



## Team Results for Clean Snowmobile Challenge 2014 Team 5



**2014 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet**

Test Date : 2014/03/07 14:06:03  
 Team Name : ETS  
 Team Number : 5  
 Model : MXZ  
 Engine : Rotax  
 Displacement[cc] : 600.00  
 100% Speed : 6390  
 100% Torque : 70.6  
 No of Strokes : 4  
 Fuel : gasoline                      H/C: 1.99                      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	:	46.7	19.1	11.7	6.1	0.0	13.5
HC_m g/hr	:	83.25	7.08	2.66	1.35	1.45	2.59
CO_m g/hr	:	12353.39	918.86	6.82	91.38	7.52	867.31
NOx_m g/hr	:	12.91	9.88	179.58	1.62	0.07	60.30
Soot_m mg/hr	:	383.35	5.52	1.44	0.96	0.30	13.91
N2O_m mg/hr	:	0.00	0.01	0.05	0.01	0.00	0.02
CO2_m g/hr	:	30822.95	18402.10	13026.08	8820.36	2826.35	15881.95
CH4_m g/hr	:	21.66	2.44	1.01	0.89	0.23	2.46
W_HC g/hr	:	9.99	1.91	0.67	0.42	0.07	2.59
W_CO g/hr	:	1482.41	248.09	1.70	28.33	0.38	867.31
W_NOx g/hr	:	1.55	2.67	44.89	0.50	0.00	60.30
W_HCNOx g/hr	:	11.54	4.58	45.56	0.92	0.08	62.89
W_Soot mg/hr	:	46.00	1.49	0.36	0.30	0.02	13.91
W_N2O g/hr	:	0.00	0.00	0.01	0.00	0.00	0.02
W_CO2 g/hr	:	3698.75	4968.57	3256.52	2734.31	141.32	15881.95
W_CH4 g/hr	:	2.60	0.66	0.25	0.28	0.01	2.46

Total Weighted Power [kW] 15.565

**Weighted Emissions**

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	13.06	1760.91	49.62	62.68
Specific Mass [g/kW-hr]	0.84	113.13	3.19	4.03
BSFC [g/kW-hr]	365.4			

Total Soot [mg/hr] 48.16                      Specific Soot [mg/kW-hr] 3.09

**Not Used for Competition**

Total N2O [mg/hr]	0.02	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	14799.47	Specific CO2 [g/kW-hr]	950.82
Total CH4 [g/hr]	3.80	Specific CH4 [g/kW-hr]	0.24
RMC BSFC [g/kW-hr]	407.53		

**EMISSION TESTS:**

	Value	Limit	Result
Power	47.23	<96.94 kW	PASS
Soot	3.09	<100 mg/kW-hr	PASS
CO	113.13	<275 g/kW-hr	PASS
HC + NOX	4.03	<90 g/kW-hr	PASS
E-Score	179.03	>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	RMC
Total Points	points	600	1200	1200	1200	1200	12031
PtsInMode	points	1210	3050	2720	3470	1480	12031
Speed	rpm	6389.27	5431.54	4792.52	4153.42	1705.81	4755.89
Torque	Nm	69.77	33.57	23.31	13.96	0.00	27.07
Power	kW	46.68	19.10	11.70	6.07	0.00	13.48
BSFC	g/kw-hr	344.47	331.32	355.05	470.36	**	407.53
Fuel	g/hr	16079.82	6326.95	4154.20	2855.90	905.26	5494.13
T_int	degC	8.47	7.99	6.97	8.28	7.67	7.89
RelHumid	%	28.92	26.67	28.19	28.27	28.03	27.96
Baro	in Hg	28.64	28.64	28.64	28.64	28.65	28.64
Baro	mmHg	727.36	727.49	727.56	727.45	727.60	727.46
Pvap_kPa	kPa	0.30	0.27	0.26	0.29	0.27	0.28
Pvap_inHg	inHg	0.09	0.08	0.08	0.08	0.08	0.08
AbsHumidity	grains/lb	13.39	11.99	11.92	12.93	12.36	12.50
SatPres	kPa	96.68	96.72	96.73	96.70	96.73	96.71
Hum Factor		0.78	0.77	0.77	0.77	0.77	0.77
F_fac		0.98	0.98	0.98	0.98	0.98	0.98
K_fac		1.01	1.01	1.01	1.01	1.01	1.01
Humidity	g/kg	1.91	1.71	1.70	1.85	1.77	1.79
H2		2.73	0.34	0.00	0.07	0.02	0.37
WetDry Factor		0.88	0.87	0.88	0.87	0.88	1.00



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**Modal Emissions Concentrations**

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	822.35	151.29	81.83	62.54	202.78	63.37
CO	%	6.11	0.98	0.01	0.21	0.05	1.06
N2O	ppm	0.00	0.79	5.14	1.01	0.12	1.63
CH4	ppm	187.43	45.63	27.31	36.09	28.31	52.69
CO2	%	9.70	12.52	12.76	13.00	12.60	12.39
O2	%	0.00	0.01	0.89	0.28	1.12	0.42
CNOx	ppm	38.86	64.30	1682.90	22.88	3.08	449.90
AHC	ppm	34.69	2.76	0.00	0.00	3.53	5.65
C2H2	ppm	6.87	2.82	2.41	2.30	2.33	2.99
C2H4	ppm	74.24	6.96	9.05	2.02	0.99	12.22
C3H6	ppm	18.12	1.63	0.21	0.02	0.20	2.78
C4H6	ppm	9.91	10.82	0.11	2.65	0.25	4.80
ETOH	ppm	2.05	5.45	1.85	3.54	1.66	3.44
H2O	%	12.35	13.15	12.32	12.69	11.98	0.00
HCHO	ppm	2.16	1.10	1.79	0.61	0.95	1.29
HCN	ppm	13.72	4.17	0.83	1.23	0.78	3.53
HNCO	ppm	4.39	8.00	0.47	1.13	0.16	3.21
MECHO	ppm	1.65	0.20	0.05	0.10	0.11	0.32
NC5	ppm	8.57	2.72	1.25	1.38	15.20	3.51
NH3	ppm	223.27	325.65	1.24	42.76	5.83	126.43
NO	ppm	50.13	83.54	2171.38	29.88	4.34	579.75
NO2	ppm	0.09	0.01	10.12	0.00	0.00	2.46
Soot	mg/m3	2.20	0.07	0.03	0.03	0.02	0.20
AFR	:1	11.39	13.60	14.77	14.16	14.82	13.89



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	3.109	0.094	12.349	77.088	0.891	12.025	1.000
2	0.394	0.017	13.152	80.232	0.927	14.262	1.000
3	0.004	0.009	12.325	81.328	0.940	15.489	0.955
4	0.081	0.007	12.688	80.655	0.932	14.838	0.986
5	0.020	0.023	11.979	80.381	0.929	15.556	0.943

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	83.246	0.094	0.012	0.106	99.228	0.772
2	7.083	0.011	0.001	0.012	97.127	2.873
3	2.660	-0.648	-0.081	-0.729	97.373	2.627
4	1.351	-0.211	-0.026	-0.238	96.892	3.108
5	1.449	-0.796	-0.100	-0.896	96.083	3.917

# Power Run

## Team 5

TeamNumber	5
TeamName	ETS
Model	MXZ
Engine	Rotax

Displacement cc	600.00
RatedSpeed	6390
RatedTorque	70.6

