



Team Results for Clean Snowmobile Challenge 2019 Team 14



2019 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2019/03/06 17:22:47
Team Name : Rochester
Team Number : 14
Model : Weber 750
Engine : Weber 750
Displacement[cc] : 750.00
100% Speed : 6943
100% Torque : 45.3
No of Strokes : 4
Fuel : Gas H/C: 1.95 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	:	35.0	14.2	8.1	4.1	0.0	11.1
HC_m g/hr	:	822.19	408.38	356.88	277.56	157.92	151.45
CO_m g/hr	:	17979.13	8134.63	6376.08	4790.58	1151.22	7793.04
NOx_m g/hr	:	8.72	4.46	2.33	0.87	0.28	3.28
Soot_m mg/hr	:	48.46	42.99	76.73	24.62	7.11	103.50
N2O_m mg/hr	:	0.66	0.30	0.25	0.18	0.04	0.29
CO2_m g/hr	:	19691.77	13060.58	10172.78	7574.37	3160.62	12102.74
CH4_m g/hr	:	33.73	20.60	25.59	25.91	14.75	31.15
W_HC g/hr	:	98.66	110.26	89.22	86.04	7.90	151.45
W_CO g/hr	:	2157.50	2196.35	1594.02	1485.08	57.56	7793.04
W_NOx g/hr	:	1.05	1.20	0.58	0.27	0.01	3.28
W_HCNOx g/hr	:	99.71	111.47	89.80	86.31	7.91	154.74
W_Soot mg/hr	:	5.82	11.61	19.18	7.63	0.36	103.50
W_N2O g/hr	:	0.08	0.08	0.06	0.06	0.00	0.29
W_CO2 g/hr	:	2363.01	3526.36	2543.20	2348.06	158.03	12102.74
W_CH4 g/hr	:	4.05	5.56	6.40	8.03	0.74	31.15

Total Weighted Power [kW] 11.319

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	392.09	7490.51	3.11	395.20
Specific Mass [g/kW-hr]	34.64	661.78	0.28	34.92
BSFC [g/kW-hr]	814.7			

Total Soot [mg/hr] 44.59 Specific Soot [mg/kW-hr] 3.94

Not Used for Competition

Total N2O [mg/hr]	0.28	Specific N2O [mg/kW-hr]	0.02
Total CO2 [g/hr]	10938.65	Specific CO2 [g/kW-hr]	966.42
Total CH4 [g/hr]	24.78	Specific CH4 [g/kW-hr]	2.19
RMC BSFC [g/kW-hr]	711.36		

EMISSION TESTS:

	Value	Limit	Result
Power	32.97	<96.94 kW	PASS
Soot	3.94	<50 mg/kW-hr	PASS
CO	661.78	<275 g/kW-hr	FAIL
HC + NOX	34.92	<90 g/kW-hr	PASS
E-Score	21.28	>175	FAIL
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	11431
PtsInMode	points	1210	3370	3470	1800	1480	11431
Speed	rpm	6943.67	5842.90	5207.38	4511.02	1811.70	5268.36
Torque	Nm	48.17	23.17	14.88	8.60	0.00	20.09
Power	kW	35.02	14.18	8.11	4.06	0.00	11.08
BSFC	g/kw-hr	458.14	607.63	834.13	1248.80	**	711.36
Fuel	g/hr	16046.10	8614.61	6768.64	5073.10	1735.99	7883.08
T_int	degC	19.56	18.68	19.42	18.20	19.33	19.21
RelHumid	%	14.11	18.31	18.42	16.56	18.34	17.27
Baro	in Hg	28.92	28.93	28.93	28.93	28.93	28.93
Baro	mmHg	734.67	734.77	734.77	734.70	734.76	734.73
Pvap_kPa	kPa	0.27	0.34	0.35	0.30	0.35	0.33
Pvap_inHg	inHg	0.08	0.10	0.10	0.09	0.10	0.10
AbsHumidity	grains/lb	12.20	15.08	15.81	13.28	15.66	14.65
SatPres	kPa	97.67	97.62	97.61	97.65	97.61	97.63
Hum Factor		0.77	0.78	0.78	0.78	0.78	0.78
F_fac		1.00	1.00	1.00	1.00	1.00	1.00
K_fac		1.02	1.02	1.02	1.02	1.02	1.02
Humidity	g/kg	1.74	2.15	2.26	1.90	2.24	2.09
H2		4.88	3.66	3.67	3.67	2.25	3.73
WetDry Factor		0.88	0.88	0.88	0.88	0.87	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	8361.04	7589.43	8478.00	8769.26	14418.91	2971.54
CO	%	9.12	7.54	7.56	7.55	5.24	7.63
N2O	ppm	21.26	17.81	18.52	17.81	10.79	17.77
CH4	ppm	299.59	334.47	530.90	715.06	1176.25	533.81
CO2	%	6.36	7.71	7.67	7.60	9.16	7.54
O2	%	0.05	0.01	0.00	0.00	0.05	0.02
CNOx	ppm	26.94	25.15	16.80	8.32	7.84	19.56
AHC	ppm	124.09	113.89	128.13	121.02	140.70	127.38
C2H2	ppm	23.92	23.52	43.59	54.49	71.62	39.11
C2H4	ppm	99.12	127.69	182.28	247.45	463.70	186.56
C3H6	ppm	52.58	65.77	69.05	52.26	74.94	64.78
C4H6	ppm	3.76	5.39	5.99	6.36	6.88	5.73
ETOH	ppm	1.56	2.70	2.17	1.92	0.19	2.17
H2O	%	12.11	12.48	12.42	12.44	13.05	0.00
HCHO	ppm	7.09	4.11	3.28	2.81	18.88	4.75
HCN	ppm	14.89	18.70	17.97	14.32	10.36	16.69
HNCO	ppm	1.69	1.93	1.61	1.80	4.19	1.67
MECHO	ppm	6.65	4.29	2.86	0.84	3.80	3.67
NC5	ppm	141.78	78.50	42.46	16.95	82.73	69.24
NH3	ppm	103.41	112.79	94.24	81.30	53.56	95.63
NO	ppm	35.73	33.23	22.39	11.33	10.47	25.91
NO2	ppm	0.00	0.00	0.00	0.01	0.03	0.01
Soot	mg/m3	0.33	0.51	1.17	0.50	0.41	1.32
AFR	:1	9.04	9.82	9.65	9.59	9.47	10.60



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	5.553	0.951	12.106	68.934	0.797	9.870	0.998
2	4.177	0.867	12.481	72.041	0.833	10.662	1.000
3	4.189	0.968	12.421	71.755	0.829	10.586	1.000
4	4.196	1.002	12.440	71.475	0.826	10.547	1.000
5	2.587	1.658	13.051	74.906	0.866	11.126	0.998

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	822.194	0.907	0.113	1.021	93.974	6.026
2	408.380	0.861	0.108	0.969	95.456	4.544
3	356.879	0.968	0.121	1.089	95.257	4.743
4	277.559	1.000	0.125	1.125	94.929	5.071
5	157.919	1.614	0.202	1.815	96.801	3.199

Carbon Balance Verification

		1	2	3	4	5	6
Power	kW	35.024	14.177	8.115	4.062	0.000	11.082
BSFC	g/kw-hr	458.1	607.6	834.1	1248.8	**	711.4
Fuel_MassFlow	g/hr	16046	8615	6769	5073	1736	7883
HC_m	g/hr	822.19	408.38	356.88	277.56	157.92	151.45
CO_m	g/hr	17979	8135	6376	4791	1151	7793
CO2_m	g/hr	19692	13061	10173	7574	3161	12103
TW_Power	kW	11.319					
TW_BSFC	g/kw-hr	814.70					
Fuel_MassFlow	g/hr	16046	8615	6769	5073	1736	7883
FuelCalc	g/hr	16180	8681	6827	5118	1762	7908
FuelCalcDev	%	-0.8355	-0.7729	-0.8599	-0.8924	-1.4857	-0.3117

\$HCR_ENG	1.949
\$OCR_ENG	0
MassFracCFuel H/C ratio	0.85943

Power Run

Team 14

TeamNumber	14
TeamName	Rochester
Model	Weber 750
Engine	Weber 750

Displacement cc	750.00
RatedSpeed	6943
RatedTorque	45.3

