



Team Results for Clean Snowmobile Challenge 2016 Team 6



2016 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2016/03/10 14:59:55
Team Name      : MTU
Team Number    : 6
Model         : Yamaha
Engine        : Yamaha
Displacement[cc] : 500.00
100% Speed    : 10723
100% Torque   : 44.8
No of Strokes : 4
Fuel          : GASOLINE           H/C: 2.00       O/C: 0.03
  
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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	:	50.2	21.8	12.0	6.2	0.0	14.5
HC_m g/hr	:	256.40	9.41	32.68	10.37	12.14	10.68
CO_m g/hr	:	7455.59	152.07	927.65	249.88	301.70	890.38
NOx_m g/hr	:	233.13	192.24	44.31	9.44	0.11	61.64
Soot_m mg/hr	:	118.14	3.32	14.85	4.70	0.03	12.81
N2O_m mg/hr	:	0.23	0.08	0.05	0.03	0.01	0.06
CO2_m g/hr	:	38021.07	21741.08	12863.91	9169.77	2394.68	16958.18
CH4_m g/hr	:	36.90	1.86	5.56	2.14	2.24	5.14
W_HC g/hr	:	30.77	2.54	8.17	3.21	0.61	10.68
W_CO g/hr	:	894.67	41.06	231.91	77.46	15.08	890.38
W_NOx g/hr	:	27.98	51.90	11.08	2.93	0.01	61.64
W_HCNOx g/hr	:	58.74	54.45	19.25	6.14	0.61	72.33
W_Soot mg/hr	:	14.18	0.90	3.71	1.46	0.00	12.81
W_N2O g/hr	:	0.03	0.02	0.01	0.01	0.00	0.06
W_CO2 g/hr	:	4562.53	5870.09	3215.98	2842.63	119.73	16958.18
W_CH4 g/hr	:	4.43	0.50	1.39	0.66	0.11	5.14

Total Weighted Power [kW] 16.833

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	45.30	1260.19	93.89	139.18
Specific Mass [g/kW-hr]	2.69	74.87	5.58	8.27
BSFC [g/kW-hr]	374.1			

Total Soot [mg/hr] 20.24 Specific Soot [mg/kW-hr] 1.20

Not Used for Competition

Total N2O [mg/hr]	0.07	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	16610.96	Specific CO2 [g/kW-hr]	986.84
Total CH4 [g/hr]	7.10	Specific CH4 [g/kW-hr]	0.42
RMC BSFC [g/kW-hr]	404.05		

EMISSION TESTS:

	Value	Limit	Result
Power	50.25	<96.94 kW	PASS
Soot	1.20	<50 mg/kW-hr	PASS
CO	74.87	<275 g/kW-hr	PASS
HC + NOX	8.27	<90 g/kW-hr	PASS
E-Score	185.77	>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	1200	1200	1200	1200	12032
PtsInMode	points	1210	3050	2720	3470	1480	12032
Speed	rpm	10722.77	9113.03	7800.89	6968.08	2474.56	7886.23
Torque	Nm	44.72	22.82	14.73	8.48	0.00	17.56
Power	kW	50.21	21.78	12.03	6.19	0.00	14.50
BSFC	g/kw-hr	320.77	322.03	382.13	493.87	**	404.05
Fuel	g/hr	16105.96	7013.94	4596.60	3057.68	926.33	5860.70
T_int	degC	19.20	17.51	16.21	16.28	15.92	17.18
RelHumid	%	38.17	36.30	35.03	35.01	35.69	35.51
Baro	in Hg	28.95	28.96	28.96	28.95	28.96	28.96
Baro	mmHg	735.43	735.50	735.59	735.44	735.63	735.49
Pvap_kPa	kPa	0.72	0.63	0.56	0.56	0.56	0.60
Pvap_inHg	inHg	0.21	0.19	0.17	0.17	0.17	0.18
AbsHumidity	grains/lb	32.45	28.07	25.16	25.25	25.21	26.95
SatPres	kPa	97.32	97.43	97.51	97.48	97.51	97.45
Hum Factor		0.83	0.82	0.81	0.81	0.81	0.82
F_fac		1.00	1.00	0.99	1.00	0.99	1.00
K_fac		1.02	1.01	1.01	1.01	1.01	1.01
Humidity	g/kg	4.64	4.01	3.59	3.61	3.60	3.85
H2		1.29	0.05	0.49	0.19	0.85	0.36
WetDry Factor		0.86	0.86	0.86	0.86	0.86	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	2234.53	178.77	971.74	458.43	1828.50	247.13
CO	%	3.25	0.14	1.38	0.55	2.28	1.03
N2O	ppm	6.43	4.79	4.56	3.98	3.79	4.24
CH4	ppm	281.89	31.04	144.88	82.99	295.63	104.20
CO2	%	10.56	13.16	12.19	12.92	11.49	12.50
O2	%	0.04	0.18	0.00	0.00	0.00	0.04
CNOx	ppm	619.39	1113.13	401.70	127.19	5.23	434.68
AHC	ppm	83.98	3.30	26.26	8.49	68.21	24.50
C2H2	ppm	14.88	1.93	3.56	1.59	2.99	3.96
C2H4	ppm	189.99	13.93	65.98	31.65	147.31	47.96
C3H6	ppm	60.58	4.23	11.25	2.88	30.21	11.31
C4H6	ppm	34.75	2.17	31.48	17.27	5.15	17.71
ETOH	ppm	13.83	2.50	10.44	7.20	6.35	8.49
H2O	%	13.77	13.70	13.95	13.98	13.71	0.00
HCHO	ppm	10.55	4.05	3.30	0.94	2.31	3.43
HCN	ppm	23.76	1.77	15.75	3.24	2.38	8.22
HNCO	ppm	6.27	1.12	9.65	4.93	0.12	5.11
MECHO	ppm	9.43	0.42	0.86	0.02	0.69	1.64
NC5	ppm	68.17	6.09	55.20	27.43	68.48	36.48
NH3	ppm	630.11	24.32	875.33	428.98	73.85	465.61
NO	ppm	743.64	1357.44	495.89	156.72	5.63	532.56
NO2	ppm	0.13	1.22	0.16	0.52	0.85	0.53
Soot	mg/m3	0.63	0.04	0.26	0.12	0.00	0.17
AFR	:1	12.07	14.13	13.20	13.70	12.56	13.59



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	1.490	0.259	13.769	78.503	0.907	13.034	0.998
2	0.056	0.021	13.702	83.586	0.966	14.841	0.991
3	0.573	0.113	13.952	81.749	0.945	14.011	1.000
4	0.220	0.053	13.979	83.109	0.961	14.443	1.000
5	0.987	0.212	13.710	79.953	0.924	13.493	1.000

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	256.396	0.228	0.028	0.256	97.305	2.695
2	9.412	-0.119	-0.015	-0.134	100.255	0.255
3	32.675	0.113	0.014	0.127	99.225	0.775
4	10.368	0.053	0.007	0.060	100.032	0.032
5	12.141	0.212	0.026	0.238	98.058	1.942

Power Run

Team 6

TeamNumber	6
TeamName	MTU
Model	Yamaha
Engine	Yamaha

Displacement cc	500.00
RatedSpeed	10723
RatedTorque	44.8

