



Team Results for Clean Snowmobile Challenge 2017 Team 14



2017 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2017/03/09 11:21:22
Team Name      : Duluth
Team Number    : 14
Model         : Kymco
Engine        : Kymco
Displacement[cc] : 700.00
100% Speed    : 6861
100% Torque   : 63.4
No of Strokes : 4
Fuel          : Gasoline           H/C: 2.38       O/C: 0.24
  
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ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power kW	:	42.5	19.8	11.3	5.6	0.0	13.4
HC_m g/hr	:	12.51	21.33	17.88	10.22	2.52	5.78
CO_m g/hr	:	451.37	420.86	261.07	106.56	13.56	267.63
NOx_m g/hr	:	61.23	7.14	4.09	0.20	0.03	6.72
Soot_m mg/hr	:	35.50	21.59	12.55	6.92	0.42	14.65
N2O_m mg/hr	:	0.13	0.03	0.05	0.01	0.00	0.04
CO2_m g/hr	:	53723.08	28001.05	16983.00	11158.13	3936.01	21848.64
CH4_m g/hr	:	7.57	7.71	3.63	3.17	1.41	5.26
W_HC g/hr	:	1.50	5.76	4.47	3.17	0.13	5.78
W_CO g/hr	:	54.16	113.63	65.27	33.03	0.68	267.63
W_NOx g/hr	:	7.35	1.93	1.02	0.06	0.00	6.72
W_HCNOx g/hr	:	8.85	7.69	5.49	3.23	0.13	12.50
W_Soot mg/hr	:	4.26	5.83	3.14	2.14	0.02	14.65
W_N2O g/hr	:	0.02	0.01	0.01	0.00	0.00	0.04
W_CO2 g/hr	:	6446.77	7560.28	4245.75	3459.02	196.80	21848.64
W_CH4 g/hr	:	0.91	2.08	0.91	0.98	0.07	5.26

Total Weighted Power [kW] 14.995

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	15.02	266.78	10.36	25.38
Specific Mass [g/kW-hr]	1.00	17.79	0.69	1.69
BSFC [g/kW-hr]	511.8			

Total Soot [mg/hr] 15.39 Specific Soot [mg/kW-hr] 1.03

Not Used for Competition

Total N2O [mg/hr]	0.04	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	21908.62	Specific CO2 [g/kW-hr]	1461.08
Total CH4 [g/hr]	4.95	Specific CH4 [g/kW-hr]	0.33
RMC BSFC [g/kW-hr]	543.43		

EMISSION TESTS:

	Value	Limit	Result
Power	45.57	<96.94 kW	PASS
Soot	1.03	<50 mg/kW-hr	PASS
CO	17.79	<275 g/kW-hr	PASS
HC + NOX	1.69	<90 g/kW-hr	PASS
E-Score	204.42	>175	PASS
Valid Data for All 5 Modes			PASS
RMC			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	6791.92	5831.16	5145.13	4279.69	1570.19	5064.60
Torque	Nm	59.82	32.41	20.89	12.47	0.00	25.32
Power	kW	42.55	19.79	11.26	5.59	0.00	13.43
BSFC	g/kw-hr	419.18	475.35	507.54	665.43	**	543.43
Fuel	g/hr	17835.08	9406.14	5712.87	3718.50	1298.25	7297.29
T_int	degC	39.81	40.84	38.59	30.49	35.31	37.00
RelHumid	%	16.97	15.05	14.38	14.72	14.02	15.14
Baro	in Hg	29.04	29.04	29.04	29.03	29.04	29.04
Baro	mmHg	737.60	737.60	737.52	737.41	737.57	737.56
Pvap_kPa	kPa	0.93	0.87	0.74	0.51	0.62	0.73
Pvap_inHg	inHg	0.28	0.26	0.22	0.15	0.18	0.21
AbsHumidity	grains/lb	41.71	38.86	33.26	22.70	27.58	32.40
SatPres	kPa	97.40	97.47	97.58	97.80	97.71	97.61
Hum Factor		0.86	0.85	0.84	0.80	0.82	0.83
F_fac		1.05	1.05	1.05	1.03	1.04	1.04
K_fac		1.05	1.05	1.05	1.03	1.04	1.04
Humidity	g/kg	5.96	5.55	4.75	3.24	3.94	4.63
H2		0.07	0.12	0.12	0.08	0.03	0.10
WetDry Factor		0.84	0.83	0.83	0.84	0.84	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	90.94	293.32	408.26	355.21	253.59	102.62
CO	%	0.17	0.30	0.31	0.19	0.07	0.24
N2O	ppm	3.05	1.35	4.06	0.84	0.32	2.08
CH4	ppm	49.56	95.44	74.66	99.17	127.76	84.16
CO2	%	12.79	12.61	12.70	12.70	12.96	12.70
O2	%	0.02	0.00	0.00	0.00	0.01	0.00
CNOx	ppm	139.43	30.75	29.24	2.16	1.00	37.37
AHC	ppm	1.95	3.21	5.70	4.37	2.76	4.08
C2H2	ppm	2.98	2.56	1.54	1.13	1.13	1.89
C2H4	ppm	5.89	27.00	36.19	14.94	8.28	23.43
C3H6	ppm	0.88	3.77	6.58	3.16	1.74	4.09
C4H6	ppm	2.02	2.68	4.82	2.22	1.40	2.82
ETOH	ppm	0.52	7.19	15.99	10.72	3.33	8.72
H2O	%	16.41	16.51	16.51	16.48	16.44	0.00
HCHO	ppm	0.70	3.17	3.32	1.84	0.57	2.44
HCN	ppm	1.89	1.14	2.04	0.69	0.33	1.26
HNCO	ppm	2.58	3.21	5.89	2.47	2.08	3.47
MECHO	ppm	0.84	7.47	24.06	14.07	1.94	12.20
NC5	ppm	0.75	2.38	9.34	9.62	4.45	5.91
NH3	ppm	23.49	33.38	105.15	42.57	15.24	51.14
NO	ppm	161.54	37.36	36.08	3.92	1.76	46.00
NO2	ppm	0.58	0.34	0.32	0.28	0.43	0.36
Soot	mg/m3	0.15	0.17	0.16	0.14	0.02	0.15
AFR	:1	11.10	10.98	10.95	11.00	11.08	11.05



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.081	0.011	16.408	87.951	1.017	15.197	0.999
2	0.144	0.035	16.510	87.550	1.012	15.087	1.000
3	0.148	0.049	16.511	87.983	1.017	15.072	1.000
4	0.091	0.043	16.477	87.653	1.013	15.131	1.000
5	0.033	0.030	16.441	88.495	1.023	15.213	0.999

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	12.508	-0.008	-0.001	-0.009	104.589	4.589
2	21.335	0.034	0.004	0.038	104.204	4.204
3	17.880	0.047	0.006	0.053	104.783	4.783
4	10.216	0.043	0.005	0.048	104.244	4.244
5	2.521	0.021	0.003	0.024	105.186	5.186

Power Run

Team 14

TeamNumber	14
TeamName	Duluth
Model	Kymco
Engine	Kymco

Displacement cc	700.00
RatedSpeed	6861
RatedTorque	63.4

