



Team Results for Clean Snowmobile Challenge 2018 Team 17



2018 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2018/03/07 13:34:04
Team Name : Kettering
Team Number : 17
Model : Rotax
Engine : Ace
Displacement[cc] : 599.00
100% Speed : 6954
100% Torque : 47.2
No of Strokes : 4
Fuel : GASOLINE H/C: 2.04 O/C: 0.07

ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power kW	:	33.7	14.9	8.5	4.3	0.0	11.0
HC_m g/hr	:	316.77	20.65	9.74	3.86	7.11	9.41
CO_m g/hr	:	5914.75	21.54	8.67	2.37	6.33	277.75
NOx_m g/hr	:	15.52	110.44	61.08	16.35	0.16	65.78
Soot_m mg/hr	:	35.37	44.33	4.31	0.03	0.05	16.95
N2O_m mg/hr	:	0.16	0.05	0.04	0.01	0.00	0.04
CO2_m g/hr	:	25725.99	15521.16	10593.82	7184.33	4549.38	13560.40
CH4_m g/hr	:	16.32	1.31	0.99	0.63	0.54	1.88
W_HC g/hr	:	38.01	5.57	2.43	1.20	0.36	9.41
W_CO g/hr	:	709.77	5.81	2.17	0.73	0.32	277.75
W_NOx g/hr	:	1.86	29.82	15.27	5.07	0.01	65.78
W_HCNOx g/hr	:	39.87	35.39	17.70	6.26	0.36	75.19
W_Soot mg/hr	:	4.24	11.97	1.08	0.01	0.00	16.95
W_N2O g/hr	:	0.02	0.01	0.01	0.00	0.00	0.04
W_CO2 g/hr	:	3087.12	4190.71	2648.46	2227.14	227.47	13560.40
W_CH4 g/hr	:	1.96	0.35	0.25	0.20	0.03	1.88

Total Weighted Power [kW] 11.506

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	47.57	718.80	52.03	99.60
Specific Mass [g/kW-hr]	4.13	62.47	4.52	8.66
BSFC [g/kW-hr]	398.7			

Total Soot [mg/hr] 17.30 Specific Soot [mg/kW-hr] 1.50

Not Used for Competition

Total N2O [mg/hr]	0.05	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	12380.90	Specific CO2 [g/kW-hr]	1076.03
Total CH4 [g/hr]	2.78	Specific CH4 [g/kW-hr]	0.24
RMC BSFC [g/kW-hr]	407.28		

EMISSION TESTS:

	Value	Limit	Result
Power	34.40	<96.94 kW	PASS
Soot	1.50	<50 mg/kW-hr	PASS
CO	62.47	<275 g/kW-hr	PASS
HC + NOX	8.66	<90 g/kW-hr	PASS
E-Score	188.61	>175	PASS
Valid Data for All 5 Modes			PASS
RMC			PASS
LAB EMISSION TEST			PASS



Team Results for Clean Snowmobile Challenge 2018 Team 17



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	6675.02	5910.50	5216.04	4519.59	2014.22	5285.73
Torque	Nm	48.19	24.06	15.50	9.04	0.00	19.89
Power	kW	33.69	14.89	8.47	4.28	0.00	11.01
BSFC	g/kw-hr	341.68	335.23	401.63	538.08	**	407.28
Fuel	g/hr	11510.34	4992.63	3400.29	2301.44	1464.46	4483.34
T_int	degC	22.56	22.60	22.57	22.79	22.65	22.60
RelHumid	%	23.66	21.22	20.54	23.64	21.01	22.25
Baro	in Hg	28.79	28.79	28.79	28.79	28.79	28.79
Baro	mmHg	731.34	731.34	731.31	731.35	731.32	731.34
Pvap_kPa	kPa	0.54	0.48	0.47	0.55	0.48	0.51
Pvap_inHg	inHg	0.16	0.14	0.14	0.16	0.14	0.15
AbsHumidity	grains/lb	24.25	21.79	21.05	24.53	21.63	22.85
SatPres	kPa	96.96	97.02	97.03	96.96	97.02	96.99
Hum Factor		0.81	0.80	0.80	0.81	0.80	0.80
F_fac		1.02	1.02	1.01	1.02	1.02	1.02
K_fac		1.03	1.03	1.03	1.03	1.03	1.03
Humidity	g/kg	3.46	3.11	3.01	3.50	3.09	3.26
H2		1.52	0.01	0.01	0.00	0.01	0.14
WetDry Factor		0.87	0.86	0.86	0.86	0.86	1.00



Team Results for Clean Snowmobile Challenge 2018 Team 17



Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	3916.53	543.02	374.77	219.97	637.29	276.45
CO	%	3.67	0.03	0.02	0.01	0.03	0.41
N2O	ppm	6.29	4.35	4.54	1.87	0.17	3.80
CH4	ppm	177.43	30.24	33.47	31.74	42.42	48.44
CO2	%	10.17	13.05	13.04	13.09	13.03	12.73
O2	%	0.00	0.04	0.06	0.01	0.13	0.07
CNOx	ppm	58.67	888.13	718.99	285.03	4.37	590.85
AHC	ppm	52.43	5.25	1.59	0.17	2.38	8.54
C2H2	ppm	7.75	1.09	0.70	0.62	0.71	1.66
C2H4	ppm	100.48	8.84	4.87	2.20	2.60	16.15
C3H6	ppm	34.94	4.15	1.90	0.77	1.32	5.95
C4H6	ppm	16.57	1.32	0.93	0.96	0.91	2.90
ETOH	ppm	12.92	2.58	1.37	0.71	3.28	3.19
H2O	%	13.22	13.92	13.83	14.00	13.90	0.00
HCHO	ppm	1.90	3.11	2.05	0.56	1.51	2.13
HCN	ppm	9.85	0.78	0.49	0.37	0.41	1.61
HNCO	ppm	5.72	1.77	1.77	1.58	1.49	2.14
MECHO	ppm	2.96	0.01	0.00	0.00	0.03	0.31
NC5	ppm	48.92	9.56	9.15	5.29	24.38	14.91
NH3	ppm	326.93	1.87	4.36	5.53	3.26	41.52
NO	ppm	73.02	1109.36	901.40	351.67	5.72	735.63
NO2	ppm	0.03	0.11	0.15	0.17	0.10	0.17
Soot	mg/m3	0.27	0.68	0.10	0.00	0.00	0.29
AFR	:1	10.87	13.31	13.37	13.37	13.30	13.23



Team Results for Clean Snowmobile Challenge 2018 Team 17



Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	1.748	0.451	13.216	76.049	0.879	12.681	1.000
2	0.011	0.063	13.920	82.764	0.957	14.805	0.998
3	0.007	0.043	13.833	82.501	0.954	14.836	0.997
4	0.003	0.026	13.999	82.793	0.957	14.797	1.000
5	0.011	0.074	13.902	82.762	0.957	14.817	0.993

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	316.771	0.451	0.056	0.508	95.139	4.861
2	20.647	0.030	0.004	0.034	99.135	0.865
3	9.736	-0.004	-0.001	-0.005	98.780	1.220
4	3.858	0.020	0.003	0.023	99.057	0.943
5	7.113	-0.025	-0.003	-0.028	99.016	0.984

Carbon Balance Verification

		1	2	3	4	5	6
Power	kW	33.687	14.893	8.466	4.277	0.000	11.008
BSFC	g/kw-hr	341.68	335.23	401.63	538.08	**	407.28
Fuel_MassFlow	g/hr	11510	4993	3400	2301	1464	4483
HC_m	g/hr	316.77	20.65	9.74	3.86	7.11	9.41
CO_m	g/hr	5914.8	21.5	8.7	2.4	6.3	277.7
CO2_m	g/hr	25726	15521	10594	7184	4549	13560
TW_Power	kW	11.506					
TW_BSFC	g/kw-hr	398.73					
Fuel_MassFlow	g/hr	11510	4993	3400	2301	1464	4483
FuelCalc	g/hr	12485	5394	3673	2485	1582	4842
FuelCalcDev	%	-8.4679	-8.0361	-8.0126	-7.9906	-8.0494	-7.9984

\$HCR_ENG	2.04
\$OCR_ENG	0.07
MassFracCFuel H/C ratio	0.79086

Power Run

Team 17

TeamNumber	17
TeamName	Kettering
Model	Rotax
Engine	Ace

Displacement cc	599.00
RatedSpeed	6954
RatedTorque	47.2

