



Team Results for Clean Snowmobile Challenge 2015 Team 9



2015 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2015/03/06 11:46:26
Team Name : Waterloo
Team Number : 9
Model : Polaris
Engine : Weber
Displacement[cc] : 750.00
100% Speed : 8296
100% Torque : 71.0
No of Strokes : 4
Fuel : GASOLINE H/C: 1.92 O/C: 0.03

ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power kW	:	60.5	28.1	15.2	7.6	0.0	18.2
HC_m g/hr	:	283.86	260.51	148.93	158.26	7.92	88.54
CO_m g/hr	:	30460.28	16226.64	8573.00	7303.48	173.55	12346.05
NOx_m g/hr	:	15.72	3.41	1.35	0.31	0.04	2.01
Soot_m mg/hr	:	878.53	1706.28	385.49	280.14	34.53	1159.19
N2O_m mg/hr	:	0.98	0.51	0.26	0.23	0.00	0.38
CO2_m g/hr	:	33945.97	18634.62	12976.80	8693.41	3860.76	16910.55
CH4_m g/hr	:	77.16	54.83	30.07	44.92	6.31	68.76
W_HC g/hr	:	34.06	70.34	37.23	49.06	0.40	88.54
W_CO g/hr	:	3655.23	4381.19	2143.25	2264.08	8.68	12346.05
W_NOx g/hr	:	1.89	0.92	0.34	0.10	0.00	2.01
W_HCNOx g/hr	:	35.95	71.26	37.57	49.16	0.40	90.55
W_Soot mg/hr	:	105.42	460.70	96.37	86.84	1.73	1159.19
W_N2O g/hr	:	0.12	0.14	0.06	0.07	0.00	0.38
W_CO2 g/hr	:	4073.52	5031.35	3244.20	2694.96	193.04	16910.55
W_CH4 g/hr	:	9.26	14.80	7.52	13.92	0.32	68.76

Total Weighted Power [kW] 21.017

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	191.09	12452.43	3.24	194.33
Specific Mass [g/kW-hr]	9.09	592.50	0.15	9.25
BSFC [g/kW-hr]	595.0			

Total Soot [mg/hr] 751.06 Specific Soot [mg/kW-hr] 35.74

Not Used for Competition

Total N2O [mg/hr]	0.39	Specific N2O [mg/kW-hr]	0.02
Total CO2 [g/hr]	15237.06	Specific CO2 [g/kW-hr]	725.00
Total CH4 [g/hr]	45.82	Specific CH4 [g/kW-hr]	2.18
RMC BSFC [g/kW-hr]	637.36		

EMISSION TESTS:

	Value	Limit	Result
Power	61.69	<96.94 kW	PASS
Soot	35.74	<100 mg/kW-hr	PASS
CO	592.50	<275 g/kW-hr	FAIL
HC + NOX	9.25	<90 g/kW-hr	PASS
E-Score	55.71	>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	RMC
Total Points	points	600	1200	1200	1200	1200	12031
PtsInMode	points	1210	3050	2720	3470	1480	12031
Speed	rpm	8130.38	7051.47	6222.17	5394.86	2189.51	6137.76
Torque	Nm	71.02	38.04	23.38	13.52	0.00	28.31
Power	kW	60.46	28.09	15.24	7.64	0.00	18.20
BSFC	g/kw-hr	433.56	507.21	560.01	858.02	**	637.36
Fuel	g/hr	26214.89	14249.04	8532.13	6551.42	1318.14	11597.84
T_int	degC	22.84	23.08	18.69	21.07	15.36	20.81
RelHumid	%	14.43	13.42	13.06	14.35	13.94	13.82
Baro	in Hg	28.75	28.74	28.75	28.75	28.75	28.75
Baro	mmHg	730.31	730.12	730.17	730.25	730.15	730.22
Pvap_kPa	kPa	0.33	0.31	0.24	0.30	0.21	0.29
Pvap_inHg	inHg	0.10	0.09	0.07	0.09	0.06	0.08
AbsHumidity	grains/lb	15.01	14.14	10.82	13.55	9.58	12.87
SatPres	kPa	97.03	97.03	97.11	97.06	97.13	97.07
Hum Factor		0.78	0.78	0.77	0.78	0.76	0.77
F_fac		1.02	1.02	1.00	1.01	1.00	1.01
K_fac		1.03	1.03	1.02	1.03	1.02	1.03
Humidity	g/kg	2.14	2.02	1.55	1.94	1.37	1.84
H2		4.85	4.77	3.83	4.63	0.30	4.16
WetDry Factor		0.88	0.88	0.87	0.88	0.87	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	1727.38	2949.34	2749.59	3898.04	820.21	1201.96
CO	%	9.23	9.15	7.88	8.96	0.90	8.35
N2O	ppm	18.95	18.32	14.97	18.32	1.31	16.39
CH4	ppm	409.41	541.23	484.07	964.58	570.28	813.80
CO2	%	6.55	6.69	7.59	6.79	12.68	7.28
O2	%	0.00	0.00	0.00	0.01	0.22	0.02
CNOx	ppm	29.00	11.70	7.55	2.31	1.33	8.27
AHC	ppm	60.38	127.39	121.53	168.75	0.00	127.75
C2H2	ppm	29.46	24.78	11.91	25.70	0.89	29.44
C2H4	ppm	124.70	178.05	173.32	251.87	5.06	209.69
C3H6	ppm	37.51	68.29	65.78	83.43	1.94	82.68
C4H6	ppm	8.95	9.17	9.15	6.84	1.90	8.73
ETOH	ppm	4.27	4.96	5.65	3.23	2.18	5.68
H2O	%	12.25	12.24	12.57	12.23	13.16	0.00
HCHO	ppm	3.46	4.11	3.68	3.37	0.63	7.37
HCN	ppm	30.08	40.54	40.21	31.05	0.80	28.97
HNCO	ppm	0.62	0.00	0.00	0.00	0.67	0.54
MECHO	ppm	2.21	2.49	1.34	2.21	0.00	2.06
NC5	ppm	36.89	63.30	58.62	67.09	18.01	84.85
NH3	ppm	165.98	148.77	150.08	87.69	38.28	125.22
NO	ppm	36.33	14.72	9.20	2.35	0.42	10.00
NO2	ppm	0.86	0.38	0.64	0.63	1.33	0.69
Soot	mg/m3	3.57	12.77	4.58	4.55	2.06	10.21
AFR	:1	9.63	9.47	10.02	9.38	13.49	10.14



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	5.530	0.197	12.246	70.109	0.810	10.274	1.000
2	5.437	0.336	12.241	70.509	0.815	10.260	1.000
3	4.378	0.315	12.574	72.477	0.838	10.846	1.000
4	5.274	0.444	12.232	70.555	0.816	10.281	0.999
5	0.346	0.094	13.165	81.675	0.944	14.297	0.989

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	283.863	0.197	0.025	0.221	94.657	5.343
2	260.514	0.336	0.042	0.378	95.187	4.813
3	148.930	0.314	0.039	0.354	95.751	4.249
4	158.259	0.433	0.054	0.487	95.086	4.914
5	7.915	-0.082	-0.010	-0.092	98.762	1.238

Power Run

Team 9

TeamNumber	9
TeamName	Waterloo
Model	Polaris
Engine	Weber

Displacement cc	750.00
RatedSpeed	8296
RatedTorque	71.0

