

Team Results for Clean Snowmobile Challenge 2012

2012 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2012/03/07 14:28:40
 Team Name : Clarkson University
 Team Number : 1
 Model : Ski Doo
 Engine : MXZ Sport
 Displacement[cc] : 600cc
 100% Speed : 7158
 100% Torque : 52.8
 No of Strokes : 4
 Fuel : Gasoline H/C: 2.09 O/C: 0.13

ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	38.8	16.7	9.6	5.0	0.0
HC_m g/hr	:	164.85	7.57	17.82	10.40	23.66
CO_m g/hr	:	6443.86	334.98	95.80	39.41	98.25
NOx_m g/hr	:	163.10	218.49	211.74	83.73	0.67
Soot_m mg/hr	:	22.52	0.97	0.39	0.16	0.06
N2O_m mg/hr	:	0.00	0.07	0.03	0.01	0.00
CO2_m g/hr	:	30326.20	16458.99	10453.63	6923.02	1888.11
CH4_m g/hr	:	23.07	1.17	0.96	0.44	1.04
W_HC g/hr	:	19.78	2.04	4.46	3.22	1.18
W_CO g/hr	:	773.26	90.44	23.95	12.22	4.91
W_NOx g/hr	:	19.57	58.99	52.93	25.96	0.03
W_HCNOx g/hr	:	39.35	61.04	57.39	29.18	1.22
W_Soot mg/hr	:	2.70	0.26	0.10	0.05	0.00
W_N2O g/hr	:	0.00	0.02	0.01	0.00	0.00
W_CO2 g/hr	:	3639.14	4443.93	2613.41	2146.14	94.41
W_CH4 g/hr	:	2.77	0.31	0.24	0.14	0.05

Total Weighted Power [kW] 13.134

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	30.69	904.79	157.49	188.18
Specific Mass [g/kW-hr]	2.34	68.89	11.99	14.33
BSFC [g/kW-hr]	357.0			

Total Soot [mg/hr] 3.11 Specific Soot [mg/kW-hr] 0.24

Not Used for Competition

Total N2O [mg/hr]	0.03	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	12937.02	Specific CO2 [g/kW-hr]	985.02
Total CH4 [g/hr]	3.51	Specific CH4 [g/kW-hr]	0.27

EMISSION TESTS:

	Value	Limit	Result
Power	39.58	<96.94 kW	PASS
Soot	0.24	<100 mg/kW-hr	PASS
CO	68.89	<275 g/kW-hr	PASS
HC + NOX	14.33	<90 g/kW-hr	PASS
E-Score	183.23	>100	PASS
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST PASS

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Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5
Total Points	points	594	1196	1200	1200	1129
PtsInMode	points	600	1199	1200	1200	1200
Speed	rpm	7151.18	6081.88	5363.73	4633.00	1456.68
Torque	Nm	51.87	26.29	17.09	10.31	0.00
Power	kW	38.84	16.75	9.60	5.00	0.00
BSFC	g/kw-hr	338.26	325.77	356.13	449.86	**
Fuel	g/hr	13139.02	5455.41	3418.98	2250.74	678.76
T_int	degC	17.53	17.56	17.46	17.88	17.53
RelHumid	%	54.47	53.23	52.38	50.64	51.90
Baro	in Hg	28.35	28.35	28.35	28.35	28.35
Baro	mmHg	720.06	720.08	720.10	720.10	720.09
Pvap_kPa	kPa	0.94	0.92	0.90	0.89	0.90
Pvap_inHg	inHg	0.28	0.27	0.27	0.26	0.27
AbsHumidity	grains/lb	43.21	42.30	41.38	40.96	41.17
SatPres	kPa	95.06	95.08	95.10	95.11	95.10
Hum Factor		0.87	0.87	0.86	0.86	0.86
F_fac		1.02	1.02	1.02	1.02	1.02
K_fac		1.04	1.04	1.04	1.04	1.04
Humidity	g/kg	6.17	6.04	5.91	5.85	5.88
H2		1.48	0.13	0.06	0.04	0.34
WetDry Factor		0.86	0.87	0.87	0.87	0.87

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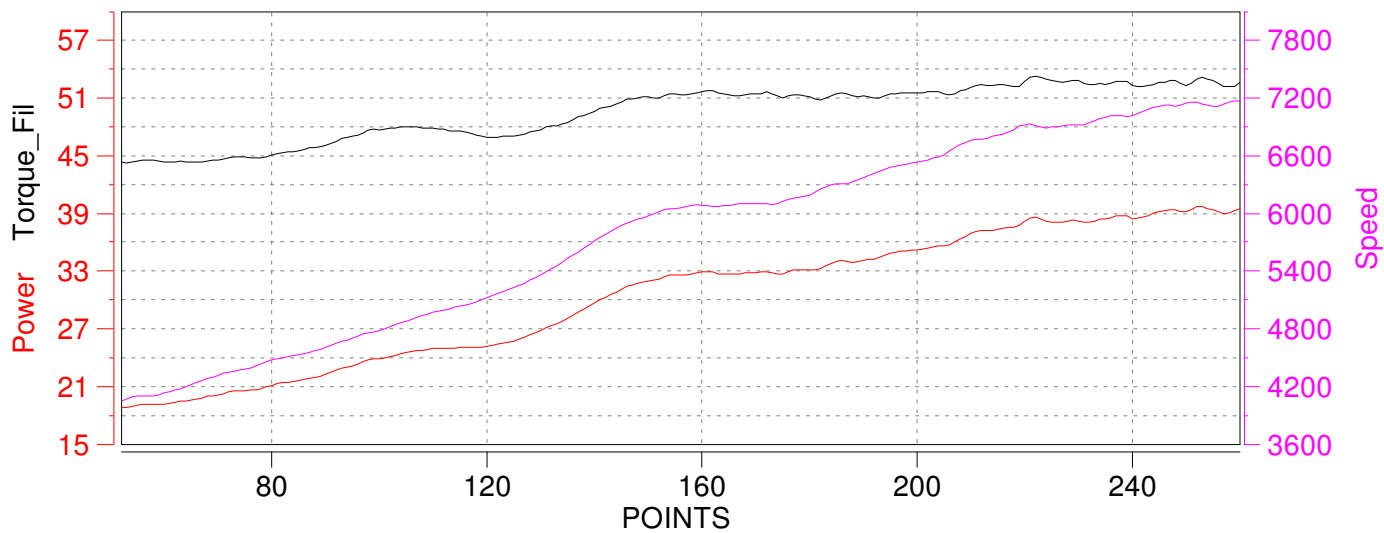
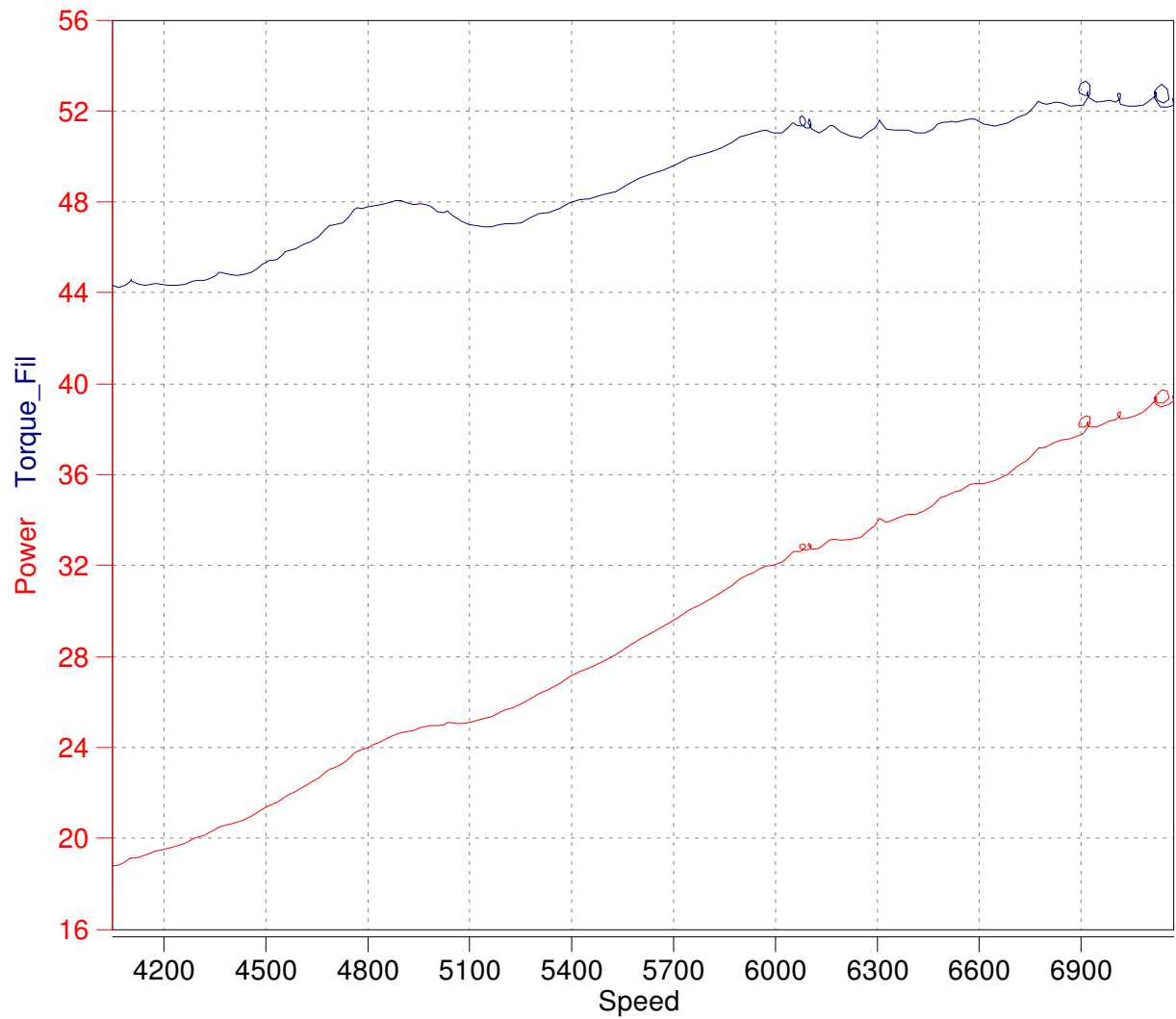
Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	1803.47	167.22	635.04	547.16	4434.07
CO	%	3.55	0.37	0.17	0.10	0.93
N2O	ppm	0.02	4.75	2.90	1.98	0.09
CH4	ppm	222.67	22.72	30.29	20.26	171.37
CO2	%	10.64	11.66	11.95	11.68	11.35
O2	%	0.11	1.60	1.38	1.86	1.45
CNOx	ppm	547.48	1481.34	2314.86	1351.88	38.73
AHC	ppm	88.84	5.13	20.05	16.63	177.51
C2H2	ppm	29.89	4.95	9.07	6.43	12.87
C2H4	ppm	113.48	19.98	85.43	66.77	195.47
C3H6	ppm	42.95	2.75	16.96	16.06	72.92
C4H6	ppm	9.42	0.44	2.14	1.88	6.44
ETOH	ppm	51.84	4.85	12.40	13.71	186.42
H2O	%	14.02	13.38	13.43	13.29	13.43
HCHO	ppm	22.29	9.94	62.53	59.55	130.04
HCN	ppm	3.89	7.02	6.35	2.75	1.02
HNCO	ppm	2.81	7.54	11.26	8.23	6.45
MECHO	ppm	31.65	1.37	16.20	16.85	153.05
NC5	ppm	17.61	0.46	3.05	4.80	196.16
NH3	ppm	97.96	1.78	0.84	0.72	3.57
NO	ppm	628.91	1690.66	2660.56	1547.44	37.61
NO2	ppm	0.37	17.28	19.38	20.74	7.28
Soot	mg/m3	0.15	0.01	0.01	0.00	0.01
AFR	:1	10.67	13.40	13.20	13.59	11.70

Power Run

TeamNumber	1
TeamName	Clarkson University
Model	Ski Doo
Engine	MXZ Sport

Displacement cc	600cc
RatedSpeed	7158
RatedTorque	52.8



Measurement Accuracy (SAE paper 961804)

H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1.726	0.210	14.015	80.422	0.930	13.139	0.994
0.153	0.019	13.380	83.042	0.960	16.025	0.919
0.070	0.073	13.425	83.189	0.962	15.922	0.930
0.042	0.063	13.285	83.365	0.964	16.345	0.906
0.393	0.512	13.428	81.965	0.947	14.999	0.926

ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
164.845	0.112	0.014	0.126	99.918	0.082
7.568	-1.110	-0.139	-1.249	98.853	1.147
17.823	-0.911	-0.114	-1.025	99.100	0.900
10.398	-1.219	-0.152	-1.371	98.918	1.082
23.660	-0.568	-0.071	-0.639	98.525	1.475