



## Team Results for Clean Snowmobile Challenge 2017 Team 13



**2017 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet**

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Test Date       : 2017/03/10 08:34:49
Team Name      : StCloud
Team Number    : 13
Model          : Polaris
Engine         : Polaris
Displacement[cc] : 1000.00
100% Speed    : 8139
100% Torque   : 87.5
No of Strokes : 4
Fuel           : Gasoline           H/C: 2.38       O/C: 0.24
  
```

ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power kW	:	73.5	33.0	20.0	9.2	0.0	22.6
HC_m g/hr	:	360.56	23.13	3.83	2.84	1.14	8.22
CO_m g/hr	:	8511.57	2497.01	231.69	237.47	47.45	1155.07
NOx_m g/hr	:	572.69	61.54	150.60	1.61	0.03	84.38
Soot_m mg/hr	:	114.69	4.01	0.01	0.18	0.00	15.39
N2O_m mg/hr	:	0.23	0.10	0.04	0.01	0.00	0.05
CO2_m g/hr	:	68800.40	36092.71	25783.35	15218.48	2623.08	30101.32
CH4_m g/hr	:	86.82	8.97	1.93	1.95	1.01	7.91
W_HC g/hr	:	43.27	6.25	0.96	0.88	0.06	8.22
W_CO g/hr	:	1021.39	674.19	57.92	73.62	2.37	1155.07
W_NOx g/hr	:	68.72	16.62	37.65	0.50	0.00	84.38
W_HCNOx g/hr	:	111.99	22.86	38.61	1.38	0.06	92.60
W_Soot mg/hr	:	13.76	1.08	0.00	0.06	0.00	15.39
W_N2O g/hr	:	0.03	0.03	0.01	0.00	0.00	0.05
W_CO2 g/hr	:	8256.05	9745.03	6445.84	4717.73	131.15	30101.32
W_CH4 g/hr	:	10.42	2.42	0.48	0.60	0.05	7.91

Total Weighted Power [kW] 25.580

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	51.41	1829.49	123.49	174.90
Specific Mass [g/kW-hr]	2.01	71.52	4.83	6.84
BSFC [g/kW-hr]	431.6			

Total Soot [mg/hr] 14.90      Specific Soot [mg/kW-hr] 0.58

Not Used for Competition

Total N2O [mg/hr]	0.07	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	29295.80	Specific CO2 [g/kW-hr]	1145.27
Total CH4 [g/hr]	13.98	Specific CH4 [g/kW-hr]	0.55
RMC BSFC [g/kW-hr]	463.24		

EMISSION TESTS:

	Value	Limit	Result
Power	74.55	<96.94 kW	PASS
Soot	0.58	<50 mg/kW-hr	PASS
CO	71.52	<275 g/kW-hr	PASS
HC + NOX	6.84	<90 g/kW-hr	PASS
E-Score	187.56	>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	8139.32	7056.67	6226.73	5289.46	1266.67	6083.84
Torque	Nm	86.22	44.70	30.69	16.55	0.00	35.44
Power	kW	73.49	33.03	20.01	9.17	0.00	22.58
BSFC	g/kw-hr	371.04	397.40	428.06	557.26	**	463.24
Fuel	g/hr	27266.50	13125.45	8565.17	5107.94	884.42	10458.43
T_int	degC	47.35	54.39	65.44	48.27	61.74	52.28
RelHumid	%	13.22	12.78	11.83	12.32	11.43	12.57
Baro	in Hg	29.33	29.34	29.33	29.33	29.34	29.33
Baro	mmHg	745.04	745.12	745.11	745.09	745.15	745.09
Pvap_kPa	kPa	1.04	1.37	2.03	1.01	1.68	1.23
Pvap_inHg	inHg	0.31	0.41	0.60	0.30	0.50	0.36
AbsHumidity	grains/lb	45.91	61.11	91.13	44.62	75.17	54.64
SatPres	kPa	98.29	97.96	97.30	98.33	97.66	98.10
Hum Factor		0.88	0.94	1.08	0.88	1.00	0.91
F_fac		1.06	1.08	1.11	1.06	1.10	1.07
K_fac		1.05	1.06	1.08	1.05	1.07	1.06
Humidity	g/kg	6.56	8.73	13.02	6.37	10.74	7.81
H2		0.83	0.54	0.07	0.13	0.15	0.30
WetDry Factor		0.86	0.84	0.84	0.84	0.84	1.00



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**Modal Emissions Concentrations**

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	1531.54	228.59	57.84	72.53	168.15	99.91
CO	%	1.86	1.27	0.18	0.31	0.36	0.72
N2O	ppm	3.21	3.25	1.80	0.76	0.77	2.01
CH4	ppm	332.14	79.88	26.33	44.91	133.69	86.60
CO2	%	9.57	11.68	12.77	12.74	12.64	11.98
O2	%	3.13	0.17	0.11	0.03	0.04	0.74
CNOx	ppm	761.95	190.49	713.35	12.90	1.19	321.12
AHC	ppm	15.81	4.67	1.93	1.39	0.81	4.10
C2H2	ppm	20.17	3.37	1.36	1.29	0.86	3.98
C2H4	ppm	220.18	22.69	3.78	4.80	1.60	34.90
C3H6	ppm	18.93	2.62	1.30	0.77	0.82	3.83
C4H6	ppm	15.05	4.51	1.96	2.68	2.47	4.25
ETOH	ppm	59.12	2.39	0.80	0.41	0.53	10.23
H2O	%	14.00	15.82	16.03	15.79	16.30	0.00
HCHO	ppm	9.30	1.23	0.50	0.38	0.37	1.70
HCN	ppm	12.70	1.24	0.27	0.22	0.13	1.94
HNCO	ppm	5.89	3.20	2.61	1.85	1.91	2.93
MECHO	ppm	35.77	2.08	0.92	0.54	0.23	5.38
NC5	ppm	8.24	1.38	1.08	1.02	1.21	2.90
NH3	ppm	255.00	103.51	13.96	26.60	23.85	69.00
NO	ppm	867.19	204.20	660.74	15.91	1.77	353.19
NO2	ppm	0.27	0.29	0.27	0.32	0.36	0.30
Soot	mg/m3	0.29	0.02	0.00	0.00	0.00	0.11
AFR	:1	11.92	10.72	11.18	11.05	11.01	11.31



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.962	0.178	13.996	85.150	0.984	16.621	0.842
2	0.640	0.027	15.823	84.627	0.978	14.732	0.992
3	0.086	0.007	16.032	87.419	1.010	15.279	0.994
4	0.149	0.009	15.794	86.479	1.000	15.129	0.998
5	0.173	0.020	16.304	87.482	1.011	15.102	0.998

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	360.559	-1.947	-0.243	-2.190	101.930	1.930
2	23.131	-0.103	-0.013	-0.116	101.733	1.733
3	3.825	-0.081	-0.010	-0.091	104.055	4.055
4	2.838	-0.016	-0.002	-0.018	103.146	3.146
5	1.143	-0.014	-0.002	-0.015	104.231	4.231

# Power Run

Team 13

TeamNumber	13
TeamName	StCloud
Model	Polaris
Engine	Polaris

Displacement cc	1000.00
RatedSpeed	8139
RatedTorque	87.5

