

THE BENEFITS OF A PROPPANT COATING TO REDUCE SILICA DUST EXPOSURE

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TOPICS OF DISCUSSION

- ❖ **Criteria to consider to effectively evaluate different engineering control options**
- ❖ **The benefits of a proppant coating to help meet silica dust permissible exposure limits**
- ❖ **The impact of sand characteristics on the selection and performance of proppant coatings**



Criteria to consider to effectively evaluate different engineering control options

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CRITERIA TO CONSIDER TO EFFECTIVELY EVALUATE ENGINEERING CONTROL OPTIONS

- ❖ Does the engineering control reduce respirable crystalline silica dust to below the PEL?
- ❖ Does the engineering control reduce respirable crystalline silica dust to below the AL to avoid additional IH monitoring costs?
- ❖ Does the engineering control occupy valuable real estate on the operations site?
- ❖ Does the engineering control provide continuous protection across the hydraulic fracturing supply chain?
- ❖ Does the engineering control require equipment with ongoing maintenance needs?
- ❖ Does the engineering control require single or multiple setups per application?
- ❖ Does the engineering control work with your unique sand?



The benefits of a proppant coating to help meet silica dust permissible exposure limits

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THE BENEFITS OF A PROPPANT COATING TO HELP MEET SILICA DUST PEL

❖ Silica Dust Reduction Built into the Sand

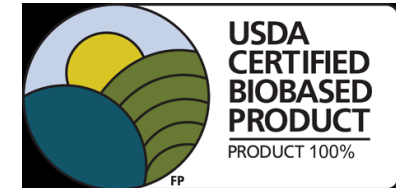
- Reduction in silica dust generation of up to 99% throughout the supply chain

❖ No Footprint

- Does not occupy valuable real estate at the fracturing site

❖ Environmentally Friendly

- Made from naturally occurring biodegradable / biorenewable substances used in every day food, nutritional and personal care products
- Non-toxic, non-irritating and odorless
- 100% USDA Certified Biobased Product under the BioPreferred® Program



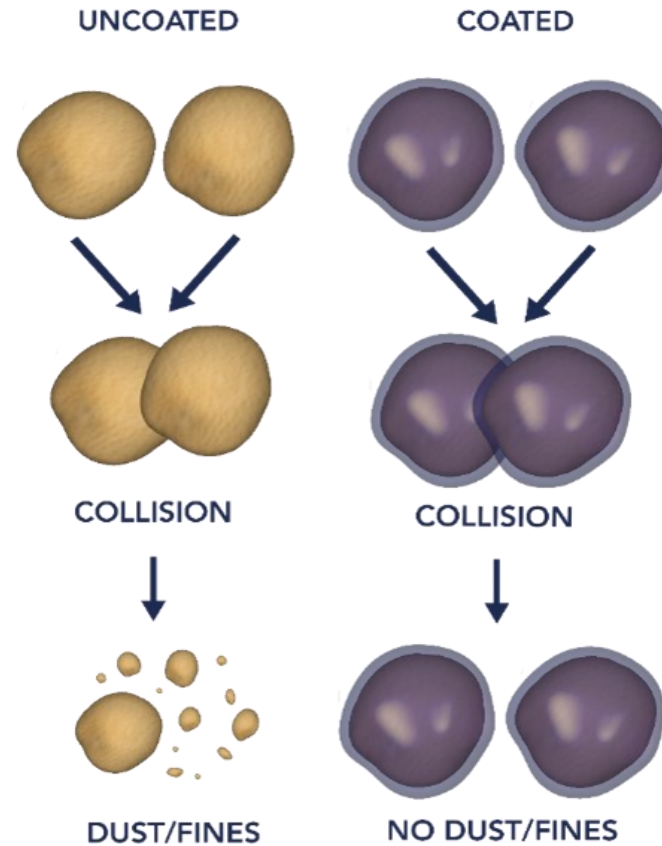
❖ Frac fluid compatible

❖ No drying or curing time required once applied to the sand

❖ Lower proppant attrition rates

- **Works by applying a microscopic coating on sand proppant which controls dust and lowers fines generation by reducing attrition whenever proppant is transferred**

THE BENEFITS OF A PROPPANT COATING TO HELP MEET SILICA DUST PEL



- ❖ Stable, long-lasting dust control through multiple frac sand transfers
- ❖ Once applied, all points along the supply chain are protected from silica dust

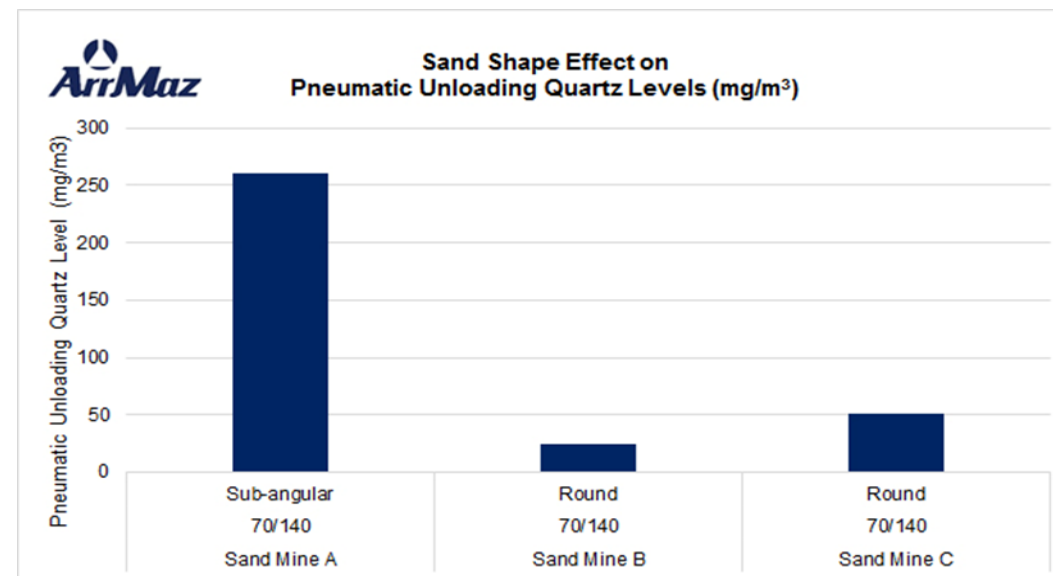
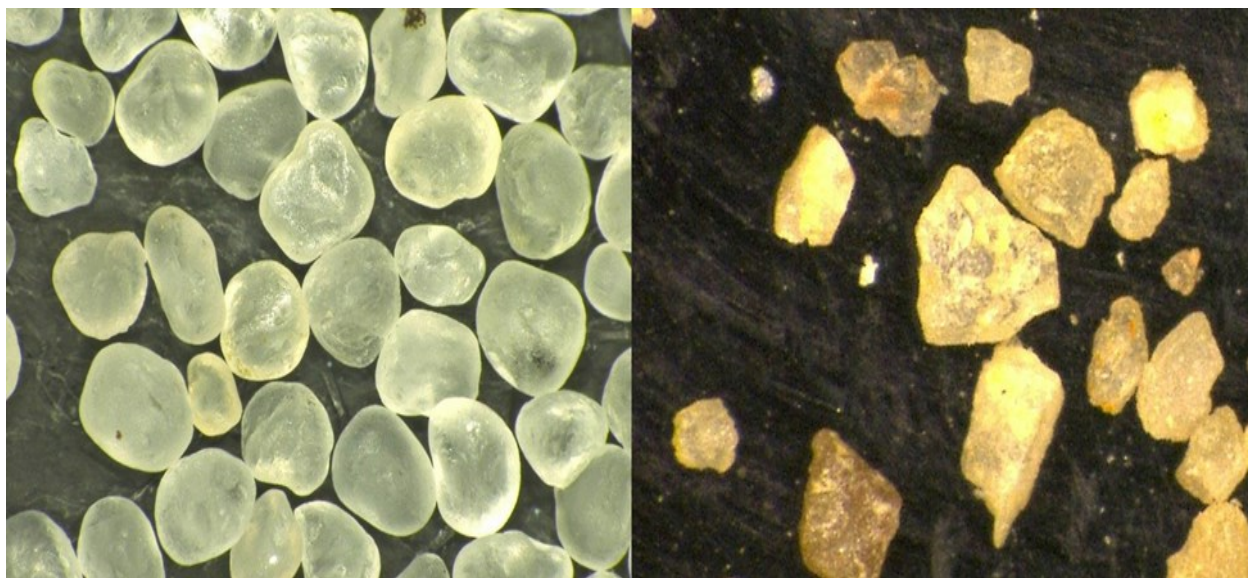


The impact of sand characteristics on the selection and performance of proppant coatings

THE IMPACT OF SAND CHARACTERISTICS ON THE PERFORMANCE OF COATINGS

❖ Sand Shape

- Spherical vs Angular

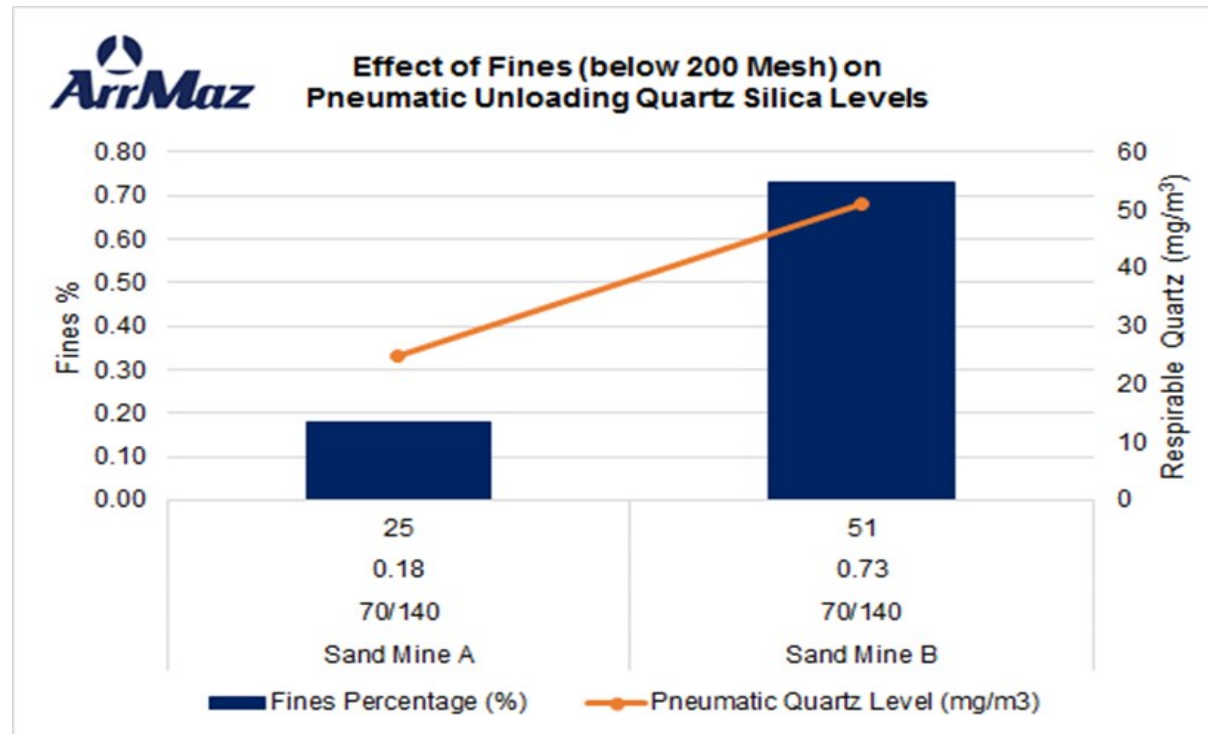


- Rounder proppants display lower levels of respirable crystalline silica
- Angular proppants sometimes require different formulations or application rates

THE IMPACT OF SAND CHARACTERISTICS ON THE PERFORMANCE OF COATINGS

❖ Sand Fines

- Sand fines can fluctuate anywhere from less than 0.1% to greater than 10%
- Generally, a lower percentage of fines will require a lower coating application rate



THE IMPACT OF SAND CHARACTERISTICS ON THE PERFORMANCE OF COATINGS

❖ Sand Surface Area

- Surface area may be impacted by either the number of fines or the composition of the sand
- The higher the surface area, the higher the coating application rate required
- Although surface area can be reduced by mitigating fines, it is important to remember that surface area is also affected by sand composition.

❖ Sand Composition

- Different mines provide different qualities of sand due to varying mining & cleaning processes
- Sand contaminants may have a much higher surface area than the sand itself
- Sand impurities can also increase the sand's dusting tendencies

ArrMaz typically runs multiple lab tests to optimize the proppant coating and application rate to account for variations in sand composition

THE IMPACT OF SAND CHARACTERISTICS ON THE PERFORMANCE OF COATINGS

- ❖ We developed our SandTec® silica dust control coatings with all of these sand characteristics in mind. SandTec® coatings are customized to work with silica sands of varying characteristics (Northern White versus Texas Brown) to ensure optimal silica dust control performance. Field trials have proven that SandTec® is effective in achieving dust reduction targets below OSHA's PEL and AL.

- ❖ Dust reduction across the entire hydraulic fracturing supply chain can be achieved with no negative impact on sand handling or downhole well performance.

THE IMPACT OF SAND CHARACTERISTICS ON THE PERFORMANCE OF COATINGS



SUMMARY

- ❖ On June 23, 2021, OSHA will begin enforcing requirements for engineering controls for hydraulic fracturing operations in the oil and gas industry
- ❖ ArrMaz has developed and patented a liquid chemical that when applied to frac sand can reduce silica dust by up to 99%
- ❖ Requires no frac site equipment
- ❖ Works on all frac sand sizes and is compatible with a wide variety of frac fluids
- ❖ Does not slow down fracturing operations or negatively impact well performance
- ❖ Non-toxic, non-irritating, odorless and biorenewable



Thank You!