



Team Results for Clean Snowmobile Challenge 2010

2010 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Team Name : North Dakota State Univ
 Model : NDSU
 Engine : NDSU
 Displacement[cc] : 750cc
 100% Speed : 5600
 100% Torque : 133.0
 No of Strokes : 4
 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	:	43.7	31.2	18.4	10.0	0.0
HC_m g/hr	:	609.33	7.36	1.83	0.05	0.02
CO_m g/hr	:	37651.77	34.61	22.92	9.29	114.53
NOx_m g/hr	:	7.60	141.68	13.71	0.65	0.01
N2O_m g/hr	:	0.00	0.00	0.00	0.00	0.00
Soot_m mg/hr	:	3550.04	1346.46	87.01	14.84	0.93
W_HC g/hr	:	73.12	1.99	0.46	0.02	0.00
W_CO g/hr	:	4518.21	9.34	5.73	2.88	5.73
W_NOx g/hr	:	0.91	38.25	3.43	0.20	0.00
W_HCNOx g/hr	:	74.03	40.24	3.89	0.22	0.00
W_Soot mg/hr	:	426.00	363.54	21.75	4.60	0.05

Total Weighted Power [kW] 21.382

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	75.6	4541.9	42.8	118.4
Specific Mass [g/kW-hr]	3.5	212.4	2.0	5.5

Total Soot [mg/hr] 816.0 Specific Soot [mg/kW-hr] 38.2
 BSFC [g/kW-hr] 389.2

Not Used for Competition

	CO2	N2O	CH4
Total Mass [g/hr]	34134	0.00	246.29
Specific Mass [g/kW-hr]	4096	0.00	29.55

EMISSION TESTS:

	Value	Limit	Result
Power	43.7	<96.94 kW	PASS
Soot	38.160	<100 mg/kW-hr	PASS
CO	212.42	<275 g/kW-hr	PASS
HC + NOX	5.54	<90 g/kW-hr	PASS
E-Score	153.2	>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	367	1207	1210	1206	1322
PtsInMode	points	367	1207	1210	1206	1322
Speed	rpm	5226.00	4760.48	4200.96	3620.89	1504.52
Torque	Nm	79.90	62.60	41.87	26.41	0.00
Power	kW	43.72	31.21	18.42	10.01	0.00
BSFC	g/kw-hr	686.46	352.78	363.83	388.97	**
Fuel	g/hr	30015.06	11009.53	6701.14	3895.40	942.44
T_int	degC	25.70	35.20	35.21	39.05	33.60
RelHumid	%	96.55	69.84	55.94	80.58	82.92
Baro	in Hg	30.14	30.13	30.12	30.12	30.12
Baro	mmHg	765.56	765.30	765.05	765.05	765.05
Pvap_kPa	kPa	2.60	3.06	2.45	4.27	3.36
Pvap_inHg	inHg	0.77	0.91	0.73	1.26	0.99
AbsHumidity	grains/lb	114.08	134.91	107.47	190.32	148.35
SatPres	kPa	99.46	98.96	99.54	97.72	98.63
Hum Factor		1.22	1.39	1.18	2.18	1.53
F_fac		1.00	1.02	1.02	1.05	1.02
K_fac		0.99	1.00	1.00	1.01	1.00
Humidity	g/kg	16.30	19.27	15.35	27.19	21.19
H2		5.12	0.01	0.01	0.00	0.27
WetDry Factor		0.90	0.87	0.87	0.87	0.87



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	3137.11	90.60	37.31	1.87	3.31
CO	%	9.60	0.02	0.02	0.02	0.84
N2O	ppm	0.38	0.69	0.29	0.13	0.02
CH4	ppm	1099.34	5.07	1.94	0.73	2.67
CO2	%	5.54	13.53	13.60	13.62	13.14
O2	%	2.46	0.12	0.00	0.00	0.00
CNOx	ppm	11.81	526.00	84.09	6.81	0.50
AHC	ppm	157.59	6.48	2.06	0.00	0.00
C2H2	ppm	21.03	1.84	0.78	0.58	0.70
C2H4	ppm	220.60	2.70	0.94	0.25	0.08
C3H6	ppm	32.53	0.30	0.08	0.01	0.02
C4H6	ppm	7.32	0.65	0.41	0.24	3.73
ETOH	ppm	8.95	1.10	1.56	1.71	5.51
H2O	%	9.93	12.96	13.05	13.24	12.50
HCHO	ppm	4.37	0.84	0.39	0.23	0.19
HCN	ppm	7.30	0.56	0.31	0.25	0.65
HNCO	ppm	3.81	1.97	1.65	1.31	1.75
MECHO	ppm	12.03	0.01	0.00	0.00	0.00
NC5	ppm	0.18	0.00	0.00	0.00	0.00
NH3	ppm	75.39	5.21	1.74	1.08	79.25
NO	ppm	9.07	377.79	71.24	3.15	0.35
SO2	ppm	1.51	2.53	2.26	2.04	1.75
Soot	mg/m3	12.382	10.320	1.109	0.327	0.087
ModalAFR_MO	-	10.482	13.244	13.071	13.020	12.701