



# P-TFS

## CEMENTING SERVICE BULLETIN

11/26/90

### P-TFS (PETROCHEM-TURBULENT FLOW SPACER)

#### TECHNICAL DATA

**P-TFS** is a turbulent flow spacer produced from a temperature sensitive blend of gelling agents and surfactants designed to suspend weighting agents. However, at BHCT below 136 deg.°F. the use of approximately 0.65 pounds of sodium chloride per Bbl. of spacer, per deg.°F. below 136 deg.°F. is required to induce turbulent flow. The precise quantity of sodium chloride is to be determined by the laboratory.

P-TFS can be prepared with either fresh or seawater but should not contain more than 10 % (by weight of water) sodium chloride per barrel of 8.6 Ppg. spacer. P-TFS spacer is prepared by mixing 16.6 pounds of P-TFS per 41 gallons of water to produce one barrel of 8.6 Ppg. spacer.

P-TFS has excellent fluid-loss properties up to 360 deg.°F. Which is essential, since the spacer will replace any filter cake removed during the turbulent flow cleaning process and protect the spacer from excessive fluid-loss since this will thicken the spacer resulting in laminar flow conditions.

P-TFS is compatible with most water-based muds. However, compatibility tests with the mud and cement must be done prior to the job. If the P-TFS is to be used with oil based mud, the addition of P-NSL surfactant is recommended at a concentration between 1 to 2 gallons per barrel of spacer, which should make the P-TFS compatible with most oil-based muds.

#### PROPERTIES

<u>PRODUCT</u>	<u>FORM</u>	<u>SP.GR.</u>	<u>PACKAGING</u>
P-TFS	White Powder	2.14	50 Lb/drum

#### SAFETY

If the product gets in the eyes flush the eyes with water for at least 15 minutes, and get medical attention. If exposed to the skin, flush skin with soap & water. Inhalation: Move to open air, if irritation persists, get medical attention.



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### SPACER CALCULATIONS

TO CALCULATE THE AMOUNT OF BARITE TO WEIGHT UP THE SPACER USE: B = POUNDS OF BARITE NEEDED PER BARREL OF 8.6 PPG SPACER. W = WEIGHT OF THE SPACER FLUID REQUIRED.

$$B = \frac{42W - 362}{1 - 0.0278W}$$

Note: Divide the 16.6 Lbs. Of P-TFS, the calculated quantity of weighting agent and the 41 gallons of mix water, by the calculated yield factor to determine the actual quantity of each product required per barrel of weighted spacer.

### TO CALCULATE THE YIELD OF THE WEIGHTED SPACER USE:

YS = YIELD OF THE WEIGHTED SPACER.

$$YS = 1 + 0.000662B$$

### TO CALCULATE TURBULENT FLOW RATE USE:

$$QC = \frac{(DH+DP)}{10.62P} [UP+ (UP^2+6.19TYP (DH-DP)^2)^{1/2}]$$

### NOMENCLATURE

QC = Critical flow rate, bpm for Reynolds number, dimensionless

DH = Hole diameter, in.

DP = Outside pipe diameter, in.

UP = Plastic viscosity, cp

TY = Yield point, lb/100 ft<sup>2</sup>

P = Slurry weight, ppg

### IMPORTANT NOTICE

If laboratory tests show that the P-TFS does not provide adequate suspension and barite settling is noted, the cause in some cases derives from the mix water containing high levels of divalent Magnesium and Calcium Ions, or the barite may contain Trivalent Iron Ions. In any or both cases the mix water is to be pre-treated (before adding any products) with 0.25 Pounds of edta plus 0.10 Gallons of Sodium Silicate per barrel of mix water.



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### **SPACER PREPARATION**

A recirculating mixer with paddles is recommended for the preparation of the spacer.

If the mud and or cement contains loss-circulating material use the same concentration in the spacer.

For large jobs the P-TFS and barite, (salt and loss circulation material if needed) can be dry blended in the bulk plant.

Do not add any other gelling agent to the P-TFS solution, as this will change the rheological properties of the spacer.

Design your job for a ten-minute contact time across the zone of interest at turbulent flow rate.

Use only barite weighting agent up to 15 ppg. Beyond which use hematite to go to 18 ppg. The object is to maximize the water to solids ratio while minimizing sedimentation.

### **Mixing instructions**

Take on required amount of water.

If edta and sodium silicate is needed add them at this time, then if the intended spacer weight is below 12 ppg. Add 0.2 Gallons of P-AFAL (Antifoam) per barrel of mix water. (Use only this type of antifoam agent as it has been field proven and any other product may be incompatible.) The antifoam is needed due to the surfactant in the P-TFS which causes some foam at low spacer weights.

Add the calculated amount of P-TFS to the mix water slowly via the jet mixer to the recirculating mixer and allow to hydrate. The ultimate hydration time is two hours. However, the lab has found that five minutes is sufficient hydration time, therefore, use as much time that is available to you.

After hydrating the P-TFS, do not add any other materials (loss circulation material, weighting agent or salt) until you are ready to pump down hole, this will reduce the chance of sedimentation.



## MIXING CHART FOR P-TFS

<b>DENSITY (lb/gal)</b>	<b>WATER (gal)</b>	<b>P-TFS (lb)</b>	<b>P - WAB (lb)</b>
8.6	41.0	16.6	0
8.7	40.9	16.6	4.5
8.8	40.7	16.5	10.0
8.9	40.6	16.4	15.5
9.0	40.4	16.4	21.0
9.1	40.3	16.3,	26.6
9.2	40.1	16.3	32.1
9.3	40.0	16.2	37.6
9.4	39.8	16.1	43.1
9.5	39.7	16.1	48.7
9.6	39.5	16.0	54.2
9.7	39.4	16.0	59.7
9.8	39.2	15.9	65.2
9.9	39.1	15.8	70.8
10.0	38.9	15.8	76.3
10.1	38.8	15.7	81.8
10.2	38.6	15.7	87.3
10.3	38.5	15.6	92.8
10.4	38.3	15.5	98.4
10.5	38.2	15.5	103.9
10.6	38.0	15.4	109.4
10.7	37.9	15.4	114.9
10.8	37.7	15.3	120.5
10.9	37.6	15.2	126.0
11.0	37.4	15.2	131.5
11.1	37.3	15.1	137.0
11.2	37.1	15.1	142.6
11.3	37.0	15.0	148.1
11.4	36.8	14.9	153.6
11.5	36.7	14.9	159.1
11.6	36.5	14.8	164.6
11.7	36.4	14.8	170.2
11.8	36.2	14.7	175.7
11.9	36.1	14.6	181.2
12.0	35.9	14.6	186.7
12.1	35.8	14.5	192.3
12.2	35.6	14.5	197.8
12.3	35.5	14.4	203.3
12.4	35.3	14.3	208.8



<b>DENSITY</b> <b>(lb/gal)</b>	<b>WATER</b> <b>(gal)</b>	<b>P-TFS</b> <b>(lb)</b>	<b>P - WAB</b> <b>(lb)</b>
12.5	35.2	14.3	214.4
12.6	35.0	14.2	219.9
12.7	34.9	14.2	225.4
12.8	34.7	14.1	230.9
12.9	34.6	14.0	236.5
13.0	34.4	14.0	242.0
13.1	34.3	13.9	247.5
13.2	34.1	13.9	253.0
13.3	34.0	13.8	258.5
13.4	33.8	13.8	264.1
13.5	33.7	13.7	269.6
13.6	33.5	13.6	275.1
13.7	33.4	13.6	280.6
13.8	33.2	13.5	286.2
13.9	33.1	13.5	291.7
14.0	32.9	13.4	297.2
14.1	32.8	13.3	302.7
14.2	32.6	13.3	308.3
14.3	32.5	13.2	313.8
14.4	32.3	13.2	319.3
14.5	32.2	13.1	324.8
14.6	32.0	13.0	330.3
14.7	31.9	13.0	335.9
14.8	31.7	12.9	341.4
14.9	31.6	12.9	346.9
15.0	31.3	12.8	352.4
15.1	31.3	12.7	358.0
15.2	31.1	12.7	363.5
15.3	31.0	12.6	369.0
15.4	30.8	12.6	374.5
15.5	30.7	12.5	380.1
15.6	30.5	12.4	385.6
15.7	30.4	12.4	391.1
15.8	30.2	12.3	396.6
15.9	30.1	12.3	402.1
16.0	29.9	12.2	407.7
16.1	29.8	12.1	413.2
16.2	29.6	12.1	418.7
16.3	29.5	12.0	424.2
16.4	29.3	12.0	429.8



<b>DENSITY (lb/gal)</b>	<b>WATER (gal)</b>	<b>P-TFS (lb)</b>	<b>P - WAB (lb)</b>
16.5	29.2	11.9	435.3
16.6	29.0	11.8	440.8
16.7	28.9	11.8	446.3
16.8	28.7	11.7	451.9
16.9	28.6	11.7	457.4
17.0	28.4	11.6	462.9
17.1	28.3	11.5	468.4
17.2	28.1	11.5	473.9
17.3	28.0	11.4	479.5
17.4	27.8	11.4	485.0
17.5	27.7	11.3	490.5
17.6	27.5	11.2	496.0
17.7	27.4	11.2	501.6
17.8	27.2	11.1	507.1
17.9	27.1	11.1	512.6
18.0	26.9	11.0	518.1