



Team Results for Clean Snowmobile Challenge 2013 Team 7



2012 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2013/03/07 11:23:50
Team Name      : Idaho
Team Number    : 7
Model         : Rotax
Engine        : DI E-TEC NA
Displacement[cc] : 799.00
100% Speed    : 6928
100% Torque   : 114.1
No of Strokes : 2
Fuel          : GASOLINE           H/C: 2.50       O/C: 0.28
  
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ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	80.6	35.6	20.3	10.0	0.0
HC_m g/hr	:	2427.17	1.82	91.01	53.97	7.28
CO_m g/hr	:	38638.41	79.22	166.08	14.36	0.63
NOx_m g/hr	:	44.38	258.94	53.50	4.14	0.72
Soot_m mg/hr	:	784.54	67.98	113.03	12.04	16.57
N2O_m mg/hr	:	0.00	0.18	0.01	0.00	0.00
CO2_m g/hr	:	68421.30	43475.29	23853.11	14032.68	2066.58
CH4_m g/hr	:	872.46	0.01	16.19	10.72	2.39
W_HC g/hr	:	291.26	0.49	22.75	16.73	0.36
W_CO g/hr	:	4636.61	21.39	41.52	4.45	0.03
W_NOx g/hr	:	5.33	69.91	13.37	1.28	0.04
W_HCNOx g/hr	:	296.59	70.41	36.13	18.02	0.40
W_Soot mg/hr	:	94.14	18.35	28.26	3.73	0.83
W_N2O g/hr	:	0.00	0.05	0.00	0.00	0.00
W_CO2 g/hr	:	8210.56	11738.33	5963.28	4350.13	103.33
W_CH4 g/hr	:	104.70	0.00	4.05	3.32	0.12

Total Weighted Power [kW] 27.455

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	331.60	4704.00	89.94	421.54
Specific Mass [g/kW-hr]	12.08	171.34	3.28	15.35
BSFC [g/kW-hr]	421.7			

Total Soot [mg/hr] 145.32 Specific Soot [mg/kW-hr] 5.29

Not Used for Competition

Total N2O [mg/hr]	0.05	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	30365.62	Specific CO2 [g/kW-hr]	1106.01
Total CH4 [g/hr]	112.19	Specific CH4 [g/kW-hr]	4.09

EMISSION TESTS:

	Value	Limit	Result
Power	82.81	<96.94 kW	PASS
Soot	5.29	<100 mg/kW-hr	PASS
CO	171.34	<275 g/kW-hr	PASS
HC + NOX	15.35	<90 g/kW-hr	PASS
E-Score	156.93	>100	PASS
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST PASS



**Team Results for
Clean Snowmobile Challenge 2013
Team 7**



Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5
Total Points	points	600	1200	1200	1200	1200
PtsInMode	points	1199	1800	1800	1800	1799
Speed	rpm	6928.11	5887.58	5196.30	4504.24	1199.23
Torque	Nm	111.11	57.75	37.36	21.10	0.00
Power	kW	80.61	35.61	20.33	9.95	0.00
BSFC	g/kw-hr	559.22	404.47	396.25	471.86	**
Fuel	g/hr	45077.76	14402.37	8055.63	4696.27	690.18
T_int	degC	13.78	15.77	14.72	13.59	14.92
RelHumid	%	17.52	18.50	16.63	19.71	17.64
Baro	in Hg	29.27	29.28	29.27	29.27	29.27
Baro	mmHg	743.54	743.64	743.58	743.55	743.51
Pvap_kPa	kPa	0.25	0.29	0.25	0.27	0.26
Pvap_inHg	inHg	0.07	0.09	0.07	0.08	0.08
AbsHumidity	grains/lb	10.81	12.79	10.82	12.03	11.61
SatPres	kPa	98.88	98.85	98.89	98.86	98.86
Hum Factor		1.00	1.00	1.00	1.00	1.00
F_fac		0.97	0.98	0.98	0.97	0.98
K_fac		1.00	1.00	1.00	1.00	1.00
Humidity	g/kg	1.54	1.83	1.55	1.72	1.66
H2		3.77	0.01	0.05	0.01	0.00
WetDry Factor		0.83	0.86	0.87	0.86	0.94



**Team Results for
Clean Snowmobile Challenge 2013
Team 7**



Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	7513.80	14.30	1185.87	1325.38	535.07
CO	%	6.21	0.03	0.11	0.02	0.00
N2O	ppm	0.00	4.72	0.24	0.41	0.59
CH4	ppm	2453.76	0.10	191.64	239.16	159.70
CO2	%	7.00	11.27	10.27	11.38	5.02
O2	%	0.47	2.36	3.87	2.20	12.66
CNOx	ppm	43.41	642.14	220.25	32.15	16.76
AHC	ppm	53.28	0.00	10.94	12.40	2.24
C2H2	ppm	311.58	1.76	6.12	2.52	1.67
C2H4	ppm	1160.22	0.41	196.29	58.59	7.86
C3H6	ppm	15.76	0.03	25.43	16.07	1.69
C4H6	ppm	7.86	0.15	1.85	0.96	0.31
ETOH	ppm	7.04	2.53	45.03	67.93	18.62
H2O	%	17.19	14.03	13.14	14.22	6.42
HCHO	ppm	59.38	0.77	144.62	47.72	14.47
HCN	ppm	11.99	2.75	1.26	0.72	0.28
HNCO	ppm	10.58	4.86	7.81	0.54	0.31
MECHO	ppm	7.97	0.00	55.47	42.98	16.33
NC5	ppm	0.00	3.46	8.74	92.88	41.39
NH3	ppm	60.25	0.41	0.01	0.01	0.01
NO	ppm	40.81	632.80	116.01	18.11	0.10
NO2	ppm	2.61	9.19	104.24	14.05	16.78
Soot	mg/m3	1.65	0.31	0.86	0.17	0.72
AFR	:1	7.14	12.37	13.03	11.80	28.29



**Team Results for
Clean Snowmobile Challenge 2013
Team 7**



Measurement Accuracy (SAE paper 961804)

	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	4.558	0.907	17.188	79.469	0.919	11.676	0.976
2	0.016	0.002	14.035	85.313	0.986	17.424	0.881
3	0.054	0.137	13.142	85.264	0.986	18.695	0.806
4	0.009	0.155	14.225	85.415	0.987	17.058	0.889
5	0.001	0.057	6.425	82.228	0.950	38.953	0.382

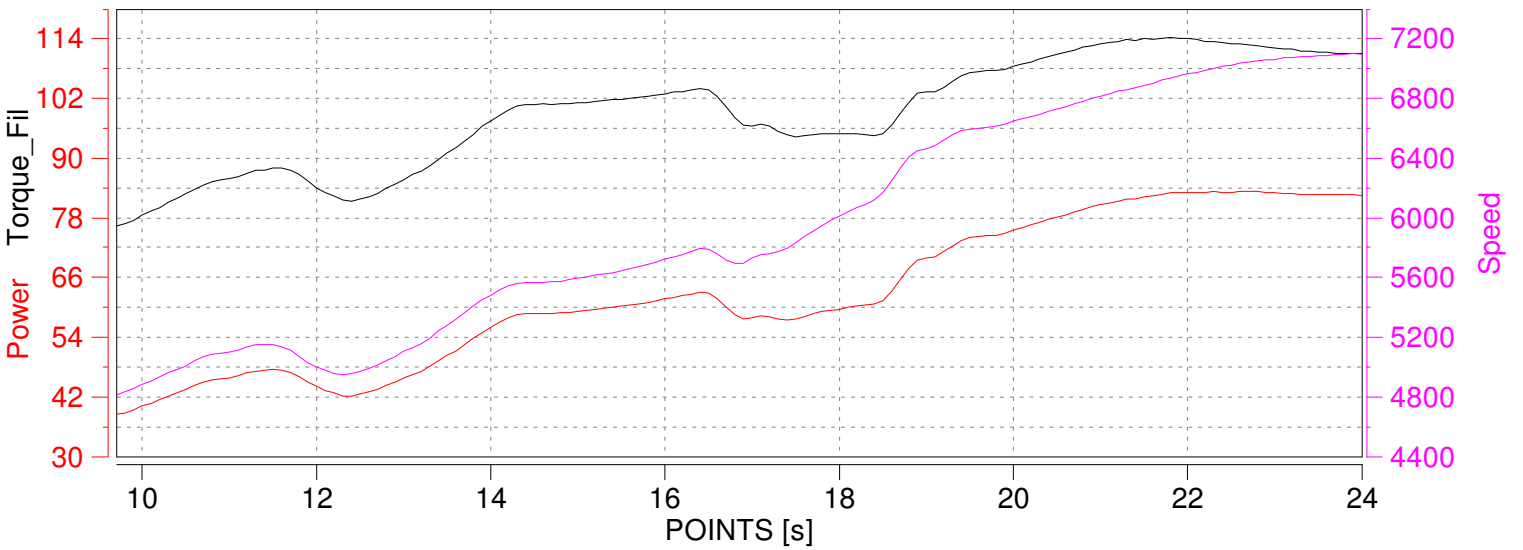
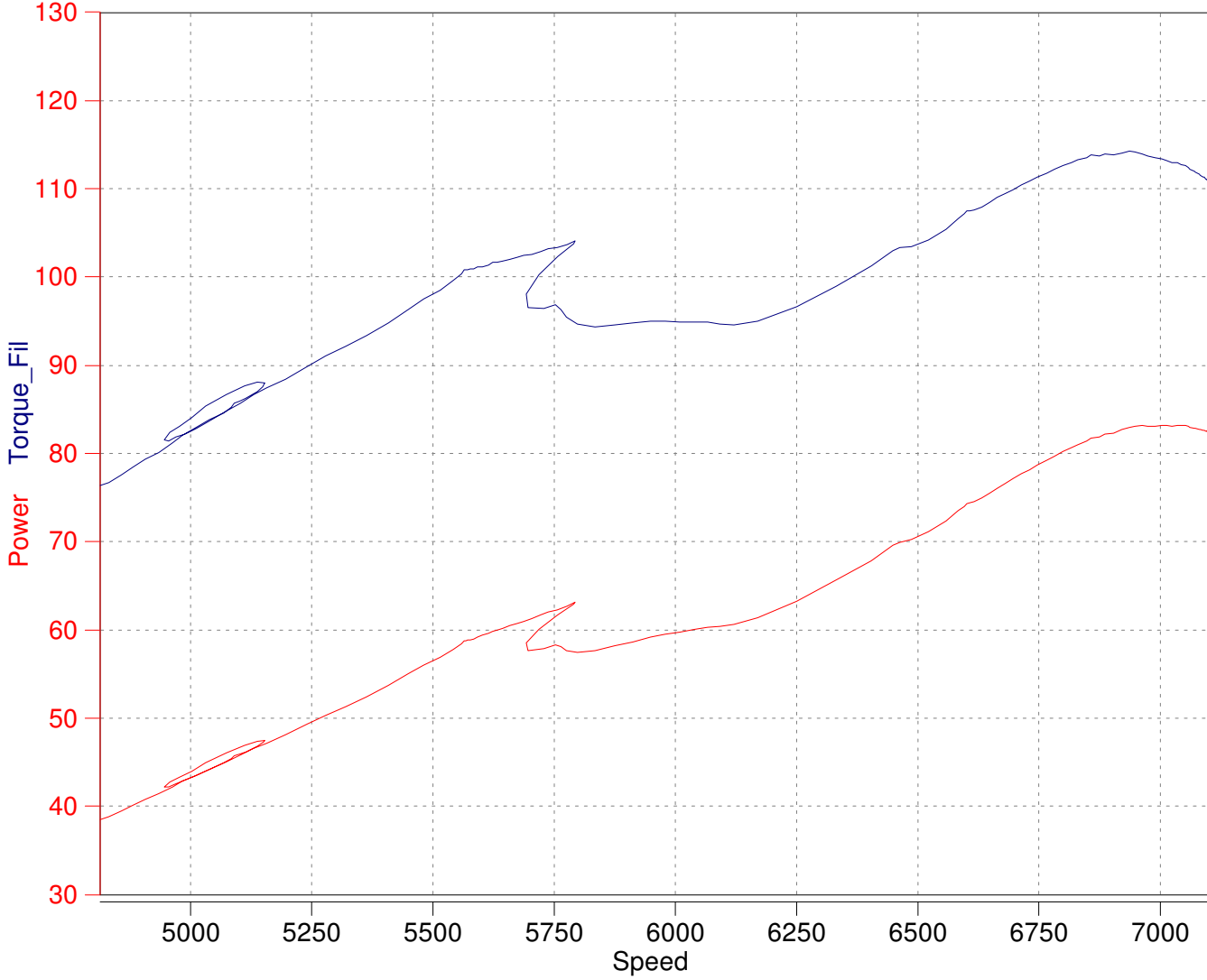
	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
	2427.172	0.496	0.062	0.558	102.023	2.023
	1.822	-1.564	-0.195	-1.759	100.528	0.528
	91.008	-2.208	-0.276	-2.484	100.246	0.246
	53.973	-1.338	-0.167	-1.505	100.767	0.767
	7.281	-3.294	-0.412	-3.706	98.368	1.632

Power Run

Team 7

TeamNumber	7
TeamName	Idaho
Model	Rotax
Engine	DI E-TEC NA

Displacement cc	799.00
RatedSpeed	6928
RatedTorque	114.1





**Team Results for
Clean Snowmobile Challenge 2013
Team 7 ECO**



2012 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2013/03/07 10:07:06
 Team Name : Idaho
 Team Number : 7
 Model : Rotax
 Engine : DI E-TEC NA
 Displacement[cc] : 799.00
 100% Speed : 5758
 100% Torque : 82.7
 No of Strokes : 2
 Fuel : GASOLINE H/C: 2.50 O/C: 0.28

ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	53.6	21.9	12.6	6.1	0.0
HC_m g/hr	:	5.40	1.92	46.45	27.44	10.49
CO_m g/hr	:	19.95	134.15	40.99	6.38	0.65
NOx_m g/hr	:	630.18	84.24	10.34	1.82	0.71
Soot_m mg/hr	:	37.86	181.82	19.98	4.61	22.11
N2O_m mg/hr	:	0.48	0.03	0.00	0.00	0.00
CO2_m g/hr	:	68562.51	27331.57	16169.25	8979.56	2190.08
CH4_m g/hr	:	0.01	0.72	9.16	12.46	2.67
W_HC g/hr	:	0.65	0.52	11.61	8.51	0.52
W_CO g/hr	:	2.39	36.22	10.25	1.98	0.03
W_NOx g/hr	:	75.62	22.74	2.58	0.56	0.04
W_HCNOx g/hr	:	76.27	23.26	14.20	9.07	0.56
W_Soot mg/hr	:	4.54	49.09	5.00	1.43	1.11
W_N2O g/hr	:	0.06	0.01	0.00	0.00	0.00
W_CO2 g/hr	:	8227.50	7379.53	4042.31	2783.66	109.50
W_CH4 g/hr	:	0.00	0.19	2.29	3.86	0.13

Total Weighted Power [kW] 17.401

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	21.81	50.87	101.55	123.36
Specific Mass [g/kW-hr]	1.25	2.92	5.84	7.09
BSFC [g/kW-hr]	421.3			

Total Soot [mg/hr] 61.16 Specific Soot [mg/kW-hr] 3.52

Not Used for Competition

Total N2O [mg/hr]	0.07	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	22542.51	Specific CO2 [g/kW-hr]	1295.49
Total CH4 [g/hr]	6.48	Specific CH4 [g/kW-hr]	0.37

EMISSION TESTS:

	Value	Limit	Result
Power	49.87	<96.94 kW	PASS
Soot	3.52	<100 mg/kW-hr	PASS
CO	2.92	<275 g/kW-hr	PASS
HC + NOX	7.09	<90 g/kW-hr	PASS
E-Score	204.54	>100	PASS
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST PASS



**Team Results for
Clean Snowmobile Challenge 2013
Team 7 ECO**



Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5
Total Points	points	600	1200	1200	1159	1200
PtsInMode	points	1200	1800	1800	1800	1800
Speed	rpm	5758.95	4893.65	4318.01	3743.46	1195.65
Torque	Nm	88.85	42.75	27.86	15.68	0.00
Power	kW	53.58	21.91	12.60	6.15	0.00
BSFC	g/kw-hr	422.92	415.31	429.27	487.44	**
Fuel	g/hr	22661.23	9098.87	5408.26	2996.61	734.19
T_int	degC	11.73	9.97	11.27	9.10	16.47
RelHumid	%	21.99	19.68	18.52	18.47	16.75
Baro	in Hg	29.27	29.27	29.28	29.28	29.27
Baro	mmHg	743.52	743.57	743.63	743.74	743.56
Pvap_kPa	kPa	0.27	0.22	0.22	0.20	0.27
Pvap_inHg	inHg	0.08	0.07	0.07	0.06	0.08
AbsHumidity	grains/lb	12.06	9.73	9.88	8.67	12.04
SatPres	kPa	98.85	98.91	98.92	98.96	98.86
Hum Factor		1.00	1.00	1.00	1.00	1.00
F_fac		0.97	0.97	0.97	0.96	0.98
K_fac		0.99	0.99	0.99	0.99	1.00
Humidity	g/kg	1.72	1.39	1.41	1.24	1.72
H2		0.00	0.04	0.02	0.01	0.00
WetDry Factor		0.86	0.86	0.86	0.86	0.93



**Team Results for
Clean Snowmobile Challenge 2013
Team 7 ECO**



Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	26.98	23.92	956.13	1048.91	779.68
CO	%	0.01	0.09	0.04	0.01	0.00
N2O	ppm	7.86	1.06	0.24	0.39	0.63
CH4	ppm	0.06	8.18	171.24	432.54	180.13
CO2	%	11.32	11.27	10.99	11.34	5.38
O2	%	2.40	2.23	2.77	2.28	12.07
CNOx	ppm	995.12	332.40	67.24	21.98	16.59
AHC	ppm	0.00	0.00	9.24	3.06	5.16
C2H2	ppm	1.57	2.74	2.92	2.05	1.62
C2H4	ppm	0.44	1.42	104.55	64.16	6.85
C3H6	ppm	0.00	0.05	27.88	12.29	0.70
C4H6	ppm	0.20	0.21	2.62	0.87	0.21
ETOH	ppm	1.08	2.18	35.03	19.87	25.41
H2O	%	13.98	14.10	13.67	14.05	6.94
HCHO	ppm	0.97	1.44	93.00	41.78	13.83
HCN	ppm	1.17	2.09	0.73	0.43	0.19
HNCO	ppm	5.71	3.49	3.80	0.81	0.43
MECHO	ppm	0.01	0.00	37.48	16.40	19.58
NC5	ppm	4.28	1.73	19.88	35.73	71.07
NH3	ppm	0.22	0.05	0.01	0.01	0.03
NO	ppm	987.03	313.39	24.73	7.45	0.23
NO2	ppm	7.67	19.18	42.51	14.53	16.41
Soot	mg/m3	0.11	1.32	0.24	0.10	0.97
AFR	:1	12.41	12.24	12.31	11.95	26.02



**Team Results for
Clean Snowmobile Challenge 2013
Team 7 ECO**



Measurement Accuracy (SAE paper 961804)

	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.003	0.003	13.982	85.538	0.989	17.474	0.879
2	0.042	0.003	14.099	84.950	0.982	17.253	0.888
3	0.021	0.111	13.670	84.853	0.981	17.642	0.860
4	0.006	0.122	14.045	85.095	0.984	17.176	0.885
5	0.001	0.084	6.942	82.648	0.955	36.201	0.409

	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
	5.399	-1.585	-0.198	-1.783	100.811	0.811
	1.915	-1.481	-0.185	-1.666	100.165	0.165
	46.455	-1.689	-0.211	-1.900	99.959	0.041
	27.445	-1.411	-0.176	-1.587	100.358	0.358
	10.493	-3.378	-0.422	-3.800	98.552	1.448

Power Run

Team 7 ECO

TeamNumber	7
TeamName	Idaho
Model	Rotax
Engine	DI E-TEC NA

Displacement cc	799.00
RatedSpeed	5758
RatedTorque	82.7

