P-TTCL

CEMENTING SERVICE BULLETIN

2/12/88

P-TTCL (PETROCHEM - THIXOTROPIC CEMENT LIQUID)

TECHNICAL DATA.

P-TTCL is a liquid additive of which the distinguishing feature is thixotropy. This property enables the cement slurry to be fluid when in motion (such as being pumped) and of forming a gel when allowed to stand. This gel structure is strong enough to support the weight of the slurry column, preventing fall back. If sufficient force is applied to move the slurry the gel structure is disturbed and the slurry returns to a fluid, pump able state. However, these systems develop considerable gel strength and becomes difficult to move after remaining stationary for a period of time.

Cement slurries prepared with P-TTCL are almost indistinguishable from those prepared with Gypsum. The major difference is that slurries prepared from P-TTCL do not have the expansion properties as cement slurries prepared with Gypsum, but remain dimensionally stable. Other than this, the slurries are applied in the same manner.

The major advantages of P-TTCL over Gypsum slurries are, it causes higher early and ultimate compressive strength development, in many cases, slurries prepared with P-TTCL reach a strength in 24 hrs. that comparable slurries prepared with Gypsum require seven days to attain. Figure 1. shows a typical comparison of the strength development of the Gypsum cement with the P-TTCL system.

A limitation of gypsum is that it cannot be used with cements having a C3A content of less than 5 % while the P-TTCL can be used with any Portland cement, since the C3A content is not a limiting factor. **Also, P-TTCL** can be used with either fresh or seawater.

The fact that the use of **P-TTCL** does not depend on the C3A content is a major advantage, especially when local cement producers may exhibit poor quality control or low C3A content in their cement, also laboratory tests will show that P-TTCL provides uniform gel strength and superior thixotropic properties when used with a wide variety of cement brands.

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Compatibility

Like Gypsum, only a limited number of additives can be used with P-TTCL. These include Cellophane flakes, P-CCL, (Petrochem- calcium chloride liquid) or the equivalent concentration of dry calcium chloride (3. 5 lbs of 77 % calcium chloride is equivalent to one gallon of P-CCL), Kolite, P-AFAL, (Petrochem-antifoam agent liquid) P-TCRL, (Petrochem-Thixotropic cement retarder liquid). P-TFL, (Petrochem-Thixotropic fluid-loss liquid). Note: **Dispersants will destroy** the thixotropic properties of the slurry.

Formulation

Essentially all Portland cements and API class J cement can be used to prepare P-TTCL slurries. When used at low temperatures where an accelerator is required Calcium chloride may be added to the mix water, but when retarding the slurry is required, only P-TCRL (Petrochem-Thixotropic cement retarder liquid) should be used.

P-TFL (Petrochem-Thixotropic Fluid-Loss Liquid) is the only known compatible Fluid-loss additive recommended for use with P-TTCL. As a fluid-loss example, the use of 0.6 GPS P-TTCL, 0.2 GPS P-TFL, 0.02 GPS P-TCRL mixed with class G cement at 14.1 PPG. (Mix water 7.76 Gal/Sk, Slurry yield 1.51 cult/Sk. @ 125F.), will provide a fluid-loss of approximately 98ml/30 mins.

Typical data

Tables I and II show P-TTCL data representative of typical formulations. These systems are formulated using P-TTCL with class G cement and correspond generally to slurries containing 10 % to 12 % of Gypsum. The slurries are designed at three temperatures: 80F, 100F, 165F, BHCT. To show the effects of seawater, slurries 1 and 2, for 80F. and 100F are repeated using seawater in instead of fresh water.

Table I shows the slurry properties for these five slurries systems. Note that the liquid additives plus the water make up the percent liquid and total fluid per sack. Table II shows the thickening times and compressive strengths at the indicated time for these same five systems. These data are presented to show general trends. However, laboratory tests should be performed for a specific well application.

Mixing

P-TTCL must be thoroughly dispersed in the mix water before being added to the neat cement. This material is very easily mixed with water and diffuses rapidly. P-TCRL, P-AFAL and P-TFL should also be added to the mix water, and not to the cement slurry in the mix tub.

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P-TTCL Safety

P-TTCL is acidic (ph l) and should not be allowed to contact the eyes or skin. Eye contact could result in permanent damage to the eyes. Exposure to the skin will be irritating and can cause a chemical burn. CHEMICAL GOGGLES, RUBBER APRON AND RUBBER GLOVES, are required while handling. An eye fountain or eye wash bottle should be available at the work site. Launder contaminated clothing before reuse. Inhalation should not be a problem.

FIRST AID PROCEDURE.

EYES. Flush eyes immediately with water and continue washing for at least 15 minutes. PROMPTLY GET MEDICAL ATTENTION.
SKIN. Wash affected area with soap and water.
INHALATION. Should not be a problem.

P-TCRL and P-CCL Safety

P-TCRL is a mixture of salts and P-CCL is a calcium chloride solution. Eye contact with these materials would cause irritation or even injury. CHEMICAL GOGGLES are required while handling. Prolonged skin contact could cause a redness. Contact with abraded skin would be irritating. RUBBER GLOVES are recommended if contact with the hands is expected. Inhalation should not be a problem.

FIRST AID PROCEDURE

EYES. Flush eyes with water for at least 15 minutes and then get medical attention. SKIN. Wash exposed area with soap and water. INHALATION. Not expected to be a problem.

P-TFL is a petroleum distillate, hydro-treated light product. Eye and skin contact may be mildly irritating. Prolonged or repeated contact may cause moderate irritation. Inhalation may cause headache, nausea or unconsciousness. Ingestion will cause slight gastrointestinal upset and possible slight central nervous system depression. If swallowed, may be aspirated resulting in inflammation and possible fluid accumulation in the lungs. The oral LD50 rat for P-TFL Emulsions is > 5,000 mg/kg.

For detail information before Handling, Read all product Material Safety Data Sheets.

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PHYSICAL PROPERTIES

PRODUCT	PURPOSE	FORM	POUR POINT	SP. GR.	PACKING
P-TTCL	Thixotropic	Liquid	-25.6F.	1.26	55 gal/Drum
P-TCRL	Retarder	Liquid	25F.	1.13	55 gal/Drum
P-CCL	Accelerator	Liquid	27-44	1.37	55 gal/Drum
P-TFL	Fluid-Loss	Liquid	Not available	1.032	55 gal/Drum

TABLE I (SLURRY PROPERTIES)

SYSTEM	ONE	TWO	THREE	FOUR	FIVE
Gal/sk P-TTCL	0.80	0.80	0.68	0.80	0.80
Gal/sk P-TCRL	0.00	0.04	0.08	0.00	0.04
Gal/sk P-CCL	0.57	0.00	0.00	0.57	0.00
% Liquid	60.00	70.00	70.00	64.00*	70.00*
Weight ppg	14.80	14.10	14.10	14.80	14.30
Yield cuft/sk	1.38	1.88	1.88	1.45	1.54
Water gal/sk	5.40	7.06	7.02	5.85	7.06
Total fluids	6.77	7.90	7.78	7.22	7.90

* Seawater

TABLE II (PERFORMANCE)

SYSTEM	ONE	TWO	THREE	FOUR	FIVE
BHCT deg. F.	80	100	165	80	100
BHST deg. F.	80	140	210	80	140
TT. (hr: min) @ BHCT	4:15	4:10	3:10	3:20	3:10
Comp.Stg. (psi)BHST					
8 HRS.	490	470	700	590	550
24 HRS.	1000	1300	1400	840	1600
72 HRS.	1900	2000	1800	1700	1900
168 HRS.	2400	2400	2000	2800	2500

These systems are made with class G cement.

CLASS G CEMENT + P-TTCL

DENSITY: 14.2 PPG
YIELD: 1.46 FT^3/SK

THICKENING TIME UNDER API CONDITIONS

ADDITIVE P-TTCL GPS	P-TCRL GPS	DEPTH (ft)	Setting Time
0.80	0.02	2700	3:00
0.80	0.13	4600	4:00
0.80	0.14	6100	3: 25
0.80	0.15	7200	4:30

COMPRESSIVE STRENGTH

ADDITIVES P-TTCL GPS	P-TCRL GPS	DEPTH (ft.)	12 hrs	24 hrs
0.80	0.02	2700	650	1000
0.80	0.13	4600	750	1250
0.80	0.14	6100	750	1275
0.80	0.15	7200	750	1350