HALLIBURTON®

Technology Bulletin

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SUBJECT: SA-541 Delayed Hydrating Suspending Aid

Table 1—SA-541 Physical Properties			
Function	suspending aid and free-water control agent	**Part Number**	516.01068
Color	cream to pale color	**Specific Gravity**	1.40
Form	powder	**Bulk Density**	47 lb/ft^3

Description

SA-541 (Part No. 516.01068) is a suspending aid and free-water control agent that has minimal effect on surface mixing viscosity. It can be used when other suspending aids, such as FWCA or FDP-C533 cause slurry mixing problems. When cement slurries containing SA-541 are heated to temperatures greater than 150°F, the material yields to suspend downhole solids.

SA-541 counteracts thermal thinning of cement slurries while allowing them to be easily mixed. SA-541 is mildly retarding and can be used at temperatures as low as 150°F. The amount of SA-541 used in a cement slurry depends on several factors, some of which are listed below:

- water-to-cement ratio
- addition level of dispersing additives such as retarders
- presence of KCl
- amount of weighting material contained in heavyweight slurries

Normally, the addition level of SA-541 will not exceed 0.5% by weight of cement (BWOC).

SA-541 will not work in saturated salt slurries.

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Table 2—Effect of Temperature on SA-541 Hydration (Premium Cement, 35% SSA-2™ silica, 0.5% Halad®-413 additive, 0.5% SCR-100™ retarder, 4.3 gal/sk water, 17.3 lb/gal)			
SA-541 (% BWOC)	**Temperature (°F)**	**Fann Data (600-300-200-100)**	**Yield Point (lb/100 ft²)**
0.0	Ambient[a]	250-124-82-40	—
0.0	190	122-54-36-16	—
0.1	Ambient[a]	284-144-100-50	4
0.1	85[b]	270-138-92-44	6
0.1	110	212-102-72-38	—
0.1	140	170-80-50-25	—
0.1	160	264-136-92-44	8
0.1	190	344-194-136-80	44
0.2	190	480-300-226-140	120

[a]Fann readings taken immediately after mixing.

[b]Stirred for 1 hour on atmospheric consistometer before Fann readings were taken.

Table 3—Thickening Times of Slurries Containing SA-541 (Premium Cement, 4.3 gal/sk water 16.4 lb/gal)		
SA-541 (% BWOC)	**Test Temperature (°F)**	**Thickening Time (hr:min)**
0.0	125	2:23
0.5	125	2:39
Premium Cement, 35% SSA-2™ silica, 0.5% SCR-100™ retarder, 0.5% Halad®-413 additive, 4.3 gal/sk water, 17.3 lb/gal		
0.0	200	4:25
0.1	200	3:50

Table 4—UCA Data for Slurries Containing SA-541 (Premium Cement, 4.3 gal/sk water, 16.4 lb/gal at 150°F)			
SA-541 (% BWOC)	**Initial Set (hr:min)**	**500 psi (hr:min)**	**24-hr strength (psi)**
0.0	2:30	4:12	3,080
0.5	9:01	12:55	1,680
Premium Cement, 35% SSA-2™ silica, 0.5% Halad®-413 additive, 0.5% SCR-100™ retarder, 4.3 gal/sk water, 17.3 lb/gal at 200°F			
0.0	11:16	—	4,710
0.1	13:00	—	4,200

Table 5—Suspension Properties of SA-541 in Heavyweight Slurries (Premium Cement, 35% SSA-2™ silica, 22 lb/sk Hi-Dense® No. 4 weight additive, 0.6% Halad®-413 additive, 1.2% SCR-100™ retarder, 0.6% HR®-25 additive, 4.46 gal/sk water, 18.5 lb/gal)

SA-541 (% BWOC)	Temperature (°F)	Fann Data (600-300-200-100)	Yield Point (lb/100 ft²)
0.0	Ambient[a]	526-270-180-90	14
0.0	190	192-80-52-24	—
0.1	Ambient[a]	558-300-190-92	42
0.1	190	500-280-192-100	60
0.1	300[b]	600+400-260-130	—

[a]Fann readings taken immediately after mixing.

[b]Heated to 300°F in stirring fluid-loss cell, then cooled to 150°F before Fann readings were taken.

Table 6—Effect of Temperature on Hydration of SA-541 (Premium Cement, 35% SSA-2™ silica, 1% HR®-15 additive, 4.3 gal/sk water, 17.3 lb/gal)

SA-541 (% BWOC)	Temperature (°F)	Fann Data (600-300-200-100)	Yield Point (lb/100 ft²)
0.0	Ambient[a]	164-78-50-26	—
0.0	140	86-30-20-10	—
0.2	Ambient[a]	184-84-56-28	—
0.2	140	312-170-118-64	28
0.2	180	348-238-188-128	128
0.5	Ambient[a]	230-110-70-36	—
0.5	140	494-328-260-176	162
0.5	180	600+ -600+ -600+ -542	—

[a]Fann readings taken immediately after mixing.

Table 7—High-Temperature Suspension Properties of SA-541 (Premium Cement, 35% SSA-1™ flour, 1.0% Halad®-413 additive, 1.0% SCR-100™ retarder, 0.5% HR®-25 additive, 4.3 gal/sk water, 17.3 lb/gal)

SA-541 (% BWOC)	Temperature (°F)	Fann Data (600-300-200-100)	Yield Point (lb/100 ft²)
0.0	190	186-86-56-28	—
0.1	190	562-304-204-104	46
0.1	300[a]	570-296-190-92	22

[a]Heated to 300°F in stirring fluid loss cell, then cooled to 150°F before Fann readings were taken.

Table 8—SA-541 in KCl Containing Cement (Premium Cement, 35% SSA-2™ silica, 0.8% Halad®-413 additive, 0.2% SCR-100™ retarder, 6.2 gal/sk water, 16.1 lb/gal)				
SA-541 (% BWOC)	**KCl (% BWOW)**	**Temperature (°F)**	**Fann Data (600-300-200-100)**	**Yield Point (lb/ft^2)**
0.0	0	Ambient[a]	76-38-24-12	0
0.0	0	190	200-108-77-44	16
0.1	3	190	100-46-30-16	—[b]
0.2	3	Ambient[a]	68-32-20-12	—
0.2	3	190	130-65-45-25	0

[a]Fann readings taken immediately after mixing.

[b]Slurry had 1mL of free water and no settling.