



## Team Results for Clean Snowmobile Challenge 2015 Team 7



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

```

Test Date       : 2015/03/06 09:54:59
Team Name      : NDSU
Team Number    : 7
Model         : Polaris
Engine        : Yanmar
Displacement[cc] : 904.00
100% Speed    : 3814
100% Torque   : 90.8
No of Strokes : 4
Fuel          : DIESEL           H/C: 1.76       O/C: 0.01
  
```

ModeNum	:	1	2	3	4	5	RMC
Weighting	:	0.12	0.27	0.25	0.31	0.05	1.00
Power kW	:	32.0	15.7	9.0	4.5	0.0	10.2
HC_m g/hr	:	17.02	0.00	0.00	0.00	0.00	0.18
CO_m g/hr	:	1152.84	0.09	0.06	0.08	0.02	72.98
NOx_m g/hr	:	1.92	86.89	65.47	35.06	9.75	65.96
Soot_m mg/hr	:	151601.01	1004.60	459.19	215.43	89.11	**
N2O_m mg/hr	:	0.04	0.02	0.02	0.01	0.01	0.03
CO2_m g/hr	:	32265.39	13533.57	8287.51	4862.85	1392.33	10694.02
CH4_m g/hr	:	7.25	0.01	0.02	0.04	0.03	0.69
W_HC g/hr	:	2.04	0.00	0.00	0.00	0.00	0.18
W_CO g/hr	:	138.34	0.02	0.01	0.03	0.00	72.98
W_NOx g/hr	:	0.23	23.46	16.37	10.87	0.49	65.96
W_HCNOx g/hr	:	2.27	23.46	16.37	10.87	0.49	66.15
W_Soot mg/hr	:	18192.12	271.24	114.80	66.78	4.46	**
W_N2O g/hr	:	0.00	0.01	0.00	0.00	0.00	0.03
W_CO2 g/hr	:	3871.85	3654.06	2071.88	1507.48	69.62	10694.02
W_CH4 g/hr	:	0.87	0.00	0.01	0.01	0.00	0.69

Total Weighted Power [kW] 11.720

Weighted Emissions

	HC	CO	NOx	HC+NOx
Total Mass [g/hr]	2.04	138.41	51.41	53.46
Specific Mass [g/kW-hr]	0.17	11.81	4.39	4.56
BSFC [g/kW-hr]	290.4			

Total Soot [mg/hr] 18649.40      Specific Soot [mg/kW-hr] 1591.20

Not Used for Competition

Total N2O [mg/hr]	0.02	Specific N2O [mg/kW-hr]	0.00
Total CO2 [g/hr]	11174.89	Specific CO2 [g/kW-hr]	953.46
Total CH4 [g/hr]	0.89	Specific CH4 [g/kW-hr]	0.08
RMC BSFC [g/kW-hr]	333.66		

EMISSION TESTS:

	Value	Limit	Result
Power	36.25	<96.94 kW	PASS
Soot	1591.20	<100 mg/kW-hr	FAIL
CO	11.81	<275 g/kW-hr	PASS
HC + NOX	4.56	<90 g/kW-hr	PASS
E-Score	204.01	>100	PASS
Valid Data for All 5 Modes			PASS

LAB EMISSION TEST      FAIL



**Team Results for  
Clean Snowmobile Challenge 2015  
Team 7**



**Modal Raw Data : Engine / Environmental**

ModeNum		1	2	3	4	5	RMC
Total Points	points	7	1200	1200	1200	1200	12032
PtsInMode	points	1210	3050	2720	3470	1480	12032
Speed	rpm	3807.39	3241.61	2861.33	2479.59	1334.25	2860.73
Torque	Nm	80.20	46.33	29.95	17.30	0.00	33.88
Power	kW	31.98	15.73	8.97	4.49	0.00	10.15
BSFC	g/kw-hr	334.41	269.61	289.35	339.10	**	333.66
Fuel	g/hr	10693.88	4240.35	2596.65	1523.66	436.25	3386.74
T_int	degC	18.57	23.26	18.56	18.49	17.58	20.21
RelHumid	%	14.68	12.84	13.52	15.05	13.34	14.11
Baro	in Hg	28.77	28.77	28.76	28.77	28.76	28.77
Baro	mmHg	730.76	730.65	730.58	730.75	730.50	730.69
Pvap_kPa	kPa	0.27	0.30	0.25	0.27	0.23	0.28
Pvap_inHg	inHg	0.08	0.09	0.07	0.08	0.07	0.08
AbsHumidity	grains/lb	12.07	13.65	11.11	12.32	10.38	12.71
SatPres	kPa	97.16	97.11	97.15	97.15	97.16	97.13
Hum Factor		0.77	0.78	0.77	0.77	0.77	0.77
F_fac		1.00	1.02	1.00	1.00	1.00	1.01
K_fac		1.02	1.03	1.02	1.02	1.02	1.03
Humidity	g/kg	1.72	1.95	1.59	1.76	1.48	1.82
H2		0.22	0.00	0.00	0.00	0.00	0.02
WetDry Factor		0.87	0.92	0.94	0.95	0.97	1.00



**Team Results for  
Clean Snowmobile Challenge 2015  
Team 7**



**Modal Emissions Concentrations**

ModeNum		1	2	3	4	5	RMC
THC	ppmC1	214.26	0.00	0.00	0.00	0.00	3.82
CO	%	0.71	0.00	0.00	0.00	0.00	0.07
N2O	ppm	1.51	1.19	1.23	1.37	1.45	1.75
CH4	ppm	78.62	0.16	0.44	1.17	1.67	12.29
CO2	%	12.72	8.68	6.39	4.89	2.54	6.96
O2	%	0.00	7.57	11.07	13.33	16.58	10.67
CNOx	ppm	7.24	533.16	482.58	337.35	170.49	410.90
AHC	ppm	15.44	0.02	0.02	0.84	0.20	3.35
C2H2	ppm	1.37	0.03	0.09	0.03	0.02	0.19
C2H4	ppm	11.67	0.26	0.22	0.24	0.19	1.16
C3H6	ppm	0.00	0.40	0.36	0.29	0.27	0.36
C4H6	ppm	11.79	1.05	1.02	1.03	0.32	1.58
ETOH	ppm	7.45	0.70	0.33	0.52	0.33	1.00
H2O	%	13.11	8.07	5.96	4.61	2.63	0.00
HCHO	ppm	0.00	0.15	0.09	0.14	0.00	0.08
HCN	ppm	1.25	0.48	0.56	0.41	0.28	0.49
HNCO	ppm	5.10	3.50	5.65	4.04	2.67	4.29
MECHO	ppm	0.00	0.00	0.00	0.00	0.00	0.00
NC5	ppm	18.36	2.15	2.09	2.94	1.93	5.39
NH3	ppm	308.38	0.25	0.12	0.69	0.06	21.84
NO	ppm	8.22	358.59	146.80	120.29	32.77	251.19
NO2	ppm	1.16	328.28	480.69	316.44	189.49	280.10
Soot	mg/m3	1130.49	11.78	6.48	3.98	3.04	#####
AFR	:1	13.92	23.04	31.61	41.48	79.24	29.37



**Team Results for  
Clean Snowmobile Challenge 2015  
Team 7**



Measurement Accuracy (SAE paper 961804)

ModeNum	H2_XLS %	ModalHC_Dry %	ModalFTIR_H2O %	N2 %	Ar %	AFR :1	Tr_Eff -
1	0.251	0.025	13.109	80.385	0.929	14.057	1.000
2	0.000	0.000	8.072	80.933	0.936	23.182	0.624
3	0.000	0.000	5.965	80.259	0.928	31.799	0.456
4	0.000	0.000	4.609	79.698	0.921	41.710	0.350
5	0.000	0.000	2.627	78.003	0.902	79.652	0.200

ModeNum	ModalWHC %	ModalC1 %	ModalC8 %	ModalSUM_HC %	ModalT_Emiss %	ModalError %
1	17.024	0.025	0.003	0.028	97.059	2.941
2	0.000	**	**	**	**	**
3	0.000	**	**	**	**	**
4	0.000	**	**	**	**	**
5	0.000	**	**	**	**	**

# Power Run

Team 7

TeamNumber	7
TeamName	NDSU
Model	Polaris
Engine	Yanmar

Displacement cc	904.00
RatedSpeed	3814
RatedTorque	90.8

