



## Team Results for Clean Snowmobile Challenge 2015 Team 10



**2015 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet**

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Test Date       : 2015/03/05 19:12:23
Team Name      : MTU
Team Number    : 10
Model         : Yamaha
Engine        : Genesis
Displacement[cc] : 500.00
100% Speed    : 8580
100% Torque   : 46.0
No of Strokes : 4
Fuel          : GASOLINE           H/C: 1.92       O/C: 0.03
  
```

ModeNum	:	1	2	3	4	5
Weighting	:	0.12	0.27	0.25	0.31	0.05
Power kW	:	52.3	22.2	13.3	6.1	0.0
HC_m g/hr	:	203.52	0.08	0.25	37.94	151.95
CO_m g/hr	:	5196.14	19.17	9.77	803.47	1604.48
NOx_m g/hr	:	348.44	230.33	117.40	10.91	0.03
Soot_m mg/hr	:	139.33	0.14	0.10	0.06	0.01
N2O_m mg/hr	:	0.21	0.15	0.07	0.03	0.06
CO2_m g/hr	:	40089.12	23648.99	16208.47	8864.21	2076.44
CH4_m g/hr	:	32.88	0.12	0.38	3.53	29.13
W_HC g/hr	:	24.42	0.02	0.06	11.76	7.60
W_CO g/hr	:	623.54	5.18	2.44	249.08	80.22
W_NOx g/hr	:	41.81	62.19	29.35	3.38	0.00
W_HCNOx g/hr	:	66.24	62.21	29.41	15.14	7.60
W_Soot mg/hr	:	16.72	0.04	0.02	0.02	0.00
W_N2O g/hr	:	0.03	0.04	0.02	0.01	0.00
W_CO2 g/hr	:	4810.69	6385.23	4052.12	2747.90	103.82
W_CH4 g/hr	:	3.95	0.03	0.09	1.09	1.46

Total Weighted Power [kW] 17.474

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	43.86	960.45	136.74	180.60
Specific Mass [g/kW-hr]	2.51	54.96	7.82	10.34
BSFC [g/kW-hr]	389.6			

Total Soot [mg/hr] 16.80      Specific Soot [mg/kW-hr] 0.96

Not Used for Competition

Total N2O [mg/hr]	0.10	Specific N2O [mg/kW-hr]	0.01
Total CO2 [g/hr]	18099.77	Specific CO2 [g/kW-hr]	1035.78
Total CH4 [g/hr]	6.62	Specific CH4 [g/kW-hr]	0.38
RMC BSFC [g/kW-hr]			

EMISSION TESTS:

	Value	Limit	Result
Power	41.33	<96.94 kW	PASS
Soot	0.96	<100 mg/kW-hr	PASS
CO	54.96	<275 g/kW-hr	PASS
HC + NOX	10.34	<90 g/kW-hr	PASS
E-Score	189.37	>100	PASS
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST      PASS



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**Modal Raw Data : Engine / Environmental**

ModeNum		1	2	3	4	5
Total Points	points	554	1200	1200	1200	1080
PtsInMode	points	1200	1799	1800	1800	1800
Speed	rpm	10725.45	9116.80	8045.99	6970.84	2780.01
Torque	Nm	46.53	23.29	15.76	8.31	0.00
Power	kW	52.26	22.24	13.28	6.06	0.00
BSFC	g/kw-hr	296.58	337.54	387.36	535.55	**
Fuel	g/hr	15499.00	7505.94	5142.92	3247.90	1609.25
T_int	degC	33.22	42.54	40.47	46.16	39.25
RelHumid	%	31.44	23.37	23.58	23.52	24.49
Baro	in Hg	29.11	29.11	29.11	29.11	29.11
Baro	mmHg	739.49	739.47	739.43	739.41	739.41
Pvap_kPa	kPa	1.25	1.46	1.34	1.74	1.31
Pvap_inHg	inHg	0.37	0.43	0.40	0.52	0.39
AbsHumidity	grains/lb	55.93	65.64	59.95	78.49	58.68
SatPres	kPa	97.34	97.12	97.24	96.83	97.27
Hum Factor		0.92	0.96	0.93	1.02	0.93
F_fac		1.04	1.06	1.06	1.07	1.05
K_fac		1.04	1.05	1.05	1.06	1.05
Humidity	g/kg	7.99	9.38	8.56	11.21	8.38
H2		0.84	0.00	0.00	0.57	3.90
WetDry Factor		0.86	0.88	0.88	0.88	0.89



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**Modal Emissions Concentrations**

ModeNum		1	2	3	4	5
THC	ppmC1	1818.04	1.26	5.76	1536.56	14655.16
CO	%	2.31	0.02	0.01	1.62	7.71
N2O	ppm	5.98	7.71	4.81	3.91	18.74
CH4	ppm	256.06	1.65	7.56	124.67	2449.86
CO2	%	11.35	11.80	11.73	11.38	6.35
O2	%	0.09	2.62	2.76	1.16	2.09
CNOx	ppm	943.85	1099.65	812.75	133.94	0.96
AHC	ppm	62.90	0.01	0.06	62.62	483.53
C2H2	ppm	8.91	0.69	0.67	2.28	51.56
C2H4	ppm	152.41	1.40	5.91	74.89	1181.05
C3H6	ppm	57.86	0.11	0.10	35.90	313.22
C4H6	ppm	15.70	0.28	0.28	8.41	15.75
ETOH	ppm	5.25	0.01	0.00	5.40	6.36
H2O	%	13.75	11.70	11.62	12.50	11.05
HCHO	ppm	17.17	0.83	1.70	4.87	23.45
HCN	ppm	12.05	1.28	0.71	7.81	4.78
HNCO	ppm	12.48	1.58	1.07	1.41	0.00
MECHO	ppm	6.69	0.16	0.21	0.65	0.00
NC5	ppm	31.89	0.83	0.63	76.97	422.25
NH3	ppm	265.26	1.57	0.98	192.40	50.92
NO	ppm	1027.94	1137.13	861.54	132.57	0.20
NO2	ppm	0.55	10.88	8.79	0.63	1.05
Soot	mg/m3	0.75	0.00	0.00	0.00	0.00
AFR	:1	12.53	16.14	16.25	13.59	8.86



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.969	0.211	13.754	80.145	0.926	13.470	0.995
2	0.005	0.000	11.703	82.809	0.957	16.877	0.868
3	0.004	0.001	11.622	82.812	0.957	16.998	0.861
4	0.648	0.176	12.496	80.038	0.925	14.558	0.941
5	4.380	1.648	11.052	71.986	0.832	11.032	0.891

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	203.523	0.136	0.017	0.153	98.260	1.740
2	0.080	-1.770	-0.221	-1.991	98.263	1.737
3	0.252	-1.848	-0.231	-2.079	98.200	1.800
4	37.935	-0.713	-0.089	-0.802	97.010	2.990
5	151.949	-0.251	-0.031	-0.282	95.072	4.928

# Power Run

## Team 10

TeamNumber	10
TeamName	MTU
Model	Yamaha
Engine	Genesis

Displacement cc	500.00
RatedSpeed	8580
RatedTorque	46.0

