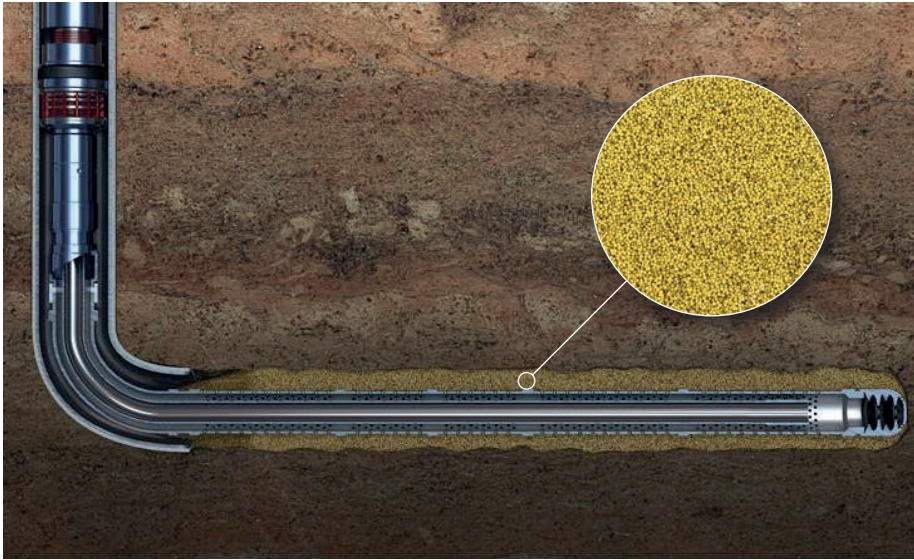


CARBOAIR for gravel pack applications

High-transport, ultra low-density ceramic proppant technology



CARBOAIR™ high-transport, ultra low-density ceramic proppant technology enables operators to efficiently create a high-quality gravel pack at low fluid viscosity and pump rates.

Efficient gravel pack placement at low pumping pressure

The excellent proppant transport characteristics of CARBOAIR technology enables lower fluid viscosity and pump rates to be used. This allows efficient pack placement and the full packing of the annulus while avoiding fracturing the formation.

The reduced fluid viscosity and pump rates are critical in wells with low frac pressure and/or a low working window between frac pressure and formation pressure. These conditions are typical in many shallow unconsolidated formations that require gravel packing for sand control.

Consistent sand retention performance

CARBOAIR technology has a consistent mesh size distribution and mean particle density (MPD) that delivers consistent sand retention performance.

High permeability for minimal pressure drop

Under radial flow conditions in a gravel pack completion where all production is passing through the pack, and perforation tunnels in cased hole, any impairment to pack permeability has a significant negative impact on well productivity. Gravel packing with CARBOAIR technology has a high completion efficiency as it results in a minimal completion skin that avoids any impairment to well productivity.

Features

- Ultra low-density ceramic proppant with chemically-engineered internal porosity
- Apparent specific gravity of 2.0; approximately 25% lower than sand, resin-coated sand (RCS) or low-density ceramic (LDC)
- Enhanced transport characteristics: 30%-40% slower settling rates compared to sand or RCS
- Exceeds the conductivity, strength and durability of sand
- Available in 40/70, 30/50 and 20/40 mesh sizes

Benefits

- Minimal completion skin for increased well productivity
- Preserves formation permeability and proppant pack conductivity
- Enhanced proppant transport for efficient gravel pack placement
- Enables low fluid viscosity and pump rates to be used
- Avoids formation fracturing during gravel pack operations

Applications

- Cased hole and open hole gravel packing in vertical, deviated and horizontal wells
- Gravel packing in low frac gradient and narrow frac formation pressure window environments
- Multi-path screen horizontal open hole gravel pack
- Gravel pack applications when using erosion-sensitive completion hardware

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Ideal for Alpha-Beta gravel packing in operations

The Alpha-Beta wave technique is typical in gravel pack operations with straight or slick water in horizontal or highly deviated wells. In these operations, the pump rate, carrier fluid viscosity and proppant density determine the height of the alpha wave and pressure applied to the formation through the treatment.

As an ultra-low density ceramic proppant, CARBOAIR technology lowers the height of the alpha wave leaving more space above it to place the beta wave. This reduces the pressure, preventing fracturing the formation.

Physical properties

Typical sieve analysis [weight % retained]

U.S. Mesh [mesh]	Microns	40/70	30/50	20/40
-16+20 mesh	-1180+850	0	0	0
-20+30 mesh	-850+600	0	1	40
-30+40 mesh	-600+425	0	75	58
-40+50 mesh	-425+300	55	24	2
-50+70 mesh	-300+212	44	0	0
-70 mesh	-212	1	0	0
Mean particle diameter [microns]		300	465	580
API/ISO crush test				
% by weight fines generated @ 6,000 psi		1	1	2

Typical additional properties

Roundness	0.9
Bulk density [lb/ft ³]	72
Apparent specific gravity	2.0
Max BHST	>500 f
Solubility in 15% HCl acid [% weight loss]	0.1
Neutral buoyancy brine	15.85

Sizing requirements:

A minimum of 96% of the tested sample should fall between the designated sieve sizes. These specifications meet the recommended practices as detailed in API RP 19C.

Long-term conductivity

Closure stress [psi]	Reference conductivity*, md-ft @ 250°F (121°C)			Reference permeability*, Darcies @ 250°F (121°C)		
	40/70	30/50	20/40	40/70	30/50	20/40
1,000	1,460	2,900	4,400	75	149	234
2,000	930	1,950	2,500	62	122	184
4,000	250	400	480	41	85	109

* Reference conductivity and permeability are measured with a single phase fluid underlaminar flow conditions in accordance with API RP 19D.

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

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CARBO

Production. Enhanced.