



February 6, 2014
Via Email: jy.angers@olimag.com

Mr. Jean-Yves Angers
Sales Vice-President
Olimag Sands, Inc.
725 Caouette Boulevard
Thetford Mines, Québec G6G 5T1
Canada

**SUBJECT: Results of SSPC-AB 1 Testing of Abrasive Material JETMAG® 30-60;
KTA-Tator, Inc. Project No. 330844**

Dear Mr. Angers:

In accordance with KTA-Tator, Inc. (KTA) Proposal No. PN132121 and the subsequent wire transfer received December 10, 2013, KTA has performed testing on one submitted abrasive material in accordance with SSPC-AB 1, “Mineral and Slag Abrasives” (April 15, 2013). This report describes the testing procedures employed and contains the results obtained.

SUMMARY

JETMAG® 30-60 abrasive was analyzed in accordance with the required qualification tests of SSPC-AB 1 for specific gravity, hardness, weight change on ignition, conductivity (water soluble contaminants), moisture content, oil content, surface profile, particle size distribution (sieve analysis) and crystalline silica content. The abrasive met the requirements of the specification for all tests performed. The abrasive was classified as a Grade 4 for surface profile (3.0 – 5.0 mils), and Class A for crystalline silica content (less than 1.0%).

SAMPLES

One bag containing approximately 45 pounds of abrasive material, designated as JETMAG® 30-60 abrasive, was received from Centre de Technologie Minérale et de Plasturgie, Inc. (CTMP) on December 9, 2013. It should be noted that at no time did KTA personnel witness the manufacturing or packaging of the sample.

LABORATORY INVESTIGATION

The laboratory investigation consisted of testing the abrasive for specific gravity, hardness, weight change on ignition, conductivity (water soluble contaminants), moisture content, oil content, surface profile, particle size distribution (sieve analysis) and crystalline silica content in accordance with the qualification test requirements of SSPC-AB 1 (April 15, 2013).

KTA-Tator, Inc.

**115 Technology Drive
Pittsburgh, PA 15275**

**412.788.1300
www.kta.com**

Specific Gravity

SSPC-AB 1 Requirement: *Specific gravity of 2.5 for mineral or slag abrasives, minimum*

Sample Performance: *Specific gravity of 3.1; Abrasive sample met the requirement*

Specific gravity was determined in accordance with SSPC-AB 1 and ASTM C128-12, “Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.” Briefly, a graduated cylinder was used to determine the volume of abrasive and displaced water. Because the sample contained small particulates, the saturated surface-dry condition was not determined due to the error associated with possible loss of fines. It was assumed that the sample would not absorb water in the saturated surface-dry condition.

Hardness

SSPC-AB 1 Requirement: *75% of grains scratch glass*

Sample Performance: *100% of grains scratched glass; Abrasive sample met the requirement*

Hardness testing was performed in accordance with Section 4.1.2 of SSPC-AB 1. Briefly, to obtain a representative test sample, five grams of the abrasive sample were examined using a microscope at 10X magnification. A few grains representing each color and shape were chosen and placed on a glass slide. A second glass slide was then placed on top of the selected abrasive. Moderate pressure was used to push and move the second slide over the abrasive for 10 seconds. The glass slides were then examined for scratches. If 75% of the grains are found to scratch the glass slides, then the abrasive is rated as having a minimum hardness of 6 on the Mohs scale.

Weight Change on Ignition

SSPC-AB 1 Requirement: *1.0% loss, maximum, 5.0% gain, maximum*

Sample Performance: *0.0012% gain; Abrasive sample met the requirement*

Weight change on ignition testing was performed in accordance with Section 4.1.3 of SSPC-AB 1. A representative sample was dried in a convection oven for one hour at $105 \pm 5^\circ\text{C}$. One gram of the dried abrasive was placed into a tarred crucible. The crucible containing the abrasive sample was placed into a muffle furnace at $750 \pm 50^\circ\text{C}$ for approximately 30 minutes, allowed to cool to room temperature and then reweighed. The percent weight change was then calculated.

Conductivity (Water Soluble Contaminants)

SSPC-AB 1 Requirement: *1000 $\mu\text{S}/\text{cm}$, maximum*

Sample Performance: *213.0 $\mu\text{S}/\text{cm}$; Abrasive sample met the requirement*

Conductivity testing was performed in accordance with SSPC-AB 1 and ASTM D4940-10, “Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives.” A slurry of the sample was prepared with 300 mL of reverse-osmosis filtered, deionized water and 300 mL of sample material and stirred for one minute. The slurry was allowed to settle for 8 minutes and was stirred again, then filtered. The supernatant liquid produced from the slurry was then tested with an Oakton[®] COND 6+ conductivity meter.

Moisture Content

SSPC-AB 1 Requirement: *0.5%, maximum*

Sample Performance: *0.028%; Abrasive sample met the requirement*

The moisture content was determined in accordance with ASTM C566-13, "Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying." Approximately 500 grams of abrasive was weighed and dried in a convection oven set at $105 \pm 5^{\circ}\text{C}$ until a constant weight was achieved. The percent moisture content was then calculated.

Oil Content

SSPC-AB 1 Requirement: *Slurry surface will show no oil on the surface of the water or as an emulsion*

Sample Performance: *No oil sheen, oil droplets or oil as an emulsion observed; Abrasive sample met the requirement*

Oil content testing was conducted in accordance with ASTM D7393-07(12), "Standard Practice for Indicating Oil in Abrasives." For this testing, the slurry prepared during conductivity testing was examined for oil sheen, oil droplets and oil as an emulsion.

Surface Profile

SSPC-AB 1 Requirement: *None*

Classifications: *Grade 1 (0.5 – 1.5 mils), Grade 2 (1.0 – 2.5 mils), Grade 3 (2.0 – 3.5 mils), Grade 4 (3.0 – 5.0 mils), Grade 5 (4.0 – 6.0 mils)*

Sample Performance: *3.9 mil average; Grade 4*

The surface profile was determined in accordance with Section 4.1.8 of SSPC-AB 1. Blast nozzle pressure was maintained at 95 ± 5 psi, while the abrasive was propelled through a #4 venturi nozzle at an angle of approximately 90° from the surface. The resultant surface profile was measured in triplicate at three locations in accordance with SSPC-PA 17 (a total of 9 measurements). Measurements were obtained according to ASTM D4417-11, "Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel," Method C (replica tape). Testex Press-O-Film™ HT X-Coarse (useful range: 2.5 – 4.5 mils) tape was used. The average profile determinations of the three locations were 3.9, 3.9 and 3.8 mils, resulting in an overall average of 3.9 mils.

Particle Size Determination (Sieve Analysis)

SSPC-AB 1 Requirement: *None*

Sample Performance: *See appendix*

A sieve analysis was performed in accordance with Section 4.1.9.1 of SSPC-AB 1 and ASTM C136-06, "Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates." A 100 gram sample was collected and was tamped through a series of sieves (screen numbers 6, 8, 12, 16, 20, 30, 40, 50, 70, 100, 140, 200 and 270, and a pan at the bottom) for seven minutes using an automated tamper. The abrasive collected on each screen was emptied into numbered and tarred sample cups. The underside of each screen was cleaned with a brass brush to

loosen any trapped particles, which were also collected into the appropriate sample cups. The contents of each sample cup were weighed and documented. The raw data for the sieve analysis is contained in Appendix 1, "KTA Sieve Analysis Report Form".

Crystalline Silica Content

SSPC-AB 1 Criteria: *Class A (Less than 1.0% crystalline silica), Class B (Less than 5.0% crystalline silica), Class C - Unrestricted crystalline silica*
Sample Performance: *< 0.5% crystalline silica; Class A*

The crystalline silica content was subcontracted to HIH Laboratory, Inc. of Webster, Texas, for determination according to NIOSH Method 7500. NIOSH Method 7500 was substituted for Method 7603 due to recent communications with SSPC. The HIH Laboratory, Inc. report containing the results of testing is attached.

If you have any questions concerning the testing or this report, please contact me by telephone at 412.788.1300 extension 188 or by email me at dchasky@kta.com.

Sincerely,

KTA-TATOR, INC.



Daniel G. Chasky
Project Manager/ Coatings Application Specialist

Appendix: KTA Sieve Analysis Report Form
Attachment: HIH Laboratory, Inc. Report

DGC/CMM:kdw
JN330844
CIN: 307556

cc: Mr. Mathieu Brousseau of Centre de Technologie Minérale et de Plasturgie, Inc. <mbrousseau@cegepth.qc.ca>

(330844 CTMP.doc)

NOTICE: This report represents the opinion of KTA-TATOR, INC. This report is issued in conformance with generally accepted industry practices. While customary precautions were taken to verify the information gathered and presented is accurate, complete and technically correct, this report is based on the information, data, time, materials, and/or samples afforded. This report should not be reproduced except in full.

APPENDIX



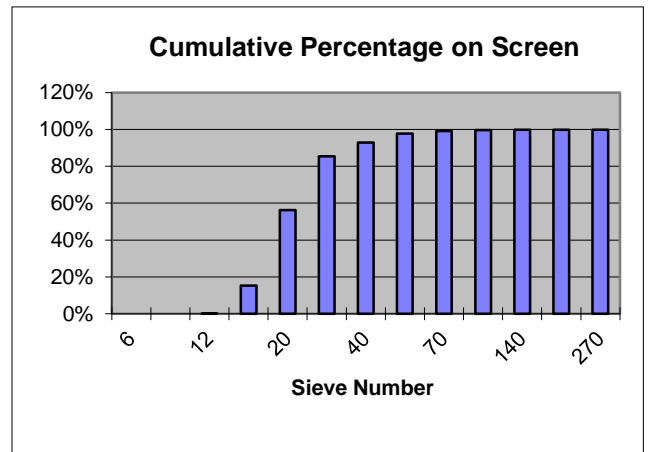
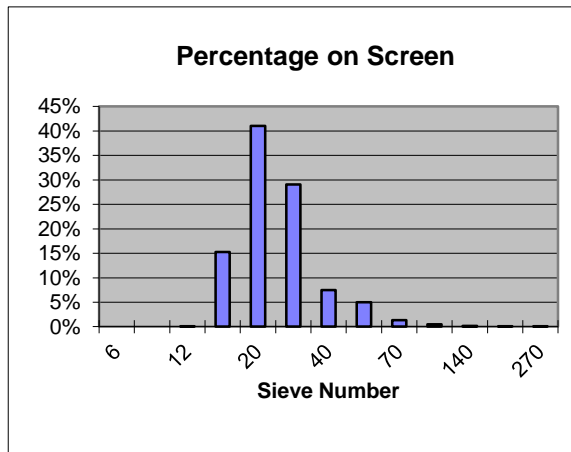
TL2399F1

KTA-Tator, Inc. Sieve Analysis Data Form

Sample ID No.: 330844 Date: 1/23/2014
 Sample Description: JETMAG® 30-60 Technician: DGC
 Initial Sample Mass (g): 100.05

US Standard Sieve No.	Retained Sample (g)	% of Total	Cumulative % of Total	Nominal Sieve Opening Size (mm)	Retained Sample (g) * Opening (mm)
6	0.000	0.000%	0.00%	3.350	0.000
8	0.000	0.000%	0.00%	2.360	0.000
12	0.030	0.030%	0.03%	1.700	0.051
16	15.230	15.245%	15.28%	1.180	17.971
20	41.010	41.051%	56.33%	0.850	34.859
30	29.020	29.049%	85.38%	0.600	17.412
40	7.460	7.467%	92.84%	0.425	3.171
50	4.970	4.975%	97.82%	0.300	1.491
70	1.330	1.331%	99.15%	0.212	0.282
100	0.510	0.511%	99.66%	0.150	0.077
140	0.140	0.140%	99.80%	0.106	0.015
200	0.060	0.060%	99.86%	0.075	0.005
270	0.060	0.060%	99.92%	0.053	0.003
Pan*	0.080	0.080%	100.00%	0.038	0.003
Total	99.9			Sum =	75.34

Average particle size (mm) = **0.75**



ATTACHMENT

HIH LABORATORY, INC.

100 E. NASAParkway, Suite 210
P.O. Box 57727
Webster, Tx 77598
(281) 338-9000
FAX (281) 338-2351

Report Number 37048

LABORATORY ANALYSIS REPORT

KTA-TATOR, INC.
115 TECHNOLOGY DRIVE
PITTSBURGH PA 15275

Attention:
Ms. Carly Mgee

Report Number 37048
Client Number: 992 1

Date Received: 01/30/2014
Date Reported: 01/31/2014

<i>HIH Sample Number:</i>	<i>Client Sample ID</i>	<i>Date Collected</i>	<i>Sample time (min)</i>	<i>Sample Vol. (L) or Area</i>					
<i>Analyte</i>	<i>Result</i>	<i>Units</i>	<i>Actual Exp</i>	<i>Units</i>	<i>Test date:</i>	<i>Reporting Limit</i>	<i>Blank Corrected</i>	<i>Lower 95% Confidence Limit</i>	<i>Upper 95% Confidence Limit</i>
468402	SAMPLE								
Cristobalite	< 5000	ug/g	< 0.5	%	1/31/2014	5000 ug/g	N/A		
Quartz	< 5000	ug/g	< 0.5	%	1/31/2014	5000 ug/g	N/A		

HIH LABORATORY, INC.

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LABORATORY ANALYSIS REPORT

Report Number
37048

SUPPLEMENTARY QUALITY ASSURANCE INFORMATION

Analyte	Method	Media	Test date:	Analyst:	Instrument:	MSD % RECOVERY:	NUMBER OF SPIKES:	MS % Recovery:	LCS % Recovery:	Precision (% Sr)	Result	DUP RPD	MS/M SD RPD:	Batch No:	Lit Ref	Smp #
Cristobalite	NIOSH 7500	Bulk Material	01/31/2014	NM	XRD1	---	---	---	---	---	---	---	---	29772		468402
Quartz	NIOSH 7500	Bulk Material	01/31/2014	NM	XRD1	---	---	92.3	---	---	---	---	---	29772		468402

Method Literature References

HIH Laboratory did not collect these samples; therefore, calculations are based on client-supplied sampling data.
Samples arrived in good condition unless otherwise noted.

Approved By: Carole A. Newman, Quality Manager
Esteban P. Piña, Technical Manager