

Team Results for Clean Snowmobile Challenge 2012

2012 Clean Snowmobile Competition - Lab Emission Event Emission Data Sheet

Test Date : 2012/03/08 13:53:37
 Team Name : Kettering
 Team Number : 9
 Model : Ski Doo
 Engine : Renegade Sport
 Displacement[cc] : 600cc
 100% Speed [rpm] : 7232
 100% Torque [Nm] : 56.1
 No of Strokes : 4
 Fuel : Gasoline H/C: 2.09 O/C: 0.13

| ModeNum | : | 1 | 2 | 3 | 4 | 5 |
|--------------|---|----------|----------|----------|---------|---------|
| Weighting | : | 0.12 | 0.27 | 0.25 | 0.31 | 0.05 |
| Power kW | : | 39.7 | 18.7 | 10.7 | 6.1 | 0.0 |
| HC_m g/hr | : | 53.72 | 1.19 | 3.16 | 6.57 | 17.49 |
| CO_m g/hr | : | 1002.12 | 0.38 | 0.71 | 0.73 | 0.48 |
| NOx_m g/hr | : | 186.66 | 144.07 | 49.75 | 28.90 | 1.38 |
| Soot_m mg/hr | : | 112.78 | 1.64 | 2.92 | 0.46 | 0.15 |
| N2O_m mg/hr | : | 0.00 | 0.02 | 0.01 | 0.01 | 0.00 |
| CO2_m g/hr | : | 35320.91 | 19410.02 | 13492.30 | 9037.46 | 3748.24 |
| CH4_m g/hr | : | 16.38 | 0.96 | 1.92 | 1.90 | 3.85 |
| W_HC g/hr | : | 6.45 | 0.32 | 0.79 | 2.04 | 0.87 |
| W_CO g/hr | : | 120.25 | 0.10 | 0.18 | 0.23 | 0.02 |
| W_NOx g/hr | : | 22.40 | 38.90 | 12.44 | 8.96 | 0.07 |
| W_HCNOx g/hr | : | 28.84 | 39.22 | 13.23 | 11.00 | 0.94 |
| W_Soot mg/hr | : | 13.53 | 0.44 | 0.73 | 0.14 | 0.01 |
| W_N2O g/hr | : | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 |
| W_CO2 g/hr | : | 4238.51 | 5240.71 | 3373.07 | 2801.61 | 187.41 |
| W_CH4 g/hr | : | 1.97 | 0.26 | 0.48 | 0.59 | 0.19 |

Total Weighted Power [kW] 14.368

Weighted Emissions

| | HC | CO | NOx | HC+NOx |
|-------------------------|-------|--------|-------|--------|
| Total Mass [g/hr] | 10.47 | 120.79 | 82.76 | 93.23 |
| Specific Mass [g/kW-hr] | 0.73 | 8.41 | 5.76 | 6.49 |
| BSFC [g/kW-hr] | 375.3 | | | |

Total Soot [mg/hr] 14.86 Specific Soot [mg/kW-hr] 1.03

Not Used for Competition

| | | | |
|-------------------|----------|-------------------------|---------|
| Total N2O [mg/hr] | 0.01 | Specific N2O [mg/kW-hr] | 0.00 |
| Total CO2 [g/hr] | 15841.31 | Specific CO2 [g/kW-hr] | 1102.53 |
| Total CH4 [g/hr] | 3.48 | Specific CH4 [g/kW-hr] | 0.24 |

EMISSION TESTS:

| | Value | Limit | Result |
|----------------------------|--------|---------------|--------|
| Power | 42.49 | <96.94 kW | PASS |
| Soot | 1.03 | <100 mg/kW-hr | PASS |
| CO | 8.41 | <275 g/kW-hr | PASS |
| HC + NOX | 6.49 | <90 g/kW-hr | PASS |
| E-Score | 203.57 | >100 | PASS |
| Valid Data for All 5 Modes | | | PASS |

LAB EMISSION TEST PASS

Team Results for Clean Snowmobile Challenge 2012

Modal Raw Data : Engine / Environmental

| ModeNum | | 1 | 2 | 3 | 4 | 5 |
|---------------|-----------|----------|---------|---------|---------|---------|
| Total Points | points | 594 | 1198 | 1194 | 1197 | 1166 |
| PtsInMode | points | 594 | 1198 | 1194 | 1197 | 1193 |
| Speed | rpm | 7200.71 | 6110.48 | 5525.66 | 4337.99 | 1935.77 |
| Torque | Nm | 52.63 | 29.17 | 18.57 | 13.35 | 0.00 |
| Power | kW | 39.69 | 18.66 | 10.75 | 6.06 | 0.00 |
| BSFC | g/kw-hr | 299.52 | 333.65 | 402.97 | 479.20 | ** |
| Fuel | g/hr | 11887.52 | 6226.92 | 4331.02 | 2905.60 | 1219.93 |
| T_int | degC | 14.52 | 15.09 | 15.02 | 13.89 | 14.22 |
| RelHumid | % | 35.21 | 29.91 | 28.80 | 27.80 | 27.99 |
| Baro | in Hg | 28.82 | 28.82 | 28.81 | 28.81 | 28.82 |
| Baro | mmHg | 732.02 | 731.96 | 731.87 | 731.89 | 731.96 |
| Pvap_kPa | kPa | 0.51 | 0.45 | 0.43 | 0.39 | 0.40 |
| Pvap_inHg | inHg | 0.15 | 0.13 | 0.13 | 0.12 | 0.12 |
| AbsHumidity | grains/lb | 23.08 | 20.24 | 19.42 | 17.56 | 18.02 |
| SatPres | kPa | 97.08 | 97.13 | 97.14 | 97.18 | 97.18 |
| Hum Factor | | 0.80 | 0.80 | 0.79 | 0.79 | 0.79 |
| F_fac | | 0.99 | 1.00 | 1.00 | 0.99 | 0.99 |
| K_fac | | 1.01 | 1.02 | 1.02 | 1.01 | 1.01 |
| Humidity | g/kg | 3.30 | 2.89 | 2.77 | 2.51 | 2.57 |
| H2 | | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 |
| WetDry Factor | | 0.86 | 0.88 | 0.88 | 0.88 | 0.89 |

Team Results for Clean Snowmobile Challenge 2012

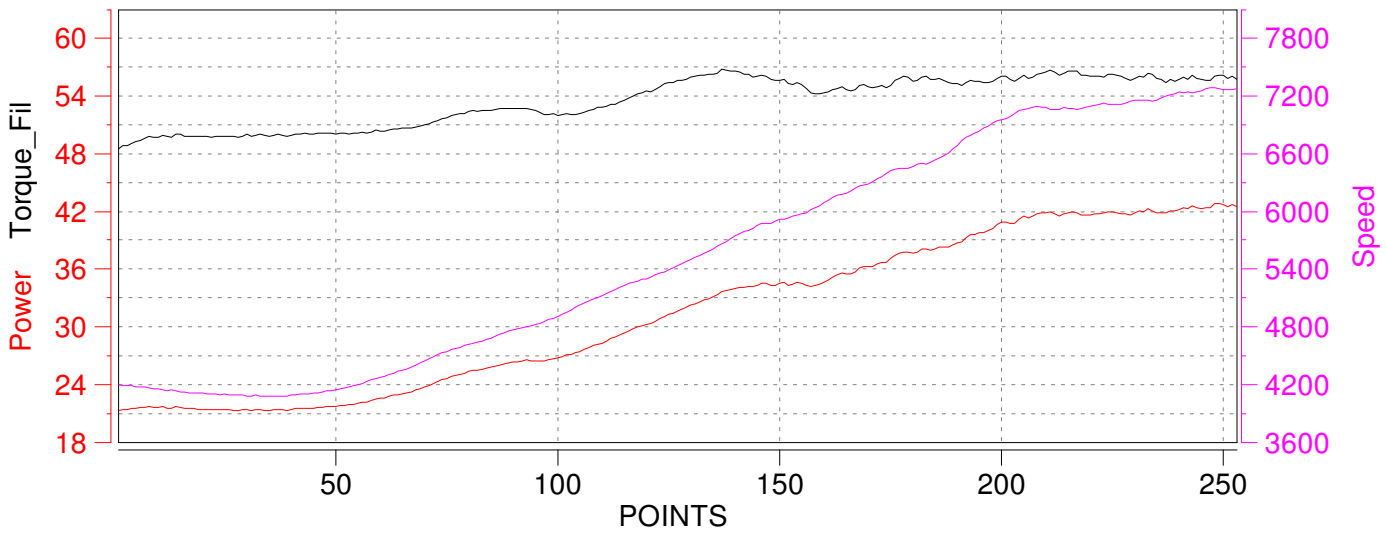
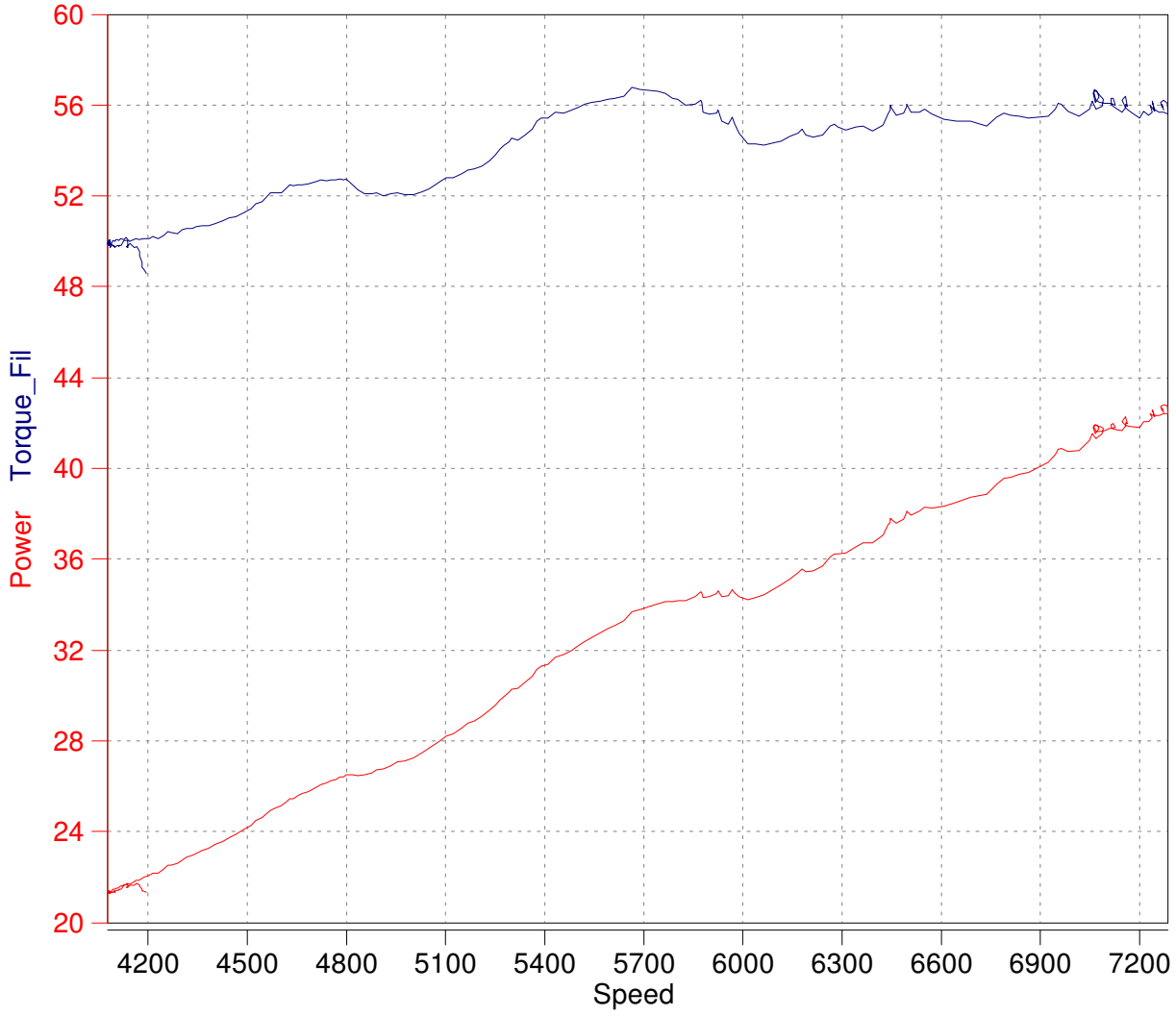
Modal Emissions Concentrations

| ModeNum | | 1 | 2 | 3 | 4 | 5 |
|---------|-------|--------|---------|--------|--------|---------|
| THC | ppmC1 | 602.91 | 22.00 | 79.41 | 241.19 | 1567.93 |
| CO | % | 0.57 | 0.00 | 0.00 | 0.00 | 0.00 |
| N2O | ppm | 0.03 | 1.14 | 0.81 | 1.23 | 0.54 |
| CH4 | ppm | 162.16 | 15.70 | 42.53 | 61.47 | 304.21 |
| CO2 | % | 12.72 | 11.55 | 10.86 | 10.64 | 10.78 |
| O2 | % | 0.00 | 2.56 | 3.55 | 3.84 | 3.78 |
| CNOx | ppm | 642.80 | 819.89 | 383.22 | 325.48 | 38.08 |
| AHC | ppm | 23.07 | 0.45 | 0.97 | 3.01 | 6.12 |
| C2H2 | ppm | 0.35 | 0.25 | 0.22 | 0.41 | 0.23 |
| C2H4 | ppm | 61.26 | 2.17 | 12.81 | 40.03 | 116.52 |
| C3H6 | ppm | 9.19 | 0.05 | 0.27 | 5.97 | 31.28 |
| C4H6 | ppm | 4.41 | 0.14 | 0.18 | 1.59 | 1.11 |
| ETOH | ppm | 6.82 | 2.32 | 2.50 | 3.42 | 0.88 |
| H2O | % | 14.12 | 12.40 | 11.67 | 11.52 | 11.33 |
| HCHO | ppm | 0.94 | 0.47 | 0.37 | 0.46 | 1.82 |
| HCN | ppm | 0.72 | 0.18 | 0.19 | 0.28 | 0.26 |
| HNCO | ppm | 2.90 | 2.41 | 2.13 | 2.73 | 1.98 |
| MECHO | ppm | 0.32 | 0.08 | 0.17 | 0.28 | 3.14 |
| NC5 | ppm | 5.27 | 2.10 | 2.16 | 7.15 | 111.29 |
| NH3 | ppm | 58.43 | 4.94 | 8.27 | 23.43 | 15.21 |
| NO | ppm | 799.67 | 1024.96 | 482.65 | 411.56 | 47.08 |
| NO2 | ppm | 0.05 | 5.52 | 1.87 | 1.78 | 1.20 |
| Soot | mg/m3 | 0.73 | 0.02 | 0.04 | 0.01 | 0.01 |
| AFR | :1 | 12.05 | 14.35 | 15.21 | 15.42 | 14.76 |

Power Run

| | |
|------------|----------------|
| TeamNumber | 9 |
| TeamName | Kettering |
| Model | Ski Doo |
| Engine | Renegade Sport |

| | |
|-----------------|-------|
| Displacement cc | 600cc |
| RatedSpeed | 7232 |
| RatedTorque | 56.1 |



Measurement Accuracy (SAE paper 961804)

| H2_XLS % | ModalHC_Dry % | ModalFTIR_H2O % | N2 % | Ar % | AFR :1 | Tr_Eff - |
|-------------|------------------|--------------------|---------|---------|-----------|-------------|
| 0.236 | 0.070 | 14.119 | 82.739 | 0.956 | 14.564 | 1.000 |
| 0.000 | 0.003 | 12.395 | 83.185 | 0.962 | 17.081 | 0.871 |
| 0.000 | 0.009 | 11.671 | 82.502 | 0.954 | 18.072 | 0.822 |
| 0.001 | 0.027 | 11.519 | 82.400 | 0.952 | 18.378 | 0.807 |
| 0.001 | 0.177 | 11.334 | 82.169 | 0.950 | 18.036 | 0.810 |

| ModalWHC % | ModalC1 % | ModalC8 % | ModalSUM_HC % | ModalT_Emiss % | ModalError % |
|---------------|--------------|--------------|------------------|-------------------|-----------------|
| 53.718 | 0.070 | 0.009 | 0.079 | 99.570 | 0.430 |
| 1.186 | -1.700 | -0.212 | -1.912 | 98.457 | 1.543 |
| 3.164 | -2.185 | -0.273 | -2.458 | 97.368 | 2.632 |
| 6.571 | -2.298 | -0.287 | -2.585 | 97.183 | 2.817 |
| 17.488 | -2.165 | -0.271 | -2.436 | 97.109 | 2.891 |