



## Team Results for Clean Snowmobile Challenge 2013 Team 5



2012 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2013/03/06 15:12:31
Team Name      : MTU
Team Number    : 5
Model         : Polaris
Engine        : Pro Star 900
Displacement[cc] : 875.00
100% Speed    : 6116
100% Torque   : 67.8
No of Strokes : 4
Fuel          : GASOLINE           H/C: 2.50       O/C: 0.28
  
```

ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	36.8	18.9	10.9	5.5	0.0
HC_m g/hr	:	3.20	53.44	43.18	13.22	66.56
CO_m g/hr	:	10.19	3773.37	1951.61	495.66	720.31
NOx_m g/hr	:	581.34	34.21	0.01	0.00	0.00
Soot_m mg/hr	:	13.43	14.05	5.18	1.64	0.56
N2O_m mg/hr	:	0.03	0.01	0.00	0.00	0.00
CO2_m g/hr	:	37140.70	20697.49	13010.23	9422.71	4408.92
CH4_m g/hr	:	0.75	17.98	9.28	3.64	14.31
W_HC g/hr	:	0.38	14.43	10.80	4.10	3.33
W_CO g/hr	:	1.22	1018.81	487.90	153.65	36.02
W_NOx g/hr	:	69.76	9.24	0.00	0.00	0.00
W_HCNOx g/hr	:	70.14	23.66	10.80	4.10	3.33
W_Soot mg/hr	:	1.61	3.79	1.30	0.51	0.03
W_N2O g/hr	:	0.00	0.00	0.00	0.00	0.00
W_CO2 g/hr	:	4456.88	5588.32	3252.56	2921.04	220.45
W_CH4 g/hr	:	0.09	4.86	2.32	1.13	0.72

Total Weighted Power [kW] 13.941

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	33.04	1697.60	79.00	112.04
Specific Mass [g/kW-hr]	2.37	121.77	5.67	8.04
BSFC [g/kW-hr]	481.4			

Total Soot [mg/hr] 7.24      Specific Soot [mg/kW-hr] 0.52

Not Used for Competition

Total N2O [mg/hr]	0.01	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	16439.25	Specific CO2 [g/kW-hr]	1179.20
Total CH4 [g/hr]	9.11	Specific CH4 [g/kW-hr]	0.65

EMISSION TESTS:

	Value	Limit	Result
Power	43.42	<96.94 kW	PASS
Soot	0.52	<100 mg/kW-hr	PASS
CO	121.77	<275 g/kW-hr	PASS
HC + NOX	8.04	<90 g/kW-hr	PASS
E-Score	174.20	>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
Total Points	points	600	1200	951	1200	1200
PtsInMode	points	1200	1800	1800	1800	1800
Speed	rpm	6112.83	5198.57	4586.71	3975.83	2878.21
Torque	Nm	57.50	34.80	22.63	13.11	0.00
Power	kW	36.81	18.94	10.87	5.46	0.00
BSFC	g/kw-hr	333.48	467.07	492.44	619.96	**
Fuel	g/hr	12275.67	8847.82	5353.13	3382.67	1896.59
T_int	degC	11.57	9.88	11.71	12.66	10.22
RelHumid	%	24.84	29.31	26.93	26.11	24.62
Baro	in Hg	29.15	29.15	29.15	29.15	29.15
Baro	mmHg	740.29	740.29	740.29	740.44	740.37
Pvap_kPa	kPa	0.31	0.33	0.33	0.34	0.28
Pvap_inHg	inHg	0.09	0.10	0.10	0.10	0.08
AbsHumidity	grains/lb	13.56	14.49	14.82	15.19	12.41
SatPres	kPa	98.39	98.37	98.36	98.37	98.43
Hum Factor		0.78	0.78	0.78	0.78	0.77
F_fac		0.97	0.97	0.98	0.98	0.97
K_fac		1.00	0.99	1.00	1.00	0.99
Humidity	g/kg	1.94	2.07	2.12	2.17	1.77
H2		0.00	1.50	1.23	0.44	1.33
WetDry Factor		0.88	0.85	0.84	0.84	0.84

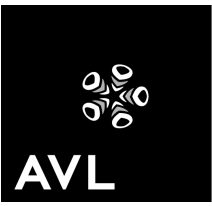


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**Modal Emissions Concentrations**

ModeNum		1	2	3	4	5
THC	ppmC1	25.40	832.12	1098.32	508.85	4906.13
CO	%	0.00	3.05	2.58	0.99	2.76
N2O	ppm	0.91	0.26	0.00	0.00	0.00
CH4	ppm	5.41	254.40	214.43	127.28	958.42
CO2	%	9.73	10.65	10.93	11.98	10.73
O2	%	4.78	0.36	0.00	0.00	0.00
CNOx	ppm	1457.55	168.33	0.08	0.02	0.04
AHC	ppm	0.01	26.60	41.92	12.52	141.16
C2H2	ppm	1.13	1.38	1.19	1.08	1.40
C2H4	ppm	5.22	49.78	90.04	49.98	147.34
C3H6	ppm	0.07	2.63	4.98	3.68	18.75
C4H6	ppm	0.14	23.84	31.82	10.94	7.11
ETOH	ppm	0.28	14.29	17.14	9.22	1.46
H2O	%	12.44	14.76	15.64	16.16	15.69
HCHO	ppm	1.22	0.46	0.58	0.33	2.33
HCN	ppm	0.33	1.23	0.72	0.48	0.68
HNCO	ppm	3.32	15.06	20.09	6.66	0.01
MECHO	ppm	0.04	4.36	1.97	0.79	7.62
NC5	ppm	2.10	27.76	35.08	13.95	411.21
NH3	ppm	1.63	691.20	867.61	283.10	96.10
NO	ppm	1831.90	211.70	0.06	0.07	0.07
NO2	ppm	45.87	10.62	0.10	0.02	0.03
Soot	mg/m3	0.06	0.13	0.08	0.04	0.02
AFR	:1	14.46	9.71	9.62	10.34	8.75



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Measurement Accuracy (SAE paper 961804)

	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.002	0.003	12.441	85.225	0.985	20.176	0.761
2	1.754	0.098	14.764	82.199	0.950	14.098	0.982
3	1.460	0.130	15.637	82.956	0.959	14.038	1.000
4	0.519	0.061	16.156	85.377	0.987	14.875	1.000
5	1.579	0.582	15.690	82.623	0.955	13.564	1.000

	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
	3.201	-2.656	-0.332	-2.989	100.022	0.022
	53.435	-0.200	-0.025	-0.225	101.194	1.194
	43.184	0.130	0.016	0.146	101.530	1.530
	13.225	0.061	0.008	0.068	102.414	2.414
	66.565	0.581	0.073	0.654	101.811	1.811

# Power Run

## Team 5

TeamNumber	5
TeamName	MTU
Model	Polaris
Engine	Pro Star 900

Displacement cc	875.00
RatedSpeed	6116
RatedTorque	67.8

