



Team Results for Clean Snowmobile Challenge 2014 Team 9



2014 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2014/03/07 12:18:15
 Team Name : Waterloo
 Team Number : 9
 Model : Rush 600
 Engine : Weber
 Displacement[cc] : 750.00
 100% Speed : 7994
 100% Torque : 83.6
 No of Strokes : 4
 Fuel : gasoline H/C: 1.99 O/C: 0.03

ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	55.4	30.3	17.6	8.6	0.0
HC_m g/hr	:	8.47	226.74	323.01	275.64	6.80
CO_m g/hr	:	23.45	12252.67	13114.82	10449.25	350.64
NOx_m g/hr	:	968.56	0.44	0.00	0.00	0.01
Soot_m mg/hr	:	67.38	3163.55	4752.39	1867.07	3.86
N2O_m mg/hr	:	0.31	0.00	0.00	0.00	0.00
CO2_m g/hr	:	57195.42	26614.75	17092.51	11189.84	3022.00
CH4_m g/hr	:	0.77	97.77	109.05	87.58	2.81
W_HC g/hr	:	1.02	61.22	80.75	85.45	0.34
W_CO g/hr	:	2.81	3308.22	3278.71	3239.27	17.53
W_NOx g/hr	:	116.23	0.12	0.00	0.00	0.00
W_HCNOx g/hr	:	117.24	61.34	80.75	85.45	0.34
W_Soot mg/hr	:	8.09	854.16	1188.10	578.79	0.19
W_N2O g/hr	:	0.04	0.00	0.00	0.00	0.00
W_CO2 g/hr	:	6863.45	7185.98	4273.13	3468.85	151.10
W_CH4 g/hr	:	0.09	26.40	27.26	27.15	0.14

Total Weighted Power [kW] 21.907

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	228.78	9846.54	116.35	345.12
Specific Mass [g/kW-hr]	10.44	449.46	5.31	15.75
BSFC [g/kW-hr]	671.9			

Total Soot [mg/hr] 2629.33 Specific Soot [mg/kW-hr] 120.02

Not Used for Competition

Total N2O [mg/hr]	0.04	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	21942.51	Specific CO2 [g/kW-hr]	1001.60
Total CH4 [g/hr]	81.04	Specific CH4 [g/kW-hr]	3.70
RMC BSFC [g/kW-hr]			

EMISSION TESTS:

	Value	Limit	Result
Power	69.95	<96.94 kW	PASS
Soot	120.02	<100 mg/kW-hr	FAIL
CO	449.46	<275 g/kW-hr	FAIL
HC + NOX	15.75	<90 g/kW-hr	PASS
E-Score	87.13	>100	FAIL
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST FAIL



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Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5
Total Points	points	300	1200	1200	1200	1200
PtsInMode	points	400	1400	1400	1400	1800
Speed	rpm	7993.71	6795.64	5996.46	5200.52	1759.96
Torque	Nm	66.15	42.61	27.99	15.88	0.00
Power	kW	55.37	30.32	17.58	8.65	0.00
BSFC	g/kw-hr	329.29	489.15	701.44	1048.39	**
Fuel	g/hr	18233.98	14832.83	12328.13	9067.34	1144.59
T_int	degC	17.27	17.46	16.96	16.11	14.40
RelHumid	%	25.46	24.80	24.28	26.34	24.06
Baro	in Hg	28.61	28.62	28.62	28.61	28.62
Baro	mmHg	726.80	726.84	726.87	726.79	726.87
Pvap_kPa	kPa	0.43	0.43	0.41	0.42	0.35
Pvap_inHg	inHg	0.13	0.13	0.12	0.12	0.10
AbsHumidity	grains/lb	19.62	19.32	18.39	19.01	15.75
SatPres	kPa	96.46	96.48	96.50	96.48	96.56
Hum Factor		0.79	0.79	0.79	0.79	0.78
F_fac		1.01	1.01	1.01	1.00	1.00
K_fac		1.03	1.03	1.03	1.02	1.02
Humidity	g/kg	2.80	2.76	2.63	2.72	2.25
H2		0.00	3.07	4.78	5.54	0.72
WetDry Factor		0.89	0.89	0.89	0.90	0.90



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	52.69	2467.57	4511.69	5319.42	754.83
CO	%	0.01	6.67	9.17	10.09	1.95
N2O	ppm	6.19	0.00	0.00	0.00	0.00
CH4	ppm	4.19	932.04	1334.20	1480.41	272.94
CO2	%	11.33	9.22	7.60	6.88	10.69
O2	%	3.21	0.00	0.00	0.02	2.42
CNOx	ppm	1834.80	1.45	0.01	0.00	0.34
AHC	ppm	1.10	92.82	202.12	262.63	33.06
C2H2	ppm	2.18	2.86	3.77	2.93	1.76
C2H4	ppm	6.50	170.45	267.65	274.78	26.43
C3H6	ppm	1.70	39.16	72.54	82.09	2.76
C4H6	ppm	0.26	12.95	10.07	8.86	3.23
ETOH	ppm	1.30	4.19	0.06	0.00	2.41
H2O	%	10.95	11.24	10.55	10.13	10.45
HCHO	ppm	3.34	0.76	0.90	0.68	0.32
HCN	ppm	0.78	15.15	7.99	6.01	1.22
HNCO	ppm	1.53	5.32	0.55	0.19	0.84
MECHO	ppm	0.44	1.68	2.58	2.17	0.31
NC5	ppm	2.65	2.60	11.78	21.84	0.01
NH3	ppm	1.47	320.99	139.08	95.76	63.62
NO	ppm	2292.67	1.49	0.00	0.00	0.59
NO2	ppm	21.55	0.34	0.15	0.08	0.01
Soot	mg/m3	0.24	20.24	40.22	22.36	0.24
AFR	:1	16.82	10.81	9.56	9.07	14.68



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.003	0.006	10.953	81.611	0.943	17.613	0.838
2	3.458	0.278	11.238	73.540	0.850	11.650	1.000
3	5.342	0.504	10.554	70.320	0.813	10.509	1.000
4	6.164	0.592	10.132	68.268	0.789	10.058	0.999
5	0.804	0.084	10.454	77.952	0.901	15.524	0.877

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	8.473	-2.053	-0.257	-2.310	96.843	3.157
2	226.741	0.278	0.035	0.313	96.069	3.931
3	323.006	0.502	0.063	0.565	95.789	4.211
4	275.638	0.574	0.072	0.645	94.766	5.234
5	6.795	-1.657	-0.207	-1.864	94.608	5.392

Power Run

Team 9

TeamNumber	9
TeamName	Waterloo
Model	Rush 600
Engine	Weber

Displacement cc	750.00
RatedSpeed	7994
RatedTorque	83.6

