**Polaris Axys 800 HO Pipe Shootout**

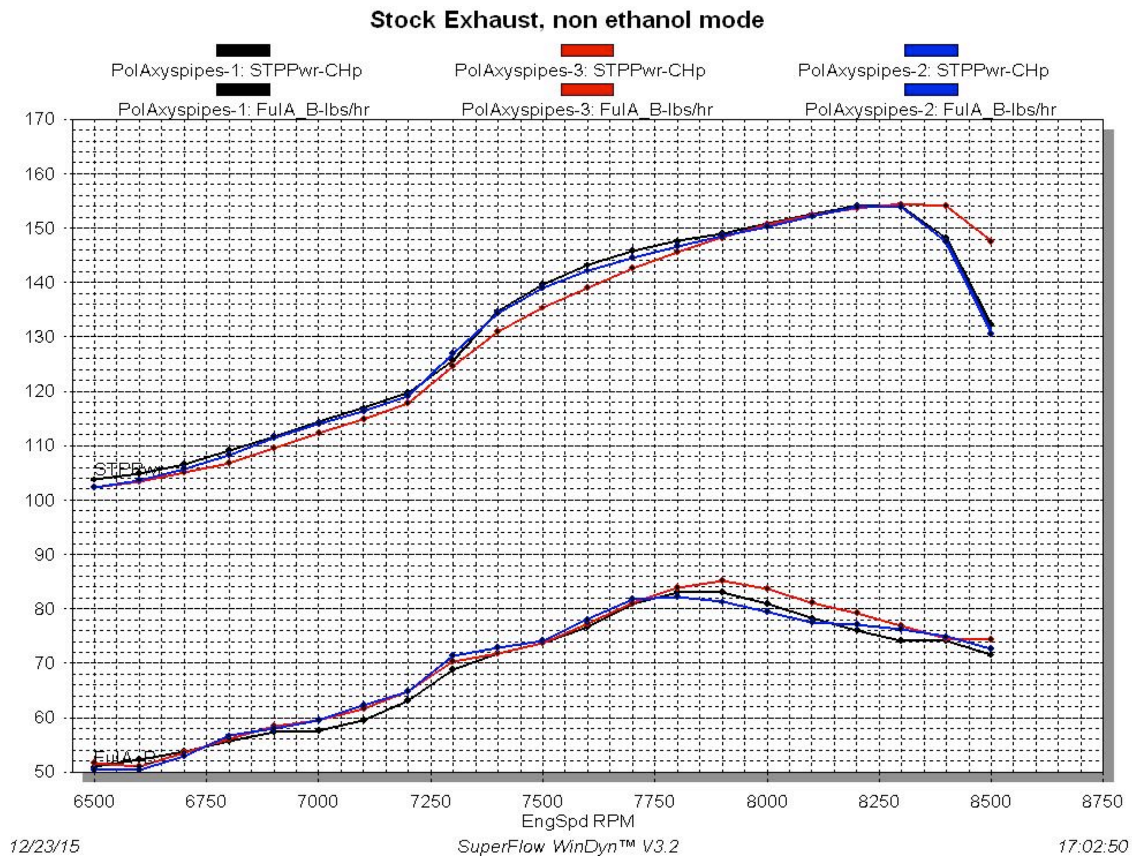
Here's the third dyno session for Heath Lynk's 2015 Polaris Axys 800 HO. Heath (owner of Integrity Automotive in Cobleskill, NY) is a great technician and is one of many who enjoy learning about optimal trail and racing snowmobile engine performance here. We used Heath's new Axys for the original DTR tech article (posted here on 10/7/14) as well as the followup dyno test of the engine with real breakin miles and a real "broken in" ECU (posted here on 3/3/15). Now, after this session, Heath's properly seasoned 800 HO engine has 2300 miles *and* close to 200 full throttle dyno tests on it. 200 full throttle dyno tests on a properly engineered dyno system is easier on an engine than most people realize--rubber dampening media that we have engineered into the driveshaft between crankshaft taper and load inducing dynamometer absorber cancels out destructive torsional vibrations that every crankshaft emits at various "critical speed" RPM--where cranks can twist from one end to the other, wind up and then unload with violent torque spikes. Here, instead of beating up solid dyno shaft drives and themselves, turning unmeasured HP into driveshaft/ crankshaft taper fretting (localized welding of high spots on male and female taper surfaces) and heat, those torque spikes are "stored" temporarily by the "wound up" rubber dampeners, then released in an orderly fashion, where they can be measured by the now-smooth running dyno absorber. Heath Lynk understands that and is always willing to offer his engines and services to DTR for discovering ways to optimize his own, and others' performance. 200 full throttle dyno tests? At DTR, that's surely as easy on the engine as a five mile trail ride. So that's why Heath is back again, testing, tuning and learning at DTR.

Heath got involved in this project after DTR pal Canadian Brock Ratch (a moderator at PolarisStarPower,com) conceived this Polaris Axys pipe shootout with pipes he and other PSP members had, and would be obtained from manufacturers. Brock's original idea was to use his Canadian pal Rich Lys' 0 mile Axys 800, and obtain all the single pipes we could, and test them for optimal HP. But since we've seen 800 HO HP gradually rise in the first 50 or so dyno tests, doing a meaningful pipe shootout might be unfair to the early pipes tested on a new engine, and provide some advantage to the last pipes tested. So we went to Heath with his well-seasoned and great running 2015 Axys 800 to provide the "mule" for comparing these pipes. Our other Polaris aficionado pal Norm Ahrons (who provided the CFI2 engine for VF3R reed test posted on 2/24/14 and for the RKT shim kit engine test posted on 2/26/15), was here to meet Brock, Heath and the others and to help tweak PCV fuel and timing maps to create optimal HP curves with best overrev. But he would have to wait until all pipes were tested and documented so we could home in on the SSI pipe mod that Heath would be running on his sled this winter.

We came up with five aftermarket single pipes to compare to Heath's stock pipe--Aaen, BMP, and SLP pipes, and stock pipes modified by SSI and Terra Alps. "Pipe Mods" are less expensive tweaks to stock tuned pipes where internal stingers are added along with changes in overall length.

Our plan today was to monitor exact coolant and exhaust pipe center section temperature with our Digital Wrench computer system, then do two or three back to back dyno tests on each pipe/ tuning combo--each of which would be at least 10 seconds at WOT from start to finish. With Heath's sled's cooling system tied into the dyno cooling tower, we could begin each series of back to back to back tests by loading the engine at half throttle, 6450 RPM--then as coolant temp hit 65F the throttle would be opened fully for five or more seconds as coolant and pipe heat would climb to 80F and @800F, respectively--then the engine would be accelerated slowly at 250 RPM/sec to the HP peak and beyond (as the SuperFlow 902 dyno recorded data @100x per second), then brought back to 6450 and immediately tested again, two or three times until HP subsided due to rising coolant and pipe temperature. The multiple-test graphs show the changes in HP and peak HP RPM and fuel flow in response to the temperature rise. It also shows how pipes vary in their response to temperature rise. Following each graph is an average of the multiple tests, showing STP corrected torque and HP, and fuel flow lb/hr (fulA_B) which is the lb/hr of flow from pump to rail minus the lb/hr of flow back to the tank. The BSFA_B is the lb of fuel per HP per hour--old time DynoTech readers remember the "old days" when anything below .60 lb/hphr was too lean for pump gas! The game has changed because modern two-stroke engines have better cooling thanks to tight, low volume "shrink wrapped" cooling passages in heads and cylinders. This creates higher velocity, turbulent coolant that does a much better job of scouring deto-producing heat from combustion chambers than did the early high volume stagnant coolant "bathtub" designs (still ignorantly touted by some sellers of replacement heads). Improved cooling, combined with cleaner burning engines (which have much less unburned fuel included in the short circuited air going out the exhaust) can allow deto-free operation even with sub-.50 lb/hphr BSFC! The dyno data also includes A/F (lb of air per lb of fuel) and SCFM (standard cubic feet of air flowing through the engine). LamAF1 is the A/F reading from the dyno Innovate wideband O2 sensor and LM1Air is airflow computed by comparing wideband A/F with measured fuel flow. And remember--because of the aforementioned lack of unburned fuel in the short circuited airflow, we can assume that even though the *average* exhaust gas measures, say, 13.5/1 the air/fuel mixture trapped and burned in the combustion chambers might be closer to 12.5/1. As an aside, today's wideband A/F meters are a valuable, inexpensive tuning tool. When I built this facility nearly 30 years ago, an accurate Horiba wideband A/F meter cost $4000 in 1980's dollars. Today, you can buy an Innovate digital wideband A/F gauge for $200 from Jegs or Summit--including a $55 Bosch O2 sensor!

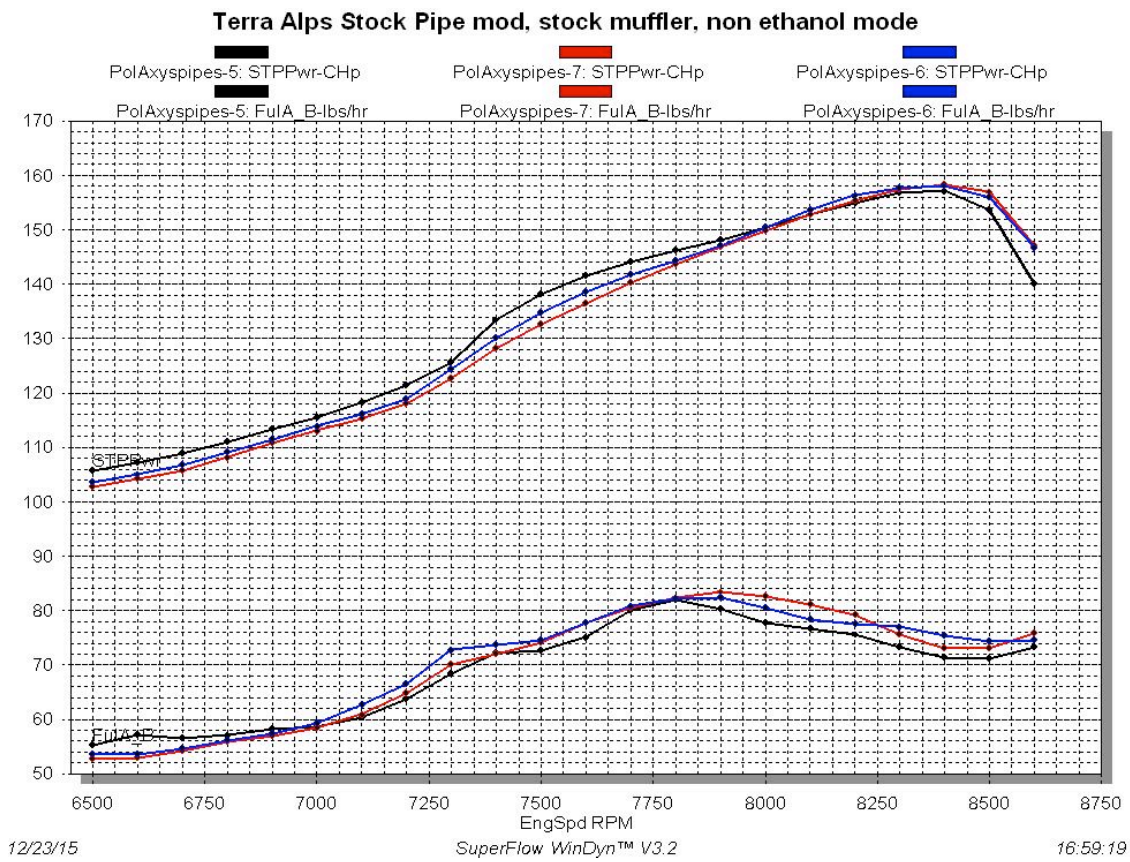
Today, Heath had 91 octane non-ethanol fuel, and all initial tests were done in non-ethanol mode. On each non stock pipe we ran a series of three tests with the ECU switched to ethanol mode (to see if added fuel would add to HP), and in each case we lost some HP (remember, the Ethanol fuel mode is said to retard timing slightly, too). So all of these multi-pass tests are with ECU in non ethanol mode.




**Average of three back to back tests, stock exhaust:**

| EngSpd RPM | STPPwr CHp | STPTrq Clb-ft | BSFA_B lb/hph | LamAF1 Ratio | LM1Air SCFM | ElpsTm Secnds | AirInT degF |
|---|---|---|---|---|---|---|---|
| 6500 | 102.8 | 83.1 | 0.532 | 15.44 | 181 | 0.57 | 60.9 |
| 6600 | 104.1 | 82.7 | 0.529 | 15.50 | 183 | 1.25 | 60.9 |
| 6700 | 105.7 | 82.9 | 0.542 | 15.47 | 190 | 1.67 | 60.9 |
| 6800 | 108.1 | 83.5 | 0.558 | 15.14 | 195 | 1.99 | 60.9 |
| 6900 | 110.9 | 84.4 | 0.562 | 14.68 | 196 | 2.49 | 60.9 |
| 7000 | 113.6 | 85.2 | 0.557 | 14.48 | 196 | 2.90 | 60.9 |
| 7100 | 116.1 | 85.8 | 0.566 | 14.54 | 204 | 3.23 | 60.9 |
| 7200 | 118.9 | 86.8 | 0.580 | 14.53 | 214 | 3.51 | 60.9 |
| 7300 | 125.7 | 90.4 | 0.599 | 14.04 | 227 | 4.03 | 60.9 |
| 7400 | 133.3 | 94.6 | 0.581 | 13.63 | 226 | 4.49 | 60.9 |
| 7500 | 138.0 | 96.6 | 0.574 | 13.65 | 231 | 4.86 | 61.0 |
| 7600 | 141.4 | 97.7 | 0.587 | 13.49 | 240 | 5.30 | 61.0 |
| 7700 | 144.4 | 98.5 | 0.604 | 13.06 | 244 | 5.70 | 61.0 |
| 7800 | 146.7 | 98.8 | 0.608 | 12.70 | 243 | 6.12 | 61.0 |
| 7900 | 148.6 | 98.8 | 0.601 | 12.68 | 242 | 6.49 | 61.0 |
| 8000 | 150.6 | 98.8 | 0.580 | 12.83 | 240 | 6.97 | 61.0 |
| 8100 | 152.4 | 98.8 | 0.557 | 13.09 | 238 | 7.38 | 61.0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8200 | 153.9 | 98.6 | 0.541 | 13.38 | 238 | 7.76 | 61.0 |
| 8300 | 154.1 | 97.5 | 0.528 | 13.63 | 237 | 8.12 | 61.0 |
| 8400 | 149.9 | 93.7 | 0.534 | 13.82 | 237 | 8.59 | 61.1 |
| 8500 | 136.8 | 84.5 | 0.573 | 13.85 | 232 | 9.35 | 61.1 |




**Average of three tests, Terra Alps stock pipe mod, Stock muffler**

| EngSpd RPM | STPPwr CHp | STPTrq Clb-ft | BSFA_B lb/hph | FulA_B lbs/hr | LamAF1 Ratio | LM1Air SCFM | FuelA lbs/hr | FuelB lbs/hr |
|---|---|---|---|---|---|---|---|---|
| 6500 | 104.0 | 84.1 | 0.556 | 53.8 | 15.15 | 188 | 261.3 | 207.5 |
| 6600 | 105.4 | 83.9 | 0.556 | 54.5 | 15.16 | 190 | 261.5 | 207.0 |
| 6700 | 107.1 | 84.0 | 0.554 | 55.2 | 15.19 | 193 | 261.7 | 206.6 |
| 6800 | 109.4 | 84.5 | 0.553 | 56.3 | 15.03 | 195 | 261.6 | 205.3 |
| 6900 | 111.9 | 85.2 | 0.553 | 57.5 | 14.75 | 195 | 261.3 | 203.7 |
| 7000 | 114.2 | 85.7 | 0.554 | 58.8 | 14.53 | 197 | 261.6 | 202.7 |
| 7100 | 116.6 | 86.2 | 0.565 | 61.3 | 14.56 | 205 | 261.5 | 200.2 |
| 7200 | 119.5 | 87.2 | 0.585 | 65.0 | 14.55 | 218 | 261.4 | 196.4 |
| 7300 | 124.3 | 89.4 | 0.609 | 70.4 | 14.17 | 230 | 260.8 | 190.4 |
| 7400 | 130.5 | 92.6 | 0.598 | 72.6 | 13.76 | 230 | 260.1 | 187.5 |

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|---|---|---|---|---|---|---|---|---|
| 7500 | 135.2 | 94.7 | 0.587 | 73.8 | 13.77 | 234 | 260.1 | 186.3 |
| 7600 | 138.9 | 96.0 | 0.595 | 76.8 | 13.64 | 241 | 260.6 | 183.8 |
| 7700 | 142.1 | 96.9 | 0.608 | 80.4 | 13.20 | 244 | 261.1 | 180.7 |
| 7800 | 144.7 | 97.5 | 0.610 | 82.2 | 12.92 | 244 | 261.2 | 179.1 |
| 7900 | 147.4 | 98.0 | 0.598 | 82.0 | 12.92 | 244 | 260.9 | 178.9 |
| 8000 | 150.2 | 98.6 | 0.574 | 80.2 | 13.08 | 242 | 260.4 | 180.2 |
| 8100 | 153.1 | 99.3 | 0.553 | 78.7 | 13.28 | 241 | 260.7 | 182.0 |
| 8200 | 155.5 | 99.6 | 0.535 | 77.4 | 13.51 | 241 | 261.0 | 183.6 |
| 8300 | 157.3 | 99.5 | 0.515 | 75.3 | 13.73 | 238 | 260.6 | 185.3 |
| 8400 | 157.8 | 98.7 | 0.499 | 73.2 | 13.93 | 235 | 260.4 | 187.1 |
| 8500 | 155.6 | 96.1 | 0.504 | 72.8 | 14.02 | 235 | 260.4 | 187.6 |
| 8600 | 144.6 | 88.3 | 0.556 | 74.6 | 13.64 | 234 | 261.2 | 186.6 |

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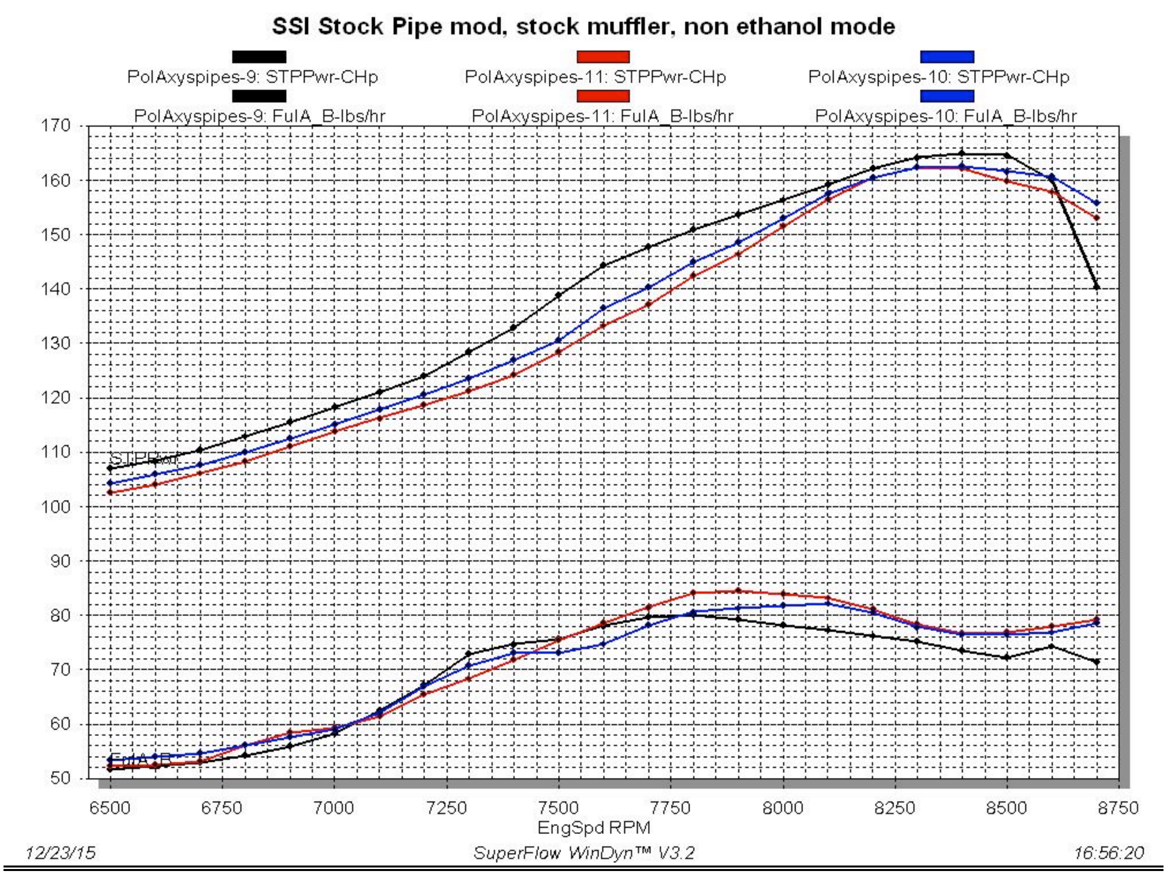
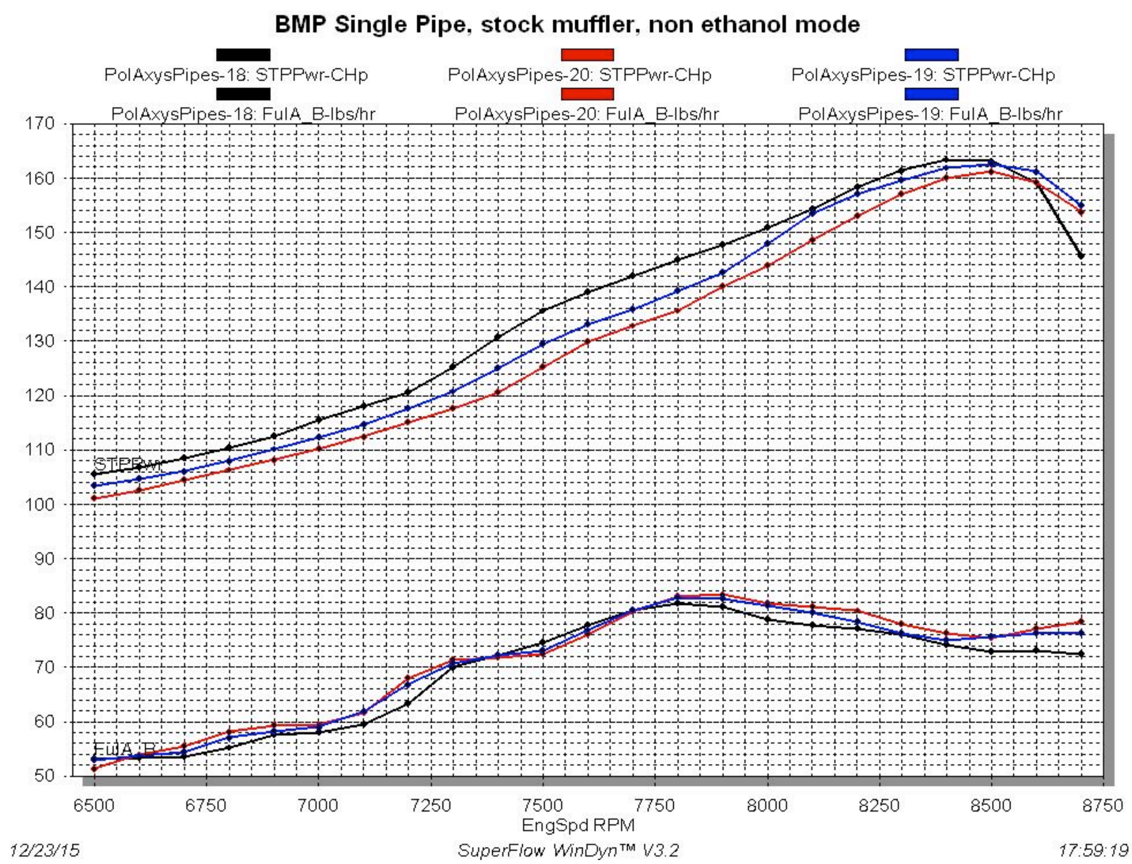



**AVERAGE OF THREE TESTS, SSI STOCK PIPE MOD, STOCK MUFFLER**

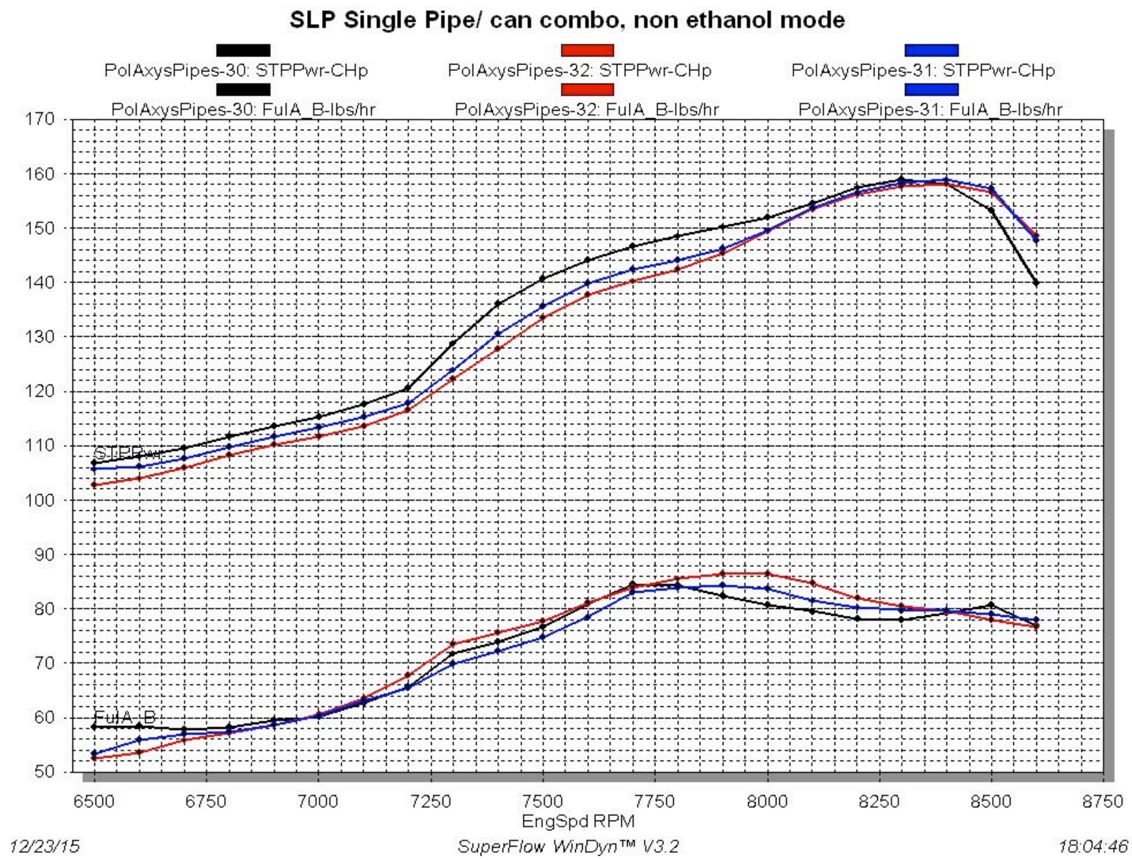
| EngSpd<br>RPM | STPPwr<br>CHp | STPTrq<br>Clb-ft | BSFA_B<br>lb/hph | FulA_B<br>lbs/hr | LamAF1<br>Ratio | LM1Air<br>SCFM | AirDen<br>lb/cft | DenAlt<br>Feet |
|---|---|---|---|---|---|---|---|---|
| 6500 | 104.6 | 84.5 | 0.539 | 52.5 | 14.62 | 176 | 0.073 | 2068 |
| 6600 | 106.1 | 84.4 | 0.536 | 53.0 | 14.63 | 178 | 0.073 | 2069 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6700 | 108.0 | 84.7 | 0.533 | 53.6 | 14.66 | 181 | 0.073 | 2070 |
| 6800 | 110.4 | 85.3 | 0.540 | 55.5 | 14.57 | 186 | 0.073 | 2071 |
| 6900 | 113.1 | 86.1 | 0.545 | 57.3 | 14.33 | 189 | 0.073 | 2072 |
| 7000 | 115.7 | 86.8 | 0.547 | 58.8 | 14.10 | 191 | 0.073 | 2073 |
| 7100 | 118.3 | 87.5 | 0.563 | 62.0 | 14.06 | 200 | 0.073 | 2073 |
| 7200 | 121.1 | 88.3 | 0.590 | 66.5 | 13.86 | 212 | 0.072 | 2074 |
| 7300 | 124.4 | 89.5 | 0.610 | 70.7 | 13.35 | 217 | 0.072 | 2075 |
| 7400 | 128.1 | 90.9 | 0.614 | 73.2 | 13.06 | 220 | 0.072 | 2076 |
| 7500 | 132.6 | 92.8 | 0.606 | 74.7 | 13.08 | 225 | 0.072 | 2077 |
| 7600 | 137.9 | 95.3 | 0.601 | 77.1 | 13.05 | 231 | 0.072 | 2078 |
| 7700 | 141.8 | 96.7 | 0.604 | 79.7 | 12.83 | 235 | 0.072 | 2079 |
| 7800 | 146.1 | 98.4 | 0.600 | 81.6 | 12.49 | 234 | 0.072 | 2080 |
| 7900 | 149.5 | 99.4 | 0.587 | 81.7 | 12.48 | 234 | 0.072 | 2081 |
| 8000 | 153.6 | 100.9 | 0.568 | 81.3 | 12.63 | 236 | 0.072 | 2082 |
| 8100 | 157.7 | 102.3 | 0.551 | 80.8 | 12.81 | 238 | 0.072 | 2083 |
| 8200 | 161.0 | 103.1 | 0.529 | 79.3 | 13.06 | 238 | 0.072 | 2084 |
| 8300 | 163.0 | 103.1 | 0.509 | 77.1 | 13.30 | 236 | 0.072 | 2085 |
| 8400 | 163.2 | 102.0 | 0.498 | 75.6 | 13.40 | 233 | 0.072 | 2085 |
| 8500 | 162.0 | 100.1 | 0.499 | 75.2 | 13.42 | 232 | 0.072 | 2086 |
| 8600 | 159.5 | 97.4 | 0.515 | 76.4 | 13.26 | 233 | 0.072 | 2087 |
| 8700 | 149.8 | 90.4 | 0.549 | 76.4 | 12.86 | 226 | 0.072 | 2090 |



## AVERAGE OF THREE TESTS, BMP PIPE STOCK MUFFLER

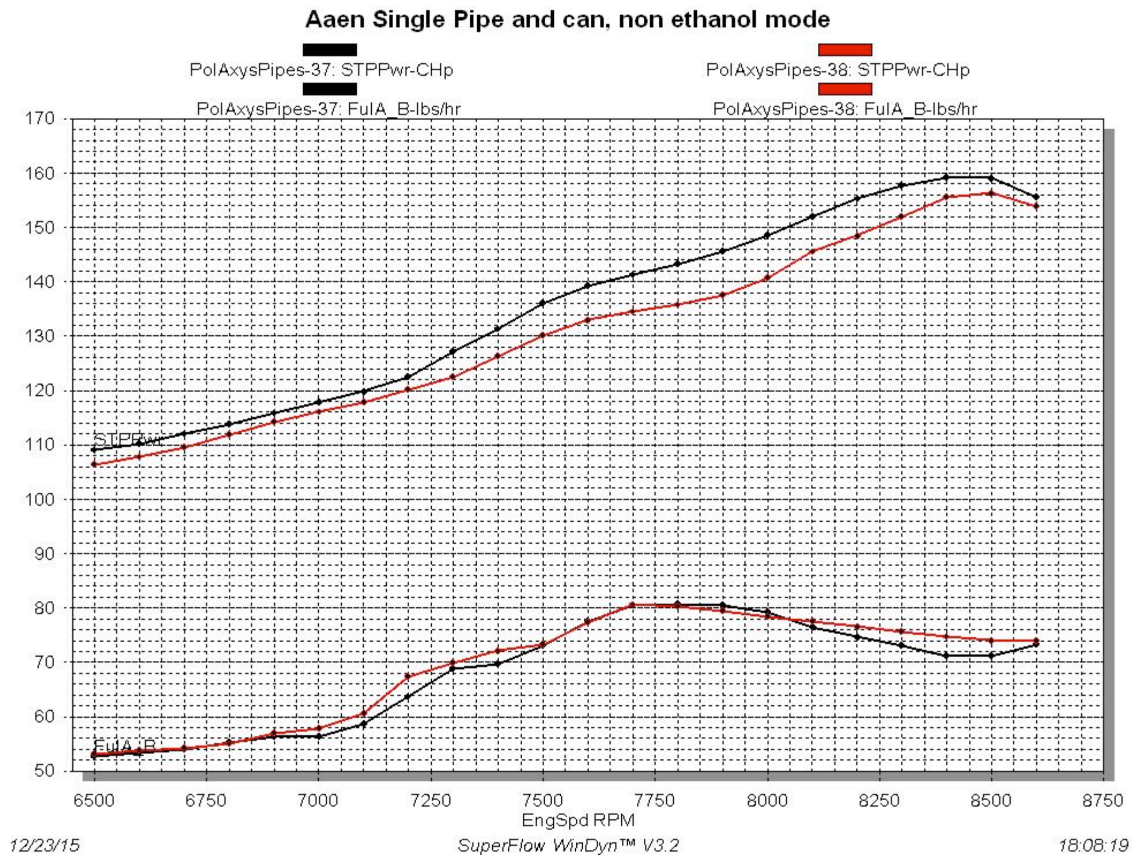
| EngSpd | STPPwr | STPTrq | BSFA_B | FulA_B | LamAF1 | LM1Air | Vap_P | Humidy |
|---|---|---|---|---|---|---|---|---|
| RPM | CHp | Clb-ft | lb/hph | lbs/hr | Ratio | SCFM | InHg | % |
| 6500 | 103.4 | 83.5 | 0.545 | 52.4 | 14.65 | 177 | 0.36 | 66.8 |
| 6600 | 104.6 | 83.3 | 0.551 | 53.6 | 14.68 | 181 | 0.36 | 66.8 |
| 6700 | 106.3 | 83.3 | 0.552 | 54.5 | 14.74 | 185 | 0.36 | 66.8 |
| 6800 | 108.2 | 83.6 | 0.564 | 56.8 | 14.63 | 191 | 0.36 | 66.7 |
| 6900 | 110.3 | 84.0 | 0.569 | 58.3 | 14.35 | 193 | 0.36 | 66.7 |
| 7000 | 112.6 | 84.5 | 0.561 | 58.8 | 14.09 | 191 | 0.36 | 66.6 |
| 7100 | 115.0 | 85.1 | 0.570 | 61.0 | 14.06 | 197 | 0.36 | 66.6 |
| 7200 | 117.7 | 85.9 | 0.603 | 66.0 | 13.85 | 210 | 0.36 | 66.6 |
| 7300 | 121.2 | 87.2 | 0.627 | 70.7 | 13.40 | 218 | 0.36 | 66.6 |
| 7400 | 125.4 | 89.0 | 0.618 | 72.1 | 13.08 | 217 | 0.36 | 66.5 |
| 7500 | 130.1 | 91.1 | 0.607 | 73.4 | 13.16 | 222 | 0.36 | 66.5 |
| 7600 | 134.0 | 92.6 | 0.617 | 76.9 | 13.02 | 230 | 0.36 | 66.5 |
| 7700 | 136.9 | 93.4 | 0.632 | 80.4 | 12.65 | 234 | 0.36 | 66.4 |
| 7800 | 139.9 | 94.2 | 0.635 | 82.5 | 12.38 | 235 | 0.36 | 66.4 |
| 7900 | 143.5 | 95.4 | 0.617 | 82.3 | 12.39 | 235 | 0.36 | 66.4 |
| 8000 | 147.6 | 96.9 | 0.587 | 80.6 | 12.61 | 234 | 0.36 | 66.3 |
| 8100 | 152.1 | 98.7 | 0.563 | 79.6 | 12.84 | 235 | 0.36 | 66.3 |
| 8200 | 156.2 | 100.0 | 0.542 | 78.6 | 13.08 | 237 | 0.36 | 66.3 |
| 8300 | 159.3 | 100.8 | 0.518 | 76.8 | 13.36 | 236 | 0.36 | 66.3 |
| 8400 | 161.7 | 101.1 | 0.500 | 75.1 | 13.58 | 235 | 0.36 | 66.2 |
| 8500 | 162.2 | 100.2 | 0.495 | 74.6 | 13.60 | 234 | 0.36 | 66.2 |
| 8600 | 159.9 | 97.6 | 0.508 | 75.4 | 13.25 | 230 | 0.36 | 66.2 |
| 8700 | 151.4 | 91.4 | 0.539 | 75.7 | 12.73 | 222 | 0.36 | 66.1 |




**AVERAGE OF THREE TESTS, SLP PIPE AND CAN**

| EngSpd RPM | STPPwr CHp | STPTrq Clb-ft | BSFA_B lb/hph | FulA_B lbs/hr | LamAF1 Ratio | LM1Air SCFM | Baro_P InHga | AirInT degF |
|---|---|---|---|---|---|---|---|---|
| 6500 | 105.1 | 84.9 | 0.561 | 54.7 | 14.43 | 182 | 28.48 | 62.5 |
| 6600 | 106.0 | 84.4 | 0.569 | 56.0 | 14.46 | 187 | 28.48 | 62.5 |
| 6700 | 107.7 | 84.5 | 0.568 | 56.8 | 14.50 | 190 | 28.48 | 62.6 |
| 6800 | 109.9 | 84.9 | 0.564 | 57.6 | 14.35 | 191 | 28.48 | 62.6 |
| 6900 | 111.8 | 85.1 | 0.568 | 58.9 | 14.11 | 192 | 28.48 | 62.6 |
| 7000 | 113.4 | 85.1 | 0.572 | 60.3 | 13.97 | 194 | 28.48 | 62.6 |
| 7100 | 115.4 | 85.4 | 0.589 | 63.1 | 14.02 | 204 | 28.48 | 62.6 |
| 7200 | 118.3 | 86.3 | 0.603 | 66.3 | 13.99 | 214 | 28.48 | 62.6 |
| 7300 | 124.9 | 89.9 | 0.618 | 71.7 | 13.49 | 223 | 28.48 | 62.6 |
| 7400 | 131.5 | 93.3 | 0.605 | 73.9 | 13.16 | 224 | 28.48 | 62.6 |
| 7500 | 136.6 | 95.6 | 0.602 | 76.4 | 13.20 | 232 | 28.48 | 62.6 |
| 7600 | 140.6 | 97.1 | 0.614 | 80.2 | 13.03 | 241 | 28.48 | 62.6 |
| 7700 | 143.1 | 97.6 | 0.630 | 83.8 | 12.54 | 242 | 28.48 | 62.6 |
| 7800 | 145.0 | 97.6 | 0.628 | 84.6 | 12.32 | 240 | 28.48 | 62.7 |
| 7900 | 147.3 | 97.9 | 0.617 | 84.3 | 12.39 | 241 | 28.48 | 62.7 |
| 8000 | 150.4 | 98.7 | 0.599 | 83.6 | 12.60 | 243 | 28.48 | 62.7 |
| 8100 | 153.9 | 99.8 | 0.573 | 81.9 | 12.85 | 243 | 28.48 | 62.7 |
| 8200 | 156.7 | 100.4 | 0.550 | 80.1 | 13.08 | 242 | 28.48 | 62.7 |
| 8300 | 158.3 | 100.2 | 0.540 | 79.4 | 13.25 | 243 | 28.48 | 62.7 |
| 8400 | 158.4 | 99.0 | 0.540 | 79.4 | 13.38 | 245 | 28.48 | 62.7 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8500 | 155.7 | 96.2 | 0.548 | 79.2 | 13.38 | 244 | 28.48 | 62.7 |
| 8600 | 145.3 | 88.8 | 0.573 | 77.2 | 13.07 | 233 | 28.48 | 62.7 |




# AVERAGE OF TWO TESTS, AAEN SINGLE PIPE AND GLASSPACK

| EngSpd RPM | STPPwr CHp | STPTrq Clb-ft | BSFA_B lb/hph | FulA_B lbs/hr | LamAF1 Ratio | LM1Air SCFM | STPCor Factor | SAECor Factor |
|---|---|---|---|---|---|---|---|---|
| 6500 | 107.7 | 87.0 | 0.528 | 52.8 | 14.53 | 177 | 1.067 | 1.026 |
| 6600 | 109.0 | 86.8 | 0.529 | 53.5 | 14.53 | 179 | 1.067 | 1.026 |
| 6700 | 110.8 | 86.9 | 0.526 | 54.1 | 14.62 | 182 | 1.067 | 1.026 |
| 6800 | 112.9 | 87.2 | 0.526 | 55.1 | 14.55 | 185 | 1.067 | 1.026 |
| 6900 | 115.0 | 87.5 | 0.530 | 56.6 | 14.32 | 187 | 1.067 | 1.026 |
| 7000 | 116.9 | 87.7 | 0.525 | 57.1 | 14.18 | 187 | 1.067 | 1.026 |
| 7100 | 118.8 | 87.9 | 0.540 | 59.6 | 14.16 | 195 | 1.067 | 1.026 |
| 7200 | 121.4 | 88.5 | 0.581 | 65.5 | 13.76 | 208 | 1.067 | 1.026 |
| 7300 | 124.9 | 89.8 | 0.598 | 69.3 | 13.16 | 210 | 1.067 | 1.026 |
| 7400 | 128.8 | 91.4 | 0.593 | 70.9 | 12.95 | 212 | 1.067 | 1.026 |
| 7500 | 133.1 | 93.2 | 0.592 | 73.2 | 12.98 | 219 | 1.067 | 1.026 |
| 7600 | 136.1 | 94.1 | 0.612 | 77.4 | 12.69 | 226 | 1.067 | 1.026 |
| 7700 | 137.9 | 94.1 | 0.629 | 80.5 | 12.20 | 227 | 1.067 | 1.026 |
| 7800 | 139.5 | 93.9 | 0.622 | 80.6 | 12.03 | 223 | 1.067 | 1.026 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7900 | 141.5 | 94.1 | 0.608 | 79.9 | 12.15 | 224 | 1.067 | 1.026 |
| 8000 | 144.7 | 95.0 | 0.587 | 78.8 | 12.46 | 226 | 1.067 | 1.026 |
| 8100 | 148.8 | 96.5 | 0.558 | 77.1 | 12.78 | 227 | 1.067 | 1.026 |
| 8200 | 151.8 | 97.3 | 0.536 | 75.6 | 12.99 | 227 | 1.067 | 1.026 |
| 8300 | 154.8 | 98.0 | 0.517 | 74.3 | 13.27 | 228 | 1.067 | 1.026 |
| 8400 | 157.3 | 98.4 | 0.499 | 72.9 | 13.45 | 226 | 1.067 | 1.026 |
| 8500 | 157.7 | 97.4 | 0.496 | 72.6 | 13.40 | 224 | 1.067 | 1.026 |
| 8600 | 154.8 | 94.5 | 0.513 | 73.6 | 13.08 | 222 | 1.067 | 1.026 |

Note that with the Aaen pipe and muffler combo, airflow was restricted compared to the other pipes--airflow was low which also created comparatively rich A/F mixture since fuel flow is constant regardless of the pipe's airflow. Remember the Aeen pipe worked great on the CFI2 800 tested on this website (posted 3/14/11) with more HP and three lb/ft more torque than the other pipes, but that was with stock muffler. The pipe we got from Aaen for the Axys would not fit the stock muffler--only the Aaen supplied glasspack can that may be have too "tight"—maybe fine for high altitude but not at 700'. We'll see if we can obtain an Aaen pipe that will match up to the stock muffler and test it on another 800 HO engine later.

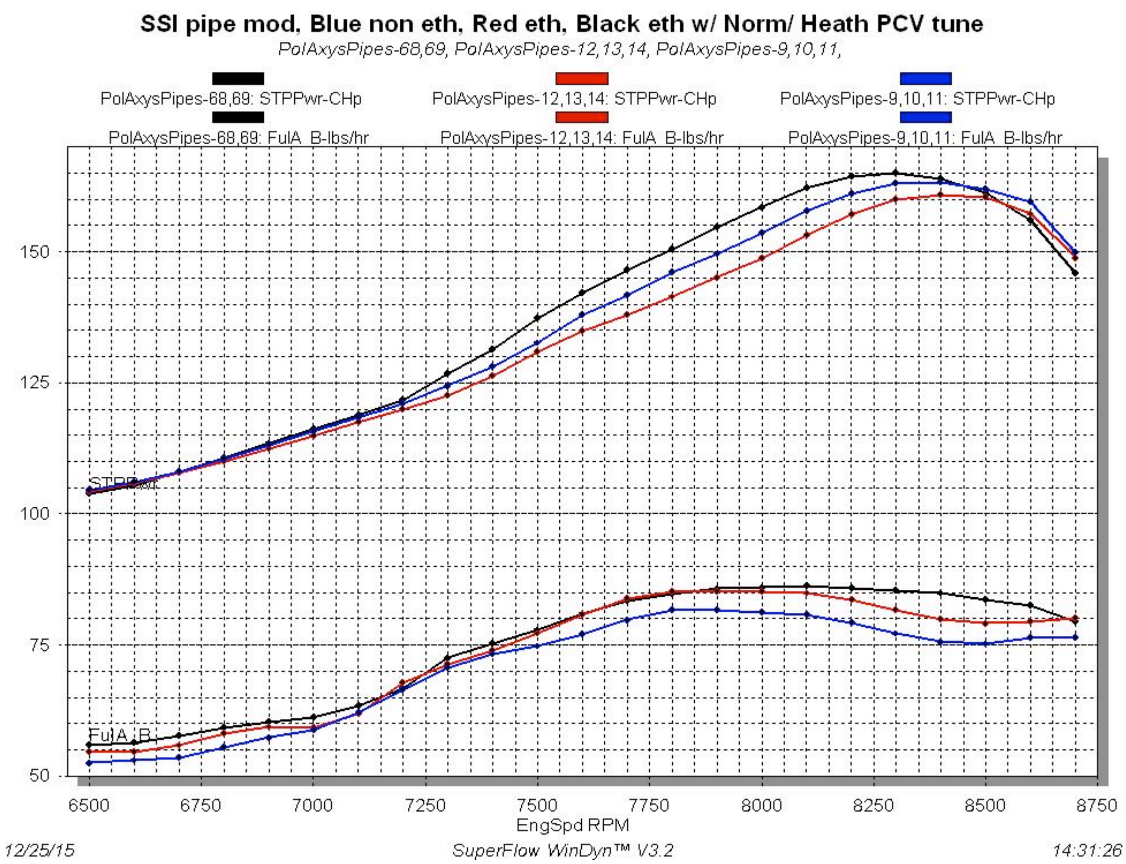
Surely the bargain of the bunch is the SSI "pipe mod"--a stock pipe, modified by the addition of a custom internal stinger and a slightly lengthened center section for only $250. The SSI pipe mod tested today is Brock's, and like Heath's own SSI pipe mod (tested during Heath's second session here) also had the stock heat shields fitted to it--insulating the pipe and maintaining pipe temperature. The first SSI pipe mod we tested during Heath's first dyno session last November was bare—no insulating heat shields which may explain it's slightly lower HP output. It surely appears that reinstalling the factory insulating heat shield on the modded pipe is worth the effort. BMP also performs that similar pipe mod.

Since Heath is running a SSI pipe mod on his sled this year, at the end of the session he and Greedy Norm tweaked a dandy fuel map that would flatten that big pile of fuel at peak torque, and add some fuel at higher revs where the stock fuel map leaned out. Then they came up with a timing curve that added lots in the midrange, a few degrees at peak revs, then retarded timing beyond the HP peak to flatten out the HP curve on top end, increasing overrev HP. Great Stuff. Here's the final "H&N" PCV timing and fuel map for the 2015 Axys 800 HO with SSI pipe mod compared to the stock timing and fuel map. This map should be great for the BMP single pipe, too since it's so similar in airflow/ HP.

**AVERAGE OF TWO FINAL TESTS, SSI PIPE MOD, HEATH & NORM'S MAP**

| EngSpd | STPPwr | STPTrq | BSFA_B | FulA_B | LamAF1 | LM1Air | ElpsTm | Air_1s |
|---|---|---|---|---|---|---|---|---|
| RPM | CHp | Clb-ft | lb/hph | lbs/hr | Ratio | SCFM | Secnds | SCFM |
| 6500 | 103.8 | 83.9 | 0.578 | 55.8 | 14.25 | 183 | 0.6 | 172.0 |
| 6600 | 105.4 | 83.8 | 0.576 | 56.4 | 14.31 | 186 | 1.07 | 176.1 |
| 6700 | 107.9 | 84.6 | 0.574 | 57.6 | 14.42 | 191 | 1.58 | 178.9 |
| 6800 | 110.6 | 85.4 | 0.576 | 59.3 | 14.35 | 196 | 2.04 | 182.1 |
| 6900 | 113.4 | 86.3 | 0.572 | 60.3 | 14.10 | 196 | 2.49 | 185.6 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7000 | 116.1 | 87.1 | 0.566 | 61.1 | 13.86 | 195 | 2.87 | 189.0 |
| 7100 | 118.8 | 87.9 | 0.573 | 63.3 | 13.77 | 201 | 3.24 | 193.1 |
| 7200 | 121.7 | 88.8 | 0.589 | 66.6 | 13.68 | 210 | 3.59 | 197.5 |
| 7300 | 126.8 | 91.2 | 0.615 | 72.5 | 13.18 | 220 | 4.02 | 206.1 |
| 7400 | 131.4 | 93.2 | 0.616 | 75.2 | 12.90 | 224 | 4.43 | 211.6 |
| 7500 | 137.2 | 96.1 | 0.610 | 77.8 | 12.90 | 231 | 4.81 | 218.7 |
| 7600 | 142.2 | 98.3 | 0.612 | 80.9 | 12.82 | 239 | 5.28 | 224.6 |
| 7700 | 146.6 | 100.0 | 0.611 | 83.3 | 12.52 | 240 | 5.62 | 229.9 |
| 7800 | 150.6 | 101.4 | 0.605 | 84.8 | 12.32 | 241 | 6.03 | 234.5 |
| 7900 | 154.6 | 102.8 | 0.596 | 85.7 | 12.30 | 243 | 6.44 | 239.1 |
| 8000 | 158.5 | 104.1 | 0.583 | 85.9 | 12.39 | 245 | 6.85 | 243.2 |
| 8100 | 162.1 | 105.1 | 0.572 | 86.3 | 12.53 | 249 | 7.31 | 246.9 |
| 8200 | 164.4 | 105.3 | 0.561 | 85.8 | 12.65 | 250 | 7.72 | 249.4 |
| 8300 | 165.1 | 104.4 | 0.557 | 85.4 | 12.77 | 251 | 8.16 | 250.9 |
| 8400 | 164.0 | 102.5 | 0.557 | 84.8 | 12.87 | 252 | 8.61 | 251.5 |
| 8500 | 161.3 | 99.7 | 0.558 | 83.6 | 12.92 | 249 | 9.02 | 251.3 |
| 8600 | 156.0 | 95.3 | 0.569 | 82.4 | 12.73 | 242 | 9.51 | 249.7 |
| 8700 | 145.9 | 88.1 | 0.587 | 79.4 | 12.43 | 228 | 10.18 | 244.8 |



Remember--all of this testing was done at a Density Altitude of 2000+, and there was no hint of deto in all of this data, even with those low BSFC numbers. But the ultimate test will be when these sleds/ pipes/ tunes are operated at sub-zero F temps and DA's well below sea level. Then, there are lots more O2 molecules packed into the combustion chambers on each compression stroke which is very much like increasing the compression ratio. So what might be knock-free today could rattle the knock sensor sillly--which, thankfully, will [usually] protect the engines from damage. Listen to your deto protection! If you get knock, you can switch to ethanol mode (if you're knocking in non ethanol mode), or add fuel or retard timing with your PCV--even a few % can take care of it. Or, perhaps just yanking out that awful 120 F thermostat might help--Arctic Cat uses Tstats that open at 80F, and Terra Alps makes kits to fit those to the Polaris engines. Heath Lynk has been running his 2015 Axys w/o Tstat since new--reporting that it usually operates at 105-115 F. Cooler engines = more HP and less chance of detonation. Cold seizures are the result of the cold fuel failing to vaporize, resulting in lean, very hot net mixtures (16-17/1) that will either detonate or just be so hot that the piston(s) will try to grow to a size larger than the bore. Squeeek. So even with high 10 psi RVP winter pump gas, it's wise to warm the engine up to 80F before pounding on it!

Everyone needs to go back and read, reread, and reread again KC's great article on deto!

**DETONATION: a technical explanation by Kevin Cameron**
Causes, effects, avoidance... understanding the chemistry = better tuning!
*1/31/2014*

And, once again, feel free to share general DTR info to help your friends, but please, no copying/ pasting on the internet!