



Magnetite Cement Used in Oil Wells

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Abstract

During the drilling of oil wells, sometimes the digging drill passes through layers with coarse porosity which causes drilling mud loss. Concerning the preciousness of drilling mud, preventing its loss can be economically efficient and lead to a desirable drilling which increases productivity of the oil well. Due to the invaluable of the pores in different ground strata for Hydrocarbon material extraction purposes, a blocker should be used to prevent drilling mud loss. Magnetite Cement is used for this purpose.

Keyword: Magnetite Cement, porosity, drilling mud.

1. Introduction

Powdered alkaline Magnesium Oxide reacts with Magnesium Sulfate in the right density and creates two types of Magnetite Cement as Oxy Chloride (Sorel Cement) and Oxy Sulfate which are hard cements with useful features (1). There is no mutual agreement on the chemical formula of this type of cement among different researchers.

$5\text{MgO}, \text{MgCl}_2, 8\text{H}_2\text{O}$

$5\text{MgO}, \text{MgSO}_4, 8\text{H}_2\text{O}$

During the drilling of oil wells, the digging drill often passes layers and strata with small and large pores. In this case, the drilling mud exits from these vents and gets lost. Concerning the preciousness of drilling mud, finding out about the wasting drilling mud and blocking the vents, as soon as possible, is one the most crucial tasks of the drillers. There are several types of materials used as blockers of these pores and vents which are commonly consumed in the oil drilling industry. Basically, most of these materials block the vents and pores of the oil containing will layers, permanently. Although it's vital to use blocking materials to pass this type of layer and continue oil well drilling operation, using them in extraction area will decrease the extraction rate as oil needs to be extracted through the same pores (2).

In order to prevent oil extraction decrease in oil containing layers, it's necessary to use blocking materials during the digging operation and to prevent digging mud loss, which can be brought out after the digging operation is done to make the pores reversible to their natural primary condition; To do so, a special kind of cement is used; It's called Magnetite Cement. (API Spec. 1984)

Drilling Magnetite Cement: A kind of cement composed of different salts and minerals like Magnesium and Calcium and soluble in Hydrochloric Acid. Magnetite Cement slurry accompanied with required additives in its formation, is used as a blocker to obstruct the holes and massive gaps of ground strata in oil well drilling operation; it reduces drilling mud loss, especially in oil containing layers of the ground.

Moreover, Magnetite Cement is used as P.B.2 special operation to control retaining water and oil levels which prevents any harm to oil containing layer of the well.

2. Discussion

Magnetite Cement and required additives: Drilling Magnetite Cement: Used as the main material to prepare drilling Magnetite Cement slurry.

Magnetite Cement plasticizer (thinner): This additive is used to spread the Magnetite Cement slurry particles appropriately and uniformly; Primary viscosity of the slurry decreases adequately as a result. This additive should not apply any negative effects on thickening time and compressive strength of the Magnetite Cement slurry and the other parameters.

The sampling of the Magnetite Cements to do monitoring experiments is usually done by picking out a pack of cement per 5 tons or a part of it; the required amount gets sampled by sampling tools. At least three different points of the shipment gets sampled in this sampling. Taken samples up to 60 tones can be mixed and sampled as a unit. The taken sample should be at least 3 kilograms. (API RP. April 1977)

Magnetite Cement packing in Iran is usually done by multi-layered paper packages and preferably including an anti-humidity layer; each package weighs 25 ± 0.5 kilograms. It's recommended to consider the concerning standards while applying paper bags. The following items should be written clearly and preferably in colored font on each cement containing package; for normal and low-temperature magnetite cement, blue font and for retarded and high-temperature magnetite cement, red font is usually used which makes them distinguishable with a quick glance. On the package, 'Drilling Magnetite Cement' expression and its type (normal or retarded), manufacturer's name, trademark of the producer, Magnetite Cement net weight and production number and date should be mentioned.

In physical and chemical tests of Magnetite Cement, important tests are applied such as specific gravity

Physical and chemical Characteristics

Row	Drilling Magnetite Cement technical properties	High-Temperature Drilling Magnetite Cement	Low-Temperature Drilling Magnetite Cement	Method
1	Specific gravity in grams per cubic centimeter	3±0.2	3±0.2	According to National Standard of Iran No.6528
2	Thickening time in minute 2.1 Thickening time in 140 °F and Atmospheric Pressure 2.2 Thickening time in 170 °F and Atmospheric Pressure 2.3.Thickening time in 200 °F and Atmospheric Pressure 2.4 Thickening time in 225 °F and 2500 pounds per inch of Pressure	----- ----- 215 ± 25 Minutes without retarder 215 ±25 Minutes with 15 Pounds retarder	215±25 Minutes without retarder 215±25 Minutes with 10 pounds retarder 215±25 Minutes with 25 pounds retarder -----	
3	Compressive Strength in pounds per square inches 3.1 After 24 hours in 140-200 ° F 3.2 After 24 hours in 200-250 ° F	----- Minimum of 300	Minimum of 250 -----	
4	Primary density of slurry in centipoise	Maximum of 10	Maximum of 10	
5	Grading Amount 5.1 Residue on Standard Sieve #20 (0.85 mm) 5.2 Residue on Standard Sieve #200 (0.075 mm) 5.3 Residue on Standard Sieve #325 (0.045 mm)	0% 20% ± 5 45% ± 5	0% 20% ± 5 45% ± 5	
6	Solubility in 15% Hydrochloric Acid 6.1 Based on passing through Standard Sieve #325 6.2 Based on passing through Whatman filter paper 42	99% ± 1 90% ± 10	99% ± 1 90% ± 10	
7	Moisture content	Maximum of 4%	Maximum of 4%	
8	Free water	Should not have	Should not have	
9	Foaming	Should not have	Should not have	
10	Compatibility with Magnetite Cement additives including Retarder, Thinner and Accelerator	Should have	Should have	

(density) measurement of Magnetite Cement slurry, thickening time measurement method of Drilling Magnetite Cement, compressive strength measurement method of Drilling Magnetite Cement, primary density measurement method of the slurry, grading measurement method of Drilling Magnetite Cement and compatibility with magnesia additives (retarder, thinner, thickening time accelerator).(API RP. April 1976)

-Magnetite Cement thickening time moderator (retarder): This additive is used to delay Magnetite Cement slurry thickening time.

-Magnetite Cement thickening time accelerator (accelerator): This additive is used to accelerate Magnetite Cement slurry thickening time in regions where the temperature is less than 140° F.

Drilling Magnetite Cement is graded into two types based on setting time and applied temperature:

-Low-temperature Drilling Magnetite Cement: The application of this type of cement is in less than 200°F.

-High-temperature Drilling Magnetite Cement (retarded magnesia): The application of this type cement is in more than 200°F

In this regard, materials and equipment such as a sampling tool, a scale with the accuracy of 0.01 grams, Drilling Magnetite Cement slurry mixer, a density or specific gravity measurement device for Drilling Magnetite Cement slurry, a thickening time measurement device under atmosphere pressure ,compressive strength measurement device and Magnetite Cement slurry are used in different tem-

Properties	High-temperature	Drilling	Low-temperature	Drilling	
	Magnetite Cement		Magnetite Cement		
Experiment area temperature (F)	225	200	200	170	140
Added retarder amount	15	-	25	10	-
Added thinner amount	3	3	3	3	3

peratures (3,4,5). (Drilling Magnetite Cement used in oil wells 2004) (Magnetite Cement used in oil wells 2004)

3. Conclusion

Regarding to the discussed matters, Magnetite Cement can definitely be used as a blocker for well pores around the digging drill in order to operate an optimized and efficient oil extraction and prevent drilling mud loss.

References

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