

2008 Yamaha Nytro Excell exhaust header/ muffler evaluation

Heres a 2008 stock Nytro that new Hubbardsville, NY Yamaha dealer Aaron Excell (315-691-6916) brought to be a mule for dyno testing. Two other stockers—one brought for baseline numbers by Justin from Full Power Performance turbo systems and the one we got from Big Moose Yam/Cat for the Shootout both made 135 CHP. This one was close to 142, and interpolating the Innovate wideband numbers, higher fuel flow, air density (.073) we can assume the added HP was due to added airflow compared to the Nytro 135ers tested here. Our best assumption is that the 142 sled Aaron brought here has a better, quiet but higher flowing muffler than the other two. Did Yamaha create, at the last minute, a higher flowing quiet muffler?

Besides selling new Yamaha sleds, Aaron has been working with a major manufacturer of sportbike exhaust systems to create and market upgrades for the Yamaha four-stroke sleds.

Accompanying Aaron for this tuning session was Allen Ulmer of Ulmer Racing in South Dakota. Aaron had some airbox mods to try, as well as custom Power Commander boxes to add fuel and tweak timing to try to optimize HP.

Here's Aaron's bone stock 08 Nytro, baseline HP averaged over three tests. Those of you who still think you must clutch your sleds to shift first at torque peak then slide up to HP peak look at this and tell me what you think.

EngSpd	STPTRq	STPPwr	BSFC	FulA+B	WtrOut	AirTmp	OilOut	BSFC	FuelP
RPM	Cib-ft	CHp	Lb/hph	lb/hr	DegF	degF	degF	lb/hph	psig
6200	92.7	109.4	0.452	47	106	60	147	0.452	45.9
6300	93.1	111.7	0.453	48.1	107	60	148	0.453	45.8
6400	93.6	114.1	0.455	49.3	107	60	148	0.455	45.8
6500	94.2	116.6	0.457	50.7	108	60	149	0.457	45.8
6600	95.0	119.4	0.458	51.9	108	61	149	0.458	45.8
6700	96.2	122.8	0.453	52.8	109	61	149	0.453	45.8
6800	96.4	124.8	0.452	53.6	109	61	149	0.452	45.7
6900	95.8	125.9	0.450	53.9	109	60	149	0.450	45.8
7000	95.4	127.2	0.453	54.8	109	60	150	0.453	45.7
7100	94.6	127.9	0.457	55.6	110	60	150	0.457	45.7
7200	94.0	128.9	0.456	55.8	111	60	150	0.456	45.7
7300	93.3	129.7	0.456	56.1	111	60	151	0.456	45.6
7400	92.6	130.5	0.456	56.5	112	60	151	0.456	45.7
7500	92.2	131.7	0.457	57.2	112	60	152	0.457	45.6
7600	91.9	132.9	0.456	57.5	113	60	152	0.456	45.7
7700	91.7	134.4	0.456	58.2	113	60	152	0.456	45.6
7800	91.0	135.2	0.455	58.4	114	60	152	0.455	45.6
7900	91.4	137.4	0.459	59.8	115	61	153	0.459	45.6
8000	90.7	138.2	0.463	60.7	116	61	153	0.463	45.6
8100	90.2	139.1	0.466	61.5	117	61	154	0.466	45.5
8200	89.6	139.8	0.468	62.1	118	60	154	0.468	45.6
8300	89.0	140.6	0.471	62.8	118	60	155	0.471	45.5
8400	88.3	141.3	0.469	62.9	118	60	155	0.469	45.5

8500	87.6	141.7	0.476	63.9	119	60	156	0.476	45.5
8600	86.6	141.8	0.477	64.1	120	60	156	0.477	45.5
8700	85.4	141.5	0.476	63.9	120	60	157	0.476	45.5
8800	84.2	141.1	0.482	64.4	121	60	158	0.482	45.5
8900	82.7	140.1	0.483	64.1	123	60	158	0.483	45.5
9000	80.6	138.1	0.492	64.4	123	59	159	0.492	45.5
9100	79.0	136.9	0.497	64.4	125	60	160	0.497	45.7
9200	77.0	135.0	0.505	64.5	126	60	161	0.505	45.5

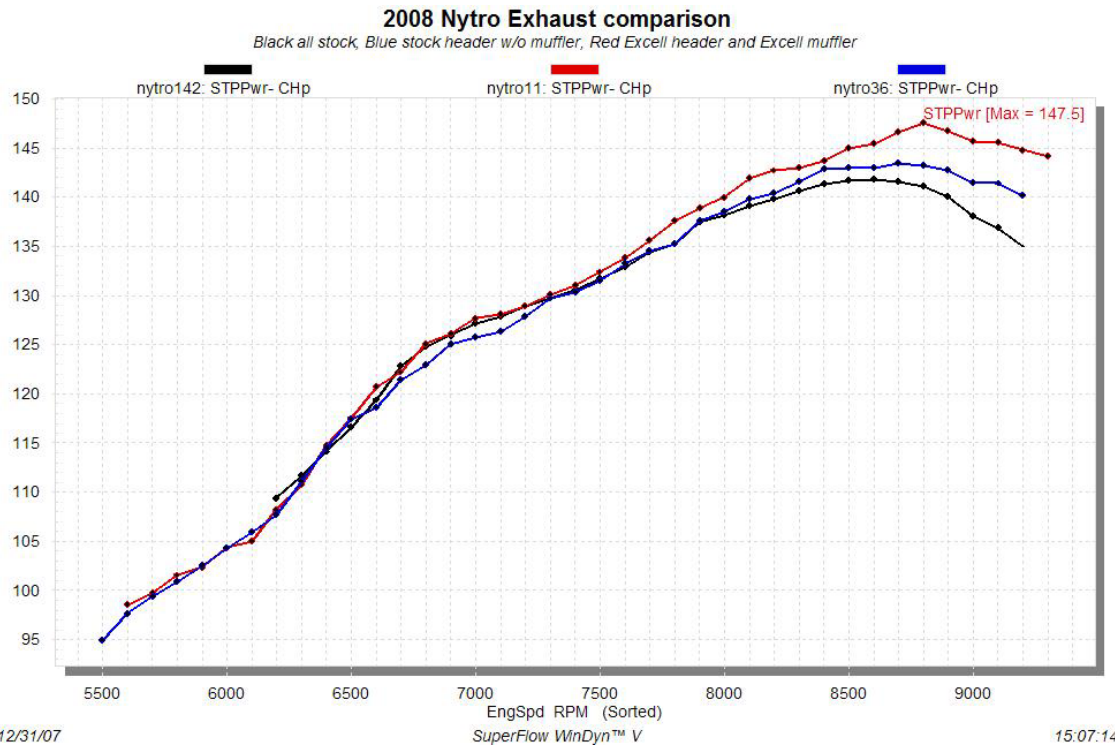
Next here we yanked the stock muffler off of the stock exhaust system, with ear-bleeding dB that annoyed some of my industrial park neighbors. This showed a much lower improvement than what we obtained doing the same mod on Justin Fuller's stocker, adding to our surmising that Yamaha has slipped in a better muffler w/ appropriate EFI calibration at the last minute.

EngSpd	STPTrq	STPPwr	BSFC	FulA+B	AirTmp
RPM	Clb-ft	CHp	lb/hph	lb/hr	degF
5500	90.6	94.9	0.496	44.6	61
5600	91.6	97.6	0.483	44.7	60
5700	91.6	99.4	0.478	45.0	60
5800	91.4	100.9	0.479	45.8	60
5900	91.3	102.6	0.476	46.3	60
6000	91.3	104.3	0.47	46.4	60
6100	91.2	105.9	0.472	47.3	61
6200	91.2	107.7	0.472	48.1	61
6300	92.6	111.1	0.471	49.6	60
6400	93.9	114.5	0.472	51.1	61
6500	94.9	117.4	0.473	52.5	62
6600	94.4	118.6	0.468	52.5	62
6700	95.1	121.4	0.471	54.0	62
6800	94.9	122.9	0.476	55.3	62
6900	95.1	125.0	0.474	56.0	61
7000	94.3	125.7	0.472	56.0	62
7100	93.5	126.4	0.471	56.2	62
7200	93.3	127.9	0.470	56.8	62
7300	93.3	129.7	0.461	56.4	62
7400	92.5	130.3	0.469	57.7	62
7500	92.0	131.4	0.467	57.9	62
7600	92.1	133.2	0.456	57.3	62
7700	91.7	134.5	0.462	58.6	63
7800	91.0	135.2	0.466	59.5	62
7900	91.4	137.6	0.465	60.3	62
8000	90.9	138.5	0.467	61.0	63
8100	90.6	139.8	0.472	62.3	62
8200	89.9	140.4	0.477	63.2	62
8300	89.6	141.6	0.478	63.8	62
8400	89.3	142.8	0.474	63.8	62
8500	88.4	143.0	0.478	64.4	62
8600	87.3	143.0	0.478	64.3	63
8700	86.6	143.5	0.485	65.5	63

8800	85.5	143.2	0.481	65.0	61
8900	84.2	142.7	0.484	65.1	62
9000	82.5	141.5	0.488	65.0	62
9100	81.6	141.4	0.486	64.6	63
9200	80.0	140.2	0.494	65.1	63

Next Aaron installed his mandrel-bent, tig welded three into one header and fairly quiet stainless steel baffled muffler. Here are the HP numbers, and my industrial park neighbors were happy.

EngSpd	STPTrq	STPPwr	BSFC	FulA+B	AirTmp	OilOut
RPM	Clb-ft	CHp	lb/hph	lb/hr	degF	degF
5600	92.4	98.5	0.479	44.9	58	103
5700	91.8	99.7	0.480	45.5	58	103
5800	91.9	101.5	0.473	45.7	59	104
5900	91.1	102.4	0.472	45.9	59	104
6000	91.3	104.3	0.471	46.7	59	104
6100	90.4	105.0	0.468	46.7	59	104
6200	91.7	108.2	0.468	48.1	59	104
6300	92.3	110.7	0.47	49.4	59	104
6400	94.2	114.8	0.467	50.9	59	105
6500	94.9	117.5	0.466	52.0	59	105
6600	96.1	120.7	0.465	53.4	59	106
6700	95.8	122.2	0.468	54.3	60	106
6800	96.6	125.1	0.463	55.0	59	106
6900	96.0	126.1	0.461	55.2	59	106
7000	95.8	127.7	0.464	56.3	59	106
7100	94.8	128.1	0.470	57.2	59	107
7200	94.0	128.9	0.467	57.3	57	107
7300	93.6	130.1	0.467	57.8	57	107
7400	93.0	131.0	0.466	58.1	58	108
7500	92.7	132.4	0.463	58.2	58	109
7600	92.5	133.8	0.461	58.6	58	110
7700	92.5	135.6	0.463	59.7	58	110
7800	92.6	137.5	0.463	60.5	59	110
7900	92.3	138.8	0.464	61.1	59	111
8000	91.9	140.0	0.461	61.1	60	111
8100	92.0	141.9	0.467	63.0	58	111
8200	91.4	142.7	0.472	63.9	58	112
8300	90.5	143.0	0.471	63.9	58	113
8400	89.9	143.7	0.478	65.2	58	113
8500	89.5	144.9	0.476	65.5	58	114
8600	88.8	145.5	0.478	66.0	58	116
8700	88.5	146.6	0.470	65.3	59	116
8800	88.1	147.5	0.472	66.1	58	116
8900	86.6	146.8	0.472	65.7	58	117
9000	85.0	145.7	0.474	65.4	58	119
9100	84.0	145.6	0.473	65.2	59	120
9200	82.7	144.8	0.480	65.7	60	120
9300	81.4	144.1	0.482	65.6	60	121



Next we tested fuel adjustment with Allen Ulmer's custom Power Commander plug-in box. If we added airflow CFM with Excell exhaust perhaps more fuel would be necessary to optimize A/F ratio. Here is data of the above dyno numbers, compared with 8% added fuel above 8000 RPM. Note there is some added midrange HP from enriched fuel but top end HP is not affected. But added fuel flow with the same HP must be good.

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	BSFC lb/hph	FulA+B lb/hr	AirTmp degF	LAMAF1 Ratio
5600	93.1	99.2	0.472	44.5	60	12.7
5700	92.8	100.7	0.471	45.0	60	12.7
5800	92.6	102.2	0.473	45.9	60	12.7
5900	92.8	104.2	0.471	46.6	60	12.7
6000	92.0	105.0	0.469	46.8	60	12.7
6100	92.8	107.8	0.467	47.8	60	12.7
6200	92.4	109.1	0.466	48.2	60	12.7
6300	93.6	112.3	0.461	49.2	60	12.7
6400	94.1	114.6	0.460	50.1	59	12.7
6500	95.4	118.1	0.464	52.1	59	12.8
6600	96.3	121.0	0.466	53.6	59	12.8
6700	96.6	123.2	0.460	53.9	59	12.9
6800	96.0	124.3	0.462	54.9	53	12.9
6900	95.9	126.0	0.463	55.8	53	12.9
7000	95.9	127.8	0.467	56.8	58	12.9
7100	95.5	129.1	0.467	57.2	59	12.8
7200	94.2	129.2	0.465	57.0	60	12.7
7300	94.0	130.7	0.470	58.2	61	12.6
7400	93.2	131.3	0.464	57.7	61	12.6
7500	93.3	133.3	0.461	58.3	60	12.7
7600	93.1	134.8	0.457	58.4	60	12.7

7700	92.5	135.6	0.467	60.1	60	12.7
7800	92.1	136.8	0.480	62.2	60	12.5
7900	92.3	138.8	0.494	65.1	59	12.4
8000	92.3	140.6	0.496	66.3	58	12.3
8100	92.7	143.0	0.503	68.2	60	12.3
8200	91.6	143.0	0.503	68.1	60	12.3
8300	91.4	144.5	0.502	68.7	60	12.4
8400	90.9	145.4	0.503	69.3	60	12.4
8500	90.1	145.8	0.507	70.0	60	12.4
8600	89.6	146.6	0.506	70.2	60	12.4
8700	88.9	147.3	0.506	70.6	60	12.4
8800	87.7	146.9	0.513	71.3	60	12.4
8900	86.6	146.7	0.510	70.9	58	12.4
9000	84.9	145.5	0.515	70.9	60	12.3
9100	85.0	147.3	0.504	70.2	60	12.3
9200	83.0	145.5	0.508	69.9	59	12.3
9300	81.9	145.0	0.512	70.2	59	12.3
9400	81.4	145.7	0.511	70.3	60	12.4

Next Allen Ulmer installed an airbox modified with an added opening, ostensibly creating less restriction in the stock airbox. Perhaps due to good stock airbox harmonics peak HP is about the same, but midrange HP is improved.

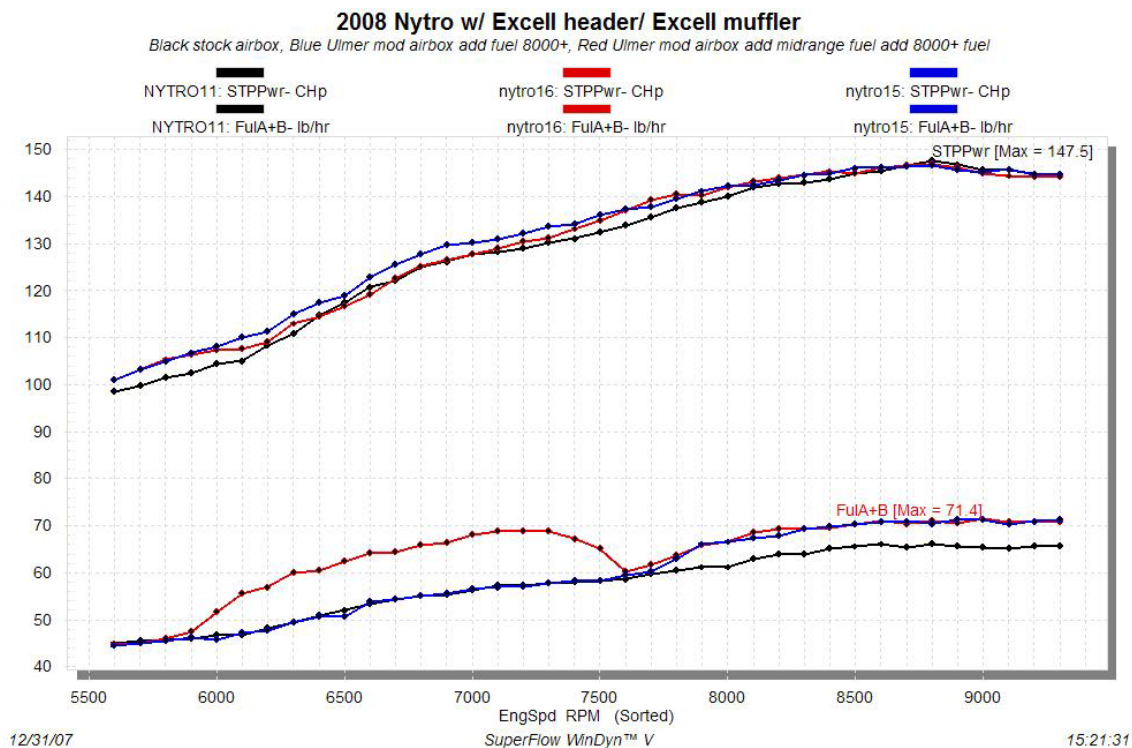
EngSpd	STPTrq	STPPwr	BSFC	FulA+B	AirTmp	LAMAF1
RPM	Clb-ft	CHp	lb/hph	lb/hr	degF	Ratio
5600	94.7	100.9	0.463	44.4	59	13.2
5700	95.0	103.1	0.460	45.1	59	13.1
5800	94.9	104.8	0.458	45.6	59	13.1
5900	95.0	106.7	0.455	46.2	59	13.0
6000	94.6	108.1	0.445	45.7	59	13.0
6100	94.8	110.1	0.453	47.3	60	13.2
6200	94.3	111.3	0.452	47.8	60	13.3
6300	95.9	115.0	0.452	49.3	60	13.6
6400	96.3	117.4	0.454	50.6	59	14.0
6500	96.0	118.8	0.449	50.7	59	14.9
6600	97.7	122.8	0.462	53.9	59	14.6
6700	98.3	125.4	0.456	54.3	60	14.6
6800	98.6	127.7	0.454	55.0	60	13.9
6900	98.7	129.6	0.451	55.5	60	13.7
7000	97.7	130.2	0.458	56.6	59	13.0
7100	96.9	131.0	0.458	56.9	59	13.5
7200	96.4	132.1	0.455	57.1	59	15.5
7300	96.1	133.5	0.456	57.8	59	14.7
7400	95.2	134.2	0.457	58.2	60	13.8
7500	95.2	136.0	0.453	58.3	61	13.4
7600	94.8	137.2	0.457	59.5	59	13.0
7700	94.0	137.8	0.461	60.3	59	12.9
7800	93.9	139.5	0.476	63.0	58	12.7
7900	93.8	141.1	0.492	66.0	58	12.6
8000	93.3	142.1	0.493	66.5	59	12.6
8100	92.4	142.4	0.498	67.3	59	12.6
8200	91.9	143.4	0.499	67.9	59	12.5

8300	91.4	144.5	0.506	69.3	60	12.6
8400	90.6	144.9	0.509	69.9	59	12.5
8500	90.2	146.0	0.507	70.2	59	12.5
8600	89.2	146.0	0.510	70.8	57	12.5
8700	88.4	146.4	0.510	70.9	56	12.5
8800	87.5	146.7	0.506	70.4	58	12.5
8900	86.0	145.7	0.516	71.2	58	12.5
9000	84.7	145.2	0.517	71.2	58	12.5
9100	84.1	145.7	0.510	70.3	59	12.4
9200	82.6	144.6	0.518	70.9	59	12.4
9300	81.7	144.7	0.521	71.2	60	12.4

Thinking that possibly that added midrange HP required more fuel to support it, Allen added 20% more fuel from 6000 to 7500 with the Power Commander. That extra fuel shows up dramatically in the accompanying graph—added fuel is excessive, drops HP then HP comes back as fuel flow resumes its initial curve.

EngSpd	STPTrq	STPPwr	BSFC	FulA+B	AirTmp	LAMAF1	OilOut
RPM	Clb-ft	CHp	lb/hph	lb/hr	degF	Ratio	degF
5600	94.8	101.1	0.467	44.8	60	13.2	109
5700	95.0	103.1	0.460	45.0	60	13.1	109
5800	95.3	105.3	0.460	46.0	60	13.1	109
5900	94.7	106.4	0.469	47.4	60	13.0	109
6000	93.9	107.2	0.508	51.7	60	12.3	109
6100	92.6	107.6	0.544	55.5	60	11.8	110
6200	92.3	109.0	0.550	56.9	60	11.7	110
6300	94.1	112.9	0.560	59.9	61	11.4	110
6400	94.0	114.6	0.556	60.4	61	11.3	110
6500	94.3	116.7	0.564	62.5	60	11.2	110
6600	94.8	119.1	0.568	64.2	59	11.3	110
6700	96.0	122.5	0.554	64.4	59	11.3	111
6800	96.7	125.1	0.554	65.9	59	11.4	112
6900	96.3	126.6	0.552	66.3	59	11.4	112
7000	95.8	127.7	0.561	68.0	59	11.4	112
7100	95.4	129.0	0.562	68.8	60	11.4	113
7200	95.1	130.4	0.557	68.9	60	11.3	113
7300	94.4	131.2	0.553	68.8	60	11.3	113
7400	94.4	133.0	0.533	67.2	60	11.5	113
7500	94.4	134.8	0.510	65.2	60	11.7	114
7600	94.7	137.1	0.464	60.3	59	12.6	115
7700	94.9	139.2	0.468	61.7	60	12.9	115
7800	94.5	140.4	0.477	63.6	59	12.8	115
7900	93.3	140.3	0.494	65.8	59	12.7	116
8000	93.2	141.9	0.494	66.5	59	12.6	116
8100	92.9	143.3	0.505	68.6	59	12.5	116
8200	92.2	143.9	0.508	69.3	60	12.5	117
8300	91.4	144.5	0.506	69.2	61	12.5	118
8400	90.8	145.3	0.507	69.6	61	12.5	119
8500	89.6	145.0	0.512	70.2	60	12.5	120
8600	89.3	146.2	0.512	70.9	60	12.5	120
8700	88.5	146.5	0.508	70.4	60	12.5	121
8800	87.6	146.8	0.511	71.0	60	12.5	122
8900	86.3	146.2	0.511	70.6	61	12.5	123

9000	84.5	144.8	0.521	71.4	60	12.4	124
9100	83.3	144.3	0.518	70.7	59	12.4	124
9200	82.2	144.1	0.520	70.9	59	12.4	125
9300	81.4	144.2	0.519	70.7	60	12.4	126



This final A to B assessment was done while Aaron was testing his header and 2” perforated tube glasspack. This muffler was louder, but made nearly identical HP as the baffled Excell muffler tested before. As expected, the engine repeated within a few tenths of a HP. We switched spark plugs from stock to CR10 plugs that Allen likes most, and peak HP increased over one HP on top end. Over 20 years of dyno testing, plug changes have typically yielded uninspiring power increases. Indexing two-stroke race engines’ plugs so the ground strap opening faces the exhaust ports sometimes yields one HP. In this case, we just removed the stock plugs, installed CR10s and some top end HP improvement was evident, with oil temp similar (important in assessing minute changes in four stroke engines). Here are the numbers.

Excell header/ 2” glasspack muffler stock sparkplugs

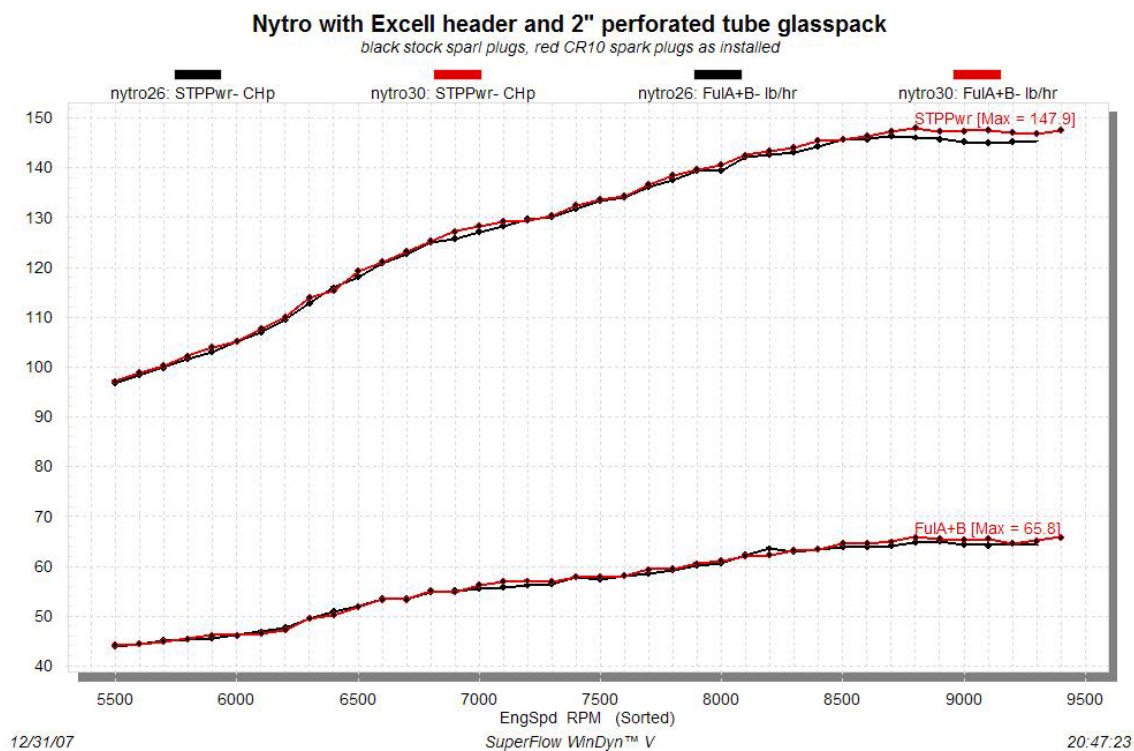
EngSpd	STPTrq	STPPwr	BSFC	FulA+B	AirTmp	LAMAF1	OilOut
RPM	Clb-ft	CHp	lb/hph	lb/hr	degF	Ratio	degF
5500	92.4	96.8	0.479	43.9	60	13.0	106
5600	92.2	98.3	0.476	44.3	61	13.0	107
5700	92.0	99.9	0.475	45.0	59	12.9	107
5800	92.0	101.6	0.469	45.2	59	12.9	107
5900	91.7	103.0	0.468	45.6	61	13.0	108
6000	91.9	105.0	0.463	46.1	60	13.0	108
6100	92.1	107.0	0.462	46.8	60	13.0	108

6200	92.7	109.4	0.460	47.6	62	13.1	109
6300	94.0	112.8	0.464	49.5	62	13.1	108
6400	95.1	115.9	0.464	50.8	62	13.1	108
6500	95.4	118.1	0.464	51.9	61	13.1	108
6600	96.2	120.9	0.467	53.4	62	13.1	109
6700	96.2	122.7	0.461	53.5	61	13.2	109
6800	96.5	124.9	0.463	54.7	62	13.2	109
6900	95.7	125.7	0.463	55.1	61	13.2	110
7000	95.4	127.1	0.462	55.6	60	13.2	110
7100	94.9	128.4	0.459	55.8	60	13.1	111
7200	94.5	129.6	0.458	56.1	61	13.1	111
7300	93.6	130.1	0.459	56.4	61	13.1	112
7400	93.5	131.7	0.464	57.7	62	13.1	113
7500	93.4	133.4	0.454	57.3	61	13.2	113
7600	92.7	134.1	0.458	58.0	61	13.2	113
7700	92.8	136.0	0.456	58.5	62	13.2	113
7800	92.6	137.5	0.456	59.1	63	13.3	113
7900	92.7	139.4	0.458	60.2	63	13.3	115
8000	91.6	139.5	0.460	60.5	63	13.3	115
8100	92.2	142.2	0.464	62.2	63	13.3	116
8200	91.4	142.7	0.472	63.5	63	13.3	116
8300	90.5	143.1	0.467	63.0	63	13.3	117
8400	90.2	144.3	0.466	63.4	63	13.3	118
8500	89.9	145.6	0.465	63.8	62	13.3	118
8600	89.0	145.8	0.465	63.9	61	13.3	119
8700	88.3	146.3	0.464	64.0	61	13.3	121
8800	87.1	146.0	0.470	64.8	61	13.3	121
8900	86.0	145.7	0.473	65.0	61	13.2	121
9000	84.8	145.2	0.471	64.4	62	13.2	123
9100	83.7	145.1	0.470	64.2	62	13.2	125
9200	82.9	145.2	0.472	64.5	62	13.2	125
9300	82.1	145.3	0.470	64.3	61	13.2	126

Excell header, 2" glasspack, CR10 sparkplugs

EngSpd	STPTrq	STPPwr	BSFC	FulA+B	AirTmp	LAMAF1	OilOut
RPM	Clb-ft	CHp	lb/hph	lb/hr	degF	Ratio	degF
5500	92.7	97.1	0.481	44.2	62	12.9	109
5600	92.7	98.9	0.474	44.3	62	12.8	109
5700	92.3	100.2	0.472	44.8	61	12.8	109
5800	92.5	102.2	0.469	45.4	61	12.8	109
5900	92.5	104.0	0.468	46.1	61	12.9	109
6000	91.9	105.0	0.464	46.1	62	12.9	110
6100	92.7	107.6	0.456	46.4	61	13.0	110
6200	93.1	109.9	0.454	47.2	61	13.0	110
6300	94.9	113.8	0.459	49.4	62	13.1	110
6400	94.7	115.4	0.459	50.1	62	13.1	110
6500	96.3	119.1	0.460	51.8	63	13.0	112
6600	96.3	121.0	0.466	53.3	62	13.1	112
6700	96.5	123.1	0.458	53.3	62	13.1	113
6800	96.8	125.3	0.464	55.0	62	13.1	112
6900	96.8	127.2	0.455	54.7	62	13.1	113
7000	96.3	128.4	0.463	56.2	62	13.1	114

7100	95.6	129.2	0.466	56.9	62	13.0	115
7200	94.3	129.3	0.467	57.0	62	13.0	115
7300	93.8	130.4	0.462	56.9	61	13.0	115
7400	94.0	132.5	0.461	57.8	61	13.0	115
7500	93.5	133.5	0.458	57.8	61	13.1	116
7600	92.8	134.3	0.457	58.0	61	13.1	116
7700	93.2	136.7	0.459	59.3	61	13.2	117
7800	93.2	138.4	0.454	59.4	61	13.2	117
7900	92.8	139.6	0.459	60.5	61	13.2	117
8000	92.3	140.6	0.460	61.0	62	13.2	118
8100	92.4	142.5	0.460	62.0	61	13.2	119
8200	91.8	143.3	0.460	62.3	60	13.2	120
8300	91.2	144.1	0.464	63.1	61	13.2	120
8400	90.9	145.3	0.462	63.4	61	13.2	121
8500	90.0	145.7	0.470	64.6	61	13.2	122
8600	89.3	146.3	0.467	64.5	61	13.2	123
8700	88.9	147.3	0.467	64.9	61	13.2	123
8800	88.3	147.9	0.472	65.8	62	13.2	124
8900	86.9	147.3	0.472	65.5	62	13.2	124
9000	86.0	147.4	0.470	65.2	63	13.1	125
9100	85.2	147.6	0.472	65.5	63	13.1	127
9200	83.9	147.0	0.466	64.5	61	13.1	128
9300	82.9	146.8	0.471	65.1	62	13.1	129
9400	82.4	147.5	0.474	65.8	62	13.1	129



Epitaph

These results are what we achieved on Aaron Excell's 08 Nytro stocker. If as we are guessing late model Nytros benefit from higher flowing exhausts, early sleds will benefit even more. Except that fuel flow of early Nytros must be increased even more to match the higher air flow of the Excell exhaust. This might require the use of something like Ulmer's Power Commander to achieve 13/1 or richer A/F ratio at WOT.

In any case, having an Innovate wide band A/F ratio meter in the exhaust is almost imperative if you want to achieve optimal results from these good airflow increasing exhaust system improvements.

Also, during this day-long test session, Allen tweaked timing ahead 2-3 degrees and HP only improved just a bit beyond the top end HP peak. So for stock engines, the stock timing curve is perfect for max HP in the RPM range used.