SkiDoo 4tec Header and muffler update Jim Czekala

Billy Howard of Howard's Inc in Coudersport, PA acquired a new Hindle Exhaust system and a new production ceramic coated DynoPort baffled quiet muffler for testing. Billy and his pal Bobby Donatelle brought a 2009 4tec to DTR already fitted with a Hindle stainless header and muffler. This is a sled that Billy had been using to Autotune Power Commander V maps to go along with the various headers/ mufflers/ PCVs he sells. The day of our test session the air was dry and cold, with a density of .075 lb/ cubic foot. We connected the dyno airflow meter to the 4tec airbox inlet to help us understand what was happening today.

Since we already have tested and compared the other available headers, today we would only compare the Hindle exhaust with the MBRP header and the loud Straightline glasspack muffler—by a slim margin the highest power combo from our last session. Additionally, Rich Daly of DynoPort says he "stumbled" onto some extra power with his baffled muffler and was anxious to have Billy dyno test it here.

The Hindle header has longer, thinner wall tubes than the MBRP header that we planned to compare it to. The header tube diameter increases in three steps to a merge collector. It also has a stainless glasspack muffler with unique inlet pipe that precluded us from testing with any other muffler. Billy has photos of the headers posted on his website www.howardsinc.net .

Billy used the Power Commander 5 to tune the 4tec engine to best knock-free power with the Hindle exhaust. Here is the Hindle exhaust dyno test file, with the data smoothed slightly to eliminate horsepower spikes from torsional vibes during each test.

Hindle full header/ muffler

EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	BSFCA lb/hph	Fuel A lb/hr	LAMAF1 Ratio	Air 2 scfm	AirTmp degF
5567	87.7	92.9	0.64	57.7	11.44	123	38
5600	88.1	93.9	0.63	57.4	11.39	124	38
5700	88.3	95.8	0.62	57.2	11.17	128	38
5800	88.9	98.2	0.61	57.3	11.02	133	37
5900	89.6	100.6	0.60	58.0	10.90	138	37
6000	90.6	103.5	0.59	58.7	10.81	143	37
6100	91.8	106.7	0.58	59.5	10.80	148	37
6200	93.3	110.1	0.58	60.3	10.83	151	37
6300	94.7	113.6	0.58	62.4	10.86	154	37
6400	95.1	115.9	0.58	64.3	10.92	155	37
6500	94.9	117.5	0.58	66.4	10.95	155	37
6600	93.7	117.8	0.58	66.9	10.93	153	37
6700	93.0	118.6	0.58	67.7	10.90	151	37
6800	93.4	120.9	0.57	67.5	10.86	151	37
6900	94.0	123.5	0.56	67.6	10.90	152	36
7000	94.9	126.4	0.55	68.3	10.98	154	36
7100	94.8	128.1	0.54	69.3	11.09	155	36

7200	96.1	131.7	0.53	70.7	11.19	159	36
7300	97.7	135.7	0.53	71.5	11.29	164	37
7400	100.0	140.9	0.52	72.1	11.37	170	37
7500	100.2	143.1	0.51	71.8	11.49	174	37
7600	100.2	145.0	0.50	71.5	11.63	177	37
7700	99.4	145.8	0.51	73.5	11.78	178	37
7800	98.6	146.4	0.53	75.8	11.88	179	37
7900	98.0	147.4	0.55	78.6	11.92	180	38
8000	97.2	148.0	0.56	79.3	11.88	180	38
8100	96.7	149.1	0.56	80.4	11.76	180	38
8200	96.0	149.8	0.55	80.3	11.63	181	38
8300	95.1	150.4	0.54	79.8	11.51	182	38
8333	94.8	150.5	0.53	79.4	11.48	182	38

Next Billy and Bobby (sounds like the movie characters they should be…) removed the Hindle exhaust and installed the MBRP header with the Straightline glasspack muffler as tested last time. Billy's latest MBRP PCV map was installed in the PCV tuner. With such a radically different design we expected dips here and peaks there—much different from one another, like we saw comparing the Hindle vs stock header on the Yamaha Nytro. But as we can see from this test data the performance from low RPM to just below the rev limit is nearly identical:

MBRP header with Straightline glasspack

EngSpd	STPTrq	STPPwr	BSFCA	Fuel A	LAMAF1	Air 2	AirTmp
RPM	Clb-ft	CHp	lb/hph	lb/hr	Ratio	scfm	degF
5567	87.7	92.9	0.64	57.7	11.44	123	38
5600	88.1	93.9	0.63	57.4	11.39	124	38
5700	88.3	95.8	0.62	57.2	11.17	128	38
5800	88.9	98.2	0.61	57.3	11.02	133	37
5900	89.6	100.6	0.60	58.0	10.90	138	37
6000	90.6	103.5	0.59	58.7	10.81	143	37
6100	91.8	106.7	0.58	59.5	10.80	148	37
6200	93.3	110.1	0.58	60.3	10.83	151	37
6300	94.7	113.6	0.58	62.4	10.86	154	37
6400	95.1	115.9	0.58	64.3	10.92	155	37
6500	94.9	117.5	0.58	66.4	10.95	155	37
6600	93.7	117.8	0.58	66.9	10.93	153	37
6700	93.0	118.6	0.58	67.7	10.90	151	37
6800	93.4	120.9	0.57	67.5	10.86	151	37
6900	94.0	123.5	0.56	67.6	10.90	152	36
7000	94.9	126.4	0.55	68.3	10.98	154	36
7100	94.8	128.1	0.54	69.3	11.09	155	36
7200	96.1	131.7	0.53	70.7	11.19	159	36
7300	97.7	135.7	0.53	71.5	11.29	164	37
7400	100.0	140.9	0.52	72.1	11.37	170	37
7500	100.2	143.1	0.51	71.8	11.49	174	37
7600	100.2	145.0	0.50	71.5	11.63	177	37
7700	99.4	145.8	0.51	73.5	11.78	178	37

7800	98.6	146.4	0.53	75.8	11.88	179	37
7900	98.0	147.4	0.55	78.6	11.92	180	38
8000	97.2	148.0	0.56	79.3	11.88	180	38
8100	96.7	149.1	0.56	80.4	11.76	180	38
8200	96.0	149.8	0.55	80.3	11.63	181	38
8300	95.1	150.4	0.54	79.8	11.51	182	38
8333	94.8	150.5	0.53	79.4	11.48	182	38

Next we removed the Straightline glasspack from the MBRP header and installed the new DynoPort quiet muffler. We left Billy's MBRP power Commander V map in place, and with this new muffler we saw airflow drop just a bit in midrange and at high revs, but HP climb! Not just at top end, but in the midrange as well. Now Rich will probably complain to me that with reduced airflow from 7500 to 8250 we could have leaned out the PCV there to be fair and he's probably correct. But this shows that designing mufflers for best power with low dB is at best done with million dollar instrumentation optimizing sound waves and backpressure like the big OEMs must do. But occasionally the cut and hack and dyno test method, like Rich Daly seems to have done here, pays dividends. It's difficult to see in the following data, but readily apparent in the final graphic comparison of airflow and HP, but perhaps there is some sound wave tuning that is helping the DynoPort muffler pack air/fuel mixture back into the combustion chamber through the exhaust ports just as the exhaust valves close! Rich suggested that their three internal-tube, baffled and chambered fiberglass-free 4tec muffler seems to be adding 4tec power even with reduced sound levels. Years ago, when Rich Daly set up his dyno cel to help him build pipes/ silencers for sleds, I suggested that he measure stock exhaust pipe backpressure and if you could match that with a can/ glasspack you could match the stock muffler HP (a great accomplishment). But as we would find out later that backpressure theory was often incorrect. Somehow the OEMs were making low dB with high HP—higher than the backpressure only would suggest. There probably is some stock muffler soundwave tuning going on—smart engineers can pack additional intake charge into the exhaust port/ valve if a soundwave chases more good stuff back into the combustion chamber at just the right time and make more HP. And when the sound energy, properly utilized, creates more HP it can't get out of the muffler outlet to create noise. Win Win.

MBRP header with DynoPort quiet muffler

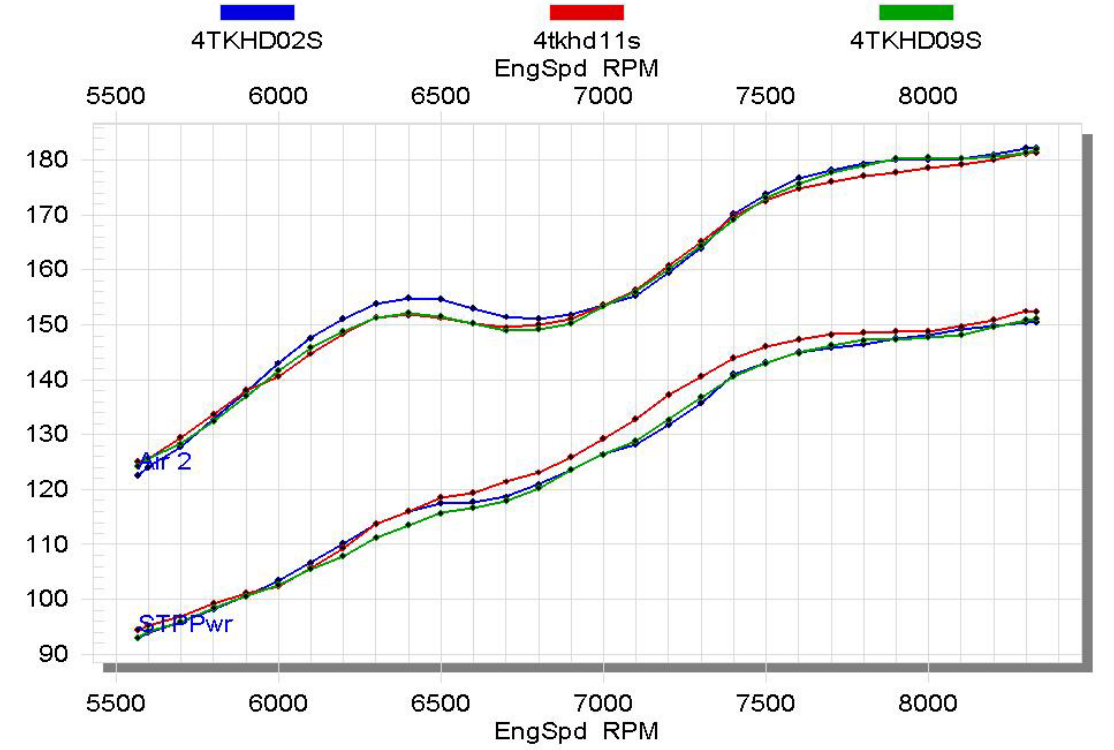
EngSpd RPM	STPTrq Clb-ft	STPPwr CHp	BSFC lb/hph	Fuel A lb/hr	LAMAF1 Ratio	Air 2 scfm
5567	89.0	94.3	0.63	57.6	11.46	125
5600	89.2	95.1	0.63	57.7	11.41	126
5700	89.2	96.8	0.62	57.9	11.07	129
5800	89.8	99.2	0.61	58.5	10.93	134
5900	89.9	101.0	0.61	59.0	10.83	138
6000	89.5	102.3	0.60	59.3	10.80	141
6100	91.0	105.7	0.59	60.2	10.80	145
6200	92.6	109.4	0.58	61.1	10.80	148
6300	94.8	113.7	0.57	62.6	10.83	151
6400	95.2	116.0	0.58	64.7	10.88	152

6500	95.8	118.5	0.59	67.4	10.92	151
6600	95.0	119.4	0.60	69.4	10.92	150
6700	95.2	121.4	0.59	69.4	10.86	149
6800	95.0	123.1	0.58	68.8	10.85	150
6900	95.9	126.0	0.56	68.3	10.85	151
7000	96.9	129.2	0.56	69.4	10.90	154
7100	98.3	132.9	0.55	70.9	10.95	156
7200	100.0	137.1	0.55	72.4	11.03	161
7300	101.2	140.6	0.54	73.3	11.15	165
7400	102.1	143.9	0.53	73.6	11.26	170
7500	102.3	146.1	0.52	73.3	11.39	173
7600	101.8	147.3	0.52	73.6	11.51	175
7700	101.1	148.2	0.52	74.6	11.63	176
7800	100.1	148.6	0.54	76.9	11.71	177
7900	98.9	148.8	0.55	79.1	11.71	178
8000	97.7	148.8	0.56	80.8	11.65	178
8100	97.1	149.7	0.56	81.5	11.53	179
8200	96.7	150.9	0.55	80.6	11.43	180
8300	96.5	152.5	0.55	80.4	11.34	181
8333	96.1	152.4	0.54	79.8	11.32	181

Here's a graph of the test data. Note that the Hindle exhaust has an airflow/ HP advantage over the MBRP at 6500 RPM compared to MBRP, perhaps due to the long header pipe length. But at high revs things seem to equal out. And note how the MBRP header with DynoPort muffler drops airflow CFM at higher revs, but horsepower climbs.

Billy Howard's 4tek exhaust update:

Blue Hindle full system, Green MBRP header Straightline glasspack, Red MBRP header DynoPort quiet baffled muffler



03/26/10 *SuperFlow WinDyn™ V* *11:26:33*