



Team Results for Clean Snowmobile Challenge 2019 Team 5



2019 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2019/03/06 11:15:21
Team Name      : Plattville
Team Number    : 5
Model          : EcoBoost
Engine         : Ford
Displacement[cc] : 1000.00
100% Speed    : 4828
100% Torque    : 132.4
No of Strokes  : 4
Fuel           : Gas
                H/C: 1.95      O/C: 0.00
  
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ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power	kW :	61.4	29.0	16.5	8.3	0.0	23.7
HC_m	g/hr :	303.91	154.28	74.74	33.40	27.48	45.29
CO_m	g/hr :	8408.47	2506.52	944.25	299.24	93.70	1887.27
NOx_m	g/hr :	94.44	33.42	11.53	1.12	0.01	23.66
Soot_m	mg/hr:	98.21	**	**	**	**	**
N2O_m	mg/hr:	0.26	0.09	0.04	0.02	0.00	0.07
CO2_m	g/hr :	42391.65	22163.74	14775.69	9232.92	2605.97	21623.23
CH4_m	g/hr :	22.49	7.30	3.91	1.99	0.77	6.66
W_HC	g/hr :	36.47	41.66	18.68	10.35	1.37	45.29
W_CO	g/hr :	1009.02	676.76	236.06	92.76	4.68	1887.27
W_NOx	g/hr :	11.33	9.02	2.88	0.35	0.00	23.66
W_HCNOx	g/hr :	47.80	50.68	21.57	10.70	1.37	68.95
W_Soot	mg/hr:	11.79	**	**	**	**	**
W_N2O	g/hr :	0.03	0.02	0.01	0.01	0.00	0.07
W_CO2	g/hr :	5087.00	5984.21	3693.92	2862.21	130.30	21623.23
W_CH4	g/hr :	2.70	1.97	0.98	0.62	0.04	6.66

Total Weighted Power [kW] 21.874

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	108.54	2019.29	23.58	132.12
Specific Mass [g/kW-hr]	4.96	92.31	1.08	6.04
BSFC [g/kW-hr]	309.9			

Total Soot [mg/hr] 11.79 Specific Soot [mg/kW-hr] 0.54

Not Used for Competition

Total N2O [mg/hr]	0.07	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	17757.63	Specific CO2 [g/kW-hr]	811.80
Total CH4 [g/hr]	6.30	Specific CH4 [g/kW-hr]	0.29
RMC BSFC [g/kW-hr]	330.80		

EMISSION TESTS:

	Value	Limit	Result
Power	66.91	<96.94 kW	PASS
Soot	0.54	<50 mg/kW-hr	PASS
CO	92.31	<275 g/kW-hr	PASS
HC + NOX	6.04	<90 g/kW-hr	PASS
E-Score	182.90	>175	PASS
Valid Data for All 5 Modes			PASS
RMC			PASS
LAB EMISSION TEST			PASS



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Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5	RMC
Total Points	points	600	1520	371	1200	1009	8591
PtsInMode	points	1210	3370	629	1800	1480	8591
Speed	rpm	4827.36	4103.38	3621.42	3138.53	1154.01	3745.47
Torque	Nm	121.37	67.44	43.48	25.18	0.00	60.53
Power	kW	61.36	28.98	16.49	8.28	0.00	23.74
BSFC	g/kw-hr	292.74	291.37	317.66	376.37	**	330.80
Fuel	g/hr	17960.99	8443.11	5237.96	3114.66	901.76	7853.51
T_int	degC	19.82	22.17	22.42	21.64	23.17	21.74
RelHumid	%	17.55	19.33	19.47	18.86	19.97	19.06
Baro	in Hg	28.94	28.94	28.94	28.94	28.94	28.94
Baro	mmHg	735.01	735.08	735.10	735.02	735.03	735.06
Pvap_kPa	kPa	0.34	0.43	0.44	0.41	0.47	0.42
Pvap_inHg	inHg	0.10	0.13	0.13	0.12	0.14	0.12
AbsHumidity	grains/lb	15.38	19.28	19.69	18.28	21.03	18.57
SatPres	kPa	97.65	97.57	97.56	97.58	97.52	97.58
Hum Factor		0.78	0.79	0.79	0.79	0.80	0.79
F_fac		1.00	1.01	1.01	1.01	1.01	1.01
K_fac		1.02	1.02	1.02	1.02	1.02	1.02
Humidity	g/kg	2.20	2.75	2.81	2.61	3.00	2.65
H2		1.27	0.66	0.34	0.17	0.19	0.49
WetDry Factor		0.87	0.88	0.90	0.90	0.90	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	2390.61	2264.40	1570.72	1161.96	3388.78	666.99
CO	%	3.30	1.84	0.99	0.52	0.58	1.39
N2O	ppm	6.39	4.04	2.42	2.21	1.25	3.49
CH4	ppm	154.54	93.58	71.69	60.39	82.67	85.62
CO2	%	10.59	10.33	9.86	10.20	10.21	10.11
O2	%	0.07	2.29	4.19	4.25	4.26	3.64
CNOx	ppm	225.67	149.00	73.61	11.81	0.19	105.83
AHC	ppm	21.91	20.70	9.71	0.00	35.62	15.41
C2H2	ppm	1.54	0.58	0.56	0.69	0.68	0.75
C2H4	ppm	53.55	44.04	35.56	16.44	48.92	38.34
C3H6	ppm	14.21	18.48	12.38	4.02	16.53	14.11
C4H6	ppm	19.38	12.83	7.35	3.34	2.82	8.90
ETOH	ppm	9.60	7.91	6.99	5.38	3.07	6.75
H2O	%	13.03	11.60	10.44	10.48	10.18	0.00
HCHO	ppm	0.37	1.35	1.67	0.74	4.30	1.49
HCN	ppm	24.65	30.59	11.70	0.69	0.15	19.48
HNCO	ppm	8.36	4.54	1.46	0.56	0.35	2.98
MECHO	ppm	0.00	0.00	0.00	0.00	0.04	0.01
NC5	ppm	19.19	29.86	23.95	35.57	73.24	32.71
NH3	ppm	529.27	409.07	286.58	142.22	93.75	303.13
NO	ppm	289.81	188.63	92.99	15.21	0.32	134.36
NO2	ppm	0.00	0.01	0.04	0.02	0.06	0.03
Soot	mg/m3	0.47	#####	#####	#####	#####	#####
AFR	:1	12.58	14.80	17.22	17.75	16.71	16.79



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	1.465	0.275	13.033	76.961	0.890	12.951	0.996
2	0.750	0.256	11.601	78.603	0.909	15.286	0.884
3	0.382	0.175	10.444	79.882	0.923	17.657	0.789
4	0.195	0.130	10.482	80.635	0.932	18.089	0.786
5	0.216	0.377	10.177	80.024	0.925	17.679	0.786

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	303.912	0.215	0.027	0.242	95.644	4.356
2	154.280	-1.375	-0.172	-1.547	95.093	4.907
3	74.735	-2.418	-0.302	-2.720	95.277	4.723
4	33.396	-2.456	-0.307	-2.763	95.725	4.275
5	27.476	-2.275	-0.284	-2.559	95.351	4.649

Carbon Balance Verification

		1	2	3	4	5	6
Power	kW	61.355	28.978	16.489	8.276	0.000	23.741
BSFC	g/kw-hr	292.74	291.37	317.66	376.37	**	330.80
Fuel_MassFlow	g/hr	17961	8443	5238	3115	902	7854
HC_m	g/hr	303.91	154.28	74.74	33.40	27.48	45.29
CO_m	g/hr	8408.5	2506.5	944.2	299.2	93.7	1887.3
CO2_m	g/hr	42392	22164	14776	9233	2606	21623
TW_Power	kW	21.874					
TW_BSFC	g/kw-hr	309.89					
Fuel_MassFlow	g/hr	17961	8443	5238	3115	902	7854
FuelCalc	g/hr	18010	8468	5250	3120	906	7861
FuelCalcDev	%	-0.27459	-0.29684	-0.23141	-0.17347	-0.49648	-0.09231

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

Power Run

Team 5

TeamNumber	5
TeamName	Plattville
Model	EcoBoost
Engine	Ford

Displacement cc	1000.00
RatedSpeed	4828
RatedTorque	132.4

