SpiritPFC Torque/Horsepower Comparison
Dynamometer Test

Date: 5/7/2006

Dynamometer Test Outline:

Contained within this document you will find data collected using a “Dyno Datamite” engine dynamometer hardware and software package, which also includes a “BlackBox” weather station. Hardware and software was obtained from Performance Trends Inc., the maker of the product. The hardware is installed on a typical inertia dyno.

Test engine was a stock Honda 135cc 4-cycle engine with the exception of a modified exhaust system to remove the exhaust gases from the test cell through an exhaust hose.

Fuel was obtained from a BP station the day of the test and is a standard 87 octane grade consumer fuel.

The first five dyno runs (labeled Raw Fuel Run # 1-5) were gathered from the test engine using untreated fuel. After the first raw fuel runs, the fuel was drained from the engine, restarted and allowed to burn remaining fuel out of the carburetor and fuel lines before refilling the fuel tank with fuel treated with a 3-gallon SpiritPFC PowerStick. The second five runs (labeled SpiritPFC purified fuel Run # 1-5) were gathered using the SpiritPFC PowerStick treated fuel. The average engine “Head Temperature” recorded during the first run of the untreated five runs was 218.37 F., and for the duration of the first run of the treated run set, was 215.19 F. reflecting in comparable beginning engine condition for both sets of runs.

All data was collected intentionally ignoring engine RPM’s below 2500 and above 4500 to account for slight variations in throttle movements and operator reactions. All test runs were done exactly the same by holding the dyno brake while bringing the engine RPM to the point of clutch engagement which was around 2000 RPM’s. At this point the brake was released and full throttle was applied until the RPM’s reached approximately 5000 RPM’s.

The “BlackBox” weather station monitored ambient Air Temperature, Dew Point and Barometric Pressure to allow for correcting torque and horsepower readings by the software, for variations in weather conditions in accordance with “SAE J1349 Revision June 90”. These corrections greatly reduce, or nullify any changes in performance due to changes in atmospheric conditions, thus assuring accurate and repeatable back to back dyno runs.

The first two pages labeled “Averaged Torque Comparison” and “Averaged Horsepower Comparison”, compare results of the first 5 “untreated fuel” runs average together against the second 5 “SpiritPFC treated” dyno runs averaged together. These charts have averaged figures again to account for fluctuations between individual runs.

The next several pages show charted results from the raw data taken from each dyno run and are labeled accordingly. The final four pages show all the data used in charting torque and horsepower reading for this test session.

Before we go any further you must understand some VERY important facts about tests such at this.

In dynamometer performance tests such as this, no matter how good the dynamometers quality is, each run will fluctuate slightly from the others. This is due to several slight engine performance and dynamometer variations. Averaging several runs together to compare a modification result will drastically reduce these errors and differences providing a much more accurate comparison.

We could have picked the lowest run of the "Untreated" series of runs and the highest run of the "Treated" series and claim a huge improvement in engine performance with our product. This is a common practice in product advertising of many products, but is **NEVER** our policy!

Analyzing the Data:

First glance at the individual run charts reveal no obvious improvement between the various untreated and treated fuel runs, however after looking at the "Averaged" charts, a significant improvement in both torque and horsepower is clear.

Peak torque occurred between 2900 and 3300 RPM's in both untreated and treated tests sets, with an improvement of .07 foot pounds of torque or 1.49%. Peak horsepower occurred between 3400 and 3900 RPM's with an improvement of .07 horsepower or 2.06%.

Although these "Peak" improvements are significant, most engines are not operated at such a narrow RPM range. For instance a typical consumer type automotive engine will idle at 800 RPM's and may range up to 6000 or higher RPM's levels. Snowmobile and motorcycle engine commonly rev 9000 RPM's or more. Knowing this consider the "Averaged" charts again from this test session and you will notice the improvement between the treated and untreated fuel at the different RPM values.

You will notice an almost across the board improvement in performance in the SpiritPFC treated fuel runs with the exception of the area ranging from 2700 to 2900 RPM. The performance reduction of the treated fuel over the untreated fuel can be explained easily once you understand the configuration of the engine and the SpiritPFC PowerStick's effect.

This area of the curve is most like caused by two conditions.

First you must consider that this test engine has a fixed timing magneto ignition system. This means that the timing is always fixed at 20 degrees BTDC (Before Top Dead Center). This means that no matter what RPM's the engine is operated at, the spark plug always fires at 20 degrees before the piston reached the top of its stroke or "Top Dead Center". More complex engines such as automotive type engine have an advance system that will either mechanically or electronically (or both) change the ignition timing to improve acceleration of the engine.

The second condition is known as running “Leaner then Peak”. Since the SpiritPFC Fuel Purifier improves the fuel quality by removing products that inhibit combustion, the engine tends to run leaner that with untreated fuel.

Knowing this you must now consider the way a typical carburetor such as the one that is used in this test works.

This carburetor is a typical “butterfly” type system similar to most automobile engines. This system employs a “butterfly” throttle that opens and closes the opening of the carburetor regulating the amount of air that can be drawn into the engine. Secondly a fuel reservoir known as a “bowl” sets below the carburetor and holds the fuel coming from the tank and fuel lines. A small hole known as a “jet” will allow a small amount of fuel to be drawn into the carburetor and mix with the incoming air creating a combustible fuel mixture that the engine can burn.

If a carburetor’s throttle is opened slowly, the fuel is drawn into the carburetor’s throat and mixes with the air quite evenly. If however the throttle is opened quickly the fuel cannot react as quickly as is needed to mix evenly, thus you will see a lean condition arise.

In many types of systems an “accelerator pump” is employed to counteract this problem. This is simply a mechanical plunger that squirts fuel into the carburetor throat under force only when a throttle is opened quickly, to add fuel at this critical point.

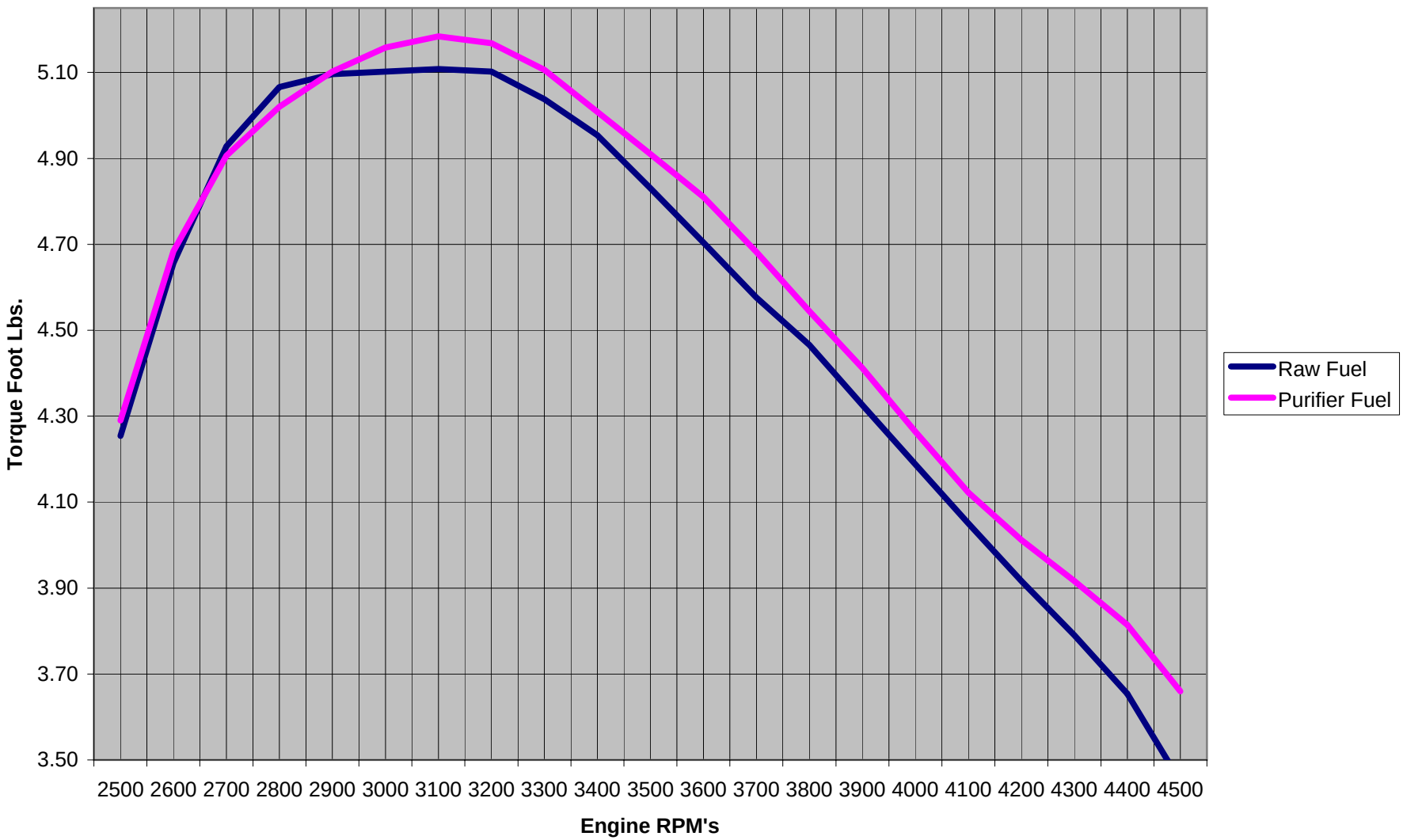
Since this carburetor does not have any such accelerator pump, you will often see a lag under a quick throttle opening assuming the engine normally runs near its optimum fuel to air ratio.

To summarize, the reason for the small reduction in performance at this RPM band of 2700 to 2900 RPM’s is that the engine is most likely is leaned too much at this point and simply looses power temporarily until the fuel has time to react. After the carburetor has time to compensate, a clear increase in torque and horsepower are seen throughout the rest of the dyno run. By simply adjusting the carburetor jets this problem would be eliminated and a better power/torque curve would result.

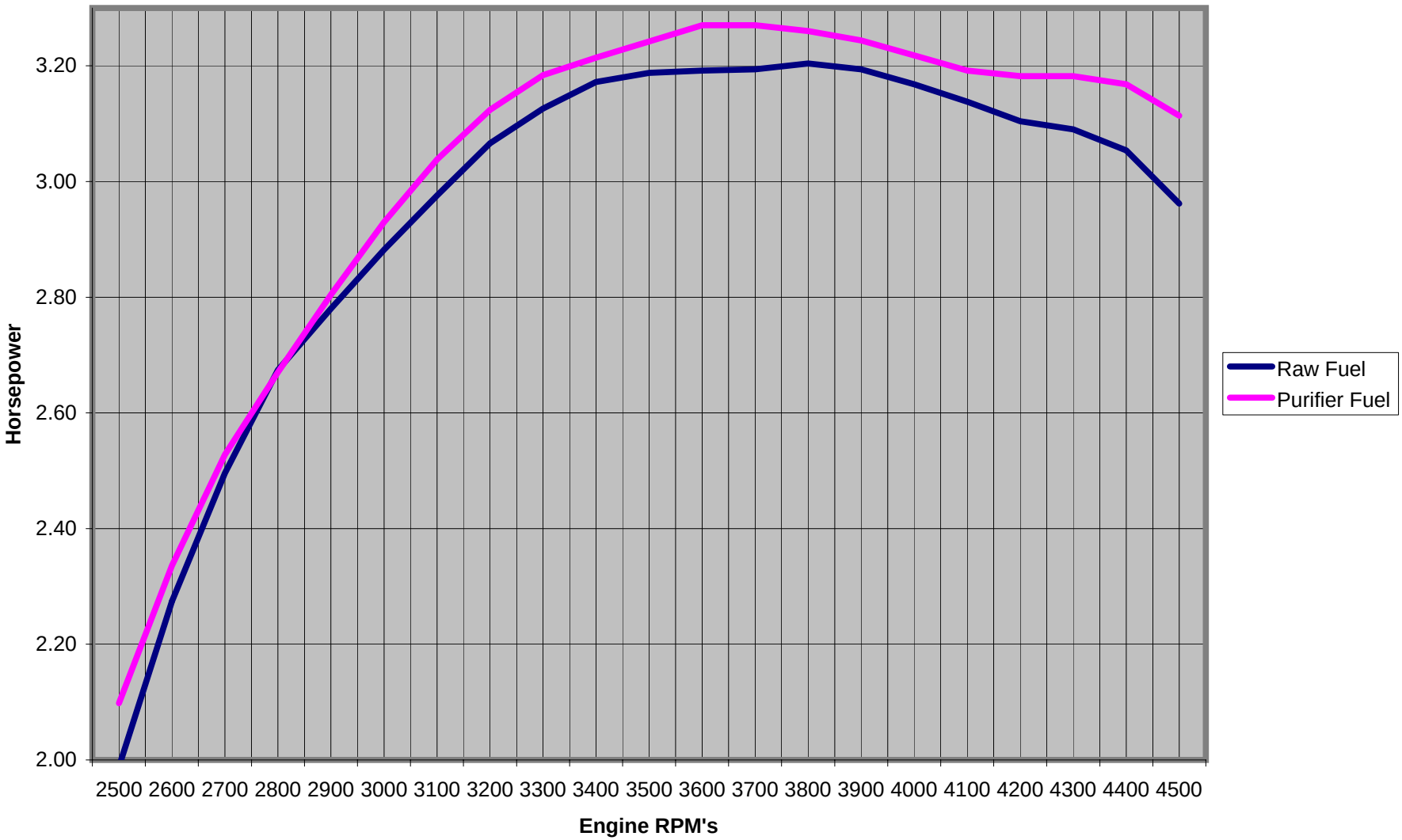
In conclusion, it is obvious from this test session that the treated fuel performed much better that the untreated fuel in identical conditions and produced more power and torque.

It now can be understood that by simply improving the fuels quality, our products improve engine performance and fuel mileage while reducing many engine deposits as well as emissions.

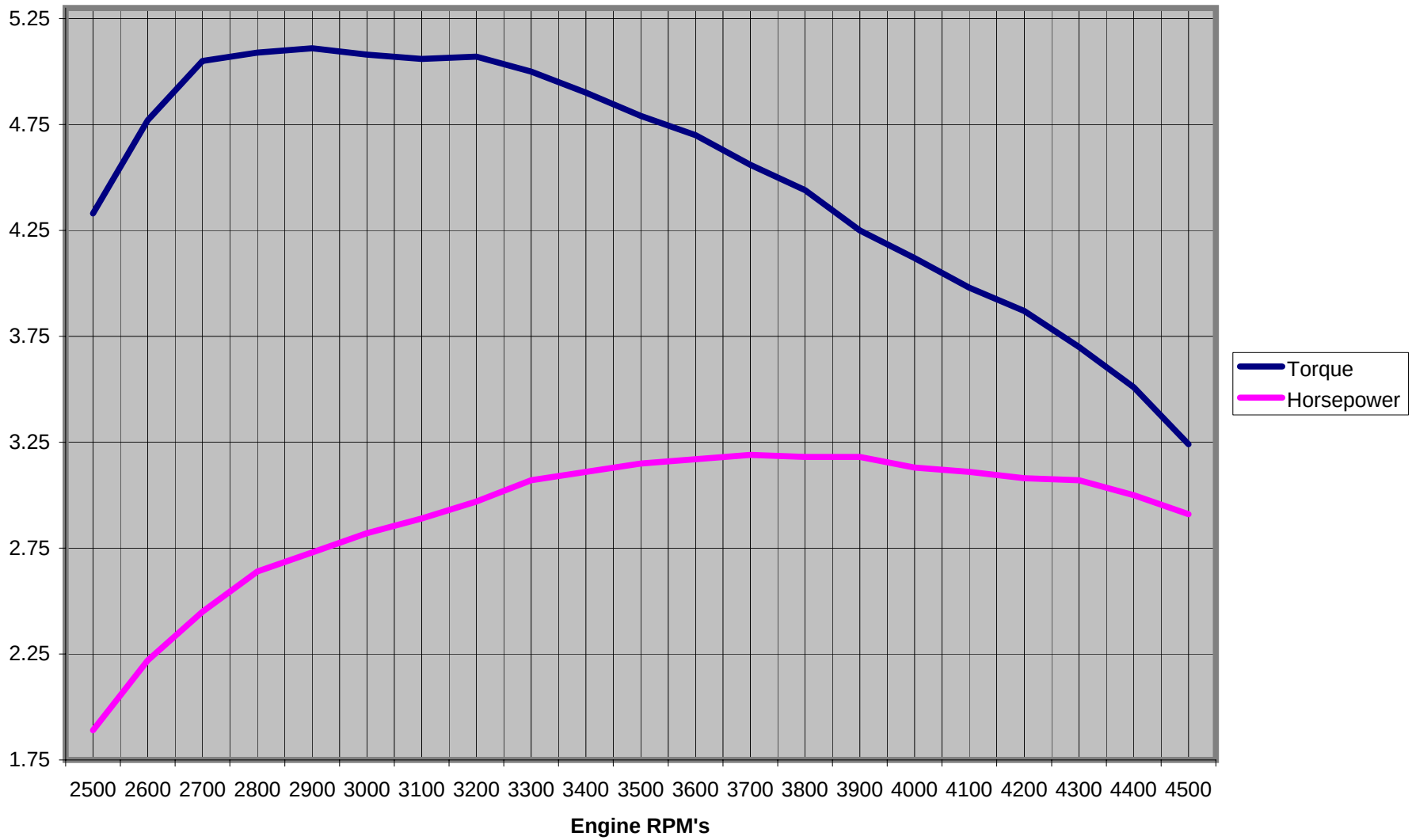
Averaged Torque Comparison



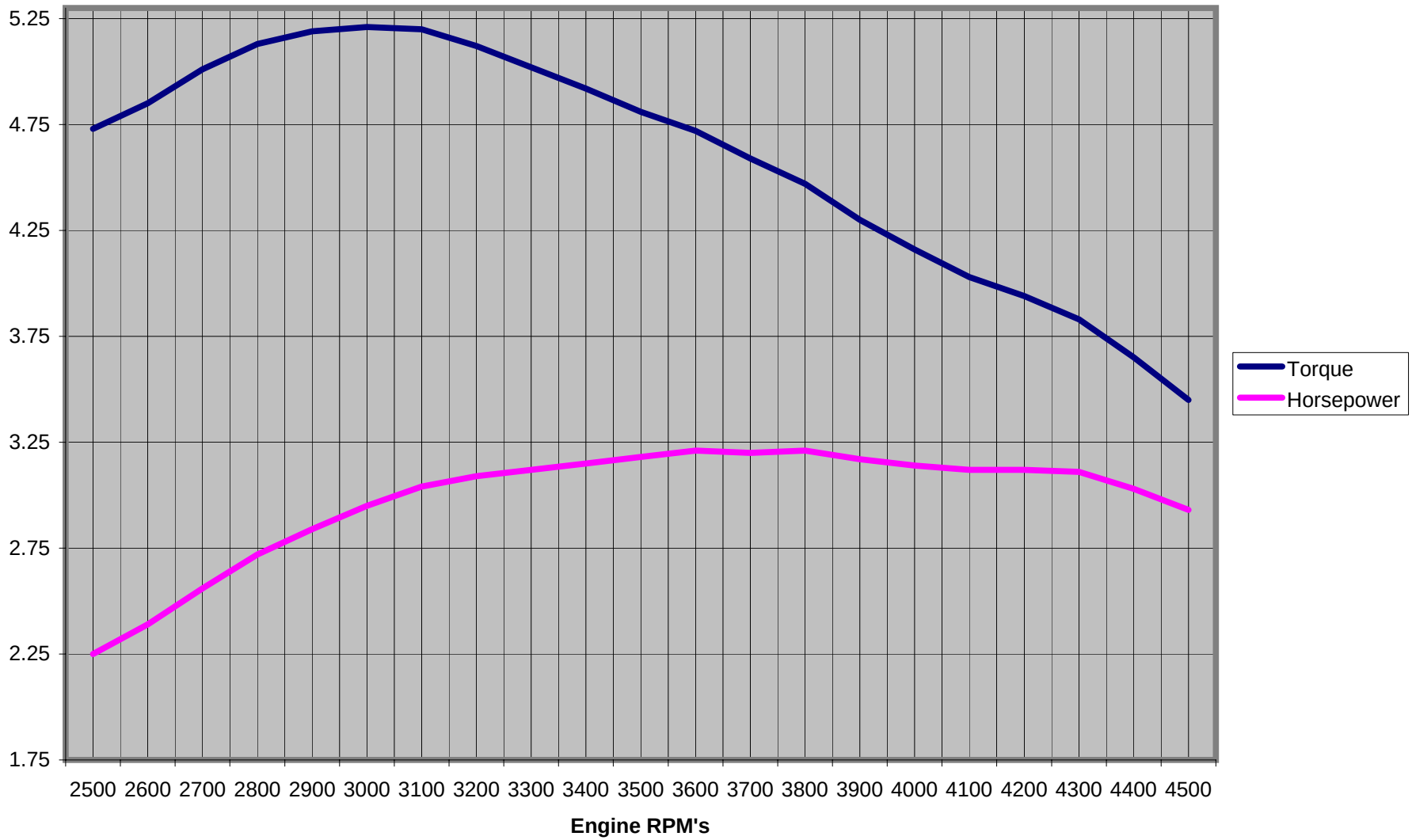
Averaged Horsepower Comparison



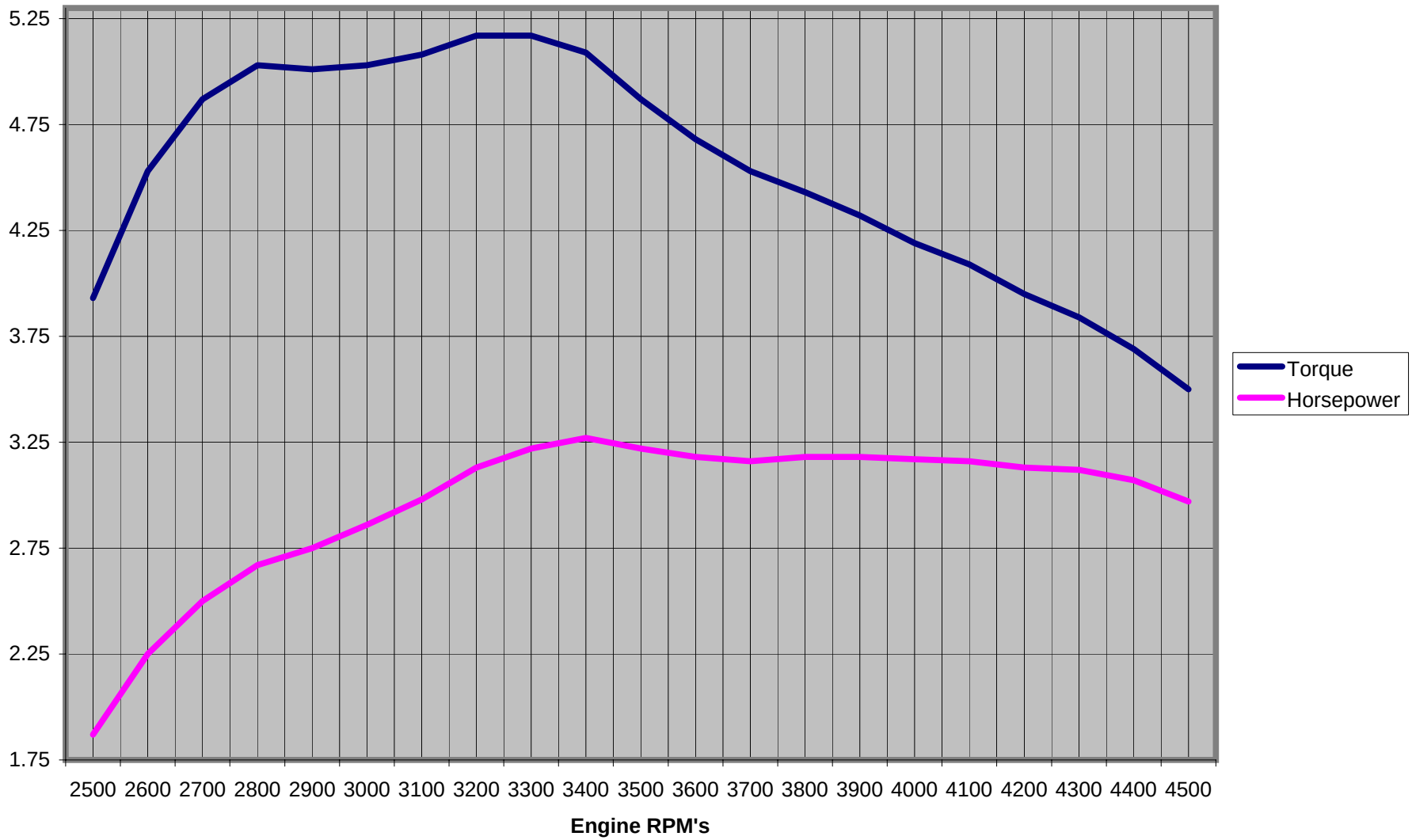
Raw Fuel Torque/HP Comparison Run #1



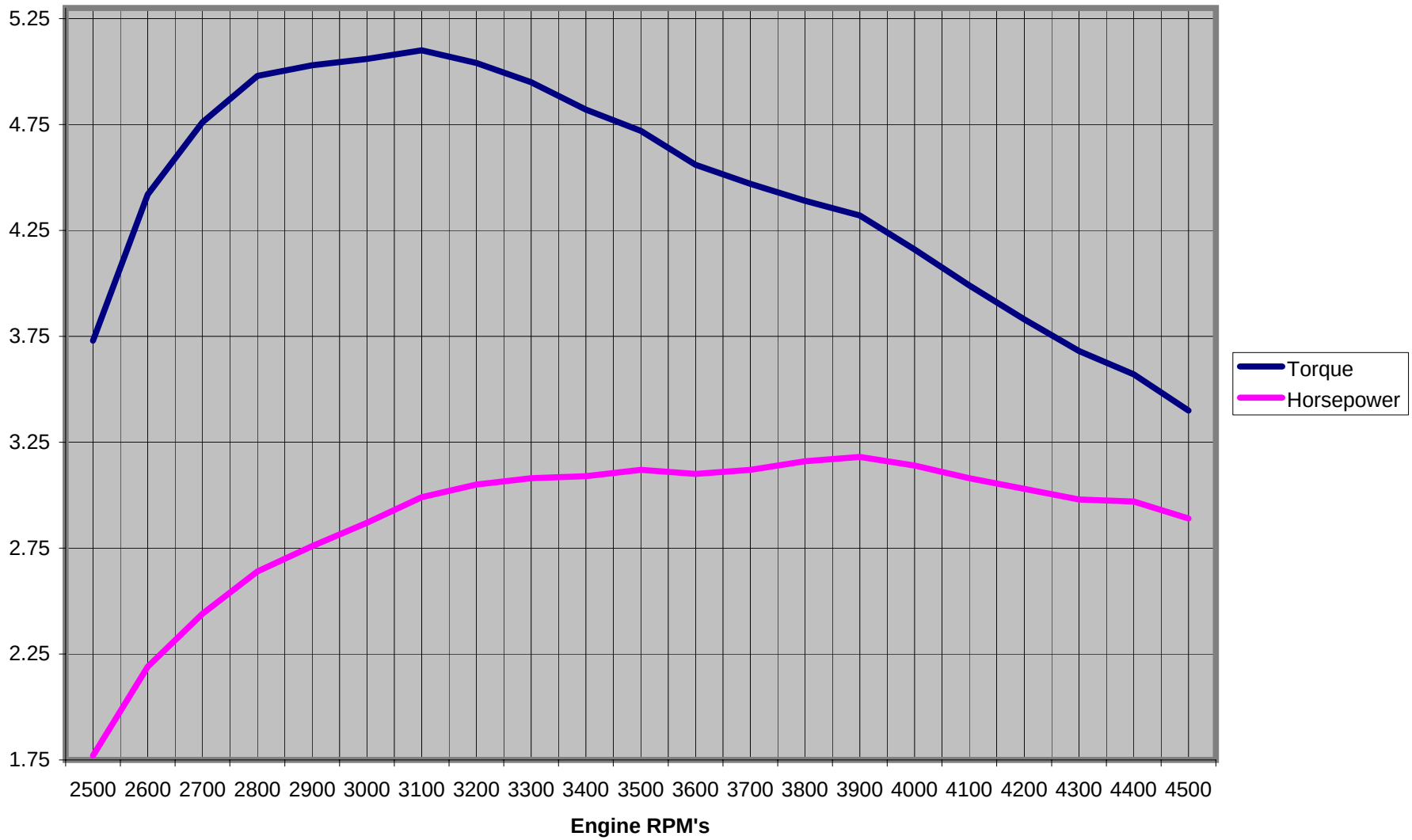
Raw Fuel Torque/HP Comparison Run #2



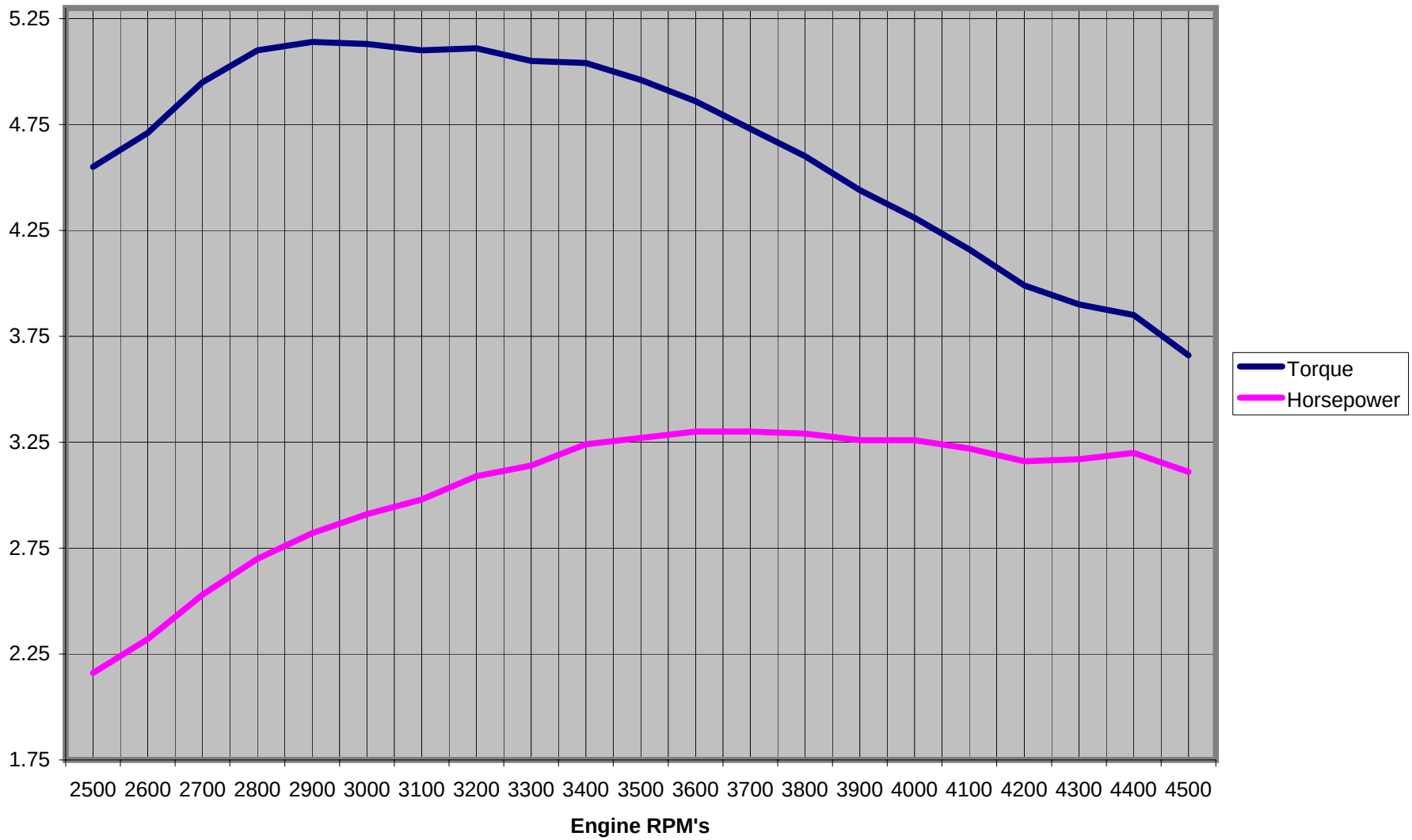
Raw Fuel Torque/HP Comparison Run #3



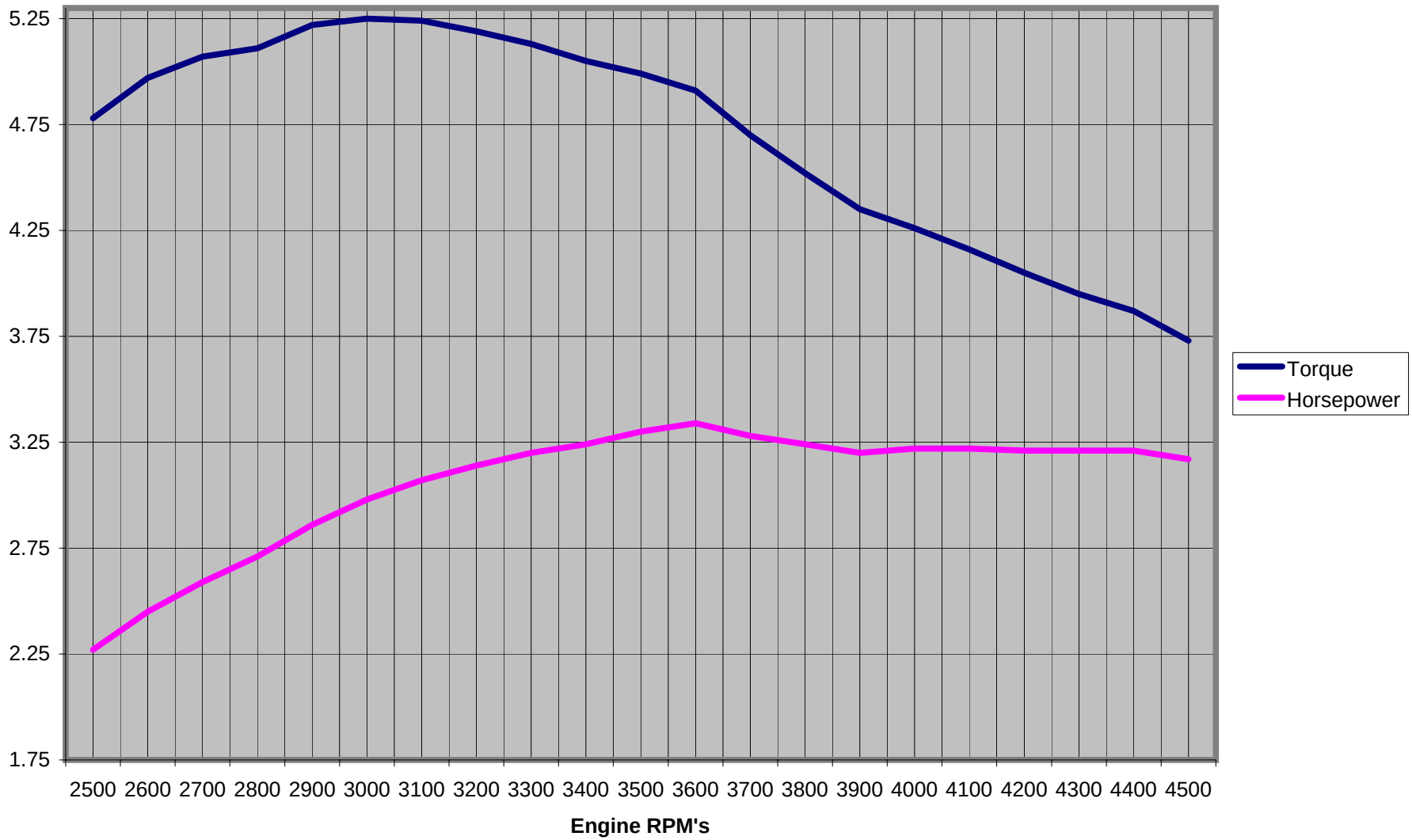
Raw Fuel Torque/HP Comparison Run #4



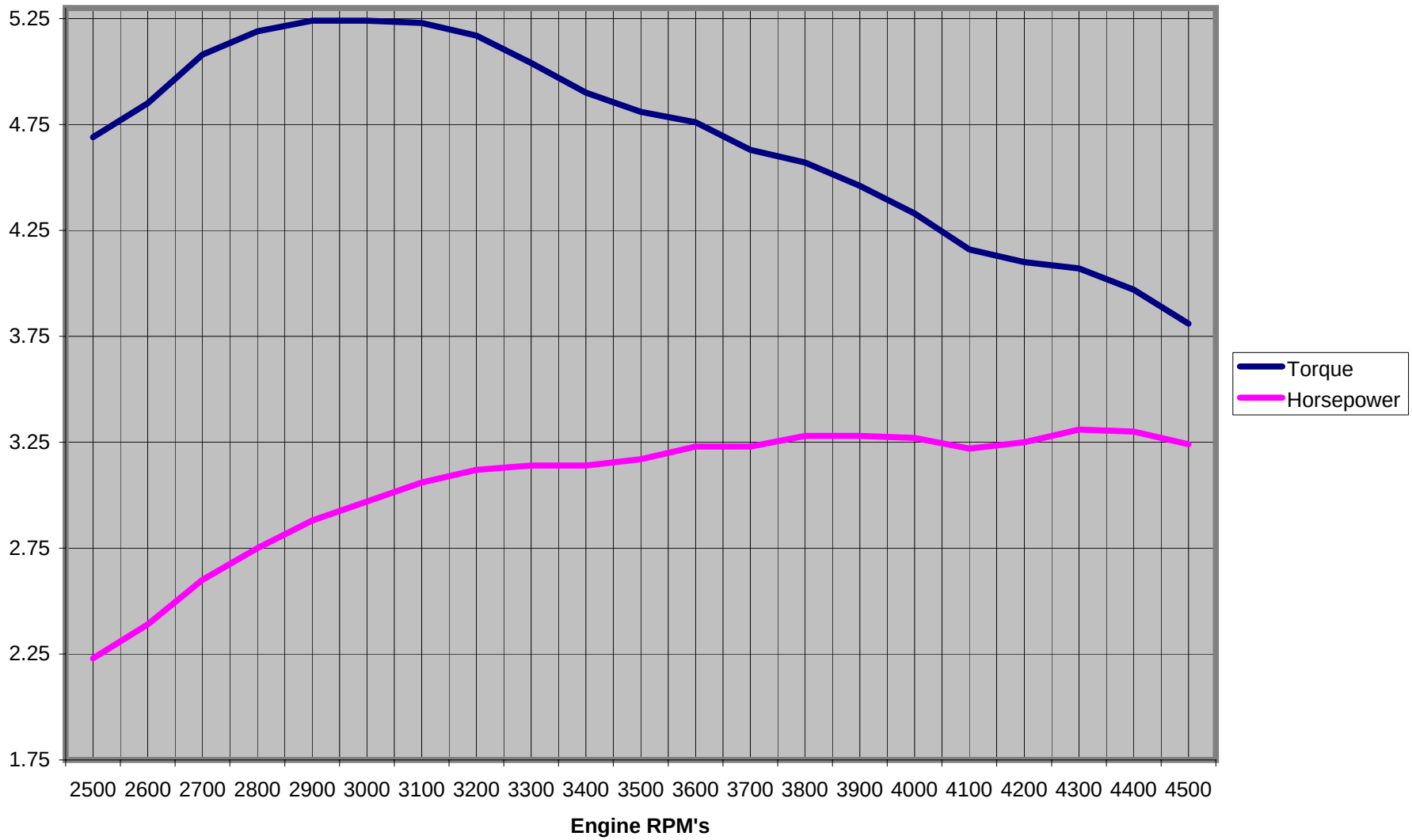
Raw Fuel Torque/HP Comparison Run #5



SpiritPFC Purified Fuel Torque/HP Comparison Run #1



SpiritPFC Purified Fuel Torque/HP Comparison Run #2



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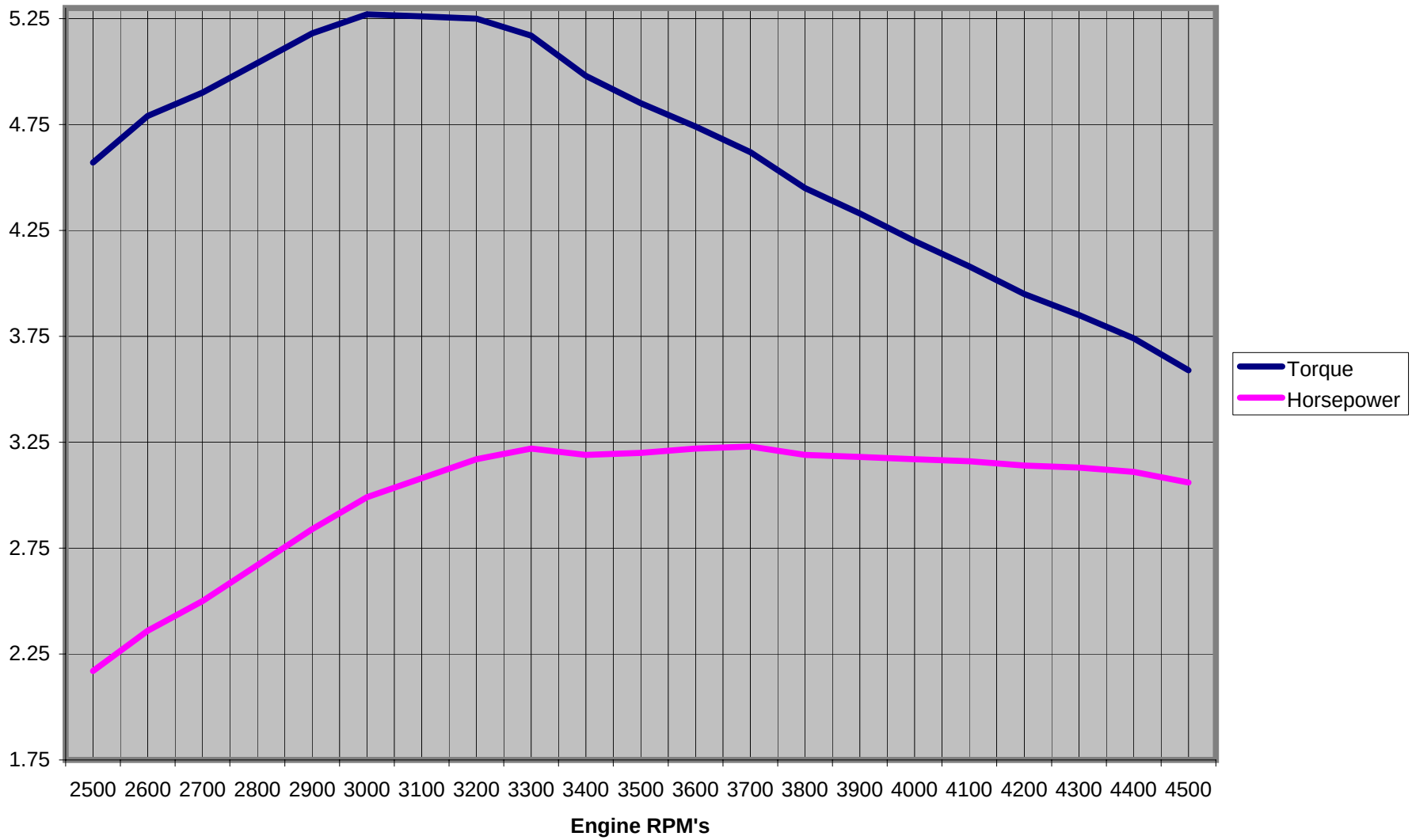

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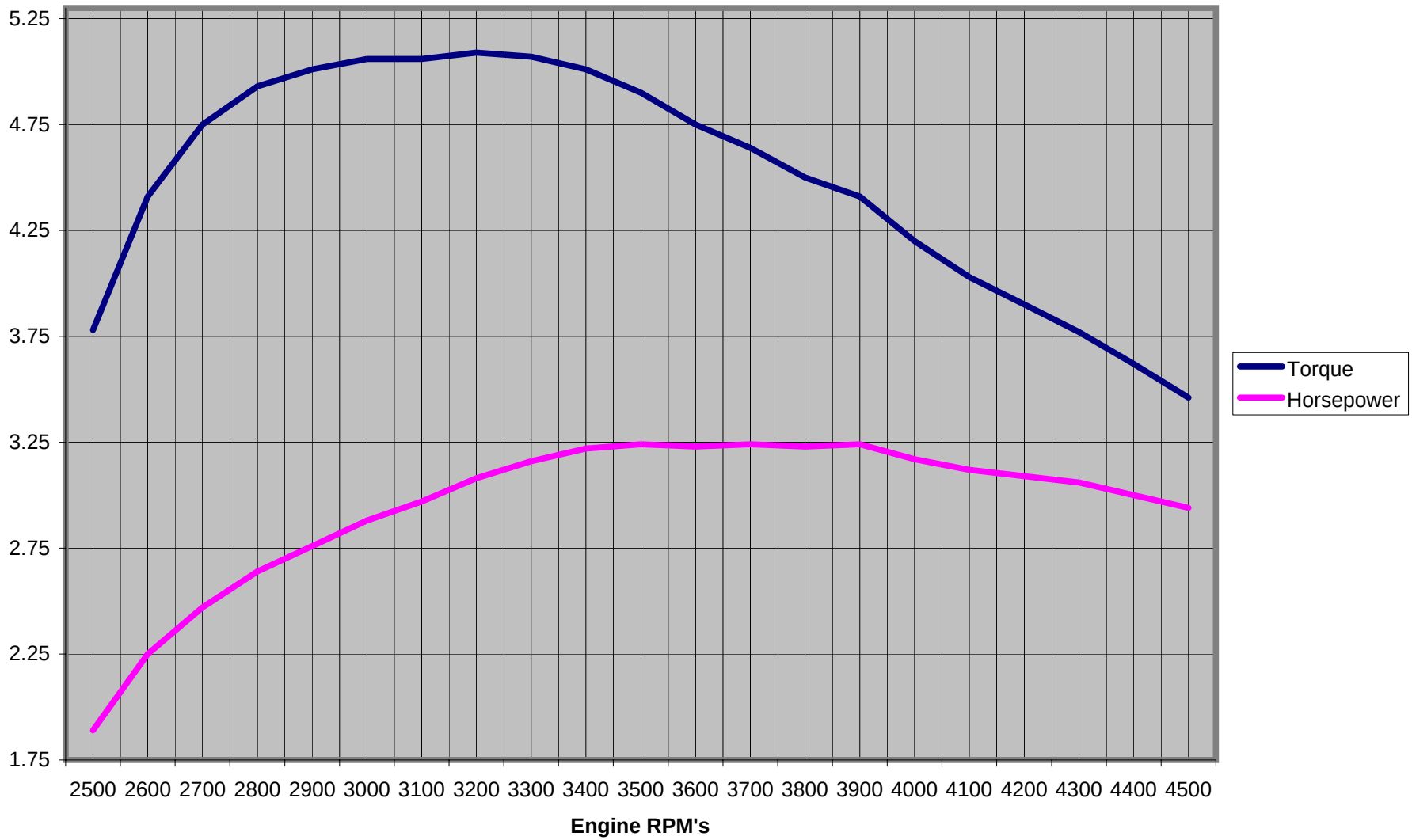
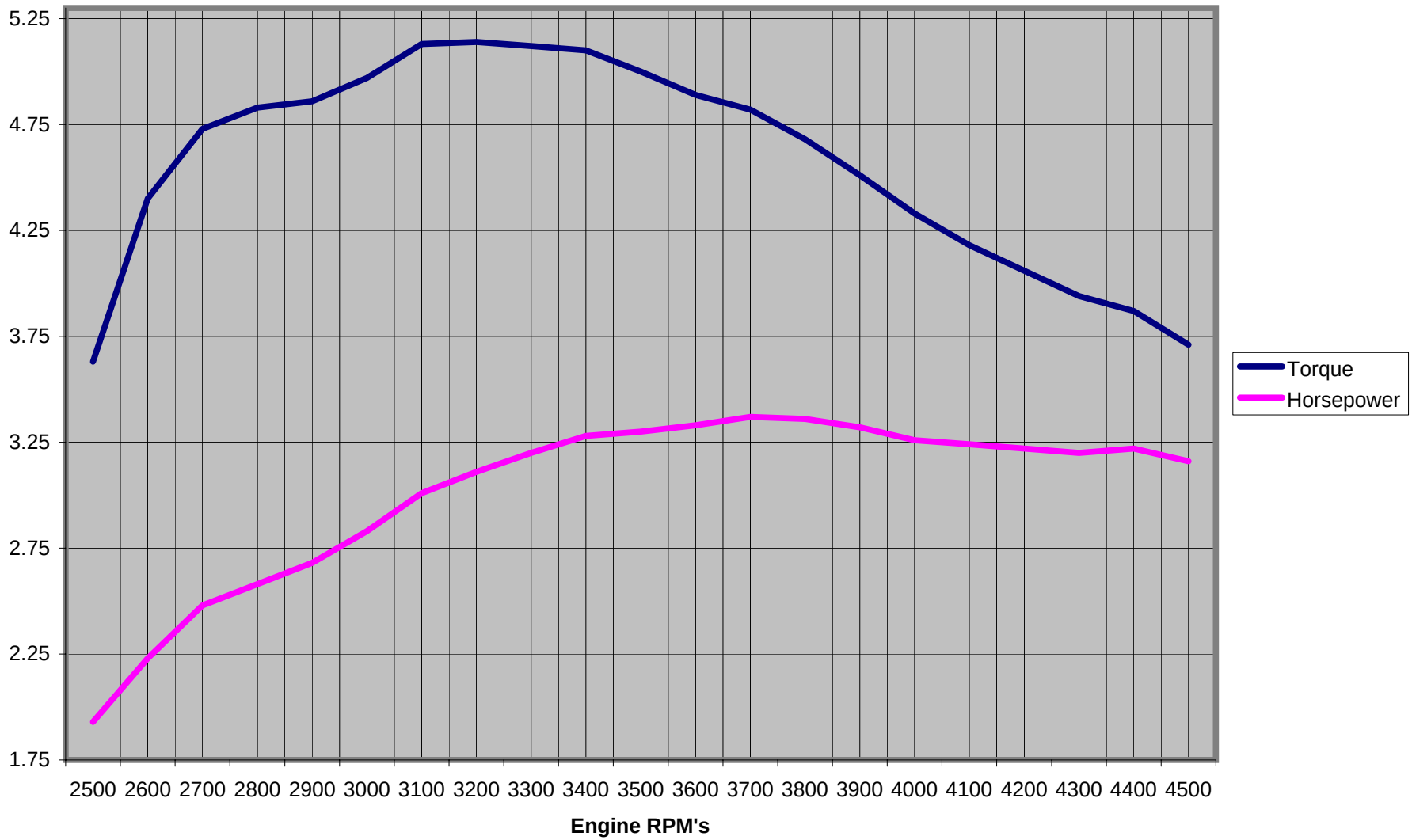


SpiritPFC Purified Fuel Torque/HP Comparison Run #5



RPM	1st Raw Fuel TORQ	2nd Raw Fuel TORQ	3rd Raw Fuel TORQ	4th Raw Fuel TORQ	5th Raw Fuel TORQ	TORQ Raw Fuel Average
2500	4.33	4.73	3.93	3.73	4.55	4.25
2600	4.77	4.85	4.53	4.42	4.71	4.66
2700	5.05	5.01	4.87	4.76	4.95	4.93
2800	5.09	5.13	5.03	4.98	5.10	5.07
2900	5.11	5.19	5.01	5.03	5.14	5.10
3000	5.08	5.21	5.03	5.06	5.13	5.10
3100	5.06	5.20	5.08	5.10	5.10	5.11
3200	5.07	5.12	5.17	5.04	5.11	5.10
3300	5.00	5.02	5.17	4.95	5.05	5.04
3400	4.90	4.92	5.09	4.82	5.04	4.95
3500	4.79	4.81	4.87	4.72	4.96	4.83
3600	4.70	4.72	4.68	4.56	4.86	4.70
3700	4.56	4.59	4.53	4.47	4.73	4.58
3800	4.44	4.47	4.43	4.39	4.60	4.47
3900	4.25	4.30	4.32	4.32	4.44	4.33
4000	4.12	4.16	4.19	4.16	4.31	4.19
4100	3.98	4.03	4.09	3.99	4.16	4.05
4200	3.87	3.94	3.95	3.83	3.99	3.92
4300	3.70	3.83	3.84	3.68	3.90	3.79
4400	3.51	3.65	3.69	3.57	3.85	3.65
4500	3.24	3.45	3.50	3.40	3.66	3.45

Change in Peak Torque		Change in Peak Horsepower	
Raw Fuel	Purified Fuel	Raw Fuel	Purified Fuel
5.11	5.18	3.20	3.27
Difference	**1.49%**	**Difference**	**2.06%**

RPM	1st Raw Fuel HP	2nd Raw Fuel HP	3rd Raw Fuel HP	4th Raw Fuel HP	5th Raw Fuel HP	HP Raw Fuel Average
2500	1.89	2.25	1.87	1.77	2.16	1.99
2600	2.22	2.39	2.25	2.19	2.32	2.27
2700	2.45	2.56	2.50	2.44	2.53	2.50
2800	2.64	2.72	2.67	2.64	2.70	2.67
2900	2.73	2.84	2.75	2.76	2.82	2.78
3000	2.82	2.95	2.86	2.87	2.91	2.88
3100	2.89	3.04	2.98	2.99	2.98	2.98
3200	2.97	3.09	3.13	3.05	3.09	3.07
3300	3.07	3.12	3.22	3.08	3.14	3.13
3400	3.11	3.15	3.27	3.09	3.24	3.17
3500	3.15	3.18	3.22	3.12	3.27	3.19
3600	3.17	3.21	3.18	3.10	3.30	3.19
3700	3.19	3.20	3.16	3.12	3.30	3.19
3800	3.18	3.21	3.18	3.16	3.29	3.20
3900	3.18	3.17	3.18	3.18	3.26	3.19
4000	3.13	3.14	3.17	3.14	3.26	3.17
4100	3.11	3.12	3.16	3.08	3.22	3.14
4200	3.08	3.12	3.13	3.03	3.16	3.10
4300	3.07	3.11	3.12	2.98	3.17	3.09
4400	3.00	3.03	3.07	2.97	3.20	3.05
4500	2.91	2.93	2.97	2.89	3.11	2.96

RPM	1st Purifier TORQ	2nd Purifier TORQ	3rd Purifier TORQ	4th Purifier TORQ	5th Purifier TORQ	TORQ Purifier Average
2500	4.78	4.69	4.57	3.78	3.63	4.29
2600	4.97	4.85	4.79	4.41	4.40	4.68
2700	5.07	5.08	4.90	4.75	4.73	4.91
2800	5.11	5.19	5.04	4.93	4.83	5.02
2900	5.22	5.24	5.18	5.01	4.86	5.10
3000	5.25	5.24	5.27	5.06	4.97	5.16
3100	5.24	5.23	5.26	5.06	5.13	5.18
3200	5.19	5.17	5.25	5.09	5.14	5.17
3300	5.13	5.04	5.17	5.07	5.12	5.11
3400	5.05	4.90	4.98	5.01	5.10	5.01
3500	4.99	4.81	4.85	4.90	5.00	4.91
3600	4.91	4.76	4.74	4.75	4.89	4.81
3700	4.70	4.63	4.62	4.64	4.82	4.68
3800	4.52	4.57	4.45	4.50	4.68	4.54
3900	4.35	4.46	4.33	4.41	4.51	4.41
4000	4.26	4.33	4.20	4.20	4.33	4.26
4100	4.16	4.16	4.08	4.03	4.18	4.12
4200	4.05	4.10	3.95	3.90	4.06	4.01
4300	3.95	4.07	3.85	3.77	3.94	3.92
4400	3.87	3.97	3.74	3.62	3.87	3.81
4500	3.73	3.81	3.59	3.46	3.71	3.66

RPM	1st Purifier HP	2nd Purifier HP	3rd Purifier HP	4th Purifier HP	5th Purifier HP	HP Purifier Average
2500	2.27	2.23	2.17	1.89	1.93	2.10
2600	2.45	2.39	2.36	2.25	2.23	2.34
2700	2.59	2.60	2.50	2.47	2.48	2.53
2800	2.71	2.75	2.67	2.64	2.58	2.67
2900	2.86	2.88	2.84	2.76	2.68	2.80
3000	2.98	2.97	2.99	2.88	2.83	2.93
3100	3.07	3.06	3.08	2.97	3.01	3.04
3200	3.14	3.12	3.17	3.08	3.11	3.12
3300	3.20	3.14	3.22	3.16	3.20	3.18
3400	3.24	3.14	3.19	3.22	3.28	3.21
3500	3.30	3.17	3.20	3.24	3.30	3.24
3600	3.34	3.23	3.22	3.23	3.33	3.27
3700	3.28	3.23	3.23	3.24	3.37	3.27
3800	3.24	3.28	3.19	3.23	3.36	3.26
3900	3.20	3.28	3.18	3.24	3.32	3.24
4000	3.22	3.27	3.17	3.17	3.26	3.22
4100	3.22	3.22	3.16	3.12	3.24	3.19
4200	3.21	3.25	3.14	3.09	3.22	3.18
4300	3.21	3.31	3.13	3.06	3.20	3.18
4400	3.21	3.30	3.11	3.00	3.22	3.17
4500	3.17	3.24	3.06	2.94	3.16	3.11