



Team Results for Clean Snowmobile Challenge 2018 Team 103



2018 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2018/03/05 18:44:28
Team Name      : UW-Platteville
Team Number    : 103
Model         : Kubota
Engine        :
Displacement[cc] : 898.00
100% Speed    : 3346
100% Torque   : 57.7
No of Strokes : 4
Fuel          : Diesel
                H/C: 1.74      O/C: 0.01
  
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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 :	19.8	8.7	5.0	2.5	0.0	6.5
HC_m	g/hr :	4.03	0.80	0.50	0.89	0.16	0.36
CO_m	g/hr :	4.40	1.64	1.77	2.04	1.47	2.25
NOx_m	g/hr :	82.10	46.75	34.19	29.35	14.59	44.36
Soot_m	mg/hr:	46.29	22.37	9.96	11.43	3.95	21.13
N2O_m	mg/hr:	0.02	0.01	0.01	0.01	0.00	0.02
CO2_m	g/hr :	16912.66	7662.59	4843.61	3122.02	819.86	6608.81
CH4_m	g/hr :	0.03	0.03	0.04	0.05	0.02	0.04
W_HC	g/hr :	0.48	0.21	0.12	0.28	0.01	0.36
W_CO	g/hr :	0.53	0.44	0.44	0.63	0.07	2.25
W_NOx	g/hr :	9.85	12.62	8.55	9.10	0.73	44.36
W_HCNOx	g/hr :	10.33	12.84	8.67	9.37	0.74	44.72
W_Soot	mg/hr:	5.56	6.04	2.49	3.54	0.20	21.13
W_N2O	g/hr :	0.00	0.00	0.00	0.00	0.00	0.02
W_CO2	g/hr :	2029.52	2068.90	1210.90	967.83	40.99	6608.81
W_CH4	g/hr :	0.00	0.01	0.01	0.02	0.00	0.04

Total Weighted Power [kW] 6.740

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	1.11	2.12	40.85	41.95
Specific Mass [g/kW-hr]	0.16	0.31	6.06	6.23
BSFC [g/kW-hr]	305.0			

Total Soot [mg/hr] 17.83 Specific Soot [mg/kW-hr] 2.65

Not Used for Competition

Total N2O [mg/hr]	0.01	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	6318.14	Specific CO2 [g/kW-hr]	937.48
Total CH4 [g/hr]	0.04	Specific CH4 [g/kW-hr]	0.01
RMC BSFC [g/kW-hr]	319.96		

EMISSION TESTS:

	Value	Limit	Result
Power	20.21	<96.94 kW	PASS
Soot	2.65	<50 mg/kW-hr	PASS
CO	0.31	<275 g/kW-hr	PASS
HC + NOX	6.23	<90 g/kW-hr	PASS
E-Score	205.77	>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	1040	948	835	1200	11431
PtsInMode	points	1210	3370	3470	1800	1480	11431
Speed	rpm	3350.17	2835.29	2493.98	2181.25	832.67	2543.47
Torque	Nm	56.41	29.36	19.05	10.83	0.00	24.26
Power	kW	19.79	8.72	4.97	2.47	0.00	6.46
BSFC	g/kw-hr	267.54	275.01	304.70	395.21	**	319.96
Fuel	g/hr	5294.38	2397.51	1515.85	978.08	257.23	2067.88
T_int	degC	3.51	10.00	9.64	9.18	3.02	8.26
RelHumid	%	22.42	21.77	21.62	22.28	21.30	21.95
Baro	in Hg	28.96	28.96	28.95	28.96	28.95	28.96
Baro	mmHg	735.66	735.49	735.42	735.58	735.33	735.54
Pvap_kPa	kPa	0.17	0.24	0.24	0.24	0.16	0.22
Pvap_inHg	inHg	0.05	0.07	0.07	0.07	0.05	0.07
AbsHumidity	grains/lb	7.59	10.90	10.60	10.63	7.00	9.91
SatPres	kPa	97.91	97.81	97.81	97.83	97.88	97.84
Hum Factor		0.76	0.77	0.77	0.77	0.76	0.77
F_fac		0.96	0.98	0.98	0.97	0.96	0.97
K_fac		0.99	1.00	1.00	1.00	0.99	1.00
Humidity	g/kg	1.08	1.56	1.51	1.52	1.00	1.42
H2		0.00	0.00	0.00	0.00	0.00	0.00
WetDry Factor		0.93	0.95	0.96	0.97	0.97	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	59.84	17.92	14.00	25.49	13.55	8.09
CO	%	0.00	0.00	0.00	0.00	0.01	0.00
N2O	ppm	1.14	1.03	1.11	1.06	0.73	1.06
CH4	ppm	0.39	0.60	0.96	1.30	1.49	0.85
CO2	%	7.86	5.40	4.27	2.79	2.22	4.67
O2	%	8.83	12.57	14.26	15.65	16.75	14.10
CNOx	ppm	365.00	314.96	288.56	250.68	377.80	300.17
AHC	ppm	1.65	0.26	0.28	0.26	0.30	0.41
C2H2	ppm	0.17	0.18	0.22	0.11	0.14	0.17
C2H4	ppm	1.03	1.05	1.09	1.06	1.12	1.09
C3H6	ppm	0.51	0.42	0.56	0.40	0.47	0.47
C4H6	ppm	0.89	0.43	0.29	0.39	0.37	0.39
ETOH	ppm	0.48	0.31	0.30	0.27	0.19	0.32
H2O	%	7.39	5.17	4.19	3.41	2.75	0.00
HCHO	ppm	1.47	1.34	1.26	1.50	1.20	1.38
HCN	ppm	0.58	0.12	0.10	0.07	0.14	0.19
HNCO	ppm	3.94	2.02	1.53	1.69	1.65	1.97
MECHO	ppm	0.00	0.00	0.00	0.00	0.00	0.00
NC5	ppm	2.99	1.07	0.84	0.72	0.70	1.08
NH3	ppm	0.21	0.01	0.01	0.08	0.02	0.06
NO	ppm	432.11	357.10	353.05	291.18	464.14	352.88
NO2	ppm	48.53	52.66	22.83	35.31	34.34	39.11
Soot	mg/m3	0.39	0.29	0.16	0.20	0.20	0.27
AFR	:1	25.34	37.36	47.35	69.81	88.96	44.19



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.001	0.006	7.392	80.897	0.935	25.640	0.563
2	0.001	0.002	5.171	80.190	0.927	37.740	0.385
3	0.001	0.001	4.192	79.827	0.923	47.820	0.307
4	0.001	0.003	3.412	77.412	0.895	70.567	0.244
5	0.002	0.001	2.746	77.771	0.899	89.869	0.194

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	4.026	-3.706	-0.463	-4.169	95.742	4.258
2	0.795	-3.498	-0.437	-3.935	96.175	3.825
3	0.496	-3.093	-0.387	-3.480	96.654	3.346
4	0.893	-2.182	-0.273	-2.455	94.975	5.025
5	0.157	-1.845	-0.231	-2.076	96.158	3.842

Carbon Balance Verification

		1	2	3	4	5	6
Power	kW	19.789	8.718	4.975	2.475	0.000	6.463
BSFC	g/kw-hr	267.54	275.01	304.70	395.21	**	319.96
Fuel_MassFlow	g/hr	5294.4	2397.5	1515.8	978.1	257.2	2067.9
HC_m	g/hr	4.0260	0.7954	0.4961	0.8926	0.1566	0.3574
CO_m	g/hr	4.4022	1.6412	1.7701	2.0396	1.4696	2.2494
CO2_m	g/hr	16913	7663	4844	3122	820	6609
TW_Power	kW	6.7395					
TW_BSFC	g/kw-hr	305.05					
Fuel_MassFlow	g/hr	5294.4	2397.5	1515.8	978.1	257.2	2067.9
FuelCalc	g/hr	5350.3	2422.7	1531.8	988.4	259.9	2089.5
FuelCalcDev	%	-1.0558	-1.0495	-1.0494	-1.0581	-1.0536	-1.0472

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

Power Run

Team 103

TeamNumber	103
TeamName	UW-Platteville
Model	Kubota
Engine	

Displacement cc	898.00
RatedSpeed	3346
RatedTorque	57.7

