



"Quality products at a competitive price with service second-to-none"

WelSAVER®

Wellbore Lubricant / Wellbore Stability / Fluid Loss

WelDril® Products have earned a prestigious reputation in the oilfield industry for their unwavering commitment to delivering exceptional products and services to clients. The WelDril WelSAVER® product exemplifies this dedication, offering a comprehensive solution that addresses a wide array of user needs. WelSAVER® incorporates a meticulously engineered particle size distribution system designed to effectively combat seepage to total fluid losses, facilitate hole cleaning, and address specific T&D challenges. Its specialized pills play a crucial role in overcoming problematic vugs, fractures, and difficult lost circulation areas. Furthermore, WelSAVER® demonstrates remarkable versatility, making it suitable for diverse applications, including various water, oil, or synthetic-based drilling fluids, as well as in HPHT and Geothermal wells.

The decreased density of WelSAVER®, ranging from 1.15 to 1.30 specific gravity, allows for effortless recovery using solids control equipment. This lower density also makes it suitable for use in mud systems with notably light weights, such as an 8.2 ppg mud system. WelSAVER® has minimal impact on drilling fluid density and rheology, even at concentrations surpassing 50 lbs./bbl. Additionally, it shows significant return permeability without inducing damage to the formation.

APPLICATIONS:

- Reducing T&D by 20 to 25%.
- LCM for micro and seepage fractures.
- Assists hole cleaning assisting friction reduction.
- Forms a vigorous filtercake and aids in managing losses.

PHYSICAL PROPERTIES:

- Black Powery Appearance.
- Specific Gravity - 1.30 g/cm³.
- Absolute Density - 80 lbs./ft³.
- PSD Range - 45µ to 400µ.
- PSD Average - 280µ.
- 40# sacks 50 per pallet
- UV Shrink Wrapped.
- Temperature Stability: Up to 1,000°F (540°C).
- 70% Acid Soluble

COST BENEFITS:

- Rigorous LCM combination.
- Easy rig footprint, reducing the need for multiple LCMs.
- Competitive pricing.
- 4 of the 5 proprietary components produced in our facilities.

CUSTOMER SERVICE BENEFITS:

- Exemplary products and services.
- Deliveries on Trucking Availability.
- Special and Extra-Large orders are ready for shipment in 24 to 48 hours.

AVAILABLE PRODUCT INFORMATION:

- Product SDS.
- General Recommendation on back.
- Custom Recommendations and Procedures upon request.



Shipping Address: 600 E. Franklin, Haskell, OK 74436
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Website: www.welldrill.com



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PERFORMANCE BENEFITS:

- A dry friction lubricant, reducing friction up to 25% in (WBM) and 40% in (OBM).
- Enhances wellbore wall filtercake assisting in hydraulically sticking pipe.
- Compatible with diverse drilling fluid systems, oil insoluble.
- Engineered for seamless integration with standard rig mixing.
- Eliminates need for pulling out of hole (POOH) with directional BHAs or RSS, preserving downhole integrity.
- Optimizes BHA mobility, minimizing torque and drag.
- Three-dimensional granular composition achieves enhances seal integrity.
- Slightly deformable for effective sealing with low fracture conductivity.
- Optimized concentrations are employed without affecting fluid density.
- Minimal rheological impact maintains fluid properties.
- Reduces logistical costs through efficient packaging paper sacks, not plastic totes.
- Cut down on transportation costs.
- ESG friendly – Passes LC50.

GENERAL RECOMMENDATIONS:

Hole Cleaning Mix 10 ppb x 20 bbls in the active mud in an available mixing / slugging tank. Pump around the total hole volume and watch for product on shakers.

Seepage (5-20 bph losses): Mix 10 - 15 ppb in the active mud in an available mixing/slugging tank. Pump 10 - 15 bbl sweeps every stand or as needed. Seepage below 5-10 bph, use Cal-Carb or Mud Co. Equal

Moderate Losses (15-40 bph losses): Mix 25+ ppb in the active mud in an available mixing/slugging tank. Pump 15 - 30 bbl sweeps every stand or as needed.

Severe Losses (40+ bph losses): Mix 35 - 50 ppb in the active mud in an available mixing/slugging tank. Pump a 25 - 40 bbl sweeps every stand or as needed.

Complete Losses / No Returns (while pumping) with downhole tools. Mix 80 ppb - 100 bbls in the active mud in an available mixing/slugging tank. Note: For smaller directional tools, Mix 45 ppb - 100 bbls in the active mud in an available mixing/slugging tank.

Note: Never stop pumping until all products are totally through the BHA or Bit

- Spot the full-volume pill just above the known loss zone. If the loss zone is unknown, spot the pill above the depth of the initial losses.
- Pull above the calculated top of the pill or back up into the last casing shoe.
- Squeeze an initial volume not exceeding half of the pill's pumped volume.
- Perform gentle hesitation squeeze to achieve the desired pressure.

Full Losses When full losses are the problem, and only try one heavy concentrated pill say 100 ppb x 100 bbls. Best practice is Pump an 100ppb x 80bbl pills as lead, pump cement with 25 ppb dry mixed at bulk plant, and squeeze the cement as a hesitation squeeze, or place and wait until.

Note to Operator: Most competitors' products are in 25# or 40# sacks and 40 sacks per pallet. It is misleading when using the number of sacks to perform the task. WelSAVER® is in 50# sacks and 50 sacks per pallet.



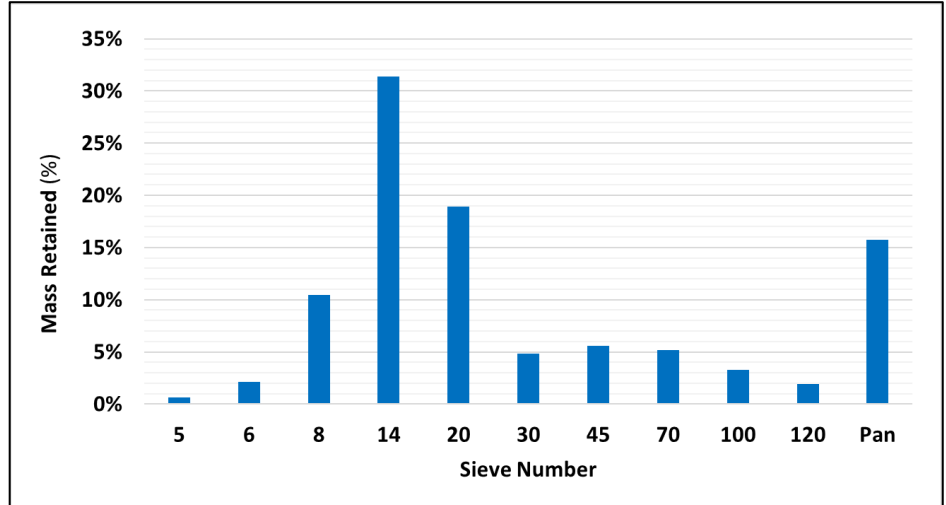
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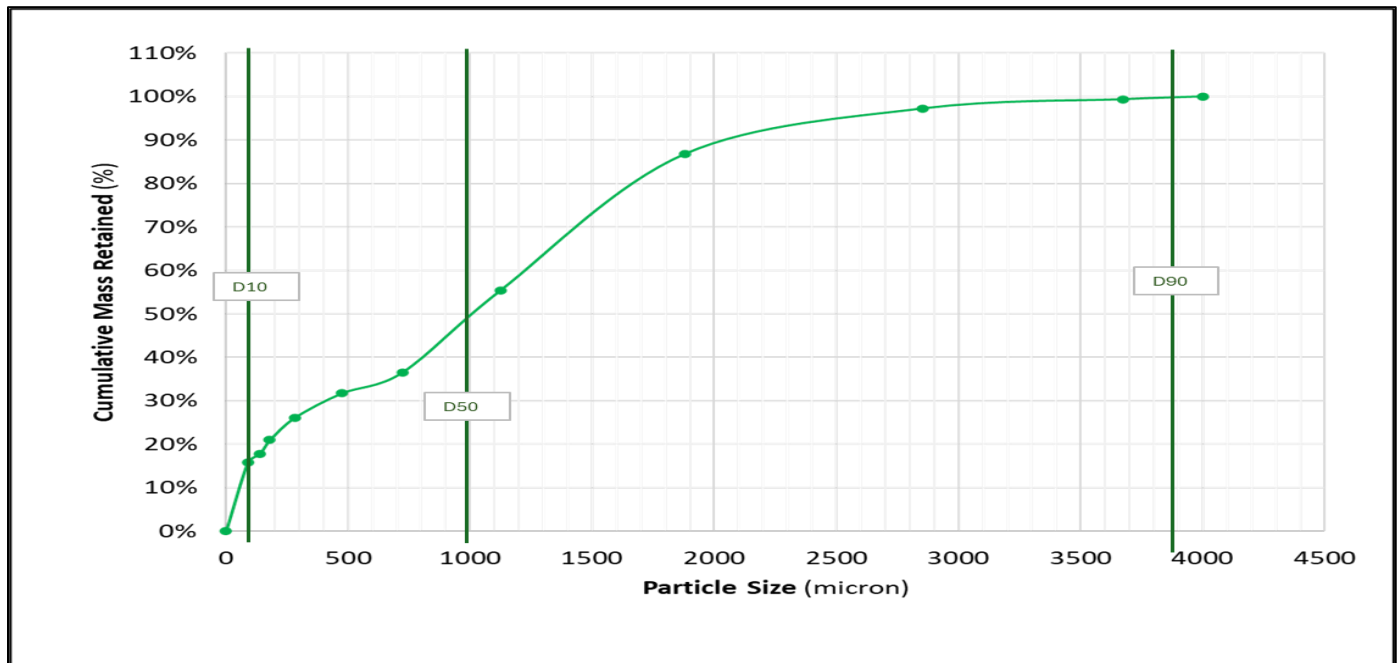
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SIEVE ANALYSIS:

Sieve No.	Wt% Retained (%) - WelSAVER LCM
5	0.6
6	2.1
8	10.5
14	31.4
20	18.9
30	4.8
45	5.6
70	5.1
100	3.3
120	1.9
Pan	15.8



PARTICLE SIZE DISTRIBUTION:



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Representative portions of WetSAVER were obtained using a Sample Splitter. This ensures consistent PSD across each test.

**RESULTS OF THE PARTICLE PERMEABILITY PLUGGING TEST:
INTERTEQ AND ASSURE LAB TESTING:**

Table 1: Results of the Static High Pressure High Temperature Fluid Loss Testing

Drilling Fluid	Temperature	Differential Pressure	Ceramic Disc	1 min Fluid Loss	7.5 Minute Fluid Loss	30 Minute Fluid Loss	Filter Cake Thickness
	°F	psi	microns	milliliters	milliliters	milliliters	millimeters
Water Based Drilling Fluid + WetSAVER	200	500	90	N/A	N/A	30	2
Assure Test Aethon Mud	200	500	90	8.6	19.5	35.75	11
Water Based Drilling Fluid + WetSAVER	200	500	190	N/A	N/A	1	< 1
Assure Test Aethon Mud	200	500	190	1.8	1.8	1.8	< 1





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Table 2: Results of the Dynamic High Pressure High Temperature Fluid Loss Testing

Drilling Fluid	Temperature	Differential Pressure	Ceramic Disc	1 Minute Fluid Loss	7.5 Minute Fluid Loss	30 Minute Fluid Loss	Filter Cake Thickness
	°F	psi	microns	milliliters	milliliters	milliliters	millimeters
Water Based Drilling Fluid + WelSAVER	200	500	90	0	0	0	12
Assure Test Aethon Mud	200	500	90	7	16.5	38	15
Water Based Drilling Fluid + WelSAVER	200	500	190	0	0	0	10
Assure Test Aethon Mud	200	500	190	5.6	11.5	12	4

Table 3: Results of the Particle Permeability Plugging Tests

Drilling Fluid	Ceramic Disc	1 min Fluid Loss	7.5 min Fluid Loss	30 min Fluid Loss	Filter Cake	Spurt Loss	Total Fluid Loss (Particle Plugging Test Value)	Static Filtration Rate
	microns	milliliters	milliliters	milliliters	millimeters	milliliters	milliliters	milliliters per square root of minutes
Water Based Drilling Fluid + WelSAVER	90	2	10	20	5	0	40	7
Assure Test 11 ppg Customer Mud	90	9.5	20.8	39	11.5	5.2	78	14
Water Based Drilling Fluid + WelSAVER	190	1	2	4	< 1	0	8	1
Assure Test 11 ppg Customer Mud	190	2	3	3	3.5	0	1	1

DRILLING MUD USE

FOR TEST

Aethon's 11 ppg Water Based Drilling Fluid Containing 50 ppb WelSAVER				
Plastic Viscosity (cP)	Yield Point (lbs/100ft ²)	Apparent Viscosity (cP)	10 sec Gel Strength (lbs/100ft ²)	10 min Gel Strength (lbs/100ft ²)
9.78	6.85	13.21	4.83	11.02



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Table 4: Instructions for the Preparation of the 11 ppg Water Based Bentonite Drilling Fluid Containing 50 ppb WelSAVER		
Drilling Fluid Component	Amount Added	Comments
Fresh Water	302.7 grams	Add fresh water to the mixing container
Prehydrated Bentonite	13 grams	Add Bentonite to the mixing container and mix for 5 minutes
CLS	0.5 grams	Add CLS to the mixing container and mix for 5 minutes
Barite	193 grams	Add Barite to the mixing container and mix for 30 minutes
Diesel	93 milliliters	Add diesel to the mixing container and mixed for 5 minutes
Sodium Hydroxide	added pH to 10	Add Sodium Hydroxide to the mixing container and mix for 5 minutes
WelSAVER	50 grams	Add WelSAVER to the mixing container and mix for 5 minutes

HISTORY:

Lost Circulation (LC) refers to the unintended escape of drilling fluid (mud) from the wellbore into subsurface formations. It typically occurs when encountering highly permeable formations, pre-existing fractures in the rock, or induced fractures due to excessive wellbore pressure during drilling operations. The effects of lost circulation include reduced annular velocity, lowered hydrostatic pressure, and potential wellbore instability, which can lead to hazardous situations such as well kicks or underground blowouts if not effectively managed. Mitigation strategies include using Lost Circulation Material (LCM) to seal fractures, adjusting fluid density to minimize pressure differentials, and employing specialized mud systems or cementing techniques to strengthen the wellbore. Applied Drilling Engineering recognized (Bourgoyne, A Chenevert, M Millhelm, S. Young Jr.,1986. Engineering Contributors; SPE, LSU, UT, OU and Amoco Research, Exxon Research).

Abrams in 1977 established the fundamental aspect of particle sealing technology and the effect of mud physical properties and its effect on mud loss. The results of the study can be briefly stated as.

- Particle size: For effective sealing the mud should contain a wide range of particles.
- Particle shape: It is not critical for sealing capability.
- Particle concentration: The high concentration provides better sealing.
- Particle density: Low density LCM can be used if mud weight resections exist.
- Continuous Treatment: Having sealing agents continuously is more effective than spotting pills.
- Fracture Characteristic: Micro cracks are easier to seal than porous zones.
- Formation Damage: Calcium carbonate is preferable while drilling productive zones. Because of acid solubility.
- Economics: The lower cost of calcium carbonate makes its preferable.



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**SEDIMENTATION TESTS ON WeSAVER®
FOR WELDRIL**

WelDril labs conducted a set of tests on WeSAVER® combined with X-C or Florigel H-Y in a 9.7 ppg bentonite mud to determine if settling would occur. At the levels of viscosifiers added, no settling was apparent.

WeSAVER® and either X-C or Florigel H-Y were added to a 9.7 ppg bentonite mud and allowed to sit for two or three days. An approximately 200 mL sample from the top half of the fluid was taken off and sieved on a 20-mesh screen to collect the larger particles in the fluid. The large particles were dried and weighed to determine the mass of large particles in the sample. This procedure was repeated on the bottom half of the mud. The results are shown in the table below.

System	Grams Large Solids/200 g Mud	Weight % Large Solids in Mud
Base Mud + 100 ppb WeSAVER	21.5	10.75
2 ppb X-C in 9.7 ppg Bentonite, Top half	20.8	10.4
2 ppb X-C in 9.7 ppg Bentonite, Bottom half	22.1	11.1
1 ppb X-C in 9.7 ppg Bentonite, Top half	21.5	10.8
1 ppb X-C in 9.7 ppg Bentonite, Bottom half	21.5	10.8
4 ppb FHY in 9.7 ppg Bentonite, Top half	21.4	10.7
4 ppb FHY in 9.7 ppg Bentonite, Bottom half	21.1	10.6

Previous tests have revealed that around 55% of WeSAVER® particles exceed 20 mesh in size. Given this information, it was predicted that approximately 10.75% by weight of a 9.7 ppg bentonite mud containing 100 ppb WeSAVER® would consist of particles larger than 20 mesh. For a 200-gram sample, this would equate to 21.5 grams of large particles. The data presented in the table corroborates this expectation, demonstrating that all samples closely aligned with the anticipated values, with no notable distinction observed between the upper and lower sections of each system.

WELDRIL TESTING WITH SUSPENSION AGENTS:

WelDril Labs' testing indicates that there is no necessity to incorporate the suspension agent unless there is a requirement for the specific mud properties tailored to the well's conditions. In such cases, the suspension agent can be introduced into the mud system based on the mud analysis provided by the mud companies.

ASSURE TESTING RESULTS:

The dynamic HPHT tests conducted by Assure Oilfield Testing are consistent with the HPHT and PPT tests run on the same systems. On media with a (190µm) pore size, the filter cakes were thin and fluid loss was low. On the smaller pore sized media (90µm), filter cakes were much thicker and higher fluid loss. This is indicative of the design of WeSAVER® to be a lost circulation material and not covering all smaller to micro fracture in a seepage loss.



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SPOTTING LCM PILL

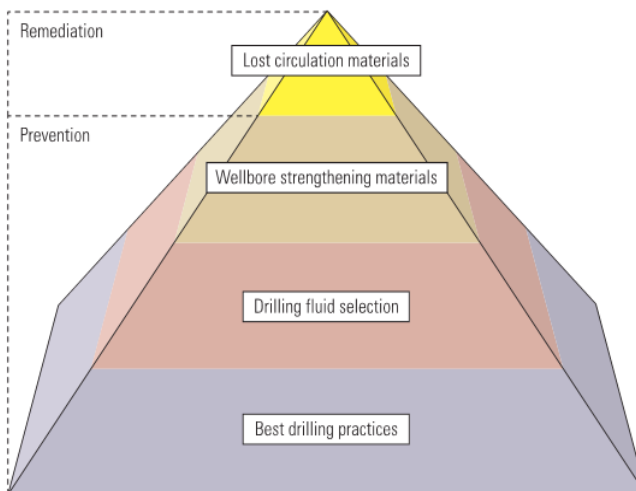
(Kahvecioglu, Alper M.Sc.)

One of the essential features of any fluid-loss pill is its ability to maintain viscosity under bottom-hole conditions, especially at high temperatures. The viscosity reduction of gel at high temperatures is either due to the degradation of polymer or reduced molecular interactions. The viscosity will not be regained. on cooling if there is molecular degradation. (Samuel et al., 2003)

There are several types of LCMs used in the drilling industry. They have varied sizes, shapes, and characteristics. Economic and technical limitations influence the use of the LCM type. For classification purposes, LCMs can be divided into fibers, flakes, granules, and mixtures. The power LCMs are used in drilling mud to lessen mud loss through the smaller face and within fractures or vugular formations, whereas flaky type LCMs can plug and bridge many types of porous formation to stop the mud loss or establish an effective seal over many permeable formations. The granular type of LCMs form bridges at the formation face and within the formation matrix, thus providing an effective seal, which depends primarily on proper particle size distribution to build a bridge with decreasing Permeability as it is being laid down. Finally, blended LCM's are combination of granular, flake and power materials that will penetrate fractures, vugs or extremely permeable zones and seal them off more effectively.

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Comprehensive lost circulation management program. The bottom three tiers of the pyramid focus on lost circulation prevention. Best drilling practices may encompass implementing accurate geomechanical models to calculate the risk of hole collapse or lost circulation and may also make use of expandable casing, managed pressure drilling or casing-while-drilling techniques. Drilling fluid selection includes the implementation of drilling fluid with the proper rheological properties to minimize or cure lost circulation. Wellbore strengthening materials consist of specially formulated and sized particulate materials that enter a fracture and arrest its propagation by isolating it from the wellbore. The top tier is devoted to remediating losses though the use of lost circulation materials such as cure or stop-loss pills.



INTERTEQ AND ASSURE LAB TETSTING:

Fracture Examples



Beautiful examples of nature, pressure, and coring induced variety of micro and natural fractures and some caverns observed in core. When core demonstrates, these make great stress indicators. With such fractures and caves WeLSAVER® multi-sized particle distribution, when the larger particles start embedding, and Larger KolSeal particles wedge in, then the PhenoFlake and Nitril Rubber lays over the particles like a blanket, and the smaller particles start filling the gaps, causes full closure and further prevention.





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START OF WELSAVER ENTERING THE FRACTURES



WELSAVER CLOSING THE FRACTURES



Within the context of fractures and caves, the innovative WelSAVER® technology harnesses a meticulously calibrated multi-sized particle distribution. As the larger particles seamlessly embed themselves into the substrate, the Larger KolSeal particles strategically wedge into the crevices, initiating a process akin to interlocking puzzle pieces. This creates a robust foundation for subsequent layers.

The application of PhenoFlake and Nitrile Rubber acts as a protective barrier, meticulously laying over the embedded particles like a finely woven blanket. This overlaying process ensures comprehensive coverage, effectively sealing off any potential avenues for leakage or seepage.

Simultaneously, the smaller particles, utilizing their finer granularity, infiltrate the remaining interstices and fissures. Through their precise placement, they facilitate a meticulous filling process, effectively closing any lingering gaps. This meticulous interplay between particle sizes results in a synergistic effect, culminating in a comprehensive closure mechanism that not only addresses existing vulnerabilities but also fortifies against future risks.



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We believe WeIDril's WeISAVER® is the ideal solution for professional engineers and businesses seeking reliable and cost-effective fluid loss materials. Its unparalleled performance and unique inert properties set it apart from traditional alternatives, ensuring optimal wellbore integrity and substantial savings.



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