



Team Results for Clean Snowmobile Challenge 2018 Team 105



2018 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2018/03/05 20:00:20
Team Name : Kettering
Team Number : 105
Model : Mrecedes
Engine :
Displacement[cc] : 799.00
100% Speed : 3919
100% Torque : 61.7
No of Strokes : 4
Fuel : Diesel H/C: 1.74 O/C: 0.01

ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power kW	:	26.1	10.9	6.3	3.1	0.0	8.4
HC_m g/hr	:	3.94	0.00	0.00	1.81	0.00	0.23
CO_m g/hr	:	0.36	0.00	0.00	0.80	0.00	0.30
NOx_m g/hr	:	381.62	111.47	71.10	2.63	4.62	91.81
Soot_m mg/hr	:	6.72	2.16	1.30	0.18	0.18	1.73
N2O_m mg/hr	:	0.07	0.05	0.08	0.03	0.01	0.06
CO2_m g/hr	:	26470.33	11131.81	6824.55	3819.51	1356.39	9546.99
CH4_m g/hr	:	0.18	0.05	0.07	0.12	0.05	0.10
W_HC g/hr	:	0.47	0.00	0.00	0.56	0.00	0.23
W_CO g/hr	:	0.04	0.00	0.00	0.25	0.00	0.30
W_NOx g/hr	:	45.79	30.10	17.78	0.82	0.23	91.81
W_HCNOx g/hr	:	46.27	30.10	17.78	1.38	0.23	92.04
W_Soot mg/hr	:	0.81	0.58	0.33	0.06	0.01	1.73
W_N2O g/hr	:	0.01	0.01	0.02	0.01	0.00	0.06
W_CO2 g/hr	:	3176.44	3005.59	1706.14	1184.05	67.82	9546.99
W_CH4 g/hr	:	0.02	0.01	0.02	0.04	0.00	0.10

Total Weighted Power [kW] 8.617

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	1.03	0.29	94.71	95.75
Specific Mass [g/kW-hr]	0.12	0.03	10.99	11.11
BSFC [g/kW-hr]	329.3			

Total Soot [mg/hr] 1.78 Specific Soot [mg/kW-hr] 0.21

Not Used for Competition

Total N2O [mg/hr]	0.05	Specific N2O [mg/kW-hr]	0.01
Total CO2 [g/hr]	9140.03	Specific CO2 [g/kW-hr]	1060.65
Total CH4 [g/hr]	0.09	Specific CH4 [g/kW-hr]	0.01
RMC BSFC [g/kW-hr]	356.90		

EMISSION TESTS:

	Value	Limit	Result
Power	25.31	<96.94 kW	PASS
Soot	0.21	<50 mg/kW-hr	PASS
CO	0.03	<275 g/kW-hr	PASS
HC + NOX	11.11	<90 g/kW-hr	PASS
E-Score	202.58	>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	1200	1200	1200	11432
PtsInMode	points	1210	3370	3470	1800	1480	11432
Speed	rpm	3918.62	3330.52	2939.58	2512.98	800.86	2957.75
Torque	Nm	63.70	31.39	20.41	11.69	0.00	27.01
Power	kW	26.14	10.95	6.28	3.08	0.00	8.37
BSFC	g/kw-hr	316.80	317.91	339.61	388.87	**	356.90
Fuel	g/hr	8280.76	3480.65	2133.87	1196.48	424.11	2985.50
T_int	degC	22.83	22.59	21.88	22.37	21.66	22.21
RelHumid	%	21.81	20.29	19.71	21.02	19.65	20.61
Baro	in Hg	28.93	28.93	28.93	28.93	28.93	28.93
Baro	mmHg	734.92	734.89	734.90	734.93	734.85	734.91
Pvap_kPa	kPa	0.50	0.46	0.43	0.47	0.43	0.46
Pvap_inHg	inHg	0.15	0.14	0.13	0.14	0.13	0.14
AbsHumidity	grains/lb	22.57	20.71	19.36	21.21	19.07	20.62
SatPres	kPa	97.47	97.51	97.54	97.51	97.54	97.52
Hum Factor		0.80	0.80	0.79	0.80	0.79	0.80
F_fac		1.01	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	3.22	2.96	2.77	3.03	2.72	2.95
H2		0.00	0.00	0.00	0.00	0.00	0.00
WetDry Factor		0.91	0.94	0.95	0.96	0.97	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	44.89	0.00	0.00	58.91	0.00	4.36
CO	%	0.00	0.00	0.00	0.00	0.00	0.00
N2O	ppm	2.42	2.95	5.81	2.62	2.72	3.42
CH4	ppm	1.79	0.83	1.44	3.38	2.69	1.65
CO2	%	9.43	6.25	5.12	3.88	2.51	5.63
O2	%	6.48	11.23	12.97	14.85	16.27	12.82
CNOx	ppm	1300.99	598.94	510.04	25.59	81.77	517.73
AHC	ppm	3.29	0.01	0.02	1.57	0.06	0.80
C2H2	ppm	0.00	0.00	0.00	0.18	0.04	0.04
C2H4	ppm	0.63	0.24	0.20	3.31	0.16	0.87
C3H6	ppm	0.75	0.64	0.48	0.40	0.37	0.52
C4H6	ppm	1.80	0.97	0.64	0.24	0.32	0.78
ETOH	ppm	0.38	0.35	0.38	2.23	0.28	0.68
H2O	%	9.26	6.05	4.90	3.86	2.55	0.00
HCHO	ppm	0.23	0.23	0.31	0.31	0.04	0.27
HCN	ppm	0.40	0.30	0.33	0.06	0.14	0.27
HNCO	ppm	7.51	3.63	1.87	1.40	1.09	3.00
MECHO	ppm	0.11	0.00	0.00	0.00	0.00	0.02
NC5	ppm	5.41	0.43	0.25	2.53	0.05	1.52
NH3	ppm	0.04	0.02	0.01	0.04	0.01	0.03
NO	ppm	792.01	289.80	319.97	15.49	25.84	300.78
NO2	ppm	829.57	461.96	323.45	16.57	77.40	349.30
Soot	mg/m3	0.04	0.02	0.02	0.00	0.01	0.02
AFR	:1	21.08	32.12	39.46	51.98	78.75	36.90



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.000	0.005	9.262	82.799	0.957	21.336	0.677
2	0.000	0.000	6.048	80.628	0.932	32.442	0.449
3	0.000	0.000	4.901	79.984	0.925	39.837	0.367
4	0.000	0.006	3.856	79.671	0.921	52.612	0.279
5	0.000	0.000	2.551	76.445	0.884	79.441	0.215

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	3.939	-3.355	-0.419	-3.774	97.698	2.302
2	0.000	**	**	**	**	**
3	0.000	**	**	**	**	**
4	1.812	-2.910	-0.364	-3.274	96.809	3.191
5	0.000	**	**	**	**	**

Carbon Balance Verification

		1	2	3	4	5	6
Power	kW	26.139	10.949	6.283	3.077	0.000	8.365
BSFC	g/kw-hr	316.80	317.91	339.61	388.87	**	356.90
Fuel_MassFlow	g/hr	8280.8	3480.7	2133.9	1196.5	424.1	2985.5
HC_m	g/hr	3.9388	0.0000	0.0000	1.8115	0.0000	0.2312
CO_m	g/hr	0.36194	0.00032	0.00000	0.80031	0.00468	0.30466
CO2_m	g/hr	26470	11132	6825	3820	1356	9547
TW_Power	kW	8.6174					
TW_BSFC	g/kw-hr	329.30					
Fuel_MassFlow	g/hr	8280.8	3480.7	2133.9	1196.5	424.1	2985.5
FuelCalc	g/hr	8367.8	3517.0	2156.2	1209.2	428.5	3016.7
FuelCalcDev	%	-1.0516	-1.0446	-1.0446	-1.0669	-1.0446	-1.0458

\$HCR_ENG	1.736
\$OCR_ENG	0.009
MassFracCFuel H/C ratio	0.86380

Power Run

Team 105

TeamNumber	105
TeamName	Kettering
Model	Mrecedes
Engine	

Displacement cc	799.00
RatedSpeed	3919
RatedTorque	61.7

