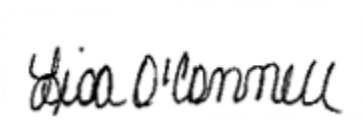
"Measurement of Properties for Proppants Used in Hydraulic Fracturing and Gravel-Packing Operations" Evaluations on Two Sand Samples For MS Industries II, LLC – Submitted April 23, 2018

Prepared For:

John Christmas
MS Industries II, LLC
2489 County Road 236
Town Creek, Alabama 35672
(404) 502-9375
jchristmas@msind.com

Prepared By:

Stim-Lab, Inc.
7118 North Highway 81
Duncan, OK 73533-8719
(580) 252-4309



Lisa O'Connell, Laboratory Supervisor

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STIM-LAB, Inc.
7118 North Highway 81
Duncan, Ok. 73533-8719
Phone: 580-252-4309
Fax: 580-252-6979
www.stimlab.com

May 11, 2018

John Christmas
MS Industries II, LLC
2489 County Road 236
Town Creek, Alabama 35672

Dear Mr. Christmas:

Stim-lab, Inc. has completed the ISO 13503-2:2006/API RP19C:2016 evaluations requested on the submitted sand samples labeled MSI 40/70 and MSI 70/200. The samples were received at Stim-Lab, Inc. on April 23, 2018.

The sieve analysis results for the samples are provided in Table 1. The sphericity and roundness (Krumbein Shape Factor), acid solubility (15% HCl), turbidity, bulk density, apparent density, and crush with K-Value results for the samples are provided in Tables 2 and 3. Pictures of the samples are provided following Table 3, for you to review. The procedures followed are as stated in ISO 13503-2:2006/API RP19C:2016.

Thank you for choosing Stim-Lab, Inc. to perform these analyses. We hope you will consider us for your future testing needs. If you have any questions regarding the testing or results, please do not hesitate to give me a call.

Sincerely,

Lisa O'Connell

Lisa O'Connell
Laboratory Supervisor
Conductivity Laboratory

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Table 1

Sieve Analysis of Submitted Proppant Samples
MS Industries II, LLC

ISO 13503-2:2006/API RP19C:2008, Section 6, "Sieve Analysis"

Sample I.D.	**MSI 40/70**		**MSI 70/200**	
US Standard Sieve No.	Weight %		Weight %	
	Retained	Cumulative	Retained	Cumulative
4	-	-	-	-
5	-	0.0	-	0.0
6	-	0.0	-	0.0
7	-	0.0	-	0.0
8	-	0.0	-	0.0
10	-	0.0	-	0.0
12	-	0.0	-	0.0
14	-	0.0	-	0.0
16	-	0.0	-	0.0
18	-	0.0	-	0.0
20	-	0.0	-	0.0
25	-	0.0	-	0.0
30	0.0	0.0	-	0.0
35	0.0	0.0	-	0.0
40	0.0	0.0	-	0.0
45	4.1	4.1	-	0.0
50	15.2	19.3	0.0	0.0
60	34.9	54.2	0.0	0.0
70	40.9	95.1	0.7	0.7
80	4.8	99.9	18.2	18.9
100	0.0	100.0	19.0	37.8
120	-	100.0	14.0	51.8
140	-	100.0	20.6	72.4
170	-	100.0	14.5	86.9
200	-	100.0	11.5	98.4
230	-	100.0	1.6	100.0
270	-	100.0	0.0	100.0
pan	0.1	100.0	0.0	100.0
total	100.0		100.0	
in-size	95.1	= as 40/70	97.7	= as 70/200
ISO Mean Dia. (mm)	0.266		0.136	
Median Dia. (mm)	0.261		0.130	

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Table 2

Sample ID: MSI 40/70
MS Industries II, LLC
April 23, 2018

Measurement of Properties of Proppants Used In Hydraulic Fracturing and Gravel-Packing Operations

ISO 13503-2:2006/API RP19C:2008, Section 7, "Proppant Sphericity and Roundness"

* mean of a 20 count

Sphericity =	**0.7**
Roundness =	**0.5**
Clusters =	**None Observed in Field of Count**

*This sample does not meet the minimum recommended roundness per API RP19C:2008

Recommended Sphericity and Roundness for proppants = 0.6 or greater (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 8, "Acid Solubility"

* mean of 3 analyses

Acid Sol. Percent (15% HCl) =	**0.4%**

Recommended Maximum Acid Solubility for proppants 40/70 to 70/140 = 3.0% (ISO/DIS 13503-2/Amd.1:2009)

Tested as per ISO 13503-2:2006/API RP19C:2008, 100ml of 12:3 HCl:HF* with 5 grams of sand or proppant at 150ºF for 30 minutes,
*Other acids may be specified, depending on desired application

ISO 13503-2:2006/API RP19C:2008, Section 9, "Turbidity Test"

Turbidity =	**110**	**NTU**

Method 1: Turbidity, suggested maximum proppant turbidity = equal or less than 250 NTU (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 10, "Procedures for Determining Proppant Bulk Density, Apparent Density"

Bulk Density =	**1.33**	**g/cm^3**
Bulk Density =	**83.0**	**lb/ft^3**
Apparent Density = (Oil)	**2.63**	**g/cm^3**

ISO 13503-2:2006/API RP19C:2008, Section 11, "Proppant Crush-Resistance Test"

Stresses Tested (psi)	*% Fines -40+70 crush prep*
5000	**9.6%**
6000	**16.1%**
K-Value =	**5K**

The highest stress level which proppant generates no more than 10% crushed material, rounded down to the nearest 1000psi = K-Value

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Table 3

Sample ID: MSI 70/200
MS Industries II, LLC
April 23, 2018

Measurement of Properties of Proppants Used In Hydraulic Fracturing and Gravel-Packing Operations

ISO 13503-2:2006/API RP19C:2008, Section 7, "Proppant Sphericity and Roundness"

* mean of a 19 count

Sphericity =	**0.7**
Roundness =	**0.5**
Clusters =	**None Observed in Field of Count**

*This sample does not meet the minimum recommended roundness per API RP19C:2008

Recommended Sphericity and Roundness for proppants = 0.6 or greater (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 8, "Acid Solubility"

* mean of 3 analyses

Acid Sol. Percent (15% HCl) =	**0.5%**

Recommended Maximum Acid Solubility for proppants 40/70 to 70/140 = 3.0% (ISO/DIS 13503-2/Amd.1:2009)

Tested as per ISO 13503-2:2006/API RP19C:2008, 100ml of 12:3 HCl:HF* with 5 grams of sand or proppant at 150ºF for 30 minutes,
*Other acids may be specified, depending on desired application

ISO 13503-2:2006/API RP19C:2008, Section 9, "Turbidity Test"

Turbidity =	**337**	**NTU**

*This sample does not meet the minimum recommended turbidity per API RP19C:2008

Method 1: Turbidity, suggested maximum proppant turbidity = equal or less than 250 NTU (ISO/DIS 13503-2/Amd.1:2009)

ISO 13503-2:2006/API RP19C:2008, Section 10, "Procedures for Determining Proppant Bulk Density, Apparent Density"

Bulk Density =	**1.32**	**g/cm^3**
Bulk Density =	**82.4**	**lb/ft^3**
Apparent Density = (Oil)	**2.63**	**g/cm^3**

ISO 13503-2:2006/API RP19C:2008, Section 11, "Proppant Crush-Resistance Test"

Stresses Tested (psi)	*% Fines -70+200 crush prep*
5000	**4.0%**
8000	**8.5%**
9000	**11.5%**
K-Value =	**8K**

The highest stress level which proppant generates no more than 10% crushed material, rounded down to the nearest 1000psi = K-Value

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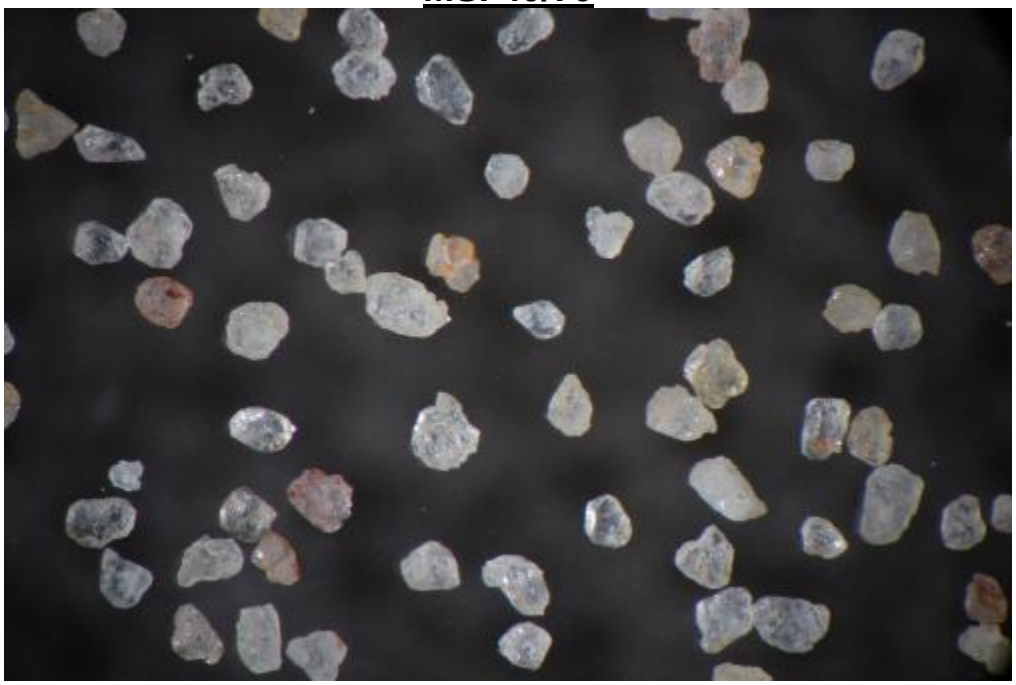
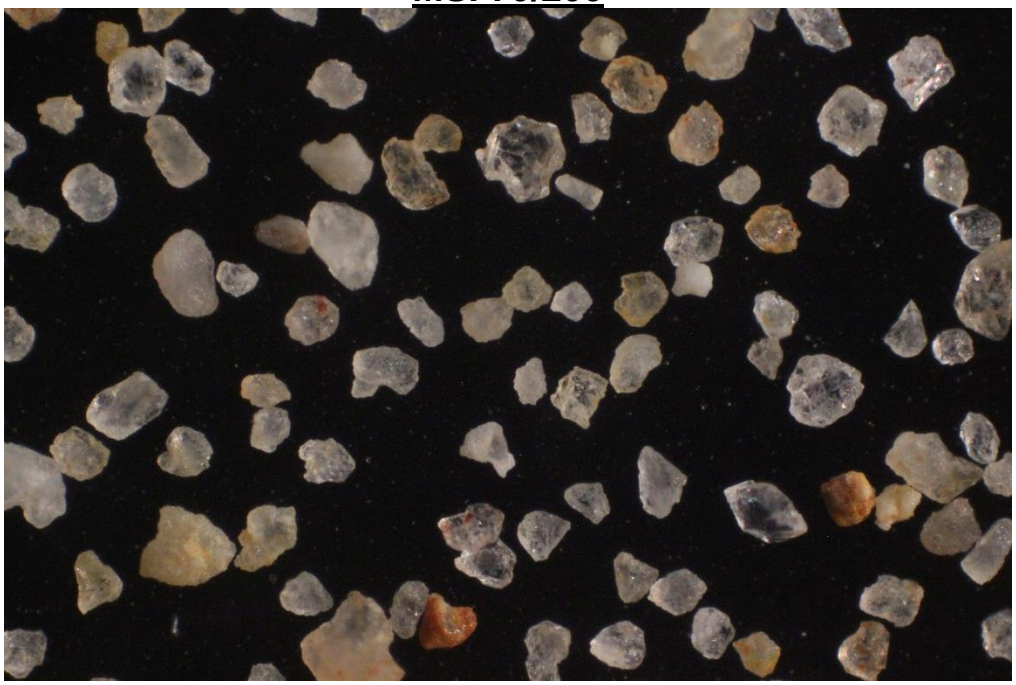
MSI 40/70



MSI 70/200



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