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OTR Tyre pyrolysis project

Annexes to

the application form

Gestion Claude Plourde Ltée



No. Plourde-1b-2017 November 10th, 2017



OTR Tyre pyrolysis project Annexes to the application form

Report 1b

Presented to

Gestion Claude Plourde Ltd

For the intent of submitting to the New Brunswick government for the exploitation permit of a pyrolysis system at St-Basile, NB

Production team

Evgeniya Smirnova, Ph.D. and Suzanne Allaire, Ph.D. for GECA Environnement

Quebec, Qc November 10th, 2017

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«In the making of this report, it is expressly acknowledged that GECA Environnement did not conduct any data collection, have not specifically tested the pyrolyser components and did not directly measure any parameter of the pyrolyser system whatsoever (air emissions, sounds, odours, chemical concentration, etc.).

All of the empirical data and technical plans (the « Facts ») on which GECA Environnement bases its conclusions have been provided by the manufacturer or have been obtained through the most recent literature devoted to the subject of pyrolysis of OTR tyres.

Considering that GECA Environnement has taken every reasonable effort to ensure the accuracy of the Facts contained in this report, and considering its prospective nature, in the event that the Facts later prove to be inaccurate or false, GECA Environnement shall in no way be held responsible for any mistaken assumptions or conclusions arising from the Facts.»

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Annexe A

Facility Layout

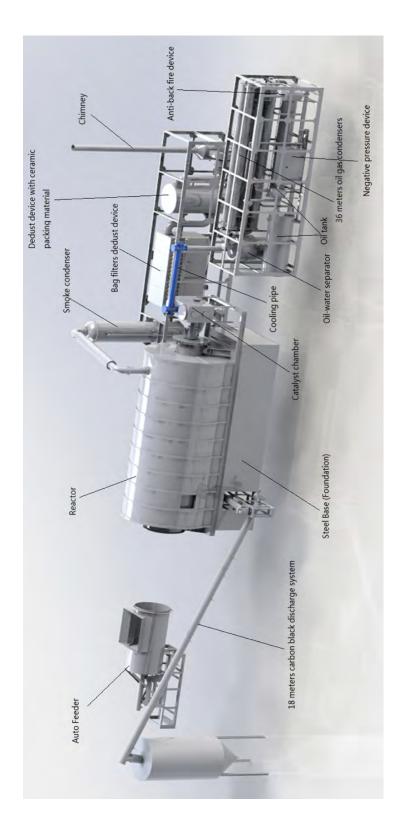


Figure 1. Pyrolyser systems

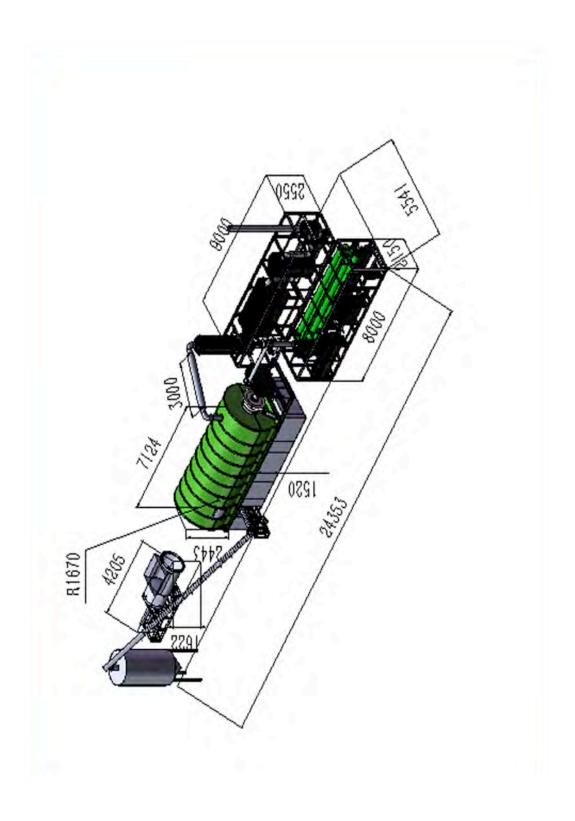


Figure 2.Pyrolyser plan with dimensions (cm); required distance will be respected around pyrolyser

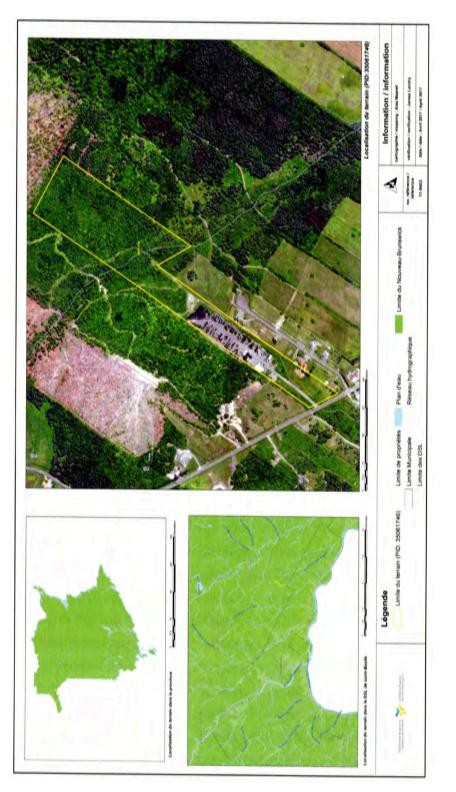


Figure 3. Site localisation, hydrological system



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Figure 4. Site localisation, hydrological system, distance to the adjacent habitations is indicated by yellow arrows

Table 1. Equipment components not included in the pyrolysis technology, which should be separately purchased by Gestion Claude Plourde Ltd

System	Equipment
Protection building	Large plastic dome (Length: 100', width: 50', height: 30')
	will be installed following engineer's plans
Concrete floor slab	A concrete floor slab with safety systems in case of oil spill
	will be constructed following engineer's plans
Feedstock pre-conditioning	Shredder, loader and other potential equipment for handling
et material handling	feedstock and products will be purchased from standard
	equipment suppliers
Supports	Stainless steel plates and other supports for the tanks will be made and installed
Oil tanks	Large oil storage tank (25-50 t) will be purchased and installed by a specialize firm
Water reservoir	A water reservoir for the cooling system will be purchased and installed following engineer's plans
Water cooling tower	Could be purchased on shelve

Table 2. Duration/capacity of each step in the pyrolysis process

Step	Duration
Batch capacity	10 m. tons/batch
Number of batches	1/day, about 20-25/month
Duration of the entire process	24 hrs for 10 tons
Loading of 10 t of OTR tyres	2-3 hrs
Reactor preheating	3-4 hrs
Pyrolysis in the reactor	12-14 hrs
Cooling and discharging the reactor	4-5 hrs
Steel removing	1-2 hrs

Additional information

Control system

The pyrolyser is equipped with an automatic control system, pressure gauges, alarm system and safety valves. There are 2 sealing devices: oil/water separator and an anti-back fire device are installed in order to impede the inflammable gas to go back toward the reactor.

For more information on the technology, see the technical report 1c.

Component	Component Dimensions Cha	Characteristics and comments
	5-meter distance should be reserved arou	5-meter distance should be reserved around the pyrolyser to allow staff security for handling and maintenance.
Auto feeder	Length 4 205 cm, radius 1 622cm; 60-ton hydraulic pressure with foundation and ladder.	Takes 2.3 hours to prepare and load 10 tons of tyres into the reactor. Maximal size of particles = 1.4 m . Could be adjusted on demand (up to 1.8 m).
		Pyrolyser itself
Reactor	R: 1 670 cm, length: 7 124 cm; 16 mm thickness Q345R pressure vessel and boiler steel plates; base, rollers, gear, reducer and insulation layer.	Prior to pyrolysis process the reactor should be preheated by huming fuel in the combustion system. Preheating process consumes 450 kg of pyrolytic oil. Required 3-4 hours to preheat the reactor prior to pyrolysis process. Temperature inside the reactor during pyrolysis coachs 550 °C. The reactor works under very small constant negative pressure. Although the reactor has the
	Burner installed on the fire furnace door or beside the fire furnace door.	ability to bear the pressure, if the pressure in the reactor reaches 0.02 Mps, the alarm will ring. The worker should open the safety valve and release the pressure. If the pressure reaches 0.3 Mpg the safety valve will release the pressure automatically.
Steel foundation	Width: 5 541 cm, height: 1 520 cm	Supports reactor
Catalytic chamber		The chamber has two layers and two double rooms. It contains molecular ring, which sories the dust and paraffin from the syngas to improve oil quality. It decreases the pressure, when the syngas changes pipe size. It slows down the oil movement speed in order to guarantee the oil can be completely cool down.
	Condenser system	Condenser system (total length: 8 000 cm, total width: 2 150 cm)
Cooling (condenser) pipe		First step of gas cooling (gas temperature can reach 300 CC) by heat-exchange method which use water piping surrounding the syngas. The non-condensed gas will be recycled into a burner (furnace) for reactor heating.
Syngas condensers	Length: 8 000 cm, width: 2 150 cm; 36- meter split into 6 x 6 m condensers; placed in three layers. German technology	The design guarantees the oil yield rate. Easy to clean. Glycol could be added to the water to prevent it from freezing, but the piping should be replaced by stainless steel pipes. If glycol is to be used, an authorisation will be completed
Gas safety system		Gas safety device that can stop the syngas to go back to the reactor will be installed.
Oil tanks (2 tanks)	Big oil storage tank: Volume: 25 t-50 t to be determined Small tank fabricated of Q235B; Volume: 2,2-2,3 m ³ .	Small tank oil storage is provided by the pyrolysis manufacturer. Small tank will be used only during processing, not for long time storage. The large tanks will be bought by Claude Plounds Ltd and installed by the proper company for this type of equipment.
Anti-back fire device (Gas recycling system)		Some gas (CH ₄ , C ₂ H ₆ , C ₂ H ₉ , C ₄ H ₁₀ , H ₂) cannot be cooled down under normal pressure; these gases will be recycled in the anti-back fire device and will be send to furnace to burn and heat the reactor.

Pressure release device		Should be opened before discharging the char allowing small resilient gas to escape to avoid potential instant combustion.
Water cooling reservoir	Volume: 70-80 m ³ , depth: 2 m, width: 4 m, length: 10 m	The water should be kept at the liquid state. The optimal water temperature for condensate the syngas is $\leq 25~\rm Mes$
Water cooling tower	To be determined	Not included in the quotation list. The water should be allowed to cool after being passed in the condenser through a simple system such as a cooling tower.
		Dedusting system
Syngas condenser	Connected to the reactor by 3-m long pipe	The dust and sulfur gas are removed by a new German technology dust removing system using a composite ceramic material. The syngas passes through condenser, which cools it down.
Dedusting system:	Deducting system: Length: 80 m, width: 25 m	The non-condensed syngas goes through the ceramic packing material filter, which sorbs the dust from the syngas and sulphur components.
Chimney	Height: 10 m, diameter: 0.26 m	Ultra-low gas emissions (Table 2) are released to the atmosphere through the chimney.
	0	Carbon black discharging system
Carbon black discharging device	Tank height: L6 m; pipe: 18 m	Once the cooling down of the char completed, it can be packed in super bags. Requires 4-5 hours for cooling the reactor and discharging the char.
The hook		After 1-2 hours since the char discharge, steel wires can be discharged.
		Electric panel
Electric and electronic panels	380V/220V, 50 Hz.	The exact need in electrical power will be determined when all the additional components from what is provided by the pyrolysis manufacturer will be added. The automation system for controlling the pypolyset (electronic) is provided by the manufacturer.

Annexe B

Air emission characteristics

Compounds	Measured	Method	Ambient air norms at
	pyrolyser in the gas.		ground level in New
	concentrations		Brunswick and Canada
	wg/m3/ rate kg/h	A MARK A A A A A	', #g/m'
0	10.0	SEPA, 2003	
HS	/+01+62.1/10.0	Analytical method, SEPA 2003	1 hr: 15;
	10'0		24 hrs: 5
SO,	15/0.730	Stationary source, HJ/T57-2000	1 hr: 450 to 900;
			24 hrs: 150-300;
			annual: 30 to 60; 20
NO	618/0.639	Stationary source, Fixed potential electrolysis methodHJ693-	1 hr: 400;
		2014	24 hrs: 200; annual:
			100; 45 1
VOC	No information		
Particulate matter	04/3.7x10 ⁺	GB/T 16157-1996	24 hrs: 120;
			1 an: 70 (geometries
			average)
00	25/16/0.0258	SEPA 2003	1 hr: 35 000;
			8 hrs: 15 000; annual: 6 000 i
Benzene	0.06	SEPA. 2003	301
C,H,			
Toluene C,H.	0.05	SEPA, 2003	1.880
Etylbenzen	10.0>	SEPA, 2003	

Table 4

Xylene	<0.02	SEPA, 2003	2.300*	
Nonmethanc	13	Stationary source, Gas chromatography, HJ/JT 38-1999		
Sn	1.00x10 ⁴	Stationary source emission. Determination of tin-Graphite furnace abs method HJ/T 65-2001		
aa	2.43x10 ⁻⁴	Stationary source emission, Determination of lead-Flame atomic absorption spectrophotometric method HJ685-2014		
Cd	<5.00x10+	Stationary source emission. Flame atomic absorption spectrophotometric HJ/T 641-2001		
Bc	<5.00x10*	Stationary source emission. Determination of benlium- graphite furnace ABS, method: HJ 684-2014		
Ni	9.67×10 ⁻⁵	Stationary source emission. Determination of nickel-flame ABS, method: HJ/T 63,1-2001		
Hg	<0.025	Stationary source emission. Determination of mercury. Cold atomic absorption spe. Method HJ 543-2009		
Sb	<5.00x10 ⁻⁵	Determination of metals in ambient particulate matter. HJ 657-2013		
Co	1.99x10+	The same as above		
Se	<2.69x10+	The same as above		
As	1.35×10+	Analytical method of monitoring of ambient air and exhausted air SEPA 2003		
Cu	9.78×10+	The same as above		
Ma	1.54x10 ⁻¹	The same as above		
F	<0.7	Stationary source emission. Determination of fluoride, ion selective method. HJ/T 67-2001		
CI AstNi	<0.2 9.81x10 ^{-z}	Determination of fluoride, ion chromatography. HJ 549-2009 SEPA 2003		
Cr+Sn+Sb+Cu+Mn CH ₂ O (formaldehyde)	0.7	SEPA 2003 Determination of formaldehyde-acatylacetone protectorebetometric mathed CD/T 15516,1005	65'	

Gas emission analyses

Information received from the manufacturer



SSGGSS Lab ID Sample Matrix Sample Description Sample Description Sample Description Sample Description 14-0379.0.01 Remark 3) Exhaust Gas 214/12/13 Item Lab ID Sample Matrix Sample Description Sample Description 14-0379.0.01 Remark 3) Exhaust Gas 214/12/13 Item Lab ID Sample Description Sample Description 14-0379.0.01 Remark 3) Exhaust Gas 214/12/13 Item Lab ID Sample Description 14-0379.0.01 Remark 3) Exhaust Gas 214/12/13 Item Lab ID Sampling Address: Kangcun Industrial Zone, Xinxiang City, Hen Sampling Date 2014-12-13 Sampling Date - 2014-12-13 Sampling Inter(HF HCI) - 10:15-11:00 Sampling Time(HF HCI) - 10:40-10:55 Sampling Time(HCHO) - 11:30-11:50 Sampling Time(HCHO) - 11:30-11:50 Sampling Time(HG H-S) - 11:30-11:50 Sampling Time(HG H-S) - 11:30-11:50 Sampling Time(NMHC) - 13:40-13:45 Gas Temp *C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m' 0.0572 Oxygen % 7.43-7.49 Humidity	- 5° , 5°			Page
Sample Description Sample DataRemark 3) Exhaust Gas 2014/12/13ItemUnitsSample Description Sampling Site Information	- 5° , 5°			
Sample Description Sumple Date2014/12/13ItemUnitsSampling site information2014/12/13Sampling bate-2014/12-13Sampling Date-2014/12-13Sampling Date-2014/12-13Sampling Docation-waste tire/ plastic pyrolys machineSampling Time(Others)-10:15-10:35Sampling Time(HF HCI)-10:15-10:35Sampling Time(HCHO)-10:40-10:55Sampling Time(BTEX)-11:340-14:00Sampling Time(HM)-11:30-11:50Sampling Time(HG H-S)-11:30-11:50Sampling Time(NHC)-13:40-13:45Gas Temp*C39-44Stack gas velocitym²0.0572Oxygen%3.4-3.5Dry Stardard Flowratem²/h10:34-1078	- 5° , 5°			
Item Units Sampling site information Sampling Address:Kangoun Industrial Zone,Xinxiang City,Henn Sampling Date - 2014-12-13 Sampling Date - 2014-12-13 - Sampling Date - waste tire/ plastic pyrolys machine - Sampling Time(Others) - 10:15-11:00 - Sampling Time(HF HCl) - 10:15-12:10 - Sampling Time(HCHO) - 11:25-12:10 - Sampling Time(BEEX) - 13:40-14:00 - Sampling Time(Cl ₀) - 11:30-11:50 - Sampling Time(HB H-S) - 11:30-11:50 - Sampling Time(HG H-S) - 13:40-13:45 - Gas Temp *C 39-44 - - Stack gas velocity m/s 5.9-6.2 - - Sec.ar. m²	- 5° , 5°			
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Sampling Date-2014-12-13Sampling location-waste tire/ plastic pyrolys machineSampling Time(Others)-10:15-11:00Sampling Time(HF HCI)-10:15-10:35Sampling Time(HF HCI)-10:40-10:55Sampling Time(HCHO)-10:40-10:55Sampling Time(HM)-11:25-12:10Sampling Time(BTEX)-13:40-14:00Sampling Time(BTEX)-11:35-14:35Sampling Time(Hg H:S)-11:30-11:50Sampling Time(Hg H:S)-13:40-13:45Gas Temp*C39-44Stack gas velocitym/s5.9-6.2Sec.ar.m²0.0572Oxygen%3.4-3.5Dry Stardard Flowratem*h1034-1078	- 5° , 5°			
Sampling Time(Others) - 10:15-11:00 Sampling Time(HF HCI) - 10:15-10:35 Sampling Time(HCHO) - 10:15-10:35 Sampling Time(HCHO) - 10:40-10:55 Sampling Time(HCHO) - 10:40-10:55 Sampling Time(HCHO) - 11:25-12:10 Sampling Time(BTEX) - 11:340-14:00 Sampling Time(BTEX) - 11:30-11:50 Sampling Time(Hg H;S) - 11:30-11:50 Sampling Time(NMHC) - 13:40-13:45 Gas Temp 'C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 3.4-3.5 Dry Stardard Flowrate m³/h 1034-1078				
Sampling Time(Others) . 10:15-11:00 Sampling Time(HF HCI) - 10:15-10:35 Sampling Time(HCHO) - 10:40-10:55 Sampling Time(HM) - 11:25-12:10 Sampling Time(BEEX) - 13:40-14:00 Sampling Time(BEEX) - 13:35-14:35 Sampling Time(Hg H:S) - 11:30-11:50 Sampling Time(Hg H:S) - 11:30-11:50 Sampling Time(Hg H:S) - 13:40-13:45 Gas Temp 'C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 3.4-3.5 Dry Stardard Flowrate m³/h 1034-1078				
Sampling Time(HF HCl) - 10:15-10:35 Sampling Time(HCHO) - 10:40-10:55 Sampling Time(HM) - 11:25-12:10 Sampling Time(HM) - 11:25-12:10 Sampling Time(BTEX) - 13:40-14:00 Sampling Time(Cl ₂) - 13:35-14:35 Sampling Time(Hg H ₂ S) - 11:30-11:50 Sampling Time(NMHC) - 13:40-13:45 Gas Temp *C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 3.4-3.5 Dry Stardard Flowrate m³/h 1034-1078				
Sampling Time(HM) - 11:25-12:10 Sampling Time(BTEX) - 13:40-14:00 Sampling Time(CL) - 13:35-14:35 Sampling Time(CL) - 13:35-14:35 Sampling Time(Hg H ₂ S) - 11:30-11:50 Sampling Time(NMHC) - 13:40-13:45 Gas Temp 'C 39-44 Stack gas velocity m's 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 7.43-7.49 Humidity % 3.4-3.5				
Sampling Time(BTEX) - 13:40-14:00 Sampling Time(Cl ₄) - 13:35-14:35 Sampling Time(Hg H ₂ S) - 11:30-11:50 Sampling Time(MMHC) - 13:40-13:45 Gas Temp 'C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 3.4-3.5 Dry Stardard Flowrate m³/h 1034-1078				
Sampling Time(Ci.) - 13:35-14:35 Sampling Time(Hg H,S) - 11:30-11:50 Sampling Time(NMHC) - 13:40-13:45 Gas Temp *C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 7.43-7.49 Humidity % 3.4-3.5				
Sampling Time(Hg H,S) · 11:30-11:50 Sampling Time(NMHC) · 13:40-13:45 Gas Temp 'C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 7.43-7.49 Humidity % 3.4-3.5 Dry Stardard Flowrate m³/h 1034-1078				
Sampling Time(NMHC) - 13:40-13:45 Gas Temp "C 39-44 Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 7.43-7.49 Humidity % 3.4-3.5 Dry Stardard Flowrate m²/h 1034-1078				
Gas Temp °C 39~44 Stack gas velocity m/s 5.9~6.2 Sec.ar. m² 0.0572 Oxygen % 7.43~7.49 Humidity % 3.4~3.5 Dry Stardard Flowrate m³/h 1034~1078				
Stack gas velocity m/s 5.9-6.2 Sec.ar. m² 0.0572 Oxygen % 7.43-7.49 Humidity % 3.4~3.5 Dry Stardard Flowrate m³/h 1034-1078				
Sec.ar. m² 0.0572 Oxygen % 7.43-7.49 Humidity % 3.4-3.5 Dry Stardard Flowrate m³/h 1034-1078				
Oxygen % 7.43-7.49 Humidity % 3.4-3.5 Dry Stardard Flowrate m³/n 1034-1078				
Humidity % 3.4~3.5 Dry Stardard Flowrate m³/h 1034~1078				
Dry Stardard Flowrate m ³ /h 1034~1078	5 50 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5			
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Exhaust Height m 10				
Exhaust height				
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9 6 6	2 6					Page
	Lab ID Sampling ID	14-03790.001 Remark 3)				
Si Sam	ample Matrix ple Description	Exhaust Gas n -				
S	ample Date	2014/12/13				
Sampling site information	Units	7. F. F.				
		Zone,Xinxiang City,Henan 2014-12-13				
Sampling location	2 9	waste tire/ plastic pyrolysis				
	S.	machine				
Sampling Time(Others)	222	10:15~11:00				
Sampling Time(HF HCI)	2 3	10:15~10:35				
Sampling Time(HCHO)	de la	10:40~10:55				
Sampling Time(HM)	6	11:25~12:10				
Sampling Time(BTEX)	4 ⁷ 4	13:40~14:00				
Sampling Time(Cl ₂)	1.9	13:35~14:35				
Sampling Time(Hg H ₂ S)	1.5	11:30~11:50				
Sampling Time(NMHC)	199	13:40~13:45				
Gas Temp	°C	39~44				
Stack gas velocity	m/s	5.9~6.2				
Sec.ar.	m²	0.0572				
Oxygen	%	7.43~7.49				
Humidity	%	3.4~3.5				
Dry Stardard Flowrate	m³/h	1034~1078				
Exhaust Height	m	10				
1997 - 199	1.5	100 - 67 - 50				
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名 检測を用意 う Testing Service	retained	for 30 days only .			SHENV	143034

SGS		TEST F	REPORT	SHE14-03790 R
Call Strang	12 3	Lab ID	14-03790.001	5 63 9 6
		Sampling ID Sample Matrix	14-03790.001 Remark 3) Exhaust Gas	
		mple Description Sample Date	2014/12/13	
Parameter	Units	LOR		
Analytical Method for Monitoring of An			EPA, China, 2003) Method:	SEPA 2003
Carbon monoxide (Emission conc.) Carbon monoxide (Conversion conc.)	mg/m ³ mg/m ³	-1	25 18	
Carbon monoxide (Emission rate)	kg/h	h	0.0258	
		Lab ID Sampling ID	14-03790.001 Remark 3)	
		Sample Matrix mple Description	Exhaust Gas	
		Sample Date	2014/12/13	
Parameter	Units	LOR		
Stationary source emission. Determina Total fluoride (Emission conc.)	ation of fluoride. Ion	selective electrode	200 2 1 2 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1	2001
Total fluoride (Conversion conc.)	mg/m³	-	<0.7 <0.5	
Total fluoride (Emission rate)	kg/h	the off	<7.24×10-4	
		Lab ID Sampling ID	14-03790.001 Remark 3)	
		Sampling ID Sample Matrix nple Description	Exhaust Gas	
		Sample Date	2014/12/13	
Parameter	Units	LOR		
Ambient air and waste gas. Determinal Chlorine hydride (Emission conc.)	tion of hydrogen chl mg/m ³	oride. Ion chromate		009
Chlorine hydride (Conversion conc.)	mg/m³	A.C.	<0.3	
Chlorine hydride (Emission rate)	kg/h	P	<3.10×10-4	
		Lab ID Sampling ID	14-03790.001 Remark 3)	
	San	ample Matrix nple Description	Exhaust Gas -	
		Sample Date	2014/12/13	
Parameter	Units	LOR		
Air quality-Determination of formaldeh	mg/m ^a	0.5	0.7 Method: GB/T 15	516-1995
Formaldehyde (Emission conc.)	kg/h		7.18×10-4	
Formaldehyde (Emission conc.) Formaldehyde (Emission rate)	- Aller - Alle			

Parameter	Sai	Lab ID Sempling ID Sample Matrix mple Description	14-03790.001 Remark 3) Exhaust Gas	5 6 5 6 B
	Sai	Sampling ID Sample Matrix	Remark 3)	2 6 6 1
Damandar	Sa			
Parameter		Sample Date	2014/12/13	1 A 8 9
Parameter	Units	LOR		S 3 4
Analytical Method for Monitoring of Amb			EPA, China, 2003) Method	d: SEPA 2003
Carbon monoxide (Emission conc.) Carbon monoxide (Conversion conc.)	mg/m ³ mg/m ³	1	25 18	2 3 3 3 9 9
Carbon monoxide (Emission rate)	kg/h	1.01	0.0258	P . P . P . P .
		Lab ID Sampling ID	14-03790.001 Remark 3)	P
	S	ample Matrix	Exhaust Gas	18 , 5 , 5 , 6
		Sample Date	2014/12/13	5 9 8 B
Parameter	Units	LOR		1 8 8 3
Stationary source emission. Determination Total fluoride (Emission conc.)	on of fluoride. Ion mg/m ³	selective electrode	method Method: HJ/T 6 <0.7	7-2001
Total fluoride (Conversion conc.)	mg/m³		<0.5	4 F 10 10 10 10
Total fluoride (Emission rate)	kg/h	the effect	<7.24×10-4	1
	10	Lab ID Sampling ID	14-03790.001 Remark 3)	St. 1. 18 - 58
		Sampling ID ample Matrix Iple Description	Exhaust Gas	1
		ample Date	2014/12/13	
Parameter	Units	LOR		
Ambient air and waste gas. Determination Chlorine hydride (Emission conc.)	n of hydrogen chlo mg/m ³	0.3	ography Method: HJ 549- <0.3	2009
Chlorine hydride (Conversion conc.)	mg/m³		<0. 1	
Chlorine hydride (Emission rate)	kg/h	1.00	<3.10×10-4	
	\$	Lab ID Sampling ID	14-03790.001 Remark 3)	
	Sam	ample Matrix ple Description	Exhaust Gas	
and the second second		ample Date	2014/12/13	
- 7	5	100 C		
	mg/m ³	0.5	method Method: GB/T 1 0.7	5516-1995
Formaldehyde (Emission rate)	kg/h		7.18×10-4	
Parameter Air quality-Determmination of formaldehyd Formaldehyde (Emission conc.) Formaldehyde (Emission rate)	mg/m³	0.5	0.7	5516-1995

Parameter Analytical Method for Monitoring of Amble Hydrogen Sulfide (Emission conc.) Hydrogen Sulfide (Emission rate)	Lab II Samplin Sample M Sample De Sample De Units LC	g ID Remark 3) Aatrix Exhaust Gas coription - Date 2014/12/13	
Analytical Method for Monitoring of Ambie Hydrogen Sulfide (Emission conc.)	Samplin Sample N Sample Des Sample I Units LC	g ID Remark 3) Aatrix Exhaust Gas coription - Date 2014/12/13	
Analytical Method for Monitoring of Ambie Hydrogen Sulfide (Emission conc.)	Sample I Units LC	Date 2014/12/13	6 . V
Analytical Method for Monitoring of Ambie Hydrogen Sulfide (Emission conc.)			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Hydrogen Sulfide (Emission conc.)			
		ir(4th ed.,SEPA,China,2003)5 01 0.01	5.4.10(3) Method: SEPA 2003
Hydrogen Sulfide (Convension conc.)	kg/h mg/m³	- 1.39×10 ⁻⁵ - 0.01	
Hydrogen Sunde (Convension conc.)	5 5 2	S. 82	- 6 C . 0
	Lab ii Samplin Sample M		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Sample Des	scription -	10 - 1 - 1 - ST - 5
	Sample		
Parameter		OR	nod Method: HJ/T 30-1999
Stationary source emission. Determination Chlorine (Emission conc.)		20 <0.20	100 Method: HJ/1 30-1999
Chlorine (conversion conc.)	mg/m³	- <0. 15	2 5 38 - 2 23
Chlorine (Emission rate)	kg/h 0.3	12 40	208.20
	Lab I Samplin		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Sample I Sample De	Matrix Exhaust Gas	
	Sample		P 0
Parameter	Units L	OR	1 1 1 1 M
Analytical Method for Monitoring of Ambie			Method: SEPA 2003
Benzene (Emission conc.) Benzene (Conversion conc.)		.01 0.06	
Benzene (Emission rate)	kg/h	- 6.36×10 ⁻⁵	
Toluene (Emission conc.) Toluene (Conversion conc.)		.01 0.05 - 0.04	25 37 19 25 39
Toluene (Emission rate)	kg/h	- 5.24×10 ⁻⁵ .01 <0.01	
Ethylbenzene (Emission conc.) Ethylbenzene (Conversion conc.)	•	- <0.007	97
Ethylbenzene (Emission rate)	kg/h	- <1.07×10 ⁻⁵	
Xylene (Emission conc.) Xylene (Conversion conc.)	mg/m³ 0 mg/m³	- <0.02	
Xylene (Emission rate)		- <2.14×10 ⁻⁵	Correction and a second second

SGS		TEST R	EPORT	SHE14-03790 R
and all a				1 4 St.
and the second		Lab ID Sampling ID	14-03790.001 Remark 3)	
	\$	Sample Matrix Sample Description Sample Date	Exhaust Gas - 2014/12/13	
Parameter	Units	LOR	LUISILIU	
Stationary source emission. Det	ermination of nonmetha	ine hydrocarbons. G	as chromatography Method	d: HJ/T 38-1999
Nonmethane hydrocarbons (Emissio Nonmethane hydrocarbons (Conversion)	and the second se		1.3	
Nonmethane hydrocarbons (Emissio		dr. et	1.35×10-3	
		Lab ID	14-03790.001	
		Sampling ID Sample Matrix	Remark 3) Exhaust Gas	
		Sample Description Sample Date	2014/12/13	
Parameter	Units	LOR		
Stationary source emission-Dete	ermination of tin-Graphit	e furnace abs metho		
Stannum (Emission conc.) Stannum (Conversion conc.)	mg/m ^a mg/m ^a		1.00×10 ⁻⁴ 1.08×10 ⁻⁷	
Stannum (Emission rate)*	kg/h	de ide	7.42×10 ⁻⁶	
and the second		Lab ID	14-03790.001	
		Sampling ID Sample Matrix	Remark 3) Exhaust Gas	
	5	ample Description Sample Date	2014/12/13	
Parameter	Units	LOR	a character at	
Stationary source emission-Dete	ermination of lead-Flame	e atomic absorption :	spectrophotometric method	Method: HJ 685-2014
Lead (Emission conc.)	mg/m ^a mg/m ^a		2.43×10 ⁻⁴ 1.80×10 ⁻⁴	
.ead (Conversion conc.) .ead (Emission rate)	mg/m- kg/h	1 100	2.62×10 ⁻⁷	
42 2 4		Lab ID	14-03790.001	
		Sampling ID Sample Matrix	Remark 3) Exhaust Gas	
	S	ample Description Sample Date	2014/12/13	
Parameter	Units	LOR		
Stationary source emission. Det	ermination of cadmium.	Flame atomic absor	ption spectrophotometric M	lethod: HJ/T 64.1-2001
Cd (Emission conc.)	mg/m³	5.00 X 10-*	<5.00×10 ⁻⁴	
Cd (Conversion conc.)"	mg/m ³ kg/h		<5.39×10* <3.70*	

	TEST F	REPORT	SHE14-03790 R0
			Pe
	Lab ID Sampling ID	14-03790.001 Remark 3)	9 5 6 9
S	Sample Matrix ample Description	Exhaust Gas -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Sample Date	2014/12/13	P . P . S . S
Units	LOR		52 . 4 5 . 34
and the second sec			HJ 684-2014
mg/m³	-	<3.70×10-5	
kg/h	·	<5.39×10-*	- 1 B B B
	Lab ID	14-03790.001	
	Sample Matrix	Remark 3) Exhaust Gas	S
Sa		2014/12/13	
Linite			1 5 F 4 8
			1 1 1 1 S
mg/m³		7.16×10-3	- 6 S. S. M. M. A. T.
kg/h	P · BY	1.04×10-*	
	Lab ID	14-03790.001	
	Sample Matrix	Exhaust Gas	8 8 1 1 1 1 1 1 1
Sa		2014/12/13	5 6 8 5
Units	LOR		1 A B B B
Determination of mercury, C	old atomic absorpti	on sne Method: H.I	543-2009
mg/m³	0.025	<0.025	
mg/m ³	1.19	<0.018	
S	6	42.10.10	
		14-03790.001 Remark 3)	2
	Sample Matrix	Exhaust Gas	
	Sample Date	2014/12/13	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Units	LOR		
ource emission-Determination	n of metals in ambi	ent particulate matter	Method: HJ 657-2013
mg/m³	5.00 X 10-5	<5.00×10-5	
kg/h	12.00	<5.39×10*	
mg/m³ mg/m³	5.00 X 10-5	1.99×10 ⁻⁴ 1.48×10 ⁻⁴	
		2.15×10-7	
kg/h			
	0.000250	<2.50×10 ⁻⁴ <1.85×10 ⁻⁴	a strand
	Units Determination of beryllium-G mg/m ³ mg/m ³ kg/h Units Determination of nickel-Flam mg/m ³ kg/h Se Units Determination of nickel-Flam mg/m ³ kg/h Se Units Determination of mercury. C mg/m ³ mg/m ³ kg/h Sa Units surce emission-Determination	Sample Description Sample Date Units LOR Determination of beryllium-Graphite furnace AE mg/m³ 5.00 × 10*9 mg/m³ 6.00 × 10*9 kg/h - Lab ID Sample Matrix Sample Description Sample Matrix Sample Description Sample Matrix Sample Description Sample Matrix Sample Description Sample Date Units LOR Determination of nickel-Flame abs method M mg/m³ 5.00 × 10*9 mg/m³ 6.00 × 10*9 Sample Matrix Sample Matrix Sample Matrix Sample Matrix Sample Description Sample Matrix Sample Matrix Sample Matrix Sample Description Sample Matrix Sample Description Sample Matrix Sample Matrix Sample Matrix Sample Matrix Sample Matrix Sample Matrix Sample Matrix Sample Matrix Sample Matrix Sample Description Sample Matrix Sample Date Lab ID Sample Date Sample Matrix Sample Date LoR Units LOR Sample Matrix Sample Date <	Sample Description Sample Date 2014/12/13 Units LOR Determination of beryllium-Graphite furnace ABS method Method: mg/m³ 5.00 × 10*9 <5.00×10*1

Annexe C

Waste storage and handling

Storage and handling are described directly in the application form. The following tables add information on the quantities and the properties of the pyrolytic oil and black carbon.

Product	Yield (%) range and average	Mass yielded for 10 tons of tyres, 1 batch	Mass yielded from 3000 t/yr*
Steel	15-20%, 12.5%	1.25 t	375 t
Carbon Black	25-30%, 27.5%	2.75 t	825 t
Oil	40-45%, 42.5%	4.25 t	1275 t
Non-condensable	Syngases: 10-15%,	Recycled in the	Burned in the
gases	12.5%	furnace for heating the reactor	reactor
Gases at the chimney	Ultra low emissions		Ultra low mass

Table 5. Yield of char, oil, steel, and black carbon

*10 tons during 300 days/yr=3000 t

Table 6. Pyrolytic oil properties

Property	Concentration, units	Methods
Ash content	0.030 % (m/m)	ASTM D482-12
рН	5	
Gross catalytic value	44.30 MJ/kg	ASTM D 4868-00 (2010)
Net catalytic value	41.72 MJ/kg	ASTM D 4868-00 (2010)
Solidification Point	<-50 °C	GB/T510-83 (2004)
Water content	0.10 % (V/V)	ASTM D95-05 (2010)
Total sulphur content	6380 mg/kg	ASTM D4294-10
Carbon Residue-Micro Method	0.15 % (m/m)	ASTM D4530-11
Density at 15 °C	0.9133 g/cm^3	ASTM D1298-12b
Kinematic Viscosity at 50 °C	$2.962 \text{ mm}^2/\text{s}$	ASTM F445-12
Flash point by PMCC	<40.0°C	ASTM D93-12 (Procedure A)

Pyrolytic oil analyses

Information received from the manufacturer



Qingdao, China

ORIGINAL

XINXIANG HUAYIN RENEWABLE ENERGY EQUIPMENT CO.,LTD. CHINA 453000

Analysis Report: QD13-01487.002

WARNING: The sample to which the findings recorded herein relate was drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample. The Company accepts no liability with regard to the origin or source from which the sample is said to be extracted.

JOB ORDER NO. : CLIENT ID :	OGCQD1302075-01 N/A		BOSS ORDER NO.: - PRODUCT DESCRIPTION : Liquid : VESSEL : N/A		d Sample - Tire Pyrolysis Oil	
LOCATION :	N/A					
SAMPLE SOURCE :	Supplied by Client	SOURCE ID :		-		
SAMPLE TYPE :	N/A	SAMPLE BY		Client		
SAMPLED :	-	RECEIVED :		26/11/2013		
ANALYSED :	29/11/2013	COMPLETED	d)	29/11/2013		
CONTAINER:	1×4L Plastic Bottle	SAMPLE STA	TE:	Liquid in Plastic	Bottle	
PROPERTY	METHOD	RESULT	UNITS	N	AIN	MAX
Ash Content	ASTM D482-12	0.030	% (m/m)			
Gross Calorific Value	ASTM D4868-00(2010)	44.30	MJ/kg			-
Net Calorific Value	ASTM D4868-00(2010)	41.72	MJ/kg	3	-	-
Solidification Point	GB/T 510-83(2004)	<-50	°C		-	-
Water Content	ASTM D95-05(2010)	0.10	% (V/V)		-	-
Total Sulfur Content	ASTM D4294-10	6380	mg/kg		-	-
Carbon Residue - Micro Method	d ASTM D4530-11	0.16	% (m/m)		-	
Density at 15°C	ASTM D1298-12b	0.9133	g/cm ³		÷	-
Kinematic Viscosity at 50°C	ASTM D445-12	2.962	mm²/s		-	-
Flash Point by PMCC	ASTM D93-12(Procedu A)	re <40.0	°C		-	-

** End of Analytical Results **

C The second sec	W-8			
methods indicated, unless specifically ma	ecifically refer to the sample(s) tested as received unless arked otherwise on the report. Precision parameters appl	y in the determination	n of the above results. Users of the data shown on	this report
should refer to the latest published revis	ions of ASTM D3244; IP 367 and ISO 4259 and when u inder the Company's General Conditions of Service (copy	itilising the test data	to determine conformance with any specification of	or process
drawn to the limitations of liability, indem	mification and jurisdictional issues defined therein. This	report shall not be	reproduced except in full, without the written appro-	oval of the
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nemist	Supervisor 13 Page 2 of 2			-05-30-V58 www.cn.sgs.com e sgs.china@sgs.i

Black carbon properties

Information received from manufacturer

Property	Values	Methods
Iodine absorption value	112 g/kg	GB/T3780.1-2006
DBP absorption value (B)	10 ⁻⁵ m ³ /kg	GB/T3780.2-2007
CTABA Adsorption of specific surface area	103 m ² /kg	GB/T37780.5-2008
Nitrogen adsorption surface area	103 m ² /kg	GB/T10722-2003
STSA	103 m ² /kg	GB/T10722-2003
Heating loss (125 °C)	1.3	GB/T3780.8-2008
Ash content (125°C)	19.6	GB/T3780.10-2009
500 μm	2.2220	GB/T3780.21-2008
45 μm	49.656	GB/T3780.21-2008
pH	9.6	GB/T3780.7-2006
Impurity		GB/T3780.12-2007
Tensile strength MPa	-23.7	GB/T3780.18-2007
Elongation at break %	-174	GB/T3780.18-2007

Table 7. Carbon black properties

Report No:	Total 2 pages Page 1				
Name Of Sample	Carbon Black	Sample No	S1131-12		
Name And Address Of Company	Xinxiang Huayin Renewable Energy Equipment Co.,Ltd	Sample Feature	Black powder		
Address	County				
Sample Model		Product Grade			
Lot Number		Sample Locations Send sa			
Sampling Basic Number		Sample Quantity	1000g		
Sent Sample	ent Sample Zhang yan Offer Date		2012.06.11		
Test Criterio	n On the page of 2	Report Date	2012.06.16		
Test Conclusion Test Results As Shown In Page 2					
	(seal for inspection report)				
	Date	e of Issue: On J	une 16, 2012		
	As for elongation at break 300% Stretching stress da		at 300%,no		
REMARKS REMARKS REMARKS the strength of the st					

Report No : NICC	B1102-12	Total 2 pag Page 2	es
Inspection Item		Estimated Value	Inspection Standard
lodine Absorption Value	g/kg	112	GB/T3780.1-2006
DBP Absorption Value (B)	10-5m3/kg	68	GB/T3780.2-2007
CTABA Dsorption Of Specific Surface Area	103m2/kg	42	GB/T3780.5-2008
Nitrogen Adsorption Surface Area	103m2/kg	55	GB/T10722-2003
STSA	103m2/kg	42	
Heating Loss(125℃)	%	1.3	GB/T3780.8-2008
Ash Content (825℃)	%	19.6	GB/T3780.10-2009
500µm Screenings	%	2.2220	
45µm	%	49.656	GB/T3780.21-2006
рН		9.6	GB/T3780.7-2006
Impurity			GB/T3780.12-2007
Tensile Strength	MPa	-23.7	
Elongation At Break	%	-174	GB/T3780.18-2007

Xinxiang Huayin Renewable Energy Equipment Co., ltd

Tel : 0373-4785888