



Team Results for Clean Snowmobile Challenge 2019 Team 101



2019 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

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Test Date       : 2019/03/04 15:51:22
Team Name      : UW Platteville
Team Number    : 101
Model          : D902
Engine         : Kubota
Displacement[cc] : 898.00
100% Speed    : 3725
100% Torque   : 64.4
No of Strokes : 4
Fuel          : Diesel
                H/C: 1.81      O/C: 0.00
  
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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 :	23.7	10.9	6.2	3.1	0.0	8.1
HC_m	g/hr :	9.47	0.00	0.00	0.37	0.00	0.01
CO_m	g/hr :	8.68	2.22	1.64	3.08	1.61	3.47
NOx_m	g/hr :	91.85	63.45	45.73	30.92	19.22	55.71
Soot_m	mg/hr:	2093.57	507.83	319.72	187.09	149.01	606.65
N2O_m	mg/hr:	0.02	0.02	0.01	0.01	0.00	0.02
CO2_m	g/hr :	22731.41	10109.22	6340.62	4208.76	1427.97	8826.01
CH4_m	g/hr :	0.28	0.03	0.04	0.07	0.03	0.08
W_HC	g/hr :	1.14	0.00	0.00	0.12	0.00	0.01
W_CO	g/hr :	1.04	0.60	0.41	0.95	0.08	3.47
W_NOx	g/hr :	11.02	17.13	11.43	9.58	0.96	55.71
W_HCNOx	g/hr :	12.16	17.13	11.43	9.70	0.96	55.72
W_Soot	mg/hr:	251.23	137.11	79.93	58.00	7.45	606.65
W_N2O	g/hr :	0.00	0.00	0.00	0.00	0.00	0.02
W_CO2	g/hr :	2727.77	2729.49	1585.15	1304.72	71.40	8826.01
W_CH4	g/hr :	0.03	0.01	0.01	0.02	0.00	0.08

Total Weighted Power [kW] 8.303

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	1.25	3.09	50.13	51.38
Specific Mass [g/kW-hr]	0.15	0.37	6.04	6.19
BSFC [g/kW-hr]	327.6			

Total Soot [mg/hr] 533.72 Specific Soot [mg/kW-hr] 64.28

Not Used for Competition

Total N2O [mg/hr]	0.01	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	8418.53	Specific CO2 [g/kW-hr]	1013.91
Total CH4 [g/hr]	0.07	Specific CH4 [g/kW-hr]	0.01
RMC BSFC [g/kW-hr]	341.64		

EMISSION TESTS:

	Value	Limit	Result
Power	25.11	<96.94 kW	PASS
Soot	64.28	<50 mg/kW-hr	FAIL
CO	0.37	<275 g/kW-hr	PASS
HC + NOX	6.19	<90 g/kW-hr	PASS
E-Score	205.78	>175	PASS
Valid Data for All 5 Modes			PASS
RMC			PASS
LAB EMISSION TEST			FAIL



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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	3725.47	3166.50	2793.86	2420.45	1393.54	2875.60
Torque	Nm	60.85	32.86	21.18	12.26	0.00	26.98
Power	kW	23.74	10.90	6.20	3.11	0.00	8.13
BSFC	g/kw-hr	301.55	291.71	321.78	426.47	**	341.64
Fuel	g/hr	7158.82	3178.68	1993.83	1324.82	449.64	2775.97
T_int	degC	28.73	17.04	19.89	17.73	23.79	19.99
RelHumid	%	13.18	18.89	27.22	12.02	21.10	18.19
Baro	in Hg	28.67	28.67	28.68	28.67	28.68	28.67
Baro	mmHg	728.15	728.31	728.42	728.19	728.41	728.30
Pvap_kPa	kPa	0.42	0.32	0.54	0.21	0.51	0.36
Pvap_inHg	inHg	0.12	0.09	0.16	0.06	0.15	0.11
AbsHumidity	grains/lb	18.77	14.32	24.22	9.47	23.20	16.25
SatPres	kPa	96.66	96.78	96.58	96.87	96.60	96.74
Hum Factor		0.79	0.78	0.81	0.76	0.80	0.78
F_fac		1.03	1.00	1.01	1.00	1.02	1.01
K_fac		1.04	1.02	1.03	1.02	1.04	1.03
Humidity	g/kg	2.68	2.05	3.46	1.35	3.31	2.32
H2		0.00	0.00	0.00	0.00	0.00	0.00
WetDry Factor		0.91	0.95	0.96	0.96	0.98	1.00



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Modal Emissions Concentrations

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	132.05	0.00	0.00	10.51	0.00	0.22
CO	%	0.01	0.00	0.00	0.00	0.00	0.00
N2O	ppm	0.84	0.89	0.93	0.90	0.71	0.92
CH4	ppm	3.34	0.54	0.73	1.58	1.21	1.30
CO2	%	9.96	5.74	4.70	3.71	2.04	5.33
O2	%	5.58	11.91	13.51	14.86	16.93	13.11
CNOx	ppm	385.06	344.83	324.18	260.89	263.24	321.90
AHC	ppm	0.00	0.79	1.12	0.17	0.50	0.66
C2H2	ppm	0.91	0.20	0.17	0.16	0.13	0.26
C2H4	ppm	1.52	1.00	0.96	0.98	1.28	1.08
C3H6	ppm	2.21	0.60	0.28	0.68	0.47	0.69
C4H6	ppm	1.17	0.61	0.30	0.46	0.35	0.55
ETOH	ppm	0.00	1.72	2.57	0.00	1.92	1.48
H2O	%	9.45	5.41	4.45	3.67	2.38	0.00
HCHO	ppm	5.98	1.05	0.79	2.51	1.31	2.91
HCN	ppm	1.01	0.15	0.07	0.21	0.04	0.28
HNCO	ppm	38.90	1.30	0.72	5.50	0.59	8.41
MECHO	ppm	0.00	0.00	0.00	0.00	0.00	0.00
NC5	ppm	7.42	2.79	2.54	3.29	1.40	3.58
NH3	ppm	4.30	0.05	0.01	0.64	0.01	0.75
NO	ppm	474.74	371.17	360.68	276.81	311.59	355.90
NO2	ppm	12.09	72.05	40.91	64.43	15.78	54.91
Soot	mg/m3	16.70	5.31	4.36	3.07	4.07	6.57
AFR	:1	20.05	35.25	43.27	54.44	97.18	39.10



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Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.002	0.015	9.447	81.544	0.943	20.058	0.721
2	0.001	0.000	5.415	79.578	0.920	35.180	0.417
3	0.001	0.000	4.452	79.268	0.916	43.184	0.342
4	0.001	0.001	3.665	78.592	0.908	54.354	0.280
5	0.001	0.000	2.378	76.811	0.888	96.976	0.185

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	9.472	-3.062	-0.383	-3.445	96.271	3.729
2	0.000	**	**	**	**	**
3	0.000	**	**	**	**	**
4	0.374	-2.779	-0.347	-3.127	95.689	4.311
5	0.000	**	**	**	**	**

Carbon Balance Verification

		1	2	3	4	5	6
Power	kW	23.740	10.897	6.196	3.106	0.000	8.125
BSFC	g/kw-hr	301.55	291.71	321.78	426.47	**	341.64
Fuel_MassFlow	g/hr	7158.8	3178.7	1993.8	1324.8	449.6	2776.0
HC_m	g/hr	9.4720	0.0000	0.0000	0.3743	0.0000	0.0113
CO_m	g/hr	8.6759	2.2227	1.6425	3.0785	1.6083	3.4742
CO2_m	g/hr	22731	10109	6341	4209	1428	8826
TW_Power	kW	8.3031					
TW_BSFC	g/kw-hr	327.60					
Fuel_MassFlow	g/hr	7158.8	3178.7	1993.8	1324.8	449.6	2776.0
FuelCalc	g/hr	7160.1	3178.6	1993.8	1324.8	449.6	2775.9
FuelCalcDev	%	-0.018260	0.001817	0.001817	-0.002469	0.001819	0.001756

\$HCR_ENG	1.808
\$OCR_ENG	0
MassFracCFuel H/C ratio	0.86826

Power Run

Team 101

TeamNumber	101
TeamName	UW Plattville
Model	D902
Engine	Kubota

Displacement cc	898.00
RatedSpeed	3725
RatedTorque	64.4

