PRODUCT BULLETIN

EnerGrout

Canadian Energy
SERVICES

ENERGROUT

Wellbore Strengthening Additive

GENERAL DESCRIPTION

EnerGrout is a proprietary mixture of solids designed primarily for wellbore strengthening but may also be used as LCM.

FEATURES AND BENEFITS

- May be used in oil or water based fluids.
- Contains resilient materials proven to be effective in wellbore strengthening applications.
- Broad range in particle size distribution (0.5-2700 µm).
- Field data indicates roughly 250 kg/m3 average increase strengthening achieved after squeezing into formation.

RECOMMENDED TREATMENT

Fluid should be treated with a minimum concentration of 5 kg/m^3 in order to see benefit for seepage loss prevention.

Concentration may be increased up to around 120 kg/m^3 or as required when used as a pill for wellbore strengthening.

Typical Physical Properties	
Colour:	Grey
Odour:	None

HANDLING

Dusts are subject to combustion. Normal precautions used with flammable materials apply. Routine industrial hygiene practices should be followed: gloves, dust masks and safety glasses are recommended for handling.

AVAILABILITY

EnerGrout is available from CES in 25 kg sacks.

SINCE 2018, ENERGROUT HAS BEEN USED ON:

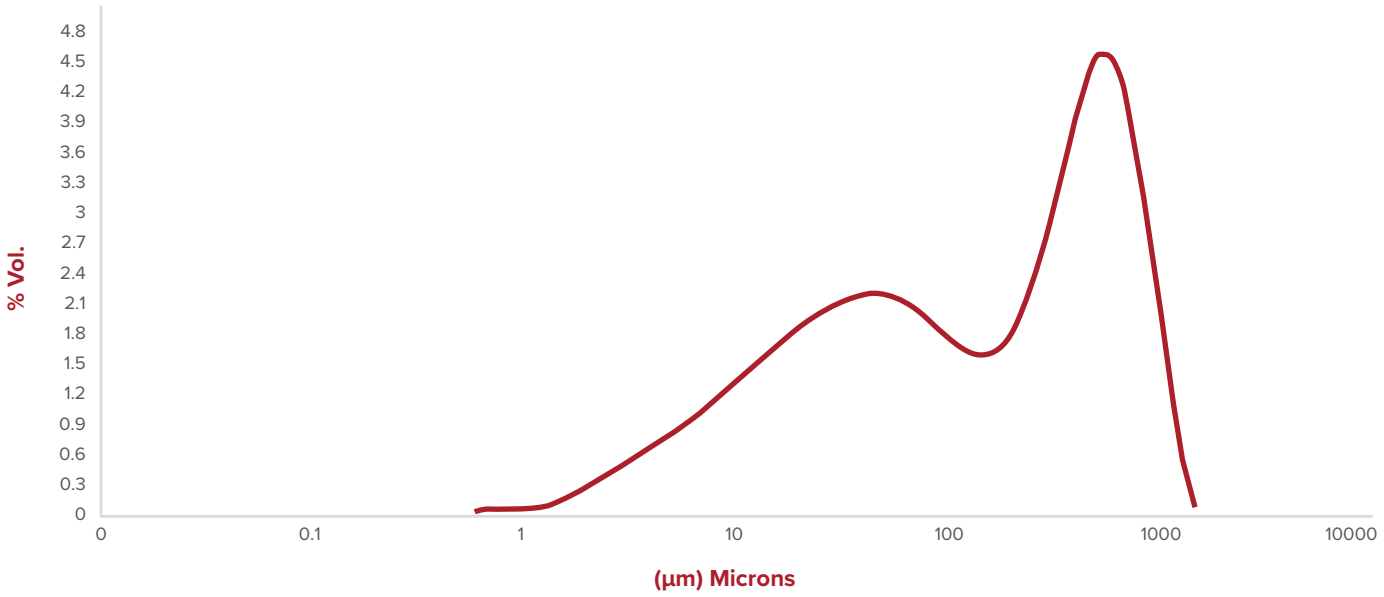
1191 OBM

504 WBM

60,000+ SACKS MIXED

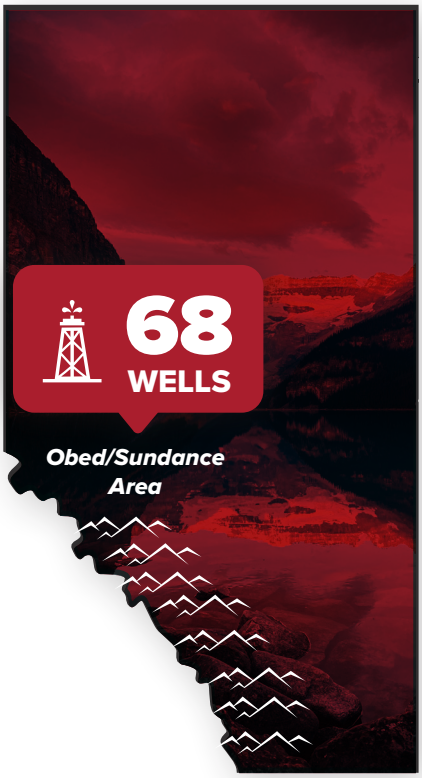
PARTICLE SIZE

EnerGrout



CASE STUDY

Deep Basin Wellbore Strengthening



CHALLENGE

One major Canadian operator was looking for a wellbore strengthening solution that would allow them to maintain higher mud densities for formation stability and wellbore control without breaking down and losing drilling fluid to tectonically weak and fractured upper hole formations (Belly River, Lea Park Shale). By doing so they could reduce their risk of major losses of costly oil-based mud (OBM), improve their cement jobs, and potentially eliminate one string of casing.

SOLUTION

A wellbore strengthening regime using a specialized blend of resilient bridging materials to increase hoop strength through these formations was proposed. EnerGrout would be used in pills at a concentration of 140-160 kg/m^3 and spotted along the problematic formations. After drilling these formations at a low fluid density to not induce losses, a wellbore strengthening pill would be spotted along the annulus. The Energrout pill would be squeezed via a pressure testing truck with the "Y" tied into the casing bowl and the drill string. Reverse pressure would be applied for a minimum of 4 to 6 hours.
After the squeeze would take place the remaining Energrout pill would be displaced from the annulus and could be isolated on surface for reuse on subsequent wells.

Fluid Type	OBM
Section	Intermediate
Depth	600m - 1800m TVD

	Top Hole Fluid Densities (kg/m^3)	Mud Weight Required (kg/m^3)
Minimum	900	1200
Median	960	1400
Maximum	1190	1643

RESULTS

The operator would drill down past the problematic zones and run an initial Formation Integrity Test (F.I.T) to the breaking point to determine the breakdown pressure of these top hole formations prior to entering in the high pressure zones below. The EnerGrout wellbore strengthening pill and regime was performed and a second F.I.T. would take place. If a sufficient increase in formation breakdown pressure occurred, the decision would be made to eliminate running an intermediate casing string.

Over the course of a 2 year program, the operator performed these wellbore strengthening squeezes using Energrout on 68 wells in the Deep Basin/Alberta Foothills. F.I.T. data showed that the highest EMD increase was over 500 kg/m^3. (Initial F.I.T. indicated 980 kg/m^3 vs final F.I.T of over 1510 kg/m^3 post EnerGrout wellbore strengthening regime). The average strengthening achieved for all pills (whether they were considered a success or not) was 253 kg/m^3. The success rate of the pill is 70.6%.

The operator saved approx $500,000 - $750,000 (no casing, cementing, pressure testing or rental equipment), and also saved approx. 4-6 days of rig time on these 48 wells that exceeded their desired FIT. Even in instances where casing had to be run, the cement job's success was greatly increased due to the newly strengthened wellbore.

*Estimated **$30,000,000** in savings to the operator over 48 wells using EnerGrout Wellbore Strengthening Regime.*

CASE STUDY

Deep Basin Wellbore Strengthening

FORMATION INTEGRITY TEST DATA (F.I.T) BEFORE AND AFTER WELLBORE STRENGHTENING REGIME WITH ENERGROUT

	EMD Increase (kg/m^3)
Min	10
P10	108
Median	253
P90	365
Max	530