ENERGY AND ENVIRONMENTAL
MEASUREMENT
CORPORATION

(206) 859-8318 ■ 1315 S. Central Avenue ■ Unit C ■ Kent, WA 98032

United States
Environmental Protection Agency
Woodstove Certification
Test Report

RSF Energy LTD
Onyx
Non-Catalytic Wood Heater

VOLUME 1

REPORT BY:

BILL NOWAK

TIM KELLY

CONFIDENTIAL

RELEASED ONLY BY
AUTHORIZED PERSONNEL

DATE 11/18/91

EEMC/BILLINGS
1744 Mullowney Lane
Billings, Montana 59101
(406) 252-4450

EEMC/TUCSON
3925 Placita de la Escarpa
Tucson, Arizona 85715
(602) 290-8985

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This section contains two photographa of the fuel load for each test run and two color photographs (side and front view) of the wood heater tested and any other photographs pertinent to testing the unit.

Photos vari

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A - Example Calculations

B - Installation Description and Operating Instructions

REPORT CERTIFICATION

The sampling and analysis for the woodstove described in this report was carried out under my direction and supervision.

Date_____ Signature Bill Nowak

Date_____ Signature_____

I have reviewed all of the testing data and results found in this test report and hereby certify that the test report is authentic and accurate.

Date_____ Signature_____

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M5H INDIVIDUAL TEST RUN PAGE INDEX
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- Table 2 Field Data
- Table 3 Field Data Averages
- Table 4 Calculations
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B. Raw Data Sheets

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Data Sheet #16 Quality Checks	1

TEST SERIES INFORMATION

Unit name and model number: RSF Model ONYX

Type: Cat: Non-cat: XX Pellet:

Manufacturer: RSF Energy, Ltd.

Address: P.O. Box 3637

Smithers, B.C. Canada V0J 2N0

Contacts: Hans Duerichen

Phone #: 604-847-4301

Observers: Hans Duerichen

Date Recvd: 10/2/91 Aged: 10/2/91 Tested: 10/17-24/91

Tested by: EEMC using EPA methods 28 and 5H
Test Location: 1315 S. Central Unit C Kent, WA 98032
Test Site Elevation: 42 feet

EEMC's Field Team

Supervisor: Bill Nowak

Others: Tim Kelly

Jerry Stoddard

Chad Garza

Darla Kingman

The following pages contain (1) test unit storage information, (2) a diagram showing the height and location of the stack components and sampling ports, and (3) copies of the certification test notices and cancellations sent to the EPA.

Wood Heater Emission Test Summary

Laboratory/Wood Heater Information

Stove Manufacturer: RSF ENERGY, LTD
Model Identification: ONYX
Stove Type> 1=cat, 2=noncat, 3=pellet: 2

Laboratory Name: EEMC
Laboratory Contact: Bill Nowak
Telephone no.: 859-8318

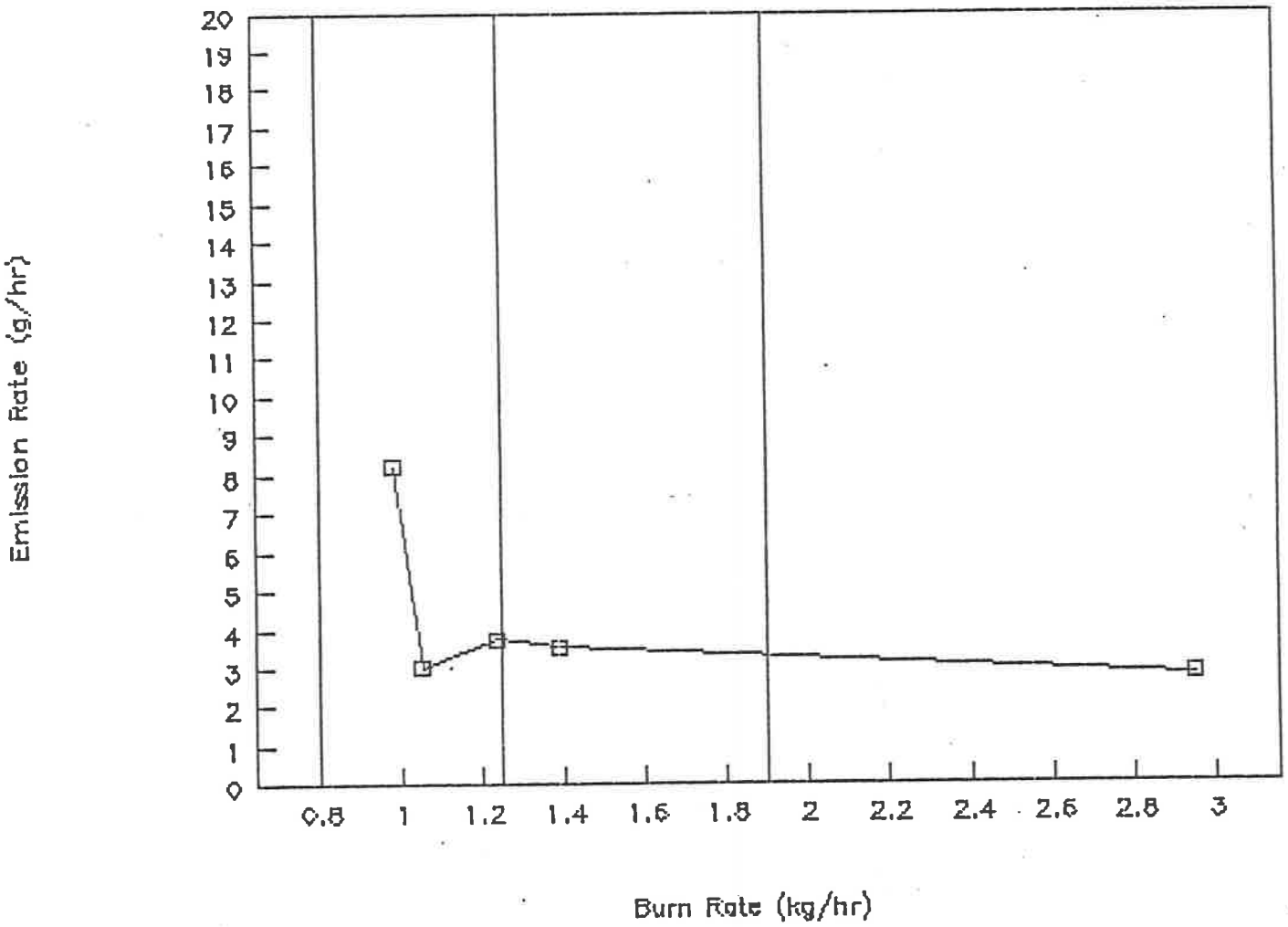
Test Dates: 10/17-24/91

Test Methods Used
Method 28/Other:
Sampling Method: 5H

Run no.	Burn Rate (kg/hr)	Emission Rate (g/hr)	Heat Output (Btu/hr)	Wtd Avg (g/hr) 4.5
1	0.981	8.224	11829	
3	1.052	3.025	12685	
2	1.235	3.724	14892	
4	1.388	3.541	16737	
6	2.954	2.817	35620	
			NA	
			NA	
			NA	

RSF ENERGY, LTD

ONTX



Woodstove Data Summary

	Run #	1	3	2	4	6		5		
Particulate Emissions:										
Concentration:	grains/dscf:	.2578	.0866	.0992	.0774	.0304		.0680		
	grams/m^3:									
Emission Rate:	grams/hr:	8.224	3.025	3.724	3.541	2.817		2.522		
Emission Factor:	gms/kg: (dry fuel weight basis)									
Front Half Catch:	% of total	44.83	48.48	43.38	34.91	45.54		30.70		%
Total Mass Captured: Frt & Bck Halves:		1557.6	574.5	560.6	380.1	66.1		489.5		mg
Efficiency Valves:										
Overall Appliance Efficiency										%
Combustion Efficiency										%
Heat Transfer Efficiency										%
Heat Output:										
Avg. BTU/hr for test cycle										BTU/hr
Fuel Burn Rates:										
Avg Kg/hr for test cycle (Wet basis)										Kg/hr
Avg Kg/hr for test cycle (Dry basis)		.981	1.052	1.235	1.388	2.954		1.106		Kg/hr

RUN #	1	3	2	4	6		5	
Fuel Moisture Content:								
Kindling (Wet basis)	4.459	8.534	4.762	5.956	9.502		6.977	%
Pretest Fuel (Wet basis)	18.186	17.677	18.1334	17.801	17.165		16.882	%
Test Fuel (Wet basis)	18.064	17.241	17.7	17.424	17.745		18.562	%
Air/Fuel Ratio:								
lbs air/lbs fuel								
Average Stack Gas Composition:								
Avg. % CO_2	4.9	5.0	5.7	5.13	5.87		4.99	%
Avg. % O_2								%
Avg. % CO	.96	.71	.66	.62	.24		.64	%
Avg. % Excess Air								%
Avg. % Moisture	5.31	4.92	5.6	5.09	5.21		5.19	%
Average Stack Gas Flow Rate:								
Stack flow rate - EPA CMB	8.2	8.97	9.65	11.78	23.84		9.54	dscfm
CHO balance								dscfm
Tracer Gas	11.157	10.303	10.450	12.533	18.819		12.178	dscfm
Draft (Static)	-.036	-.038	-.039	-.044	-.065		-.041	in.H_2O
Proportionality - Average	100	100	100	100	100		100	
Average Stack Gas Emission Factors:								
CO - g/Kg	161.014	121.865	103.245	105.661	38.77		111.580	
g/hr	157.955	128.202	127.508	146.658	114.528		123.407	

RUN #	1	3	2	4	6		5		
Average Temperatures:									
Stack Gas	284	291	307	322	564		314		°F
Primary Combustion Chamber Gas	628	649	684	692	884		664		°F
Secondary Combustion Chamber Gas	929	945	1006	848	1285		752		°F
Catalytic Combustor Exit Gas									°F
Stove Top	348	350	366	334	490		366		°F
Stove Left Sidewall	357	362	383	372	534		373		°F
Stove Back	358	351	381	303	334		381		°F
Stove Right Sidewall	283	301	304	314	476		299		°F
Stove Bottom	358	335	377	313	380		361		°F
Stove Temperature Change	-31.8	-35.2	-4.0	46.0	-88		-51		°F
Test Chamber Environment:									
Avg. Barometric Pressure	30.37	29.8	30.46	29.84	29.82		30.09		in Hg
Avg. Temperature	74	73	71	72	72		72		°F
Avg. % Ambient Moisture	1.2	1.25	1.2	1.8	1.3		1.25		% H_2O
Avg. % Relative Humidity	49	47.5	42	74	53		48.5		%RH
Avg. Air Velocity	0								m/sec
Avg. Dilution Tunnel Draft (If Applicable)	0								in/H_2O
Test Fuel Weight and Burn Time:									
Density (Dry basis)	.3596	.4442	.4945	.4092	.4015		.3970		gm/cm^3
Coal Bed Weight	3.6	3.7	3.9	3.6	3.3		3.6		lbs.
Pre Test Fuel Wt (Inc Kindling)	54.7	49.2	53.4	56.2	49.8		49.0		lbs.
Test Fuel Load Weight	14.5	15.4	15.7	14.5	14.5		15.2		lbs.
Total Test Cycle Burn Time	330	330	285	235	110		305		min.