TECHNICAL DATA SHEET

KRYPTOSPHERE XT

Advanced, ultra-conductive, low-density ceramic proppant

Features

- Precision-engineered, strong, durable, round, mono-sized and smoother proppant grains
- Designed for lower crush compared to KRYPTOSPHERE LD in high stress conditions
- Single-mesh-sized product manufactured to any size required to suit well conditions
- Significantly exceeds the conductivity, compressive strength and durability of existing low-density proppant, and many intermediate- and high-density products
- Excellent roundness, sphericity and smoothness for less erosivity
- Extraordinary strength and durability
- Highly acid-resistant compared to alternative ceramic proppant

Benefits

- Creates a frac with more uniform pore throats and more space for hydrocarbon flow
- Maintains the highest flow rates and levels of conductivity for the productive life of the frac
- Reduces flow path tortuosity to reduce non-Darcy impacts and improve overall conductivity
- Avoids the creation of fines that reduce conductivity
- Significantly less erosion during pumping, minimizes wear and tear on downhole tools and pumping equipment

Lower F&D costs, increased recovery

KRYPTOSPHERE® XT ultra-conductive, low-density ceramic proppant technology significantly exceeds the conductivity, compressive strength and durability of existing low-density products.

In addition, KRYPTOSPHERE XT technology provides comparable and, in many cases, higher conductivity than intermediate-density and bauxite ceramics while delivering improved proppant transport and increased propped fracture volume.

The higher flow rates and larger propped volume increases recovery and return on investment, thereby lowering finding and development costs per barrel of oil equivalent.

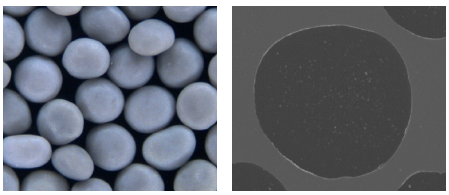
A step change in performance

KRYPTOSPHERE XT technology creates more space for hydrocarbon flow, which results in the highest levels of production and recovery across the entire range of low- and high-stress conditions. The significantly higher baseline conductivity compared to typical intermediate- and low-density ceramic proppant maintains the highest flow rates and extends the productive life of the frac.

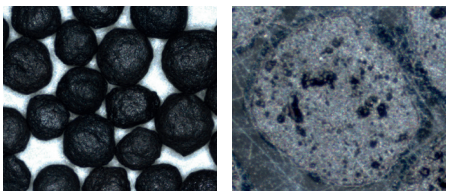
Lower beta factor and pressure drop

The spherical, smooth and uniform size characteristics of KRYPTOSPHERE XT technology creates a frac with more uniform flow paths. The reduced flow path tortuosity minimizes the pressure drop due to non-Darcy flow effects across the fracture, which further enhances overall conductivity, flow rates and ultimate recovery.

Exceptional microstructure



KRYPTOSPHERE XT
Exceptionally low and uniformly distributed internal porosity creates a proppant with extraordinary compressive strength and durability.



Imported bauxite proppant
High internal porosity with irregular distribution dramatically reduces strength, leading to the creation of fines that rapidly reduce conductivity and production.

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KRYPTOSPHERE XT

Advanced, ultra-conductive, low-density ceramic proppants

Physical and chemical properties

Typical sieve analysis [weight % retained]

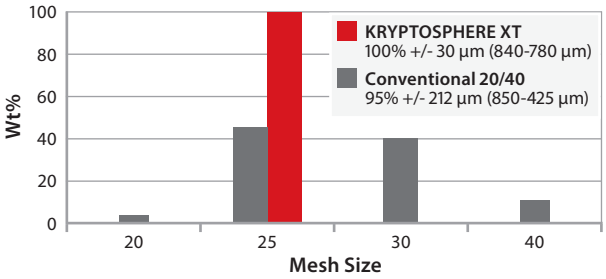
U.S. Mesh [mesh]	Microns	20 Mesh	25 Mesh	35 Mesh	45 Mesh
-18+20 mesh	-1000+850	100	0	0	0
-20+25 mesh	-850+710	0	100	0	0
-30+35 mesh	-600+500	0	0	100	0
-40+45 mesh	-415+355	0	0	0	100
Median particle diameter [microns]		960	810	575	390
API/ISO crush test % by weight fines generated @12,500 psi		6	4	2	2
API k-factor [kpsi]			16	16	21

Sizing requirements: These specifications meet the recommended practices as detailed in ISO 13503-2.

Typical additional properties

Roundness	0.9	Apparent specific gravity	2.83
Sphericity	0.9	Absolute volume [gal/lb]	0.042
Bulk density [lb/ft³] [g/cm³]	104 1.67	Solubility in 12/3 HCl/HF acid [% weight loss]	<2

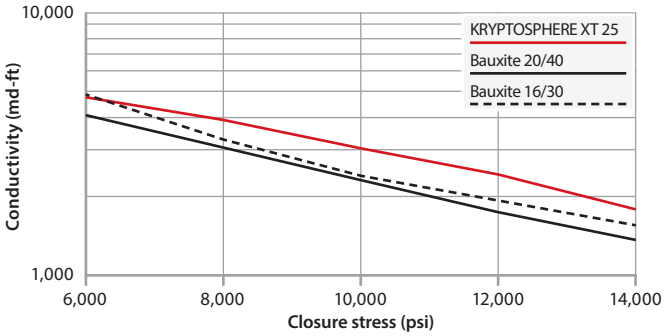
Single mesh size technology



KRYPTOSPHERE XT technology is a single-mesh-sized product that can be manufactured at the optimal size for your fracture design and reservoir conditions.

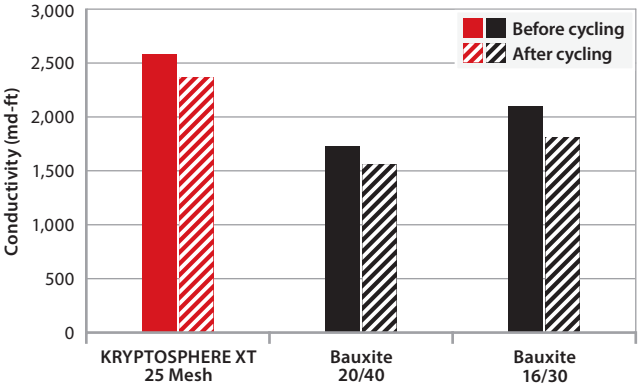
Third-party field testing comparison

Reference conductivity comparison, KRYPTOSPHERE XT vs imported bauxite field samples



Testing shows 25 Mesh KRYPTOSPHERE XT provides better conductivity than bauxite 20/40 and is even comparable to bauxite 16/30.

Reference conductivity before and after stress cycling



Stress cycling testing shows 25 Mesh KRYPTOSPHERE XT provides better conductivity than 20/40 and 16/30 bauxite field samples. Its high crush resistance withstands stress cycling to ensure that fracture conductivity, integrity and connectivity are sustained long-term to optimize production.

Baseline flow properties

Closure stress	Reference conductivity*, md-ft				Reference permeability*, Darcies				Beta Factor, atm-sec^2/gram		
[psi]	20 Mesh	25 Mesh	35 Mesh	45 Mesh	20 Mesh	25 Mesh	35 Mesh	45 Mesh	20 Mesh	25 Mesh	35 Mesh
2,000	8,695	8,120	3,335	2,091	472	432	188	120	0.000111	0.000109	0.000253
4,000	8,185	7,250	3,210	2,012	449	392	182	116	0.000119	0.000125	0.000264
6,000	7,400	6,240	3,030	1,900	413	342	173	110	0.000134	0.000152	0.000284
8,000	6,183	4,945	2,915	1,828	352	277	167	107	0.000168	0.000203	0.000296
10,000	4,625	3,800	2,475	1,552	266	215	143	91	0.000251	0.000291	0.000365
12,000	3,585	3,000	2,080	1,304	207	170	121	77	0.000359	0.000403	0.000456
14,000	2,595	2,200	1,565	981	152	125	92	59	0.000557	0.000619	0.000649
16,000	1,750	1,550	1,150	721	105	90	69	44	0.000947	0.000980	0.000954

* Reference conductivity and permeability are measured with a single phase fluid under laminar flow conditions in accordance with ISO 13503-5. In an actual fracture, the effective conductivity will be much lower due to non-Darcy and multiphase flow effects. For more information, please refer to SPE Paper #106301.

Talk to CARBO to find out how we can help you enhance your production.

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