



P-MW

CEMENTING SERVICE BULLETIN

10/12/98

P-MW (MICRO WEIGHT ADDITIVE)

P-MW is a weighting agent for spacers and cement slurries. It is a reddish brown powder with a specific gravity of 4.7 to 4.9. The P-MW particles are very small and spherical, resulting in a significantly higher particle surface area than Barite (P-WAB) or Hematite (P-WAH).

P-MW exhibits less settling tendencies than Hematite. It can be directly added to the mix water, which allows last minute slurry density changes for primary cement jobs or emergency plug back jobs. P-MW also aids the suspension of other solids (e.g., Hematite P-WAH, Silica Flour P-SF).

P-MW is compatible with most additives (E.G., Retarders P-MTRF, P-UTR, PTCRL, P-HTR and retarder aids P-RA, P-HTD/L). It can sometimes shorten the thickening time of a slurry in comparison to the same cement system using a different weighting agent. This effect should be verified in the laboratory. P-MW slurries also exhibit very good compressive strengths.

P-MW slurries can be quite viscous, especially at densities greater than 17.5 PPG. However, this high viscosity can be alleviated by the addition of a dispersant. High dispersant concentrations in P-MW systems are less likely to cause sedimentation than in systems containing other weighting agents. Dispersant P-DISL is effective up to 0.2 to 0.3 gal/sk. If this concentration range does not produce a slurry with reasonable rheological properties, then P-HTD should be used instead.

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The recommended mixing procedure is to disperse the P-MW directly in the mix water. If this is not practically possible, then the following guidelines should be followed.

P-MW can only be pneumatically moved when it is blended with cement. It can be blended with cement up to a maximum concentration of 40% BWOC. For weighting considerations greater than 40% BWOC, a blend of P-MW and PWAH should be considered.

Slurry Design

The performance of P-MW depends greatly on the cement class, brand and even batch. Therefore, the slurry properties should be checked and optimized in the laboratory prior to each job.

Mix Water

P-MW can be used in both fresh water and saline water up to salt saturation. When performing thickening time tests at salinities greater than 18 % BWOW, a gel-set can be expected. Nevertheless, the compressive strength development is still reasonable according to the test data.

Approximately 0.0011 gallons of additional water is required per pound of PMW. This is about half of the additional water requirements of Hematite (PWAH).

Rheology

Slurries with P-MW as the only weighting agent exhibits minimal free water and less settling tendencies than slurries prepared with hematite (P-WAH).



Due to its smaller particle size, P-MW increases the yield value of a slurry, necessitating the requirement for a dispersant in the system. P-DISL has been used at concentrations ranging from 0.1 to 0.3 gal/sk to significantly reduce the yield value without causing any sedimentation or free water problems. At P-DISL concentrations greater than 0.3 gal/sk, the additional reductions in the yield value are minimal. If additional dispersion is required to optimize the slurry, then better results can be achieved by using P-HTD instead.

Acceptable rheologies can be obtained by employing a blend of P-MW and P-WAH. The P-MW tends to stabilize the P-WAH settling tendencies and the P-WAH helps lower the yield value. The optimum P-MW:P-WAH ratio must be determined in the laboratory.

The variations in the yield value with respect to the P-MW : P-WAH ratio are more significant than the variation in the plastic viscosity. Generally speaking, the plastic viscosity will be approximately the same for the varying P-MW : P-WAH ratios. Therefore, a cement system can be optimized for effective-laminar flow by altering the P-MW-PHWA ratio.

The plastic viscosity tends to increase when settling becomes a problem for some slurry formulations containing 100% BWOC P-WAH.

P-MW is not recommended for use as a weighting agent in spacers (P-TFS and PPFS) designed for oil-base mud removal. Compatibility tests shows that sever mix ability problems occur with oil-base muds when the oil droplet size is roughly equal to the average particle size of P-MW. This incompatibility problem can be avoided by using a weighting agent with a larger particle size such as P-WAH or P-WAB.



Thickening Time

P-MW has an accelerating tendency in comparison to similar slurries containing a different weighting agent. Noticeable reductions of the thickening time have been observed. In some cases, the thickening time of a P-MW system was less than half that for a P-WAH system. Therefore, a thickening time test should be run for each system employed, particularly when last minute changes are made to the type of weighting agent or the P-MW:P-WAH ratio.

Some retarders may adsorb onto the P-MW surface. If for some reason P-MW settling occurs, then the thickening time will be altered.

Compressive Strength

Slurries containing P-MW exhibits very high compressive strengths. Although slightly higher compressive strengths can be achieved with P-WAH alone or a PMW/P-WAH blend as the weighting agent. However, the compressive strength of a slurry weighted solely with P-MW is more than adequate for most oilfield applications.

Fluid Loss

P-MW has no harmful effects on fluid-loss control. When used as a weighting agent in gas control (P-1000, P-1000/P-500) slurries, it does help produce very thin heavyweight slurries with no settling tendencies and no adverse effects on the fluid-loss control.

Field Mixing Procedure

The recommended mixing procedure is to disperse the P-MW directly in the mix water. Generally, it should be added last. If the mix water stands static for some time and P-MW settling does occur, then it can easily be re-suspended by good mix-water agitation. The benefit of direct addition to the mix water is that last minute alterations to the slurry density is possible.



After the P-MW has been dispersed in the mix water, the mix-water density should be checked. Density corrections may be required to compensate for a variance in the P-MW specific gravity. Immediately prior to mixing the cement, the tank containing the mix water and P-MW should be checked for P-MW settling and the mix water agitated as required.

Care should be taken when dry blending P-MW as it does not transport pneumatically on its own at normal operation conditions (30-psi). It can be moved with high volume, low-pressure air (10-psi), but these air conditions are insufficient to move cement.

P-MW can be successfully transported when it is blended with cement at concentrations up to 40% BWOC. Blends with greater than 40% BWOC P-MW do not move pneumatically. If dry blending is necessary for concentrations greater than 40 % BWOC, then a P-MW-P-WAH blend should be considered as the weighting agent. Also, it is imperative that all silos are clean and have functioning air pads.

P-MW must be stored in a dry area. If Moisture enters the bags, then it will lump, causing mixing difficulties. However, these lumps can be broken up once they are in the mix water, (when directly adding the P-MW to the mix water).

P-MW is a strong dye. If P-MW has been premixed in the mix water, then it is difficult to determine if any cement is being mixed into the system during the initial stages of cement addition.

It is strongly recommended to use an NRD (non-radioactive densitometer) to consistently and accurately measure the slurry density. P-MW has different gamma ray absorption characteristics than cement or other common Petrochem weighting agents.



In general, a radioactive densitometer reads a slurry density that is higher than the actual density. At low slurry densities with small amounts of P-MW, the density difference may only be 0.5 gal/sk. However, the Ronan densitometer reads 22.8 PPG for a 19.5 PPG system containing 75% BWOC P-MW.

The slurry density should always be checked with a pressurized mud balance. If possible, the HiCal value of the densitometer can be re-calibrated using this mud balance reading.

Safety, Health and Environmental Concerns

- Wear chemical goggles and a dust respirator P-MW is a very fine meshed metal oxide. Extreme care should be taken when handling the material to minimize the dust levels. Full-face, cartridge-type respirators are required to protect both the eyes and the respiratory system of the user/s. Prolonged exposure to P-MW dust may also be irritating to the skin. To prevent irritation, long-sleeved Nomex overalls and hand gloves should be worn.

First Aid

- Eyes: Immediately flush eyes with water for at least 15 minutes and seek medical attention.
- Skin: Wash with soap and water.
- Inhalation: Move to clean air. Consult a physician
- Disposal: Dispose according to federal, state and local regulations.

<u>PRODUCT</u>	<u>FORM</u>	<u>SP.GR.</u>	<u>PACKAGING</u>
P-MW	RED BROWN POWDER	4.7 TO 4.9	2,200 LBS./SUPER SACK