



Team Results for Clean Snowmobile Challenge 2011

2011 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date      :
Team Name     : Michigan Tech Univ
Team Number   : 2
Model        : MTU
Engine       : MTU
Displacement[cc] : 750cc
100% Speed   : 7550
100% Torque  : 77.0
No of Strokes : 4
Fuel         : Gasoline           H/C: 1.92       O/C: 0.10
  
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ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	60.0	24.9	15.2	7.1	0.0
HC_m g/hr	:	24.27	175.21	243.34	92.50	1.67
CO_m g/hr	:	2429.92	9990.25	7585.25	3463.93	0.18
NOx_m g/hr	:	28.34	0.32	0.14	0.06	2.72
Soot_m mg/hr	:	0.00	0.00	0.00	0.00	0.00
N2O_m mg/hr	:	0.03	0.02	0.01	0.01	0.00
CO2_m g/hr	:	102508.27	46189.40	29726.84	22175.11	6045.68
CH4_m g/hr	:	12.07	60.41	49.93	21.88	1.69
W_HC g/hr	:	2.91	47.31	60.84	28.67	0.08
W_CO g/hr	:	291.59	2697.37	1896.31	1073.82	0.01
W_NOx g/hr	:	3.40	0.09	0.03	0.02	0.14
W_HCNOx g/hr	:	6.31	47.39	60.87	28.69	0.22
W_Soot mg/hr	:	0.00	0.00	0.00	0.00	0.00
W_N2O g/hr	:	0.00	0.01	0.00	0.00	0.00
W_CO2 g/hr	:	12300.99	12471.14	7431.71	6874.28	302.28
W_CH4 g/hr	:	1.45	16.31	12.48	6.78	0.08

Total Weighted Power [kW] 19.938

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	139.81	5959.10	3.68	143.49
Specific Mass [g/kW-hr]	7.01	298.88	0.18	7.20
BSFC [g/kW-hr]	889.0			

Total Soot [mg/hr] 0.00 Specific Soot [mg/kW-hr] 0.00

Not Used for Competition

Total N2O [mg/hr]	0.01	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	39380.41	Specific CO2 [g/kW-hr]	1975.12
Total CH4 [g/hr]	37.11	Specific CH4 [g/kW-hr]	1.86

EMISSION TESTS:

	Value	Limit	Result
Power	60.88	<96.94 kW	PASS
Soot	0.00	<100 mg/kW-hr	PASS
CO	298.88	<275 g/kW-hr	FAIL
HC + NOX	7.20	<90 g/kW-hr	PASS
E-Score	130.48	>100	PASS
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
Total Points	points	454	1206	624	1206	1134
PtsInMode	points	456	1206	646	1211	1206
Speed	rpm	7548.14	6426.49	5649.17	4901.30	2180.22
Torque	Nm	75.87	37.04	25.78	13.81	0.00
Power	kW	59.97	24.93	15.25	7.09	0.00
BSFC	g/kw-hr	562.29	793.79	881.46	1247.76	**
Fuel	g/hr	33722.93	19789.24	13442.15	8845.56	1917.86
T_int	degC	18.22	20.39	18.78	19.20	18.69
RelHumid	%	22.37	24.80	23.42	22.37	20.80
Baro	in Hg	28.74	28.76	28.75	28.74	28.74
Baro	mmHg	730.00	730.53	730.18	730.12	730.01
Pvap kPa	kPa	0.40	0.50	0.43	0.42	0.38
Pvap inHg	inHg	0.12	0.15	0.13	0.13	0.11
AbsHumidity	grains/lb	18.09	22.61	19.54	19.10	17.26
SatPres	kPa	96.92	96.89	96.91	96.92	96.94
Hum Factor		0.79	0.80	0.79	0.79	0.79
F_fac		1.01	1.01	1.01	1.01	1.01
K_fac		1.02	1.03	1.02	1.02	1.02
Humidity	g/kg	2.58	3.23	2.79	2.73	2.47
H2		0.16	1.08	1.70	1.06	0.00
WetDry Factor		0.86	0.89	0.88	0.88	0.87



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	97.94	983.45	2772.12	1540.59	114.82
CO	%	0.49	2.79	4.30	2.87	0.00
N2O	ppm	0.40	0.39	0.42	0.38	0.02
CH4	ppm	42.47	295.59	495.89	317.75	101.25
CO2	%	13.11	8.22	10.73	11.71	13.18
O2	%	0.00	4.70	0.00	0.00	0.47
CNOx	ppm	34.68	0.55	0.47	0.28	56.78
AHC	ppm	1.96	57.19	224.33	117.09	0.00
C2H2	ppm	0.46	0.36	0.42	0.18	0.22
C2H4	ppm	7.87	66.40	175.45	75.29	1.09
C3H6	ppm	0.00	3.99	29.04	8.61	0.02
C4H6	ppm	12.03	8.24	9.12	5.66	0.19
ETOH	ppm	10.62	8.88	10.09	10.66	2.64
H2O	%	13.85	10.88	12.45	12.03	13.46
HCHO	ppm	0.13	0.24	0.38	0.32	0.39
HCN	ppm	0.72	1.31	2.64	1.74	0.23
HNCO	ppm	11.84	8.36	4.11	4.48	1.88
MECHO	ppm	0.00	0.22	3.71	0.36	0.01
NC5	ppm	0.20	0.44	1.71	0.00	0.58
NH3	ppm	402.33	294.37	216.37	200.48	7.96
NO	ppm	43.99	0.41	0.30	0.19	72.23
NO2	ppm	0.07	0.36	0.33	0.20	0.07
Soot	mg/m3	0.00	0.00	0.00	0.00	0.00
AFR	:1	12.58	14.73	10.51	11.30	13.09



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Clean Snowmobile Challenge 2011**

Measurement Accuracy (SAE paper 961804)

H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
0.186	0.011	13.852	83.446	0.965	14.405	1.000
1.208	0.110	10.883	79.999	0.925	17.038	0.763
1.946	0.317	12.448	77.899	0.900	12.507	1.000
1.204	0.175	12.027	77.944	0.901	13.216	1.000
0.000	0.013	13.457	83.716	0.968	14.983	0.976

ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
24.268	0.011	0.001	0.013	100.402	0.402
175.205	-2.844	-0.356	-3.200	96.562	3.438
243.344	0.317	0.040	0.356	98.274	1.726
92.496	0.175	0.022	0.197	96.819	3.181
1.669	-0.350	-0.044	-0.394	100.071	0.071

Power Run

TeamNumber	2
TeamName	Michigan Tech Univ
Model	MTU
Engine	MTU

Displacement cc	750cc
RatedSpeed	7550
RatedTorque	77.0

