



Team Results for Clean Snowmobile Challenge 2013 Team 6



2012 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2013/03/07 13:09:32
Team Name      : Madison
Team Number    : 6
Model         : Rotax
Engine        : 600 ACE
Displacement[cc] : 600.00
100% Speed    : 5519
100% Torque   : 53.0
No of Strokes : 4
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	:	29.6	13.1	7.4	3.9	0.0
HC_m g/hr	:	9.74	1.35	0.76	0.76	0.83
CO_m g/hr	:	496.98	0.00	0.00	0.00	0.02
NOx_m g/hr	:	19.40	174.56	90.86	37.60	2.48
Soot_m mg/hr	:	2.78	1.43	1.48	2.65	0.36
N2O_m mg/hr	:	0.01	0.05	0.02	0.02	0.00
CO2_m g/hr	:	32548.24	14911.89	9276.49	6923.04	5032.08
CH4_m g/hr	:	5.06	1.05	0.52	0.56	0.31
W_HC g/hr	:	1.17	0.36	0.19	0.23	0.04
W_CO g/hr	:	59.64	0.00	0.00	0.00	0.00
W_NOx g/hr	:	2.33	47.13	22.71	11.66	0.12
W_HCNOx g/hr	:	3.50	47.50	22.90	11.89	0.17
W_Soot mg/hr	:	0.33	0.39	0.37	0.82	0.02
W_N2O g/hr	:	0.00	0.01	0.01	0.01	0.00
W_CO2 g/hr	:	3905.79	4026.21	2319.12	2146.14	251.60
W_CH4 g/hr	:	0.61	0.28	0.13	0.17	0.02

Total Weighted Power [kW] 10.119

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	2.00	59.64	83.95	85.95
Specific Mass [g/kW-hr]	0.20	5.89	8.30	8.49
BSFC [g/kW-hr]	433.6			

Total Soot [mg/hr] 1.93 Specific Soot [mg/kW-hr] 0.19

Not Used for Competition

Total N2O [mg/hr]	0.03	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	12648.87	Specific CO2 [g/kW-hr]	1249.99
Total CH4 [g/hr]	1.21	Specific CH4 [g/kW-hr]	0.12

EMISSION TESTS:

	Value	Limit	Result
Power	30.61	<96.94 kW	PASS
Soot	0.19	<100 mg/kW-hr	PASS
CO	5.89	<275 g/kW-hr	PASS
HC + NOX	8.49	<90 g/kW-hr	PASS
E-Score	202.86	>100	PASS
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST PASS



**Team Results for
Clean Snowmobile Challenge 2013
Team 6**



Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5
Total Points	points	600	1200	1200	1200	1200
PtsInMode	points	1200	1800	1800	1800	1800
Speed	rpm	5516.99	4691.16	4139.99	3587.55	1968.09
Torque	Nm	51.22	26.58	17.00	10.31	0.00
Power	kW	29.59	13.06	7.37	3.87	0.00
BSFC	g/kw-hr	372.37	377.30	415.91	590.49	**
Fuel	g/hr	11017.99	4926.59	3064.68	2287.36	1662.88
T_int	degC	15.69	16.47	17.20	17.19	16.97
RelHumid	%	24.06	20.11	18.50	18.46	17.63
Baro	in Hg	29.28	29.28	29.28	29.27	29.27
Baro	mmHg	743.76	743.67	743.60	743.52	743.49
Pvap_kPa	kPa	0.38	0.33	0.31	0.31	0.30
Pvap_inHg	inHg	0.11	0.10	0.09	0.09	0.09
AbsHumidity	grains/lb	16.57	14.47	13.87	13.82	13.04
SatPres	kPa	98.78	98.82	98.82	98.81	98.83
Hum Factor		0.78	0.78	0.78	0.78	0.77
F_fac		0.98	0.98	0.98	0.98	0.98
K_fac		1.00	1.00	1.00	1.00	1.00
Humidity	g/kg	2.37	2.07	1.98	1.97	1.86
H2		0.13	0.00	0.00	0.00	0.00
WetDry Factor		0.84	0.84	0.85	0.85	0.85



**Team Results for
Clean Snowmobile Challenge 2013
Team 6**



Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	113.22	33.56	28.91	38.80	59.17
CO	%	0.30	0.00	0.00	0.00	0.00
N2O	ppm	0.41	3.74	2.81	3.90	0.30
CH4	ppm	53.43	23.67	18.05	26.03	19.74
CO2	%	12.50	12.25	11.71	11.73	11.78
O2	%	0.00	0.74	1.63	1.63	1.55
CNOx	ppm	71.28	1372.07	1097.21	609.44	55.53
AHC	ppm	0.03	0.00	0.00	0.00	0.00
C2H2	ppm	1.63	1.24	0.95	1.09	1.43
C2H4	ppm	10.93	1.00	1.00	0.47	0.30
C3H6	ppm	0.00	0.21	0.10	0.17	0.18
C4H6	ppm	22.71	0.07	0.14	0.11	0.11
ETOH	ppm	13.10	1.02	0.76	1.01	1.72
H2O	%	16.16	15.55	14.81	14.81	14.87
HCHO	ppm	0.14	0.12	0.11	0.08	0.38
HCN	ppm	0.82	0.49	0.41	0.48	0.47
HNCO	ppm	12.20	1.55	1.86	1.36	0.36
MECHO	ppm	0.28	0.03	0.00	0.01	1.04
NC5	ppm	0.32	0.21	0.44	0.47	5.89
NH3	ppm	579.53	0.21	0.08	0.10	0.09
NO	ppm	91.16	1696.64	1237.29	678.76	69.47
NO2	ppm	0.01	65.79	175.18	105.91	2.23
Soot	mg/m3	0.02	0.02	0.03	0.08	0.01
AFR	:1	10.70	11.32	11.88	11.86	11.78



**Team Results for
Clean Snowmobile Challenge 2013
Team 6**



Measurement Accuracy (SAE paper 961804)

	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.152	0.014	16.158	86.209	0.997	15.270	1.000
2	0.000	0.004	15.549	86.539	1.000	16.069	0.963
3	0.000	0.003	14.809	86.086	0.995	16.802	0.918
4	0.000	0.005	14.811	86.040	0.995	16.774	0.918
5	0.000	0.007	14.874	85.923	0.993	16.671	0.922

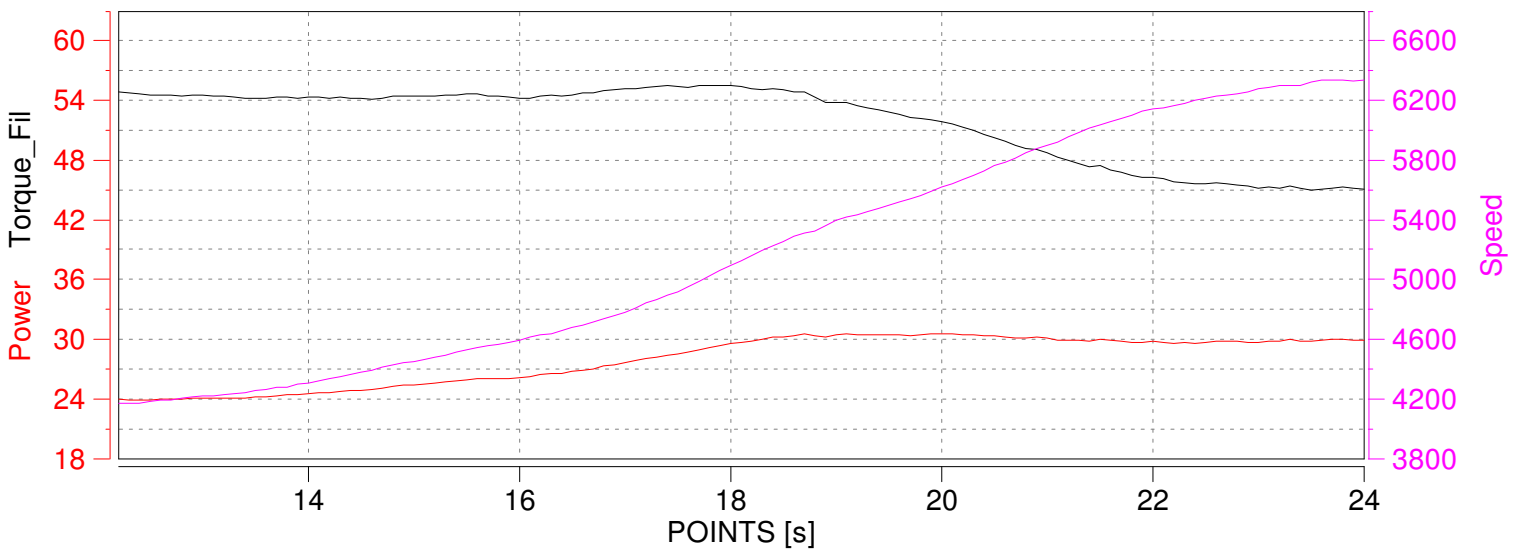
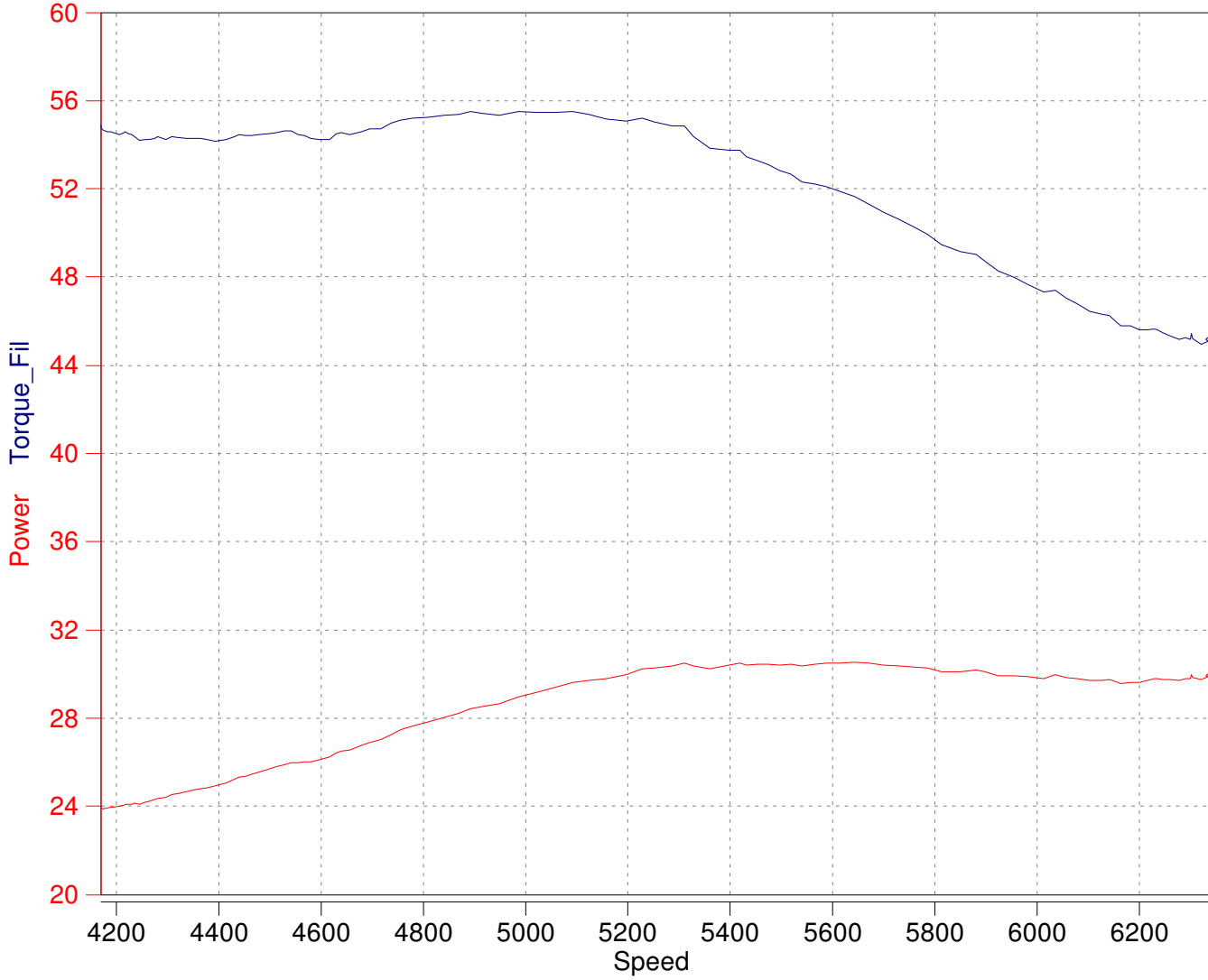
	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
	9.736	0.014	0.002	0.015	102.653	2.653
	1.349	-0.539	-0.067	-0.607	102.526	2.526
	0.756	-1.124	-0.141	-1.265	101.636	1.636
	0.756	-1.125	-0.141	-1.266	101.537	1.537
	0.835	-1.073	-0.134	-1.207	101.373	1.373

Power Run

Team 6

TeamNumber	6
TeamName	Madison
Model	Rotax
Engine	600 ACE

Displacement cc	600.00
RatedSpeed	5519
RatedTorque	53.0





Team Results for Clean Snowmobile Challenge 2013 Team 6 ECO



2012 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2013/03/07 13:32:36
Team Name      : Madison
Team Number    : 6
Model         : Rotax
Engine        : 600 ACE
Displacement[cc] : 600.00
100% Speed    : 5553
100% Torque   : 41.0
No of Strokes : 4
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	:	24.0	10.4	5.7	2.9	0.0
HC_m g/hr	:	3.96	0.79	0.57	0.51	0.61
CO_m g/hr	:	83.12	0.00	0.00	0.00	0.01
NOx_m g/hr	:	11.35	174.05	69.40	22.05	2.48
Soot_m mg/hr	:	2.44	2.07	1.30	0.67	0.30
N2O_m mg/hr	:	0.05	0.03	0.02	0.01	0.00
CO2_m g/hr	:	26291.03	12795.38	9109.62	6420.81	4992.77
CH4_m g/hr	:	2.73	0.59	0.48	0.47	0.31
W_HC g/hr	:	0.47	0.21	0.14	0.16	0.03
W_CO g/hr	:	9.97	0.00	0.00	0.00	0.00
W_NOx g/hr	:	1.36	46.99	17.35	6.84	0.12
W_HCNOx g/hr	:	1.84	47.21	17.49	7.00	0.15
W_Soot mg/hr	:	0.29	0.56	0.32	0.21	0.02
W_N2O g/hr	:	0.01	0.01	0.00	0.00	0.00
W_CO2 g/hr	:	3154.92	3454.75	2277.40	1990.45	249.64
W_CH4 g/hr	:	0.33	0.16	0.12	0.14	0.02

Total Weighted Power [kW] 7.997

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	1.02	9.98	72.67	73.69
Specific Mass [g/kW-hr]	0.13	1.25	9.09	9.21
BSFC [g/kW-hr]	516.7			

Total Soot [mg/hr] 1.40 Specific Soot [mg/kW-hr] 0.18

Not Used for Competition

Total N2O [mg/hr]	0.02	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	11127.17	Specific CO2 [g/kW-hr]	1391.40
Total CH4 [g/hr]	0.77	Specific CH4 [g/kW-hr]	0.10

EMISSION TESTS:

	Value	Limit	Result
Power	23.86	<96.94 kW	PASS
Soot	0.18	<100 mg/kW-hr	PASS
CO	1.25	<275 g/kW-hr	PASS
HC + NOX	9.21	<90 g/kW-hr	PASS
E-Score	203.55	>100	PASS
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST PASS



**Team Results for
Clean Snowmobile Challenge 2013
Team 6 ECO**



Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5
Total Points	points	600	1200	1200	1200	1200
PtsInMode	points	1200	1800	1800	1800	1800
Speed	rpm	5550.87	4719.37	4164.21	3610.85	2033.19
Torque	Nm	41.30	21.13	12.96	7.54	0.00
Power	kW	24.01	10.44	5.65	2.85	0.00
BSFC	g/kw-hr	363.67	404.82	532.43	743.93	**
Fuel	g/hr	8730.75	4226.97	3009.38	2121.24	1649.68
T_int	degC	16.09	17.42	17.63	16.67	16.82
RelHumid	%	21.82	19.92	18.10	18.22	18.88
Baro	in Hg	29.27	29.27	29.27	29.26	29.26
Baro	mmHg	743.48	743.43	743.35	743.31	743.28
Pvap_kPa	kPa	0.35	0.34	0.31	0.30	0.31
Pvap_inHg	inHg	0.10	0.10	0.09	0.09	0.09
AbsHumidity	grains/lb	15.37	15.12	13.89	13.25	13.85
SatPres	kPa	98.77	98.77	98.79	98.80	98.78
Hum Factor		0.78	0.78	0.78	0.78	0.78
F_fac		0.98	0.98	0.99	0.98	0.98
K_fac		1.00	1.00	1.00	1.00	1.00
Humidity	g/kg	2.20	2.16	1.98	1.89	1.98
H2		0.03	0.00	0.00	0.00	0.00
WetDry Factor		0.84	0.85	0.85	0.85	0.85



**Team Results for
Clean Snowmobile Challenge 2013
Team 6 ECO**



Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	57.82	21.95	22.31	28.25	43.91
CO	%	0.06	0.00	0.00	0.00	0.00
N2O	ppm	2.65	2.49	2.20	1.47	0.26
CH4	ppm	36.20	15.03	17.14	23.37	20.31
CO2	%	12.69	11.76	11.72	11.70	11.81
O2	%	0.00	1.62	1.66	1.68	1.51
CNOx	ppm	52.41	1530.73	854.34	384.40	56.05
AHC	ppm	0.00	0.00	0.00	0.00	0.00
C2H2	ppm	1.66	1.04	1.17	1.36	1.49
C2H4	ppm	2.23	0.60	0.31	0.25	0.30
C3H6	ppm	0.64	0.16	0.10	0.14	0.26
C4H6	ppm	9.97	0.05	0.07	0.05	0.07
ETOH	ppm	9.77	1.65	1.79	1.86	2.46
H2O	%	16.20	14.89	14.82	14.78	14.95
HCHO	ppm	0.11	0.14	0.12	0.13	0.34
HCN	ppm	0.75	0.45	0.46	0.50	0.52
HNCO	ppm	6.54	1.65	1.27	0.77	0.19
MECHO	ppm	0.41	0.00	0.00	0.01	0.53
NC5	ppm	0.64	0.27	0.22	0.15	3.43
NH3	ppm	277.86	0.21	0.09	0.09	0.10
NO	ppm	67.44	1783.04	951.06	422.64	69.81
NO2	ppm	0.01	178.52	147.06	73.33	2.35
Soot	mg/m3	0.02	0.03	0.03	0.02	0.01
AFR	:1	10.81	11.89	11.90	11.90	11.76



**Team Results for
Clean Snowmobile Challenge 2013
Team 6 ECO**



Measurement Accuracy (SAE paper 961804)

	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.032	0.007	16.202	86.620	1.001	15.396	1.000
2	0.000	0.003	14.894	86.613	1.001	16.812	0.918
3	0.000	0.003	14.824	86.271	0.997	16.819	0.916
4	0.000	0.003	14.776	86.011	0.994	16.814	0.915
5	0.000	0.005	14.949	86.083	0.995	16.640	0.924

	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
	3.957	0.007	0.001	0.008	102.886	2.886
	0.789	-1.124	-0.141	-1.265	102.300	2.300
	0.573	-1.152	-0.144	-1.296	101.816	1.816
	0.512	-1.163	-0.145	-1.309	101.458	1.458
	0.613	-1.052	-0.132	-1.184	101.565	1.565

Power Run

Team 6 ECO

TeamNumber	6
TeamName	Madison
Model	Rotax
Engine	600 ACE

Displacement cc	600.00
RatedSpeed	5553
RatedTorque	41.0

