Fuel Consumption/Flow Measurements

2 labs, 4 engines

2 MON, 2 RON

-Set up Engine at Respective 85.2 TSF Blend

-Document Barometric Pressure, Ambient Temp, Altitude, and Engine Parameters

- Pour 400 mL 85.2 TSF into carb bowl

- set level at 0.7 height (EQ setting)

-Start Stopwatch, consume fuel until fuel level drops

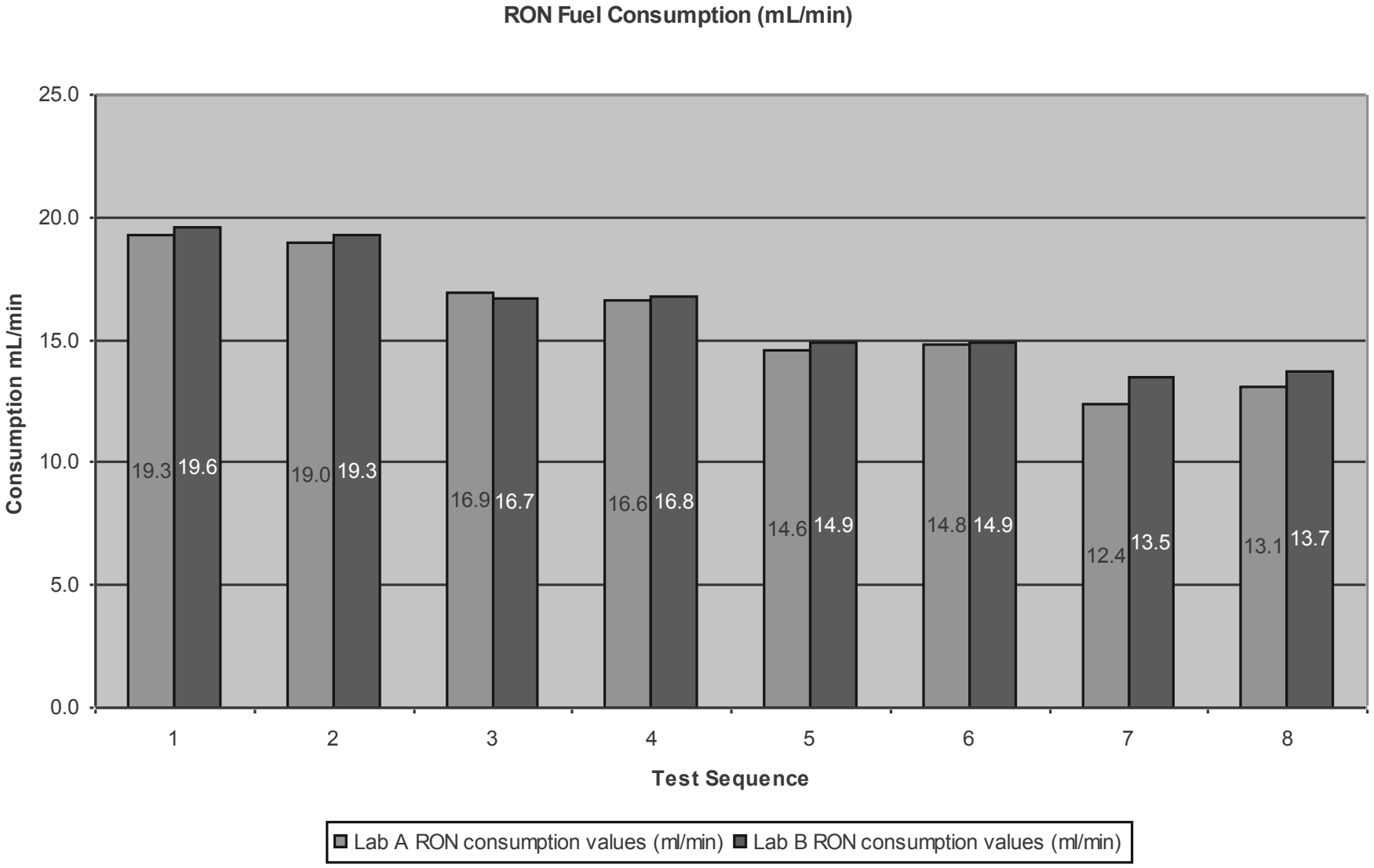
-Stop watch, document time and fuel left over

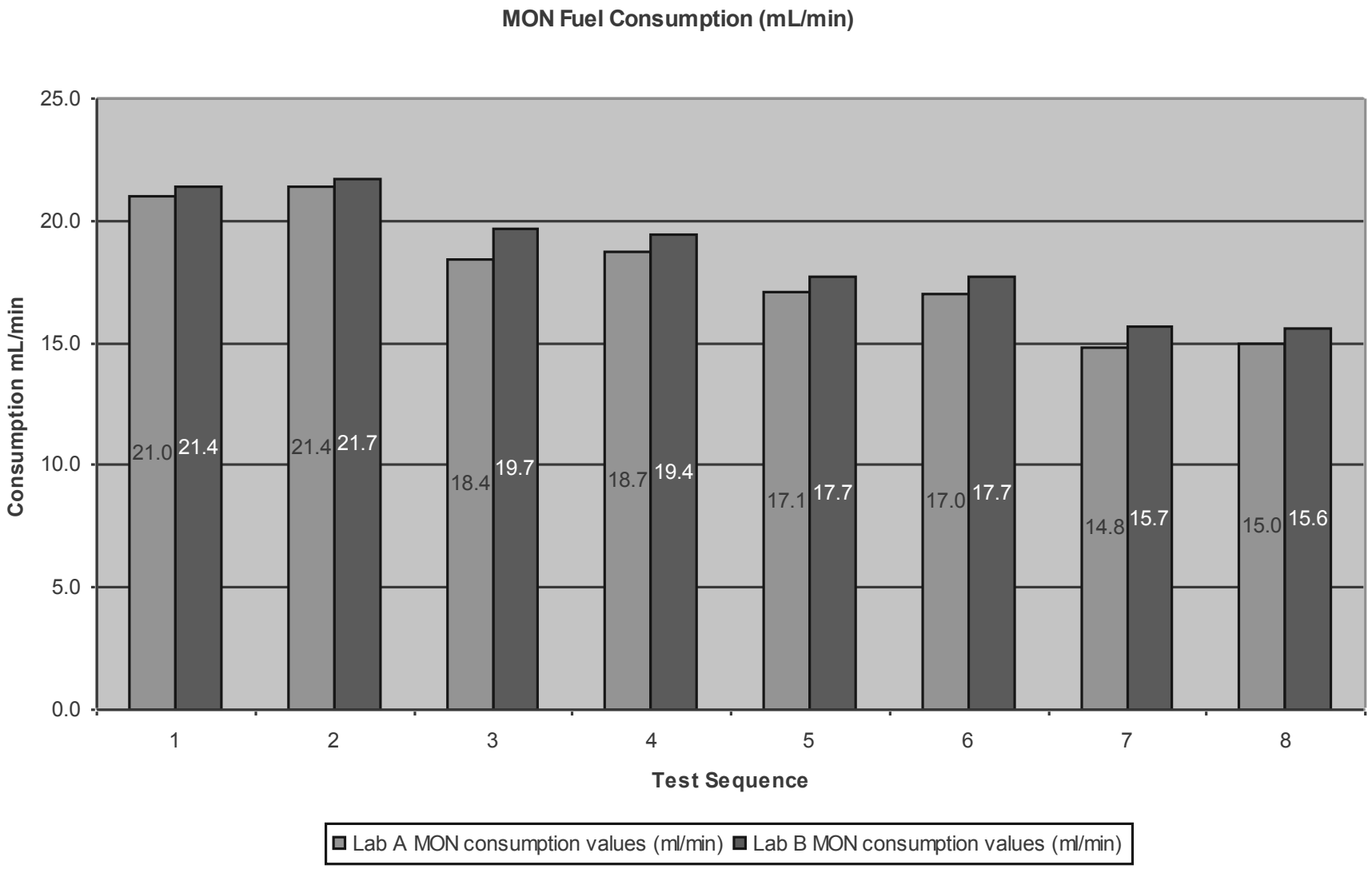
-Calculate consumption in mL/minute

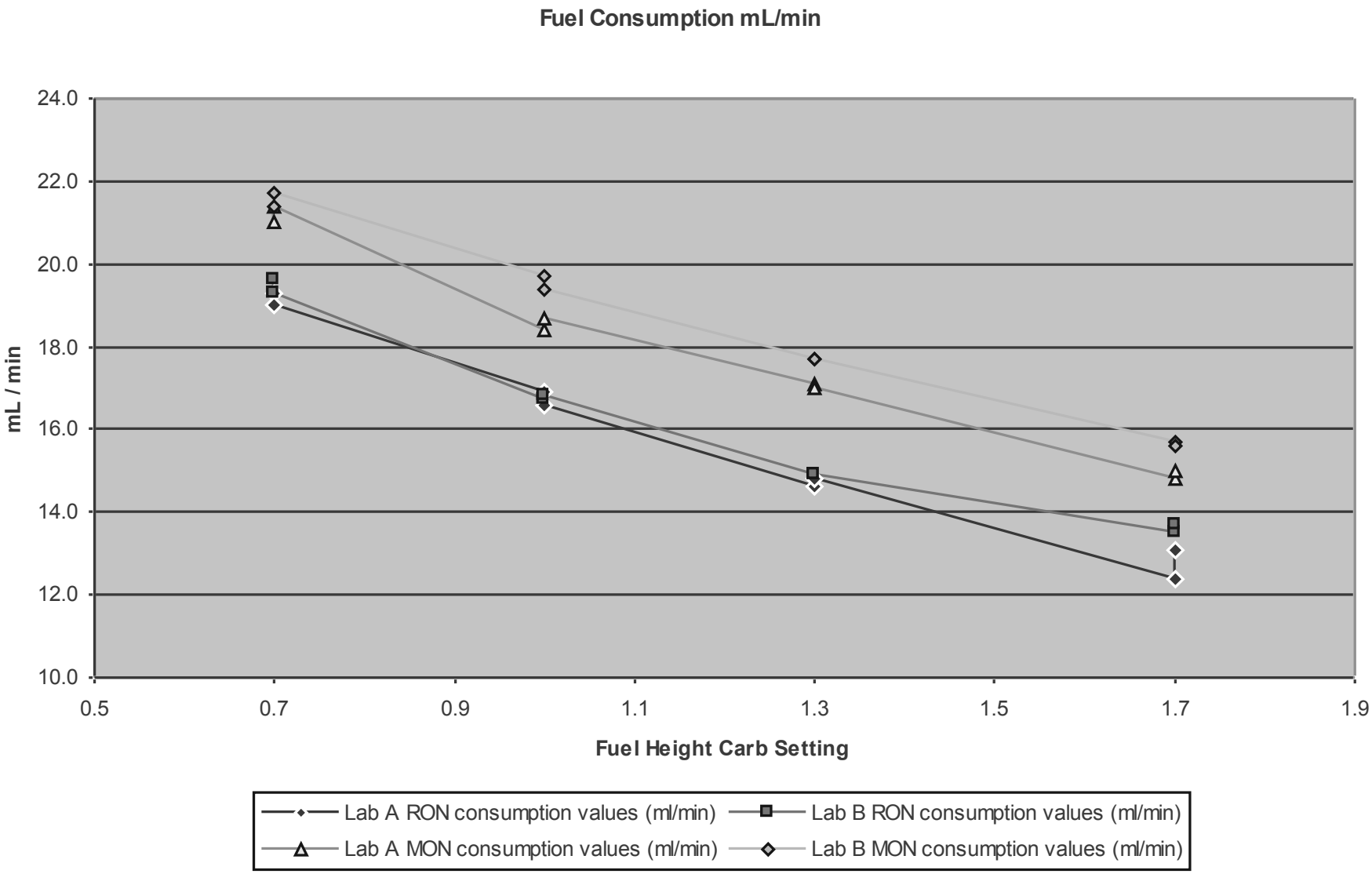
-Repeat test at various fuel height levels (i.e. 0.7, 1.0, 1.3 and 1.7)

Fuel Consumption/Flow Results
Lab A = Surge Tank
Lab B = Third Party Exhaust System

Fuel Level Height	Lab A RON consumption values (ml/min)	Lab B RON consumption values (ml/min)	Lab A MON consumption values (ml/min)	Lab B MON consumption values (ml/min)
0.7	19.3	19.6	21.0	21.4
0.7	19.0	19.3	21.4	21.7
1	16.9	16.7	18.4	19.7
1	16.6	16.8	18.7	19.4
1.3	14.6	14.9	17.1	17.7
1.3	14.8	14.9	17.0	17.7
1.7	12.4	13.5	14.8	15.7
1.7	13.1	13.7	15.0	15.6


RON Fuel Consumption (mL/min)
Consumption mL/min
25.0
20.0
15.0
10.0
5.0
0.0
19.3
19.6
19.0
19.3
16.9
16.7
16.6
16.8
14.6
14.9
14.8
14.9
12.4
13.5
13.1
13.7
1
2
3
4
5
6
7
8
Test Sequence
Lab A RON consumption values (ml/min)
Lab B RON consumption values (ml/min)


MON Fuel Consumption (mL/min)
Consumption mL/min
25.0
20.0
15.0
10.0
5.0
0.0
21.0
21.4
21.4
21.7
18.4
19.7
18.7
19.4
17.1
17.7
17.0
17.7
14.8
15.7
15.0
15.6
1
2
3
4
5
6
7
8
Test Sequence
Lab A MON consumption values (ml/min)
Lab B MON consumption values (ml/min)


Fuel Consumption mL/min
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
mL / min
0.5
0.7
0.9
1.1
1.3
1.5
1.7
1.9
Fuel Height Carb Setting
Lab A RON consumption values (ml/min)
Lab B RON consumption values (ml/min)
Lab A MON consumption values (ml/min)
Lab B MON consumption values (ml/min)

Take Aways

- Question was raised by Brian Logan as to what the fuel flow is on RON and MON
- So far test data conducted on 2 sets of MON and RON engines, show similar results.
- Why would this information be of value to know or to measure?

Take Away Points:

- Since the engine has a venturi based carburetor…fuel FOLLOWS air.
- Any change in restriction on engine breathing will immediately affect how much fuel enters the engine, and thus could affect the ON measurement.
- Likely causes of restriction: incorrect valve setting, excessive exhaust backpressure, restriction upstream of engine intake air or mechanical causes such as worn valve-train etc.

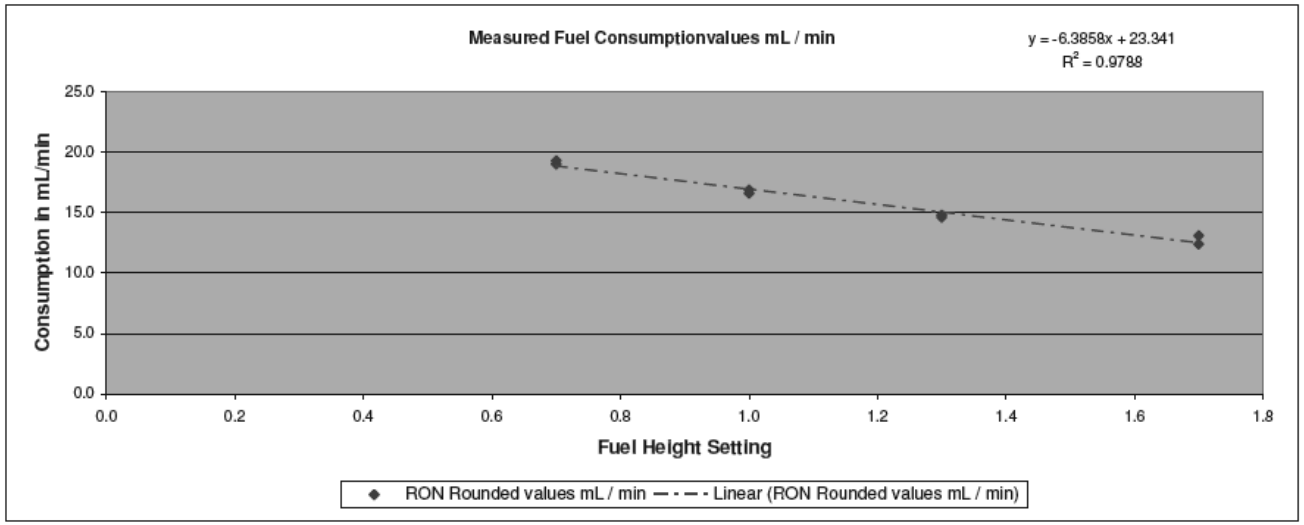
Suggestions:

- Use this test as a template to gather information at various sites for fuel consumption.
- Use these values as a “gauge” to determine when engine breathing problems are occurring.
- Possibly include this into the method as a “fit for use” criteria in the performance based test method.

Test Data: Lab A RON

Procedure: Engine was set up at standard settings for a 85.2 TSF blend. Barometric pressure was 29.5 inches Hg, standard temp was at 119 deg F, lab ambient temp was 70 deg carb cooling was used and the engine was using the ice tower. At lab temp 400 mL of 85.2 TSF was poured into carb bowl 1. The fuel level height was set at 0.7 and a stopwatch v to measure the elapsed time until the fuel level fell from 0.7 to 0.8 on the sight glass (set to float bowl setting). During that time the amount of fuel left over was measured, which m amount consumed was our consumption at that given time interval. The process was repeated at twice at each fuel height setting. Settings used were: 0.7, 1.0, 1.3 and 1.7. The da calculations are shown below.

Fuel Level Height	Time elapsed (min, sec format)	Time elapsed in seconds	Fuel Left Over	Fuel Consumption	consumption rate in mL/s	consumption rate in mL/min	RON Rounded values mL / min
0.7	14 min 7 seconds	847	128	272	0.321133412	19.26800472	19.3
0.7	14 min 19 seconds	859	128	272	0.316647264	18.99883586	19.0
1.0	15 min 49 seconds	949	132	268	0.282402529	16.94415174	16.9
1.0	15 minutes 53 seconds	953	136	264	0.277019937	16.62119622	16.6
1.3	18 minutes 2 seconds	1082	136	264	0.243992606	14.63955638	14.6
1.3	18 minutes 18 seconds	1098	130	270	0.245901639	14.75409836	14.8
1.7	20 minutes 51 seconds	1311	128	272	0.20747521	12.44851259	12.4
1.7	20 minutes 38 seconds	1238	130	270	0.2180937	13.08562197	13.1

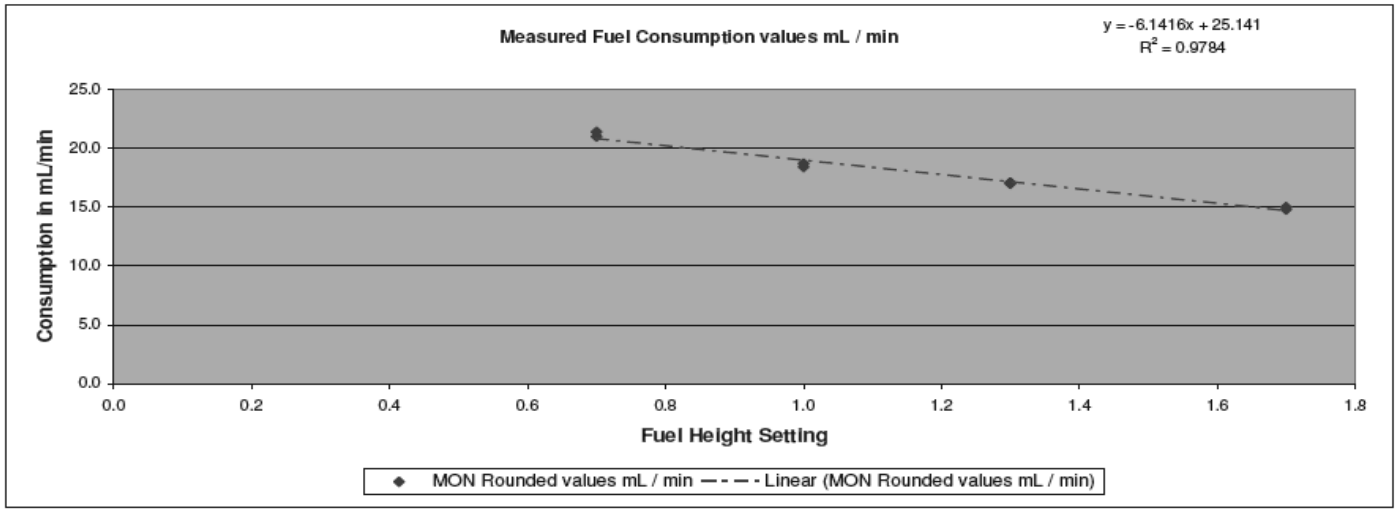


Linear Regression
y=-6.3858x + 23.341
R squared value
0.9788
2nd Order Regression
y=2.4412x^2-12.275x+26.556
R squared value
0.9922

Test Data: Lab A MON

Procedure: Engine was set up at standard settings for a 85.2 TSF blend. Barometric pressure was 29.05 inches Hg, standard temp mix was at 300 deg F, lab ambient temp was 70 d
No carb cooling was used and the engine was using the intake air refrigeration unit. At lab temp 400 mL of 85.2 TSF was poured into carb bowl 1. The fuel level height was set at 0.7
stopwatch was used to measure the elapsed time until the fuel level fell from 0.7 to 0.8 on the sight glass (set to float bowl setting). During that time the amount of fuel left over was
measured, which meant the amount consumed was our consumption at that given time interval. The process was repeated at twice at each fuel height setting. Settings used were: 0.
1.3 and 1.7. The data and calculations are shown below. Additional Info: 832 ft Altitude, 9/16" MON venturi. #68 (cc) jets

Fuel Level Height	Time elapsed (min, sec format)	Time elapsed in seconds	Fuel Left Over	Fuel Consumption	consumption rate in mL/s	consumption rate in mL/min	MON Rounded values mL / min
0.7	12 min 55 sec	775	128	272	0.350967742	21.05806452	21.0
0.7	12 min 48 sec	768	126	274	0.356770833	21.40625	21.4
1.0	14 min 46 sec	886	128	272	0.306997743	18.41986456	18.4
1.0	14 min 26 sec	866	130	270	0.311778291	18.70669746	18.7
1.3	16 min 14 sec	974	122	278	0.285420945	17.12525667	17.1
1.3	16 min 12 sec	972	124	276	0.283950617	17.03703704	17.0
1.7	18 min 30 sec	1110	126	274	0.246846847	14.81081081	14.8
1.7	18 min 26 sec	1106	124	276	0.24954792	14.97287523	15.0



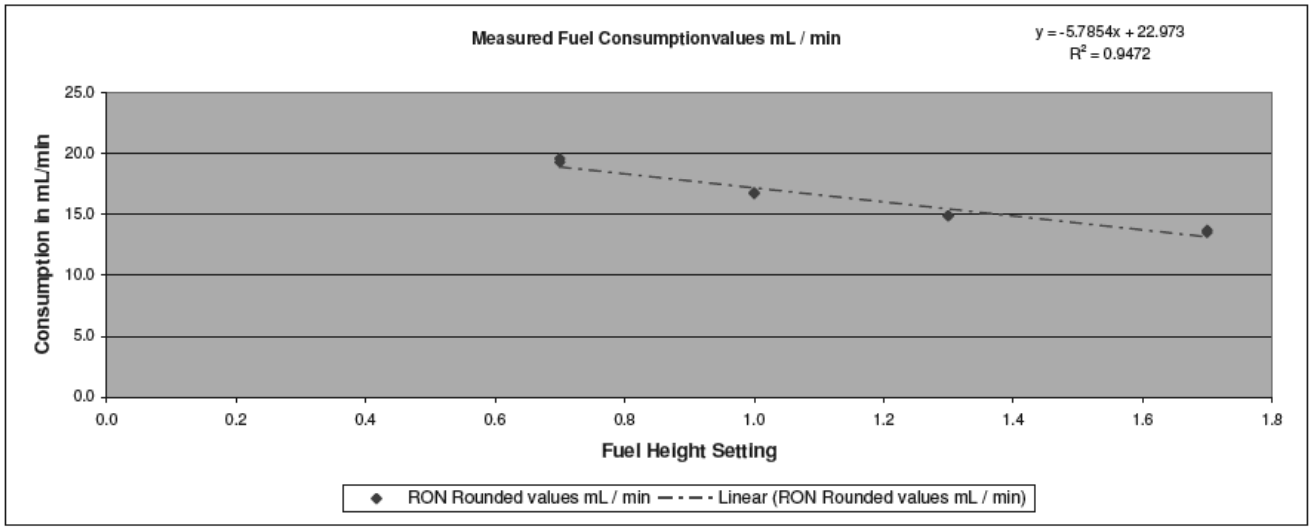
Linear Regression
y=-6.1416x + 25.141
R squared value
0.9784
2nd Order Regression
y=2.3574x^2-111828x+28.246
R squared value
0.9922

Test Data: Lab B RON

Procedure: Engine was set up at standard settings for a 85.2 TSF blend. Barometric pressure was 28.9 inches Hg, standard temp was at 110 deg F, lab ambient ter carb cooling was used and the engine was using the intake air refridgeration unit. At lab temp 400 mL of 85.2 TSF was poured into carb bowl 1. The fuel level height stopwatch was used to measure the elapsed time until the fuel level fell from 0.7 to 0.8 on the sight glass (set to float bowl setting). During that time the amount of fu measured, which meant the amount consumed was our consumption at that given time interval. The process was repeated at twice at each fuel height setting. Setti 1.3 and 1.7. The data and calculations are shown below.

Also, unit contains a Non-Waukesha exhaust system.

Fuel Level Height	Time elapsed (min, sec format)	Time elapsed in seconds	Fuel Left Over	Fuel Consumption	consumption rate in mL/s	consumption rate in mL/min	RON Rounded values mL / min
0.7	13min 32 sec	812	135	265	0.3263	19.5817	19.6
0.7	13min 42sec	822	135	265	0.3223	19.343	19.3
1.0	15min 49sec	949	136	264	0.2781	16.6877	16.7
1.0	15min 46sec	946	135	265	0.2801	16.8083	16.8
1.3	17min 47sec	1067	135	265	0.2483	14.9018	14.9
1.3	17min 53sec	1073	134	266	0.2479	14.8744	14.9
1.7	19min 44sec	1184	133	267	0.223	13.5306	13.5
1.7	19min 54sec	1194	128	272	0.2278	13.6683	13.7



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R squared value
0.9788

2nd Order Regression
y=2.4412x^2-12.275x+26.556

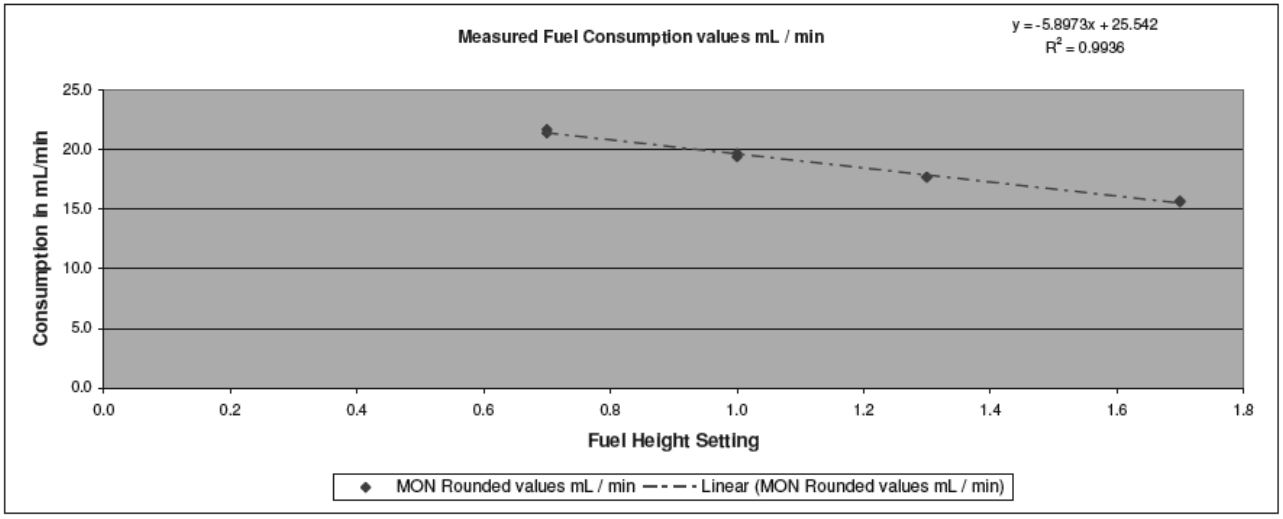
R squared value
0.9922

Test Data: Lab B MON

Procedure: Engine was set up at standard settings for a 85.2 TSF blend. Barometric pressure was 28.8 inches Hg, standard temp mix was at 300 deg F, lab ambient temp was 71 deg F. No carb cooling was used and the engine was using the intake air refrigeration unit. At lab temp 400 mL of 85.2 TSF was poured into carb bowl 1. The fuel level height was set at 0.7 and a stopwatch was used to measure the elapsed time until the fuel level fell from 0.7 to 0.8 on the sight glass (set to float bowl setting). During that time the amount of fuel left over was measured, which meant the amount consumed was our consumption at that given time interval. The process was repeated at twice at each fuel height setting. Settings used were: 0.7, 1.0, 1.3 and 1.7. The data and calculations are shown below. Additional Info: 965 ft Altitude, 9/16" MON venturi. #68 (cc) jets

Also, unit contains a Non-Waukesha exhaust system.

Fuel Level Height	Time elapsed (min, sec format)	Time elapsed in seconds	Fuel Left Over	Fuel Consumption	consumption rate in mL/s	consumption rate in mL/min	MON Rounded values mL / min
0.7	12min 16sec	736	137	263	0.3573	21.4414	21.4
0.7	12min 9sec	729	136	264	0.3621	21.7284	21.7
1.0	13min 23sec	803	137	263	0.3275	19.6518	19.7
1.0	13min 29sec	809	138	262	0.3239	19.4319	19.4
1.3	14min 53sec	893	137	263	0.2945	17.6712	17.7
1.3	14min 53sec	893	136	264	0.2956	17.738	17.7
1.7	16min 55sec	1015	135	265	0.2611	15.6656	15.7
1.7	16min 56sec	1016	135	265	0.2608	15.6499	15.6



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0.9784

2nd Order Regression
y=2.3574x^2-111828x+28.246
R squared value
0.9922

Test Data: Summary

Fuel Level Height	Lab A RON consumption values (ml/min)	Lab B RON consumption values (ml/min)	Lab A MON consumption values (ml/min)	Lab B MON consumption values (ml/min)
0.7	19.3	19.6	21.0	21.4
0.7	19.0	19.3	21.4	21.7
1	16.9	16.7	18.4	19.7
1	16.6	16.8	18.7	19.4
1.3	14.6	14.9	17.1	17.7
1.3	14.8	14.9	17.0	17.7
1.7	12.4	13.5	14.8	15.7
1.7	13.1	13.7	15.0	15.6

Site Altitude:	832 ft	832 ft.	965 ft.	965 ft.
IAT Deg F	119 deg F	100 deg F	110 deg F	100 deg F
MIXT Deg F:	N/A	300 deg F	N/A	300 deg F
Site Baro (In. Hg)	29.50	29.05	28.90	28.80
Site Ambient Temp	71	70	70	72
MON Venturi/Jets			9/16 #68cc	9/16 #68cc