



Team Results for Clean Snowmobile Challenge 2018 Team 4



2018 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2018/03/08 08:04:32
Team Name : Idaho
Team Number : 4
Model : Rotax
Engine :
Displacement[cc] : 850.00
100% Speed : 6820
100% Torque : 127.0
No of Strokes : 4
Fuel : GAS H/C: 2.04 O/C: 0.07

ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power	kW	78.5	39.1	22.5	11.6	0.0
HC_m	g/hr	5162.35	1242.84	447.81	569.30	66.16
CO_m	g/hr	18645.20	469.01	324.99	82.53	10.64
NOx_m	g/hr	59.59	298.10	59.46	8.48	0.26
Soot_m	mg/hr	8491.27	1753.31	664.20	59.69	18.85
N2O_m	mg/hr	0.59	0.10	0.04	0.04	0.00
CO2_m	g/hr	52776.87	38134.99	25168.35	12543.29	1953.71
CH4_m	g/hr	122.81	18.08	20.00	4.15	0.36
W_HC	g/hr	619.48	335.57	111.95	176.48	3.31
W_CO	g/hr	2237.42	126.63	81.25	25.59	0.53
W_NOx	g/hr	7.15	80.49	14.87	2.63	0.01
W_HCNOx	g/hr	626.63	416.05	126.82	179.11	3.32
W_Soot	mg/hr	1018.95	473.39	166.05	18.50	0.94
W_N2O	g/hr	0.07	0.03	0.01	0.01	0.00
W_CO2	g/hr	6333.22	10296.45	6292.09	3888.42	97.69
W_CH4	g/hr	14.74	4.88	5.00	1.29	0.02

Total Weighted Power [kW] 29.219

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	1246.79	2471.42	105.15	1351.94
Specific Mass [g/kW-hr]	42.67	84.58	3.60	46.27
BSFC [g/kW-hr]	361.6			

Total Soot [mg/hr] 1677.84 Specific Soot [mg/kW-hr] 57.42

Not Used for Competition

Total N2O [mg/hr]	0.12	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	26907.86	Specific CO2 [g/kW-hr]	920.90
Total CH4 [g/hr]	25.92	Specific CH4 [g/kW-hr]	0.89
RMC BSFC [g/kW-hr]	0		

EMISSION TESTS:

	Value	Limit	Result
Power	90.71	<96.94 kW	PASS
Soot	57.42	<50 mg/kW-hr	FAIL
CO	84.58	<275 g/kW-hr	PASS
HC + NOX	46.27	<90 g/kW-hr	PASS
E-Score	158.01	>175	FAIL
Valid Data for All 5 Modes			PASS
RMC			FAIL (-50 Points)
LAB EMISSION TEST			FAIL



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Modal Raw Data : Engine / Environmental

ModeNum		1	2	3	4	5
Total Points	points	100	300	300	300	300
PtsInMode	points	200	400	400	400	400
Speed	rpm	6691.35	5794.53	5114.56	4434.94	1202.68
Torque	Nm	112.04	64.51	42.01	25.03	0.00
Power	kW	78.51	39.14	22.50	11.63	0.00
BSFC	g/kw-hr	399.91	349.17	384.69	397.37	**
Fuel	g/hr	31395.98	13667.83	8655.81	4620.08	695.99
T_int	degC	25.07	20.77	21.44	20.12	19.53
RelHumid	%	28.10	23.20	24.51	25.12	24.95
Baro	in Hg	28.83	28.83	28.83	28.83	28.83
Baro	mmHg	732.30	732.30	732.34	732.35	732.38
Pvap_kPa	kPa	0.73	0.48	0.53	0.50	0.48
Pvap_inHg	inHg	0.22	0.14	0.16	0.15	0.14
AbsHumidity	grains/lb	32.98	21.54	23.60	22.52	21.64
SatPres	kPa	96.90	97.15	97.11	97.14	97.16
Hum Factor		0.84	0.80	0.81	0.80	0.80
F_fac		1.02	1.01	1.01	1.01	1.01
K_fac		1.03	1.02	1.03	1.02	1.02
Humidity	g/kg	4.71	3.08	3.37	3.22	3.09
H2		2.06	0.07	0.07	0.03	0.02
WetDry Factor		0.86	0.88	0.89	0.90	0.93



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5
THC	ppmC1	25439.57	11096.51	5758.07	12436.26	6506.96
CO	%	4.61	0.21	0.21	0.09	0.05
N2O	ppm	9.22	2.79	1.49	2.52	0.47
CH4	ppm	532.10	141.93	226.07	79.62	31.45
CO2	%	8.31	10.88	10.34	8.76	6.14
O2	%	0.84	3.20	4.20	6.57	10.74
CNOx	ppm	89.79	813.84	233.80	56.67	7.70
AHC	ppm	276.97	116.69	92.11	168.71	85.76
C2H2	ppm	38.52	11.42	16.25	9.89	12.21
C2H4	ppm	404.47	163.16	56.04	104.39	26.79
C3H6	ppm	238.61	95.40	26.67	37.81	11.72
C4H6	ppm	30.23	11.55	2.42	1.99	2.18
ETOH	ppm	218.15	99.80	28.94	120.44	120.27
H2O	%	14.47	11.99	11.27	9.51	6.79
HCHO	ppm	95.54	71.60	29.70	54.28	18.91
HCN	ppm	12.96	4.30	0.44	0.27	0.05
HNCO	ppm	4.84	3.30	1.57	0.03	0.08
MECHO	ppm	113.44	52.20	17.70	73.65	11.98
NC5	ppm	454.25	250.42	158.55	461.44	249.00
NH3	ppm	66.85	11.86	0.02	0.00	0.00
NO	ppm	109.19	1016.86	282.40	64.93	1.66
NO2	ppm	0.00	1.56	7.88	5.67	7.97
Soot	mg/m3	27.36	9.10	4.95	0.76	1.09
AFR	:1	7.31	12.22	14.51	14.06	22.10



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	2.407	2.974	14.467	76.777	0.887	10.873	0.956
2	0.082	1.261	11.993	82.499	0.954	15.963	0.838
3	0.082	0.649	11.273	82.428	0.953	17.630	0.789
4	0.034	1.374	9.509	80.894	0.935	19.310	0.671
5	0.019	0.698	6.795	80.138	0.926	28.742	0.471

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	5162.346	2.184	0.273	2.457	98.637	1.363
2	1242.840	-0.985	-0.123	-1.108	98.785	1.215
3	447.807	-1.999	-0.250	-2.249	97.869	2.131
4	569.298	-2.295	-0.287	-2.582	96.327	3.673
5	66.162	-3.190	-0.399	-3.589	95.669	4.331

Carbon Balance Verification

		1	2	3	4	5
Power	kW	78.507	39.144	22.501	11.627	0.000
BSFC	g/kw-hr	399.91	349.17	384.69	397.37	**
Fuel_MassFlow	g/hr	31396	13668	8656	4620	696
HC_m	g/hr	5162.3	1242.8	447.8	569.3	66.2
CO_m	g/hr	18645	469	325	83	11
CO2_m	g/hr	52777	38135	25168	12543	1954
TW_Power	kW	29.219				
TW_BSFC	g/kw-hr	361.62				
Fuel_MassFlow	g/hr	31396	13668	8656	4620	696
FuelCalc	g/hr	34849	14985	9428	5093	764
FuelCalcDev	%	-10.999	-9.640	-8.916	-10.237	-9.717

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

Power Run

Team 4

TeamNumber	4
TeamName	Idaho
Model	Rotax
Engine	

Displacement cc	850.00
RatedSpeed	6820
RatedTorque	127.0

