2016
PROPPANT MARKET REPORT
CONFIDENTIAL

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Forward

Recently there has been considerable discussion concerning regional, fit-for-purpose sand. I credit the popularization of “fit-for-purpose” sand to industry veterans at BJ Services and PropTester nearly a decade ago (see SPE 116054 “Using Industry Standards as a Way to Predict Sand Performance and Approve Sand Deposits: Is There A Catch 22?”, Brannon, et al). The study correctly addressed that natural frac sands can fail one or more industry qualifying standards and still meet select reservoir flow capacity needs. The fact is, regional sands of various qualities have been an important supply source since the inception of commercial hydraulic fracturing in 1949. Regional sources included niche operations such as those Doug Olmen (my dad) established in Colorado and England in the 1970s and 1980s to more present-day, high-capacity operations today involving significant private and public funding.

The use of non-traditional frac sand (specifically sands that readily do not meet all API/ISO standards) is often impacted by Tier 1 supply availability and industry economics. Generally, weak oil and natural gas prices result in a higher acceptance and use of lower-cost, lower-quality proppants to minimize completion costs, only to revert to more conductive, higher-cost proppants as economics improve. Conversely, non-traditional proppants sometimes must be used during strained supply for no other reason than to ensure timely well completions.

The present “just pump more sand” movement is not new, but the degree at which it is being applied in completion practices is challenging conventional thinking. Higher intensity loadings of all types of smaller mesh sands are showing promise in unconventional oil and gas wells in Canada, the US and even Saudi Arabia (see SPE 184823 “From the Backyard Sand Dune to Fracturing a Highly Tectonically Complex Formation in Saudi Arabia,” Bartko, et al).
Considering sources of very high quality, Tier 1 sand are not prevalent outside of the United States, if at all, this trend may bode very well for unconventional resource development outside of North America. Long-term proppant conductivity is still important, but so are maximizing reservoir contact, avoiding early screen-out, and curtailing completion costs, among other things.

In January I had the pleasure of revisiting with Ralph Veatch, the 2017 recipient of the Legends of Hydraulic Fracturing award. He may have summed it up best when he questioned, “What is the cost of not knowing what we need to know to maximize economic returns?” In other words, there is a cost of ignorance in our industry. It was not a derogatory question, but rather an understanding over a long career that our industry will, and must continue to, challenge completion practices.

In his words, there are steep learning curves involved going from millidarcy to microdarcy to nanodarcy formations, and eventually we must evolve from “bigger is better” to “smarter is better” to achieve higher economic returns. Expenditures (even though they may be relatively large) to enhance our knowledge of essential information has a high probability of dramatically increasing economic returns, especially with the high dollar costs of current operations.

We agree. Until then, we will revert, and caution others, from making absolute statements about what future proppant trends and volumes will be.

Brian D. Olmen, KELRIK LLC
Rig Efficiency and Proppant Intensity

US Sand Tons/Well Drilled

US Sand Tons/Well Completed

Sample Slide
Basic Frac Sand Types

**Tier 1**
- **Premium**
  - “Northern White”

**Tier 2**
- **Good**
  - “Brady Type”

**Tier 3**
- **Marginal**
  - “Fit-for-Purpose”
Further review of the data reveals other trends. Sand grain distribution can vary significantly within deposits. The primary source deposits for Tier 1 sands consist of St. Peter, Jordan, Wonewoc, and Mt. Simon formations, and select Wisconsin deposits which we generically refer to as Northern Mix that contain an alluvial blend of one or more of the named sources. Our Tier 1 classification includes nearly all Illinois, Iowa, Minnesota and Missouri deposits, and a select few Arkansas and Oklahoma operations that have either St. Peter or equivalent deposits. Coarse sand supply (i.e., 20/40 and coarser) is limited in St. Peter sandstone deposits and essentially non-existent south of Illinois. Considering the propensity to pump finer mesh sands the past year, it should come as no surprise that St. Peter sources fared better than their coarser kin.
### Company  |  Plant Locations  |  Source Material  |  Direct Access  |  Estimated Realistic Frac Capacity and Noteworthy Events
--- | --- | --- | --- | ---
**Capital Sand Proppants, LLC**<br>www.capitalsandproppants.com  |  Cape Girardeau, MO  |  St. Peter  |  Truck/Barge  |  Capacity: 4.000 billion (2,000,000 tons)<br>Grades: 30/50 thru 100 M/200 M<br>Established in 1973, Capital Sand, Inc., a subsidiary of Farmer Holding Company, commenced supplying frac sand after constructing a new 2.0 Million ton frac sand processing plant in April 2015. Known as Capital Sand Proppants, LLC, the new barge and truck-to-rail facility produces 30/50 thru 100 mesh from the St. Peter sandstone in Missouri. The company also supplies silica flour.

**Mississippi Sand, LLC**<br>www.Mississippi-sand.com  |  Festus, MO  |  St. Peter  |  Truck/Barge  |  Capacity: 3.800 billion lbs (1,900,000 tons)<br>Grades: 20/40 thru 100 M<br>Mississippi Sand maintains primary production facilities in Missouri, it’s flagship facility, and Arcadia, Wisconsin. The Festus operation has both barge and truck-to-rail capabilities. The previously pending Ottawa, IL mine was sold to US Silica. Capacity has increased marginally from prior year, and we expect Arcadia will recommence operations in 2017.

**American Silica LLC**<br>www.americansilica.com  |  Black Rock, AR  |  (NEW 2017)  |  BNSF  |  Capacity: 3.000 billion lbs (1,500,000 tons)<br>Grades: 30/50 thru 100 M<br>American Silica LLC constructed a $48 Million, BNSF-served processing facility near Black Rock, AR in 2016, and commenced initial product shipments January 2017. The company’s mine is located east of Cave City, AR and is a St. Peter sandstone deposit.

**Sargent Sand**<br>www.sargentsand.com  |  Ludington, MI  |  St. Peter  |  Truck  |  Capacity: 2.800 billion lbs (1,400,000 tons)<br>Grades: 30/50 thru 40/70<br>Sargent Sand completed a new, 1 Million tpy dry screen facility in Ludington, Michigan in 2012 (fully operational in 2013). The truck-to-rail based facility was expanded in mid 2014 to a current capacity of 1.4 Million tpy. Predominantly a 40/70 deposit, the company will install equipment to commence making limited 100 mesh in 2017.

**Sierra Frac Sand, LLC**<br>www.sierrafracsand.com  |  Tatum, TX  |  Northern/other<br>Gonzales, TX  |  BNSF/UPRR  |  Capacity: 2.700 billion lbs (1,350,000 tons)<br>Grades: 8/16 thru 100 M<br>Sierra Silica initially produced Northern White sands sourced from the upper Midwest deposits at its Texas processing facilities. More recently, the company has focused on producing regional sources of sand from both Texas and Louisiana. The company continues to look into new regional sources of sand, as well as expanding its dust containment business.