



Team Results for Clean Snowmobile Challenge 2010

2010 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Team Name : Univ of Minnesota-Duluth
 Model : UM-D
 Engine : UM-D
 Displacement[cc] : 700cc
 100% Speed : 7443
 100% Torque : 81.0
 No of Strokes : 2
 Fuel : Gasoline H/C: 1.85 O/C: 0.07

ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	63.9	25.4	14.7	8.8	0.0
HC_m g/hr	:	9518.15	926.79	805.41	813.57	633.01
CO_m g/hr	:	18547.26	2323.49	328.40	421.55	506.61
NOx_m g/hr	:	566.88	83.66	33.17	12.21	0.12
N2O_m g/hr	:	0.00	0.00	0.00	0.00	0.00
Soot_m mg/hr	:	153.01	57.75	22.30	5.76	3.83
W_HC g/hr	:	1142.18	250.23	201.35	252.21	31.65
W_CO g/hr	:	2225.67	627.34	82.10	130.68	25.33
W_NOx g/hr	:	68.03	22.59	8.29	3.79	0.01
W_HCNOx g/hr	:	1210.20	272.82	209.65	255.99	31.66
W_Soot mg/hr	:	18.36	15.59	5.57	1.79	0.19

Total Weighted Power [kW] 20.917

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	1877.6	3091.1	102.7	1980.3
Specific Mass [g/kW-hr]	89.8	147.8	4.9	94.7

Total Soot [mg/hr] 41.5 Specific Soot [mg/kW-hr] 2.0
 BSFC [g/kW-hr] 411.3

Not Used for Competition

	CO2	N2O	CH4
Total Mass [g/hr]	42972	0.00	126.94
Specific Mass [g/kW-hr]	5157	0.00	15.23

EMISSION TESTS:

	Value	Limit	Result
Power	63.9	<96.94 kW	PASS
Soot	1.984	<100 mg/kW-hr	PASS
CO	147.78	<275 g/kW-hr	PASS
HC + NOX	94.67	<90 g/kW-hr	FAIL
E-Score	109.9	>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	346	1206	1202	1182	1241
PtsInMode	points	346	1206	1202	1182	1241
Speed	rpm	7436.33	6308.92	5586.86	4831.52	1826.03
Torque	Nm	82.07	38.40	25.04	17.44	0.00
Power	kW	63.91	25.37	14.65	8.82	0.00
BSFC	g/kw-hr	504.59	371.00	386.58	496.59	**
Fuel	g/hr	32248.07	9413.34	5663.44	4380.85	1535.31
T_int	degC	30.99	25.65	24.98	24.53	23.65
RelHumid	%	102.83	101.65	98.12	88.94	86.31
Baro	in Hg	30.07	30.06	30.05	30.05	30.05
Baro	mmHg	763.78	763.53	763.35	763.27	763.27
Pvap_kPa	kPa	3.65	2.73	2.55	2.25	2.09
Pvap_inHg	inHg	1.08	0.81	0.75	0.67	0.62
AbsHumidity	grains/lb	162.01	120.31	111.90	98.74	91.26
SatPres	kPa	98.17	99.05	99.22	99.50	99.67
Hum Factor		1.00	1.00	1.00	1.00	1.00
F_fac		1.02	1.00	1.00	0.99	0.99
K_fac		1.00	0.99	0.99	0.99	0.99
Humidity	g/kg	23.14	17.19	15.99	14.11	13.04
H2		1.97	0.50	0.11	0.20	0.91
WetDry Factor		0.89	0.89	0.90	0.89	0.92



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	48514.90	11940.56	17244.87	24659.45	61073.31
CO	%	4.68	1.48	0.35	0.63	2.42
N2O	ppm	0.02	0.00	0.21	0.00	0.00
CH4	ppm	560.96	184.47	75.53	115.01	946.03
CO2	%	6.90	9.45	10.05	10.18	6.28
O2	%	4.67	4.22	4.73	4.16	8.43
CNOx	ppm	871.25	325.01	214.18	111.62	3.51
AHC	ppm	3196.53	736.83	1105.85	1628.43	4046.25
C2H2	ppm	113.44	42.52	23.01	39.28	499.04
C2H4	ppm	1043.69	564.66	244.51	203.27	378.75
C3H6	ppm	761.59	279.46	178.90	143.55	155.38
C4H6	ppm	55.50	16.16	8.78	7.49	15.52
ETOH	ppm	2076.09	319.93	843.95	1422.45	3647.91
H2O	%	10.75	10.66	10.28	10.62	7.96
HCHO	ppm	1217.85	668.73	333.04	203.02	159.34
HCN	ppm	16.17	6.98	2.08	1.43	5.04
HNCO	ppm	133.93	102.11	44.33	23.41	0.00
MECHO	ppm	945.70	334.64	325.21	252.70	335.74
NC5	ppm	7111.08	38.92	349.70	194.55	943.27
NH3	ppm	20.02	5.28	0.59	0.10	0.93
NO	ppm	476.58	267.27	174.91	26.66	0.42
SO2	ppm	32.89	17.40	1.59	0.00	36.36
Soot	mg/m3	0.360	0.425	0.254	0.089	0.135
ModalAFR_MO	-	14.833	16.370	17.650	16.784	21.171