly well suited for curing sedimentation problems with systems containing Fluid-loss Additives P-FLAL.

Lightweight P-1000 (Gas Control) Applications
Besides reducing slurry instability, P-ASA can be used as the slurry stabilizer in lightweight P-1000 systems. Lightweight P-1000 systems containing Extender P-SL50 requires the use of P-ASA. P-SL50 concentrations should follow the lightweight P-1000 design guidelines. Typical P-ASA concentrations from this application range from approximately 0.01 to 0.2 % BWOC.

P-ASA

CEMENTING SERVICE BULLETIN

4/1/06

P-ASA (PETROCHEM - ANTI-SETTLING AGENT POWDER)

CAUTION:

When using P-ASA, the fluid-loss control of P-1000 slurries must be verified. As mentioned earlier, sufficiently high P-ASA concentrations can eliminate the fluid-loss control, even in P-1000 slurries.

Temperature Limitations
P-ASA does not function at temperatures greater than 300°F (149°C). As it approaches this temperature, P-ASA performance undergoes a rapid degradation that cannot be overcome by increasing its concentration. Above 300^0F the use of P-HTAS (High Temperature Anti Settling) will be required.

Retarders
P-ASA is compatible with all Petrochem retarders. At temperatures less than 125°F (52°C), it may have a retardation effect on the slurry.

Accelerators
P-ASA performance is satisfactory with Sodium Chloride systems. P-ASA is not effective in systems containing Calcium chloride.

Dispersants
P-ASA is designed to counteract the detrimental effects that dispersants have on cement slurry stability. As previously mentioned, P-ASA performance is not optimum without the presence of a dispersant, dispersing retarder or dispersing fluid-loss additive. Therefore, the addition of a dispersant may sometimes be necessary to improve the P-ASA performance in controlling free water and sedimentation.

Increases in slurry rheological values are observed with increasing P-ASA concentrations. The increase in plastic viscosity can be two to three times the original values, while the yield point can increase from 2 to 7 lbf/100 ft^2. This phenomenon is increased with decreasing mixing energy (see Mixing Energy Effects).

Salt Tolerance
P-ASA can be used in cement systems containing 0 to 37% BWOW Sodium Chloride; however, sodium chloride concentrations greater than 5% BWOW must be dry blended or added to the mix after hydrating the P-ASA (see Salt Cement Systems).

Sodium chloride slurries exhibiting stability problems require higher P-ASA concentrations than unstable freshwater systems to achieve good stability and free water values. Even with higher concentrations, it will frequently be difficult to achieve zero free water in unstable salt slurries.

P-ASA can be used with seawater, although the required concentrations may be slightly higher and the results will not be as good as with freshwater or sodium chloride systems. Because its performance is impaired by the seawater, P-ASA does not always improve the stability of these systems in the presence of free water and it rarely reduces the free water value to zero.

Slurry Density Ranges
P-ASA can be used in slurries with densities ranging from 12.5 to 22.0 PPG, provided proper extenders or weighting agents are correctly used. These density limits are more a function of proper slurry design than a limit of P-ASA performance

PETROCHEM

P-ASA
CEMENTING SERVICE BULLETIN

P-ASA (PETROCHEM - ANTI-SETTLING AGENT POWDER)

Extenders
P-ASA is compatible with all Petrochem cement extenders and is an excellent slurry stabilizer for cement systems containing P-SL50. P-ASA is not an extender; therefore, it should only be used with extenders to improve stability. P-ASA is a particle-suspending agent, but it does nothing to occupy large volumes of water or to reduce the cement bulk weight role of conventional extenders. If P-ASA is used to artificially extend a cement slurry beyond its normal density, then the potential exists for the development of large pockets or channels of excess water within the set cement and high permeability's within the cement matrix, perhaps sufficiently high to allow interzonal communication.

Weighting Agents
P-ASA is compatible with all Petrochem weighting agents. The only design limitation with high-density slurries using P-ASA is the mix ability of the cement slurry. As discussed earlier, P-ASA helps reduce the density difference in a vertical cement column. This attribute becomes more noticeable as the concentration of the weighting agent is increased. P-ASA helps improve the suspension of the weighting agent throughout the cement slurry to ensure that the slurry properties remain as per design.

Shelf Life
The reported shelf life of P-ASA in a sealed (unopened) container is greater than two years.

Field Mixing Procedures
Several special field considerations must be applied when using P-ASA. These considerations involve continuous-mix operations, salt cement systems and the effect of variations in mixing energy on the slurry properties.

Continuous-mix Operations
If the mix water is prepared prior to the job, then the P-ASA must be added to the water at a high-shear area in the tank and allowed to hydrate for 5 to 10 minutes. Because P-ASA affects the slurry rheology, the material must be added to the cement slurry at the design concentration. Variations in concentration can alter the flow properties of the cement slurry, possibly decreasing its placement efficiency.

Salt Cement Systems
P-ASA does not properly hydrate in mix waters containing greater than 5% BWOW sodium chloride. If sodium chloride is to be added to the mix water at concentrations exceeding 5% BWOW, then the P-ASA must be hydrated in the mix water before adding the sodium chloride. P-ASA completely hydrates in several minutes. An alternative mixing procedure for high sodium chloride concentrations is to dry blend the sodium chloride with the cement and continuously add the P-ASA to the mix water.

For sodium chloride concentrations up to 5% BWOW in the mix water, P-ASA can be added either before or after the sodium chloride addition to the mix water. These low sodium chloride concentrations do not significantly affect the P-ASA hydration process.

Mixing Energy Effects
Contrary to most cement formulations, P-ASA slurries exhibit higher rheologies when lower mixing energies are applied to the slurry. Preliminary tests show that the rheology of normal-density slurries mixed at high-shear closely correlate to the rheology of API-mixed slurries.

When the field-mixing energy is known to vary substantially from the API energy, special laboratory procedures should be used to simulate the field-mixing energy. Good correlations between lower Warring blender speeds and lower field-mixing energy conditions have been observed.