



Team Results for Clean Snowmobile Challenge 2019 Team 108



2019 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2019/03/05 13:37:12
 Team Name : Bison Motorsports
 Team Number : 108
 Model : Mercedes
 Engine : Mercedes
 Displacement[cc] : 800.00
 100% Speed : 4001
 100% Torque : 58.7
 No of Strokes : 4
 Fuel : Diesel H/C: 1.81 O/C: 0.00

ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power kW	:	22.9	10.6	6.1	3.2	0.0	7.6
HC_m g/hr	:	82.74	0.15	0.06	0.95	0.45	15.61
CO_m g/hr	:	2120.79	0.10	0.01	2.31	0.01	295.03
NOx_m g/hr	:	53.97	134.45	108.88	63.42	10.18	103.39
Soot_m mg/hr	:	56565.66	4048.84	269.09	154.68	69.83	**
N2O_m mg/hr	:	0.15	0.03	0.03	0.02	0.03	0.05
CO2_m g/hr	:	25126.02	12946.98	8448.61	5846.62	1773.74	10903.33
CH4_m g/hr	:	14.61	0.09	0.08	0.07	0.21	5.43
W_HC g/hr	:	9.93	0.04	0.02	0.29	0.02	15.61
W_CO g/hr	:	254.49	0.03	0.00	0.72	0.00	295.03
W_NOx g/hr	:	6.48	36.30	27.22	19.66	0.51	103.39
W_HCNOx g/hr	:	16.41	36.34	27.23	19.95	0.53	118.99
W_Soot mg/hr	:	6787.88	1093.19	67.27	47.95	3.49	**
W_N2O g/hr	:	0.02	0.01	0.01	0.01	0.00	0.05
W_CO2 g/hr	:	3015.12	3495.68	2112.15	1812.45	88.69	10903.33
W_CH4 g/hr	:	1.75	0.02	0.02	0.02	0.01	5.43

Total Weighted Power [kW] 8.124

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	10.30	255.24	90.17	100.47
Specific Mass [g/kW-hr]	1.27	31.42	11.10	12.37
BSFC [g/kW-hr]	440.3			

Total Soot [mg/hr] 7999.78 Specific Soot [mg/kW-hr] 984.75

Not Used for Competition

Total N2O [mg/hr]	0.04	Specific N2O [mg/kW-hr]	0.01
Total CO2 [g/hr]	10524.10	Specific CO2 [g/kW-hr]	1295.48
Total CH4 [g/hr]	1.83	Specific CH4 [g/kW-hr]	0.23
RMC BSFC [g/kW-hr]	470.42		

EMISSION TESTS:

	Value	Limit	Result
Power	24.58	<96.94 kW	PASS
Soot	984.75	<50 mg/kW-hr	FAIL
CO	31.42	<275 g/kW-hr	PASS
HC + NOX	12.37	<90 g/kW-hr	PASS
E-Score	193.90	>175	PASS
Valid Data for All 5 Modes			PASS
RMC			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	1520	1200	1200	1200	11432
PtsInMode	points	1210	3370	3470	1800	1480	11432
Speed	rpm	3919.85	3401.24	3000.97	2603.46	1016.03	3036.92
Torque	Nm	55.90	29.89	19.29	11.60	0.00	23.99
Power	kW	22.95	10.65	6.06	3.16	0.00	7.63
BSFC	g/kw-hr	393.44	382.25	438.19	581.76	**	470.42
Fuel	g/hr	9027.90	4069.76	2655.68	1839.83	557.99	3588.51
T_int	degC	20.91	24.19	25.21	19.80	24.86	23.24
RelHumid	%	11.21	13.92	12.08	14.89	11.38	13.62
Baro	in Hg	28.81	28.80	28.80	28.80	28.80	28.80
Baro	mmHg	731.68	731.54	731.50	731.55	731.53	731.55
Pvap_kPa	kPa	0.23	0.35	0.32	0.29	0.29	0.32
Pvap_inHg	inHg	0.07	0.10	0.09	0.09	0.09	0.10
AbsHumidity	grains/lb	10.47	15.54	14.24	13.10	13.16	14.45
SatPres	kPa	97.31	97.18	97.21	97.24	97.23	97.21
Hum Factor		0.77	0.78	0.78	0.77	0.77	0.78
F_fac		1.01	1.02	1.02	1.01	1.02	1.01
K_fac		1.03	1.03	1.03	1.02	1.03	1.03
Humidity	g/kg	1.50	2.22	2.03	1.87	1.88	2.06
H2		0.46	0.00	0.00	0.00	0.00	0.09
WetDry Factor		0.88	0.92	0.94	0.95	0.97	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	1109.53	2.99	1.46	27.82	19.91	324.47
CO	%	1.40	0.00	0.00	0.00	0.00	0.30
N2O	ppm	6.47	1.88	2.03	2.06	4.47	3.25
CH4	ppm	169.44	1.48	1.67	1.77	8.07	97.66
CO2	%	10.59	8.06	6.39	5.41	2.45	7.13
O2	%	2.61	8.32	10.83	12.40	16.14	10.00
CNOx	ppm	217.60	800.84	788.09	560.94	134.33	646.37
AHC	ppm	3.39	0.00	0.00	0.00	0.00	5.00
C2H2	ppm	1.36	0.07	0.07	0.32	0.14	5.39
C2H4	ppm	26.80	0.23	0.47	0.24	0.36	41.11
C3H6	ppm	1.91	0.35	0.29	0.41	0.33	6.43
C4H6	ppm	6.08	0.64	0.37	0.62	0.24	2.96
ETOH	ppm	2.27	1.19	1.09	0.47	0.83	1.09
H2O	%	11.70	7.51	6.01	5.02	2.82	0.00
HCHO	ppm	2.20	0.00	0.00	0.02	0.00	1.20
HCN	ppm	5.42	0.15	0.14	0.11	0.03	3.21
HNCO	ppm	3.16	3.28	2.69	4.40	1.90	3.43
MECHO	ppm	0.37	0.00	0.00	0.02	0.00	0.62
NC5	ppm	3.01	1.07	1.05	1.45	1.02	3.18
NH3	ppm	183.89	0.08	0.03	1.68	0.03	26.65
NO	ppm	283.89	875.78	869.29	686.66	138.15	727.00
NO2	ppm	0.05	148.86	143.88	37.25	35.22	103.33
Soot	mg/m3	449.13	46.36	3.76	2.64	1.85	#####
AFR	:1	15.52	24.88	31.50	37.41	80.28	27.39



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.520	0.126	11.696	80.370	0.929	15.763	0.868
2	0.000	0.000	7.509	80.068	0.926	24.835	0.588
3	0.000	0.000	6.007	79.527	0.919	31.446	0.468
4	0.001	0.003	5.019	79.220	0.916	37.382	0.394
5	0.000	0.002	2.817	76.410	0.883	80.233	0.222

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	82.744	-1.684	-0.211	-1.895	96.492	3.508
2	0.151	-3.593	-0.449	-4.042	94.776	5.224
3	0.061	-3.618	-0.452	-4.070	94.805	5.195
4	0.946	-3.451	-0.431	-3.883	95.079	4.921
5	0.454	-1.958	-0.245	-2.203	94.232	5.768

Carbon Balance Verification

		1	2	3	4	5	6
Power	kW	22.946	10.647	6.061	3.163	0.000	7.628
BSFC	g/kw-hr	393.44	382.25	438.19	581.76	**	470.42
Fuel_MassFlow	g/hr	9027.9	4069.8	2655.7	1839.8	558.0	3588.5
HC_m	g/hr	82.744	0.151	0.061	0.946	0.454	15.606
CO_m	g/hr	2120.8	0.1	0.0	2.3	0.0	295.0
CO2_m	g/hr	25126	12947	8449	5847	1774	10903
TW_Power	kW	8.1237					
TW_BSFC	g/kw-hr	440.31					
Fuel_MassFlow	g/hr	9027.9	4069.8	2655.7	1839.8	558.0	3588.5
FuelCalc	g/hr	9040.3	4069.7	2655.6	1839.9	558.0	3590.8
FuelCalcDev	%	-0.13709	0.00125	0.00147	-0.00598	-0.01053	-0.06411

\$HCR_ENG	1.808
\$OCR_ENG	0
MassFracCFuel H/C ratio	0.86826

Power Run

Team 108

TeamNumber	108
TeamName	Bison Motorsports
Model	Mercedes
Engine	Mercedes

Displacement cc	800.00
RatedSpeed	4001
RatedTorque	58.7

