



Team Results for Clean Snowmobile Challenge 2014 Team 14 ECO



2014 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2014/03/06 15:01:02
Team Name : Kettering
Team Number : 14
Model : MZR sport 600ACE
Engine : Rotax
Displacement[cc] : 600.00
100% Speed : 5735
100% Torque : 63.0
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	:	33.0	16.3	9.2	4.7	0.0	10.6
HC_m g/hr	:	5.14	9.46	7.80	9.11	7.46	2.50
CO_m g/hr	:	15.89	5.60	2.97	1.56	8.81	3.66
NOx_m g/hr	:	507.94	196.37	110.68	33.49	4.53	125.47
Soot_m mg/hr	:	12.23	7.50	5.15	4.56	4.17	6.50
N2O_m mg/hr	:	0.09	0.05	0.05	0.03	0.09	0.04
CO2_m g/hr	:	28043.32	15153.68	12743.69	12471.25	11383.50	14951.48
CH4_m g/hr	:	0.80	0.58	0.78	1.06	0.73	0.88
W_HC g/hr	:	0.62	2.55	1.95	2.83	0.37	2.50
W_CO g/hr	:	1.91	1.51	0.74	0.48	0.44	3.66
W_NOx g/hr	:	60.95	53.02	27.67	10.38	0.23	125.47
W_HCNOx g/hr	:	61.57	55.58	29.62	13.21	0.60	127.97
W_Soot mg/hr	:	1.47	2.02	1.29	1.42	0.21	6.50
W_N2O g/hr	:	0.01	0.01	0.01	0.01	0.00	0.04
W_CO2 g/hr	:	3365.20	4091.49	3185.92	3866.09	569.18	14951.48
W_CH4 g/hr	:	0.10	0.16	0.20	0.33	0.04	0.88

Total Weighted Power [kW] 12.087

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	8.32	5.08	152.25	160.57
Specific Mass [g/kW-hr]	0.69	0.42	12.60	13.28
BSFC [g/kW-hr]	488.4			

Total Soot [mg/hr] 6.40 Specific Soot [mg/kW-hr] 0.53

Not Used for Competition

Total N2O [mg/hr]	0.05	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	15077.88	Specific CO2 [g/kW-hr]	1247.45
Total CH4 [g/hr]	0.81	Specific CH4 [g/kW-hr]	0.07
RMC BSFC [g/kW-hr]	451.10		

EMISSION TESTS:

	Value	Limit	Result
Power	37.82	<96.94 kW	PASS
Soot	0.53	<100 mg/kW-hr	PASS
CO	0.42	<275 g/kW-hr	PASS
HC + NOX	13.28	<90 g/kW-hr	PASS
E-Score	201.04	>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	12032
PtsInMode	points	1210	3050	2720	3470	1480	12032
Speed	rpm	5848.51	4874.46	4214.64	3728.05	1685.38	4272.48
Torque	Nm	53.82	31.90	20.75	11.95	0.00	23.61
Power	kW	32.96	16.28	9.16	4.67	0.00	10.56
BSFC	g/kw-hr	271.31	297.14	444.23	853.45	**	451.10
Fuel	g/hr	8943.43	4837.92	4067.49	3981.34	3636.93	4765.60
T_int	degC	8.26	7.86	8.54	7.37	7.38	7.30
RelHumid	%	17.77	16.77	15.10	19.87	14.99	17.39
Baro	in Hg	28.81	28.80	28.79	28.81	28.79	28.81
Baro	mmHg	731.89	731.63	731.33	731.75	731.14	731.67
Pvap_kPa	kPa	0.18	0.17	0.16	0.19	0.14	0.17
Pvap_inHg	inHg	0.05	0.05	0.05	0.06	0.04	0.05
AbsHumidity	grains/lb	8.06	7.43	6.97	8.55	6.46	7.45
SatPres	kPa	97.40	97.38	97.35	97.37	97.33	97.38
Hum Factor		0.76	0.76	0.76	0.76	0.76	0.76
F_fac		0.98	0.98	0.98	0.97	0.98	0.97
K_fac		1.00	1.00	1.00	1.00	1.00	1.00
Humidity	g/kg	1.15	1.06	1.00	1.22	0.92	1.06
H2		0.00	0.00	0.00	0.00	0.00	0.00
WetDry Factor		0.89	0.89	0.89	0.90	0.88	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	66.39	220.25	219.95	247.66	255.19	59.09
CO	%	0.01	0.01	0.00	0.00	0.02	0.00
N2O	ppm	3.61	3.42	4.68	2.56	9.50	3.19
CH4	ppm	9.10	11.84	19.33	25.14	21.74	18.17
CO2	%	11.54	11.23	11.45	10.79	12.39	11.25
O2	%	2.83	3.36	3.03	4.06	1.49	3.74
CNOx	ppm	1999.80	1392.50	951.29	277.19	47.17	903.02
AHC	ppm	0.01	5.82	4.14	4.20	7.44	3.33
C2H2	ppm	3.05	2.12	2.10	2.07	2.95	2.20
C2H4	ppm	11.92	28.30	32.41	34.19	25.89	23.55
C3H6	ppm	0.50	2.37	1.06	0.62	2.85	1.07
C4H6	ppm	0.15	0.19	0.06	0.09	0.21	0.14
ETOH	ppm	0.06	0.94	0.79	0.63	1.40	0.65
H2O	%	10.94	10.72	10.85	10.24	11.62	0.00
HCHO	ppm	4.18	9.47	6.98	4.49	1.49	5.58
HCN	ppm	1.03	1.05	1.09	0.83	0.98	0.95
HNCO	ppm	1.91	0.49	0.25	0.25	0.10	0.50
MECHO	ppm	0.34	1.22	0.76	0.90	0.45	0.77
NC5	ppm	0.05	6.12	6.18	8.19	9.59	4.94
NH3	ppm	0.17	0.01	0.02	0.00	0.06	0.06
NO	ppm	2588.12	1816.70	1247.88	362.28	62.68	1175.74
NO2	ppm	41.02	18.01	7.56	1.60	0.05	13.84
Soot	mg/m3	0.09	0.10	0.08	0.07	0.08	0.09
AFR	:1	16.45	16.87	16.53	17.54	15.12	17.24



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.004	0.007	10.936	80.942	0.936	17.243	0.857
2	0.002	0.025	10.717	81.120	0.938	17.716	0.831
3	0.002	0.025	10.852	80.892	0.935	17.359	0.847
4	0.001	0.028	10.236	80.676	0.933	18.411	0.796
5	0.006	0.029	11.624	80.120	0.926	15.880	0.924

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	5.137	-1.844	-0.230	-2.074	96.252	3.748
2	9.462	-2.106	-0.263	-2.369	96.245	3.755
3	7.796	-1.942	-0.243	-2.185	96.036	3.964
4	9.114	-2.430	-0.304	-2.734	95.465	4.535
5	7.464	-1.034	-0.129	-1.163	95.625	4.375

Power Run

Team 14 ECO

TeamNumber	14
TeamName	Kettering
Model	MZR sport 600ACE
Engine	Rotax

Displacement cc	600.00
RatedSpeed	5735
RatedTorque	63.0

