



Job File No.: 181202/65647-6931/M-NK-2015

**INSPECTION REPORT**

In pursuance of an order for inspection given to us

**BY** : " CARBO ONE LIMITED "  
**TO INSPECT** : Coal 0-50 mm, grade "High CV" (as declared) in rail cars  
**BY** : Sampling and Analysis  
**AT** : Taldinsky open cut, Kemerovo region, Russia  
**ON** : 4 January 2015

**WE HEREBY REPORT** that we have performed supervision of sampling and analysis of the above mentioned commodity.

**SAMPLING:** Mechanical sampling as per ISO 13909 Part 2. Samples collected throughout the entire loading of the vessel by MSS under SGS supervision.

Mechanical Sampling System was checked by SGS prior to loading and confirmed to have been designed and operated in accordance with ISO 13909-2,5:2001(E) Annex C / ASTM D7430-08 Part C. Performance Monitoring of the system, and collection of extraction ratios, confirmed the system continues to perform as designed. Bias Test data was made available to SGS.

**I. ANALYSES WERE PERFORMED IN SGS LABORATORY:**

1. **Proximate analysis** was performed in SGS laboratory (Accreditation Certificate No. POCRU.0001.21TY38, valid till 22.09.2016) according to ISO Methods with results as follows:

Basis reported	Total moisture, % ISO 589-2003, ISO 5068-1-2007	Ash, % ISO 1171-97	Yield of volatile matter, % ISO 562-98	Total sulphur, % ISO 19579-92	Gross calorific value, kcal/kg ISO 1928-76
As Received	9.2	10.5	30.2	0.41	6433
Air Dry Basis	2.5	11.3	32.5	0.44	6911
Dry Basis		11.6	33.3	0.45	7086
Dry Ash Free			37.7	0.51	8014

**Net Calorific Value (as received)** was calculated in accordance with ISO 1928:2009 (Pt. 12.2.2.1 и Pt E.3.3): 6175 kcal/kg

2. **Screen test** were performed in accordance with ISO 1953 with results as follows:

Nominal Top Size (mm)	+50	25-50	13-25	6-13	3-6	1-3	0.5-1	0-0.5
Yield (%)	0.3	7.1	14.6	20.4	11.9	24.6	9.0	12.1

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**3. Determination of characteristics of hygroscopic moisture** was performed in accordance with GOST 8719-90 with results as follows:

**Hygroscopic moisture: 3.49**

**4. Determination of characteristics of plastic layer** was performed in accordance with GOST 1186-87 with results as follows:

Attribute	Unit	Value
X	mm	<b>37.0</b>
Y	mm	<b>10.0</b>

**5. Ultimate analysis** was performed in accordance with ISO methods with results as follows:

Element	Percentage, %	Test's methods
	Dry Ash Free basis	
Carbon	86.69	ISO 625-96 (GOST 2408.1-95), ISO 609-96 (GOST 2408.4-98)
Hydrogen	5.80	
Nitrogen	2.46	ISO 333-83 (GOST 28743-95)
Oxygen	4.54	ISO 1994-76 (GOST 2408.3-95)

**6. Determination of chemical composition of ash** was performed in accordance with ASTM D 3682-87 (GOST 10538-87) methods with results as follows:

Compounds	Percentage, %
Silicon dioxide	65.57
Alumina	24.16
Iron trioxide	3.44
Titanium dioxide	0.89
Calcium oxide	2.15
Magnesium oxide	0.95
Potassium oxide	1.630
Sodium oxide	0.242
Sulphur trioxide	0.415
Phosphorus oxide	0.517
Manganese oxide	0.036

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**7. Determination of elements' content** was performed in accordance with ISO and ASTM methods with results as follows:

Compounds	Percentage, %	Test's methods
Fluorine	0.011	ASTM D 3761-96
Chlorine	0.0084	ISO 587-97 (GOST 9326-2002)
Arsenic	< 0.0005	ISO 601-81, ISO 2590-73 (GOST 10478-93)
Phosphorous	0.026	ISO 662-81 (GOST 1932-93)

**8. Determination of free swelling Index** was performed in accordance with ISO 501-81 (GOST 20330-91) with results as follows:

**FSI** 1.0

**9. Determination of Grey-King coke type** was performed in accordance with ISO 502-82 (GOST 16126-91) with results as follows:

**GREY-KING COKE TYPE** C

**10. Determination of Roga Index** was performed in accordance with ISO 335-74 (GOST 9318-91) with results as follows:

**RI** 15(1:5)

**11. Determination of plasticity according to Gieseler** was performed in accordance with ASTM D 2639-98 with results as follows:

Attribute	Unit	Value
Initial softening Temperature	°C	410
Max. Fluidity Temperature	°C	420
Resolidification Temperature	°C	437
Max. fluidity	ddpm	3

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**12. Audiber-Arnu Dilatometer test** was performed in accordance with ISO 349-75 (GOST 13324-94) with results as follows:

Attribute	Unit	Value
Softening Temperature	°C	395.5
Max. Contraction Temperature	°C	504.5
Max. Dilatation Temperature	°C	-
Contraction	%	-9.3
Dilatation	%	-

**13. Determination of Hardgrove Index** was performed in accordance with ISO 5074-80 (GOST 15489.2-93) with results as follows:

**HGI 55**

**14. Determination of actual density** was performed in accordance with GOST 2160-92 with results as follows:

**AD 1.40 g/cm<sup>3</sup>**

**15. Determination of ash fusibility** was performed in accordance with ASTM D1857-87. The reported results are as follows:

Attribute	Unit	Value	
		Oxidizing	Reducing
Initial deformation temperature	°C	>1550	1491
Softening temperature	°C	>1550	1509
Hemispherical temperature	°C	>1550	1522
Fluid temperature	°C	>1550	>1550

**16. Determination of petrographic composition and metamorphism stage** was performed in accordance with ISO 7404 with results as follows:

Composition		Percentage, %
Coal		92
Mineral inclusions	Clay	8
	Quartz	-
	Sulphide	-
	Carbonate	-

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**Microlythotype:**

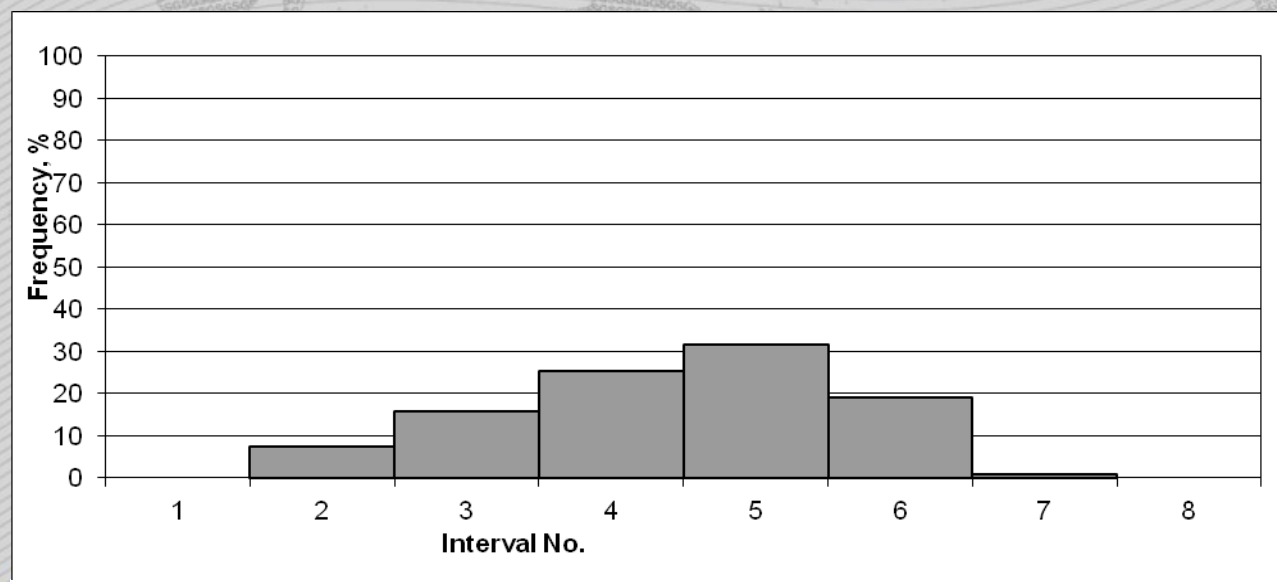
Microconstituent	Percentage, %
Vitrinite	74
Semivitrinite	3
Inertinite	20
Liptinite	3

**Sum of the fusainized components**

**ΣOK 22.0 %**

**Rank I-II**

Interval No.	Ro min	Ro max	Frequency, %
1	0.50	0.54	-
2	0.55	0.59	7
3	0.60	0.64	16
4	0.65	0.69	25
5	0.70	0.74	32
6	0.75	0.79	19
7	0.80	0.84	1
8	0.85	0.89	-



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**Reflectance indices R<sub>0</sub>:**

Average	0.70
Minimum	0.50
Maximum	0.90
Standard deviation	0.060
Quantity of scissions	0

**II. ANALYSES WERE PERFORMED IN SUBCONTRACTED LABORATORY:**

The sample was sent to subcontracted laboratory OAO "Zapadno-Sibirski Ispytatelny Centr" (Accreditation Certificate No. POCC RU.0001.21 AЯ 07) for analysis, and the findings reported by OAO "Zapadno-Sibirski Ispytatelny Centr" were as follows:

1. **Determination of elements' content** was performed in accordance with GOST methods with results as follows:

Compounds	Percentage, %
Germanium	<0.0001
Selenium	0.23*10 <sup>-4</sup>
Gallium	0.0005
Mercury	0.04*10 <sup>-4</sup>

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**2. Determination of elements' content** was performed in accordance with GOST methods with results as follows:

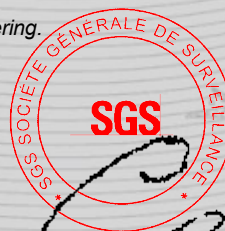
Element	Content, %	Element	Content, %	Element	Content, %
Ba	0.03	Cd	<0.001	Pb	<0.0002
Be	0.0001	Co	0.0001	Ag	<0.00001
B	0.003	Li	<0.001	Sc	0.0002
Bi	<0.0002	La	<0.001	Sr	0.04
V	<0.001	Mn	0.004	Sb	<0.002
W	<0.002	Cu	0.0002	Ti	0.05
Yb	<0.0001	Mo	0.0001	P	<0.1
Y	<0.001	As	<0.01	Cr	<0.001
Nb	<0.001	Ni	0.0005	Ce	<0.02
Sn	<0.0002	Zr	0.004		
Zn	<0.003				

**3. Determination of ash fusibility** was performed in accordance with ISO 540-81(GOST 2057-94) with results as follows:

Attribute	Unit	Value / atmosphere
		Semireducing
Initial deformation temperature	°C	>1550
Softening temperature	°C	>1550
Hemispherical temperature	°C	>1550
Fluid temperature	°C	>1550

*This document is a witness of services in collection and processing of information rendering.*

Signed and dated  
in Novokuznetsk / ES  
20 January 2015



For and on behalf of  
SGS Vostok Limited

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