ENER-CRETE THERMAL BLEND CEMENT

ENER-CRETE SYSTEMS INC.

4810-47th STREET EAST, REDWATER AB
T0A 2W0 Phone: (780)-638-9501

ENER-CRETE SYSTEMS INC.
in conjunction with

INTEGRA
Laboratory Services Ltd

INTEGRA LABORATORY SERVICES LTD.

ENER-CRETE THERMAL BLEND CEMENT

FOR WELLBORE TREATMENTS
TECHNICAL DATA SHEET

DESCRIPTION

In an environment where wellbore temperatures exceed 115°C, due to well depth, processes such as steam flooding, etc., there is a need for a special cement. Under these types of conditions, regular cement undergoes severe chemical structural changes causing a rapid breakdown of the cement integrity. Ener-Crete's Thermal Cement overcomes this degradation by blending higher content of silica (SiO2), which extends the Thermal Cement's stability to extreme temperatures up to +/-360°C.

PROPERTIES-PHYSICAL

- Appearance is a fine textured greyish-white powder
- Composition is a combination of Oil "G" cement and silica flour
- Bulk Density is 0.741 m^3/Tonne

PROPERTIES-CHEMICAL

- Solubility is that the product is insoluble in water
- pH ranges between 10-12 (in fresh water)
- Water requirement to mix product is 0.41 m^3/Tonne
- Product is a Thermally Stable Oilwell Cement

APPROX. WORKING TIME

(Hrs:min at BHT)

Bag Size (kg)	Water Req. (litres)	Slurry Yield (litres)	Density (kg/m3)	20°C	30°C
20	8.3	15.0	1885	2:30	2:00
40	16.6	30.0	1885	2:30	2:00
1mt	415.0	750.0	1885	2:30	2:00
Compressive Strength Mpa (8, 16, 24 hours)				0.1,2.5, 5.0	0.2,3.8, 6.1

NOTE

Strengths are for reference only. Actual strength values may vary under changing conditions in the wellbore, water quality, density variations. Strength samples should be taken during the application process and compared to the estimated wellbore temperature for additional strength development.

If the wellbore temperatures are typically *below* **30°C** , Thermal Cement can be augmented with a small amount of calcium chloride which accelerates set time. Typical dosages of calcium chloride is **0.5-1.0%** w/w, depending on wellbore depth & temperature. Viscosity and working time will reduce with the addition. Caution working with calcium chloride should be taken as it is an extremely corrosive material. Using it incorrectly may lead to a flash set of the Thermal cement caused by excessive heat of hydration.

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APPLICATION

Oilfield Cementing

Typical use of **Thermal Cement** is for dump-bail treatments. Thermal Cement is typically batched in small volumes according to the following blend table, and using conventional rig equipment, is "dumped" down the wellbore. After a period of time the cement sets, providing a small, hard plug in the problem area.

MIXING & HANDLING

Storage Precautions - Thermal Cement is not hazardous. Keep dry and avoid excessive humid conditions. Best stored in cool, dry place.

Handling Precautions - When mixing with water, some heat will occur due to heat of hydration process. Mix continuously once started. Mixed it is caustic in nature pH 10-12, can cause burns to eyes and skin. Wearing appropriate PPE is a must. See SDS sheet for further information.

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DATA

TESTS REQUESTED:

a) Slurry Thickening Time
b) Slurry Compressive Strength

CEMENT SYSTEMS: **a) Thermal 40**

Slurry Density:	1880	Kg/m^3
Slurry Yield:	0.75	M^3/Tonne
Water Requirement:	0.42	M^3/Tonne

Test Parameters

All tests contain Lafarge Oilwell G cement + 40% Silica Flour only.

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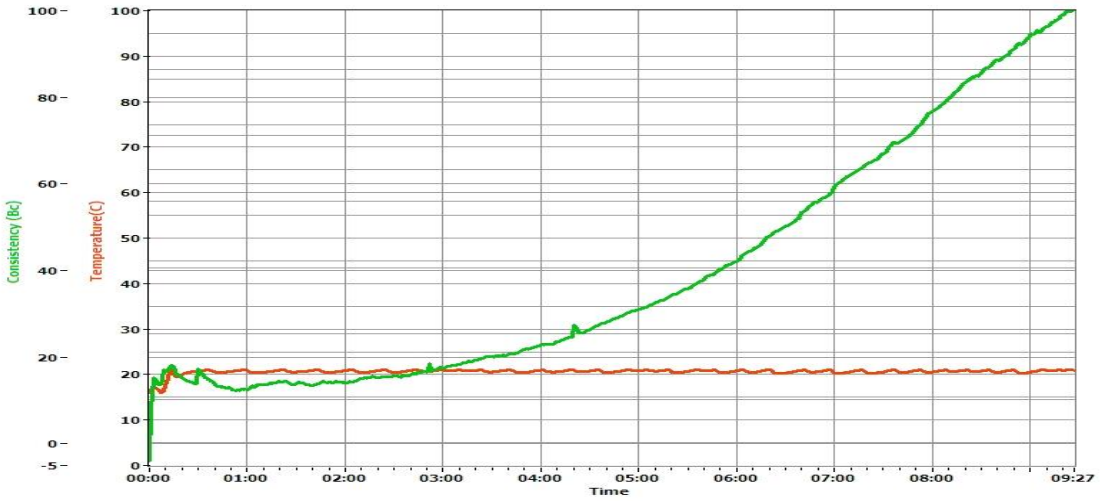
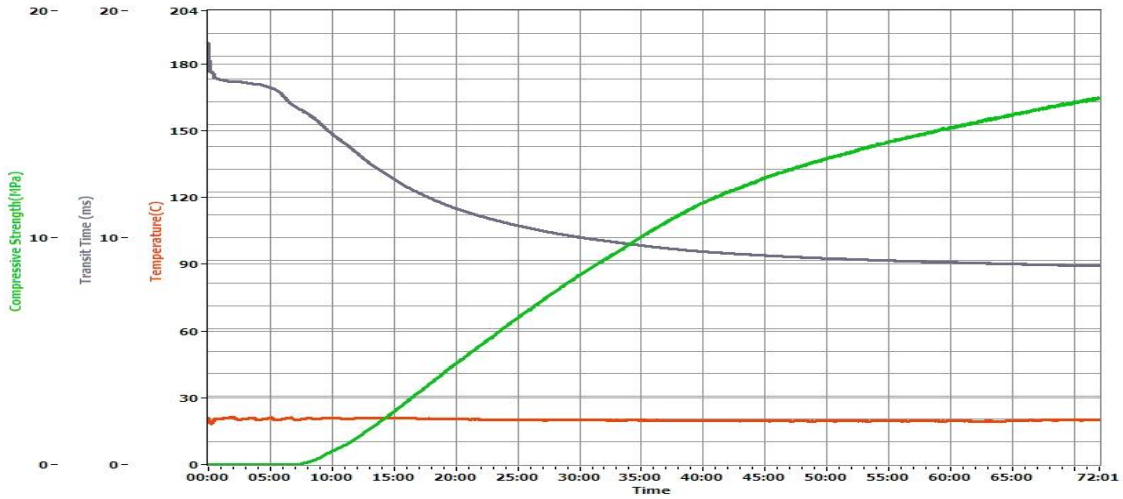
LABORATORY RESULTS

a) Thickening Time @ 20°C.



Time to (HR:mins): 40 Bc: 5:50 70 Bc: 7:44 100 Bc: 9:28

b) Compressive Strength



Time to (HR:mins): 3.5 MPa 17:47 6.05 MPa: 24 HR 13.17 MPa: 48 HR

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Comments

1) All tests were run without additives, with exception of 0.15% liquid defoamer.
2) Test results are representative of basic, neat cement/silica flour slurry.

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TERMINOLOGY

American Petroleum Institute (API): Organisation which provides standards of practice, regulations and materials standards for use in the oilfield.

Bearden Units of Consistency (B_c): Dimensionless scale from 1-100 that indicates the pumpability or consistency of a cement slurry. Thus it is a measurement of thickening time. Bc is measured by a consistometer, which measures the resistance to the paddles truing as the cement sets. Generally difficult pumping begins at 50 Bc and cement completely sets at 100 Bc. A value of 100 Bc is equivalent to 2080 g-cm of torque.

Bottom Hole Circulating Temperature (BHCT): The temperature that occurs at the bottom of the well while fluid is being circulated. This temperature is used in most tests of cement slurry in liquid state such as thickening time and fluid loss. Measured in degrees Celsius (^{O}C).

Bottom Hole Static Temperature (BHST): The temperature that occurs at the bottom of the well if fluid is left undisturbed for about 24-36 hours. This temperature is used for most tests of cement slurry in which the cement slurry is required to set or is set such as compressive strength. Measured in degrees Celsius (^{O}C).

BWOB: By weight of blend

BWOC: By weight of cement

BWOW: By weight of water

Compressive strength: The strength achieved by a set cement sample typically measured by the force required to crush it. Equivalent testing is accomplished via an ultrasonic compressive analyzer.

Filtrate: The amount of fluid which is forced out of a cement slurry during a fluid loss test.

Free Fluid: Water which has separated from a cement slurry during a Free Water Test.

Free Water Test: A method of measuring the amount of free fluid (or water separation) derived from a cement slurry over a set period of time. This test is observed at the proposed or actual wellbore angle.

Slurry Density: The weight per unit volume of cement slurry (units: kg/m^3).

Slurry Yield: The volume of slurry obtained when 1 tonne of dry cement is mixed with the required amount of water (units: m^3/tonne).

Wait on Cement (WOC): The time required to wait for the cement to develop necessary strength for the next operation.

Thickening Time: The time required for a cement slurry to become unpumpable. Generally speaking, this value is recognized as 100 Bc, but can be expressed at other values, such as 70 Bc..

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