



# Team Results for Clean Snowmobile Challenge 2015 Team 13



## 2015 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2015/03/05 16:00:32  
Team Name : Iowa State  
Team Number : 13  
Model : Polaris  
Engine : Dragon  
Displacement[cc] : 795.00  
100% Speed : 8024  
100% Torque : 109.9  
No of Strokes : 2  
Fuel : GASOLINE H/C: 1.92 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	:	86.6	40.1	22.9	15.0	0.0	28.3
HC_m g/hr	:	4653.95	2402.94	1240.16	1107.58	1338.37	873.68
CO_m g/hr	:	46779.95	14799.52	2875.54	4153.28	1787.43	10358.71
NOx_m g/hr	:	31.84	23.79	37.30	2.55	0.00	25.18
Soot_m mg/hr	:	8828.57	1952.68	792.64	197.31	519.70	1562.92
N2O_m mg/hr	:	1.58	0.53	0.09	0.15	0.08	0.36
CO2_m g/hr	:	37733.67	21892.25	17223.64	10421.07	1560.96	22579.85
CH4_m g/hr	:	314.98	87.88	20.02	20.93	7.70	57.50
W_HC g/hr	:	558.47	648.79	310.04	343.35	66.92	873.68
W_CO g/hr	:	5613.59	3995.87	718.88	1287.52	89.37	10358.71
W_NOx g/hr	:	3.82	6.42	9.32	0.79	0.00	25.18
W_HCNOx g/hr	:	562.29	655.22	319.36	344.14	66.92	898.86
W_Soot mg/hr	:	1059.43	527.22	198.16	61.17	25.99	1562.92
W_N2O g/hr	:	0.19	0.14	0.02	0.05	0.00	0.36
W_CO2 g/hr	:	4528.04	5910.91	4305.91	3230.53	78.05	22579.85
W_CH4 g/hr	:	37.80	23.73	5.01	6.49	0.39	57.50

Total Weighted Power [kW] 31.583

### Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	1927.57	11705.24	20.36	1947.93
Specific Mass [g/kW-hr]	61.03	370.62	0.64	61.68
BSFC [g/kW-hr]	390.6			

Total Soot [mg/hr] 1871.96 Specific Soot [mg/kW-hr] 59.27

### Not Used for Competition

Total N2O [mg/hr]	0.41	Specific N2O [mg/kW-hr]	0.01
Total CO2 [g/hr]	18053.44	Specific CO2 [g/kW-hr]	571.63
Total CH4 [g/hr]	73.40	Specific CH4 [g/kW-hr]	2.32
RMC BSFC [g/kW-hr]	466.20		

### EMISSION TESTS:

	Value	Limit	Result
Power	92.35	<96.94 kW	PASS
Soot	59.27	<100 mg/kW-hr	PASS
CO	370.62	<275 g/kW-hr	FAIL
HC + NOX	61.68	<90 g/kW-hr	PASS
E-Score	76.23	>100	FAIL
Valid Data for All 5 Modes			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	8024.43	6820.25	6018.60	5736.83	1831.90	6123.55
Torque	Nm	103.07	56.10	36.27	25.00	0.00	44.12
Power	kW	86.61	40.07	22.86	15.02	0.00	28.29
BSFC	g/kw-hr	460.84	417.15	355.73	431.35	**	466.20
Fuel	g/hr	39913.63	16713.30	8131.91	6479.41	2723.40	13190.25
T_int	degC	9.00	9.00	9.00	9.00	9.00	9.00
RelHumid	%	15.79	16.86	13.59	20.50	15.97	16.49
Baro	in Hg	29.12	29.13	29.12	29.13	29.12	29.13
Baro	mmHg	739.70	739.78	739.76	739.83	739.72	739.78
Pvap_kPa	kPa	0.17	0.18	0.14	0.22	0.17	0.17
Pvap_inHg	inHg	0.05	0.05	0.04	0.06	0.05	0.05
AbsHumidity	grains/lb	7.40	7.91	6.37	9.62	7.49	7.73
SatPres	kPa	98.45	98.45	98.48	98.42	98.45	98.45
Hum Factor		1.00	1.00	1.00	1.00	1.00	1.00
F_fac		0.97	0.97	0.97	0.97	0.97	0.97
K_fac		0.99	0.99	0.99	0.99	0.99	0.99
Humidity	g/kg	1.06	1.13	0.91	1.37	1.07	1.10
H2		5.24	3.15	0.89	2.01	2.48	2.23
WetDry Factor		0.90	0.89	0.89	0.89	0.95	1.00



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## Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	18251.62	21028.79	20694.51	24950.87	66426.04	8470.09
CO	%	9.14	6.45	2.39	4.66	4.42	5.00
N2O	ppm	19.63	14.79	4.63	10.65	12.78	11.17
CH4	ppm	1077.05	670.58	291.34	411.01	333.28	486.06
CO2	%	4.69	6.07	9.11	7.44	2.46	6.94
O2	%	3.19	3.62	3.35	3.39	11.36	4.29
CNOx	ppm	37.87	63.14	188.74	17.45	0.00	74.03
AHC	ppm	438.37	813.69	788.23	710.04	1567.40	779.21
C2H2	ppm	244.45	322.81	131.42	292.97	1607.78	304.69
C2H4	ppm	789.19	555.17	652.35	361.79	510.15	541.27
C3H6	ppm	546.54	439.36	541.47	259.13	183.73	414.20
C4H6	ppm	0.00	0.00	0.00	0.00	9.32	0.33
ETOH	ppm	243.91	386.85	353.90	578.08	1062.96	468.06
H2O	%	10.41	10.53	11.07	10.93	5.27	0.05
HCHO	ppm	442.60	414.84	523.85	201.03	150.10	370.46
HCN	ppm	11.95	9.98	7.73	7.05	0.00	8.50
HNCO	ppm	0.00	0.00	0.00	0.55	0.00	0.55
MECHO	ppm	149.66	121.18	175.14	211.82	262.69	173.41
NC5	ppm	917.04	1481.72	1381.87	2004.25	13191.33	1948.50
NH3	ppm	29.34	13.10	3.28	7.24	0.01	9.73
NO	ppm	32.31	54.10	170.50	14.62	0.00	66.68
NO2	ppm	5.56	9.04	18.15	2.82	0.00	7.96
Soot	mg/m3	22.98	10.91	7.96	2.76	16.01	9.30
AFR	:1	8.17	8.78	10.00	8.69	6.35	12.08



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	5.846	2.037	10.414	71.053	0.821	10.561	0.834
2	3.521	2.350	10.533	73.325	0.848	11.861	0.813
3	1.000	2.327	11.071	77.737	0.899	13.704	0.829
4	2.257	2.801	10.934	75.303	0.870	12.259	0.826
5	2.617	7.012	5.271	72.720	0.841	13.318	0.419

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	4653.948	-0.864	-0.108	-0.972	95.744	4.256
2	2402.937	-0.707	-0.088	-0.795	94.952	5.048
3	1240.159	-0.282	-0.035	-0.317	96.035	3.965
4	1107.575	-0.058	-0.007	-0.065	95.757	4.243
5	1338.370	-1.284	-0.160	-1.444	93.979	6.021

# Power Run

Team 13

TeamNumber	13
TeamName	Iowa State
Model	Polaris
Engine	Dragon

Displacement cc	795.00
RatedSpeed	8024
RatedTorque	109.9

