



# Team Results for Clean Snowmobile Challenge 2016 Team 4



## 2016 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2016/03/10 17:41:04  
Team Name : Duluth  
Team Number : 4  
Model : Kymco  
Engine : Kymco  
Displacement[cc] : 700.00  
100% Speed : 7382  
100% Torque : 63.1  
No of Strokes : 4  
Fuel : GASOLINE H/C: 2.00 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	:	47.1	21.1	12.1	6.0	0.0	14.5
HC_m g/hr	:	234.03	3.24	65.64	56.87	40.12	26.24
CO_m g/hr	:	19408.29	113.02	2084.98	2354.75	303.82	3037.51
NOx_m g/hr	:	18.54	38.69	27.76	5.80	0.08	21.72
Soot_m mg/hr	:	375.99	17.31	16.61	21.97	0.05	50.56
N2O_m mg/hr	:	0.60	0.06	0.06	0.07	0.01	0.11
CO2_m g/hr	:	30215.76	23151.71	12412.58	7142.20	2561.72	16038.76
CH4_m g/hr	:	56.89	1.65	8.16	5.59	4.09	10.91
W_HC g/hr	:	28.08	0.88	16.41	17.63	2.01	26.24
W_CO g/hr	:	2328.99	30.52	521.25	729.97	15.19	3037.51
W_NOx g/hr	:	2.22	10.45	6.94	1.80	0.00	21.72
W_HCNOx g/hr	:	30.31	11.32	23.35	19.43	2.01	47.96
W_Soot mg/hr	:	45.12	4.67	4.15	6.81	0.00	50.56
W_N2O g/hr	:	0.07	0.02	0.02	0.02	0.00	0.11
W_CO2 g/hr	:	3625.89	6250.96	3103.14	2214.08	128.09	16038.76
W_CH4 g/hr	:	6.83	0.44	2.04	1.73	0.20	10.91

Total Weighted Power [kW] 16.247

### Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	65.00	3625.92	21.41	86.42
Specific Mass [g/kW-hr]	4.00	223.17	1.32	5.32
BSFC [g/kW-hr]	430.5			

Total Soot [mg/hr] 60.76 Specific Soot [mg/kW-hr] 3.74

### Not Used for Competition

Total N2O [mg/hr]	0.13	Specific N2O [mg/kW-hr]	0.01
Total CO2 [g/hr]	15322.17	Specific CO2 [g/kW-hr]	943.07
Total CH4 [g/hr]	11.25	Specific CH4 [g/kW-hr]	0.69
RMC BSFC [g/kW-hr]	459.27		

### EMISSION TESTS:

	Value	Limit	Result
Power	48.77	<96.94 kW	PASS
Soot	3.74	<50 mg/kW-hr	PASS
CO	223.17	<275 g/kW-hr	PASS
HC + NOX	5.32	<90 g/kW-hr	PASS
E-Score	150.66	>175	FAIL
Valid Data for All 5 Modes			PASS
RMC			PASS
LAB EMISSION TEST			FAIL



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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	7381.04	6272.65	5537.04	4799.23	1616.83	5473.30
Torque	Nm	60.96	32.16	20.85	11.98	0.00	25.29
Power	kW	47.12	21.13	12.09	6.02	0.00	14.50
BSFC	g/kw-hr	415.54	352.08	419.01	583.28	**	459.27
Fuel	g/hr	19581.09	7437.76	5065.23	3511.98	1008.61	6658.35
T_int	degC	26.53	31.20	30.18	26.24	25.63	29.12
RelHumid	%	36.65	35.52	35.51	34.07	36.64	35.02
Baro	in Hg	28.98	28.99	28.98	28.98	28.98	28.98
Baro	mmHg	736.10	736.25	736.19	736.18	736.19	736.18
Pvap_kPa	kPa	1.03	1.27	1.21	0.94	0.98	1.13
Pvap_inHg	inHg	0.31	0.38	0.36	0.28	0.29	0.33
AbsHumidity	grains/lb	46.34	57.32	54.37	42.38	44.16	50.73
SatPres	kPa	97.10	96.88	96.94	97.20	97.16	97.02
Hum Factor		0.88	0.92	0.91	0.87	0.87	0.90
F_fac		1.02	1.04	1.03	1.02	1.02	1.03
K_fac		1.03	1.04	1.04	1.03	1.03	1.03
Humidity	g/kg	6.62	8.19	7.77	6.05	6.31	7.25
H2		3.82	0.03	1.12	2.09	0.77	1.26
WetDry Factor		0.87	0.86	0.86	0.86	0.86	1.00



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## Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	1838.00	58.55	1816.77	2342.96	5488.79	552.38
CO	%	7.63	0.10	2.89	4.86	2.08	3.20
N2O	ppm	14.99	3.38	5.69	9.74	3.43	7.21
CH4	ppm	391.66	26.09	198.07	201.95	490.08	201.35
CO2	%	7.56	13.32	10.95	9.38	11.17	10.76
O2	%	0.00	0.00	0.00	0.00	0.35	-0.03
CNOx	ppm	44.39	213.05	234.23	72.81	3.50	139.36
AHC	ppm	62.28	0.59	84.55	108.85	194.32	71.22
C2H2	ppm	26.74	1.39	6.81	9.36	7.92	7.59
C2H4	ppm	217.08	4.06	167.96	186.03	576.51	152.76
C3H6	ppm	45.90	0.48	52.11	62.18	142.41	43.01
C4H6	ppm	14.11	3.09	24.47	12.55	18.11	16.45
ETOH	ppm	5.19	1.53	8.16	12.05	9.65	6.98
H2O	%	12.97	13.96	13.96	13.72	13.96	0.00
HCHO	ppm	1.99	0.29	1.33	3.14	7.47	1.58
HCN	ppm	18.10	2.36	25.72	9.49	1.76	16.04
HNCO	ppm	0.26	2.24	0.22	0.00	0.00	1.82
MECHO	ppm	2.42	0.03	4.34	11.49	32.00	3.98
NC5	ppm	14.18	0.79	31.24	88.14	239.49	43.75
NH3	ppm	157.07	50.97	369.77	110.35	32.41	245.70
NO	ppm	49.33	229.71	257.21	83.56	3.73	154.84
NO2	ppm	1.04	1.04	0.17	0.47	0.39	0.56
Soot	mg/m3	1.91	0.18	0.28	0.57	0.00	0.64
AFR	:1	10.33	14.03	12.31	11.33	11.88	12.49



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	4.391	0.211	12.974	72.781	0.841	11.046	1.000
2	0.040	0.007	13.962	83.867	0.969	14.704	1.000
3	1.299	0.211	13.961	79.603	0.920	13.212	1.000
4	2.427	0.272	13.722	76.446	0.884	12.238	1.000
5	0.900	0.638	13.955	80.246	0.928	13.430	0.982

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	234.028	0.211	0.026	0.238	95.717	4.283
2	3.242	0.004	0.001	0.005	100.518	0.518
3	65.644	0.211	0.026	0.238	98.172	1.828
4	56.867	0.272	0.034	0.306	96.571	3.429
5	40.123	0.352	0.044	0.396	98.272	1.728

# Power Run

## Team 4

TeamNumber	4
TeamName	Duluth
Model	Kymco
Engine	Kymco

Displacement cc	700.00
RatedSpeed	7382
RatedTorque	63.1

