

2009 Dragon 800 Switchback

Here is our first 800 Switchback, brought for tuning by Gouverneur, NY Polaris dealer Bill Lutz of Fun Unlimited, along with the owner of the sled Mike Martin.

We began the tuning session with a stock single pipe to establish a proper baseline. With thermostat removed, Bill Lutz monitored the engine temps, timing, and knock retard with Digital Wrench. We did all of our testing this day with the coolant in the sled, unassisted by the dyno cooling tower. Fresh 93 octane gas was used.

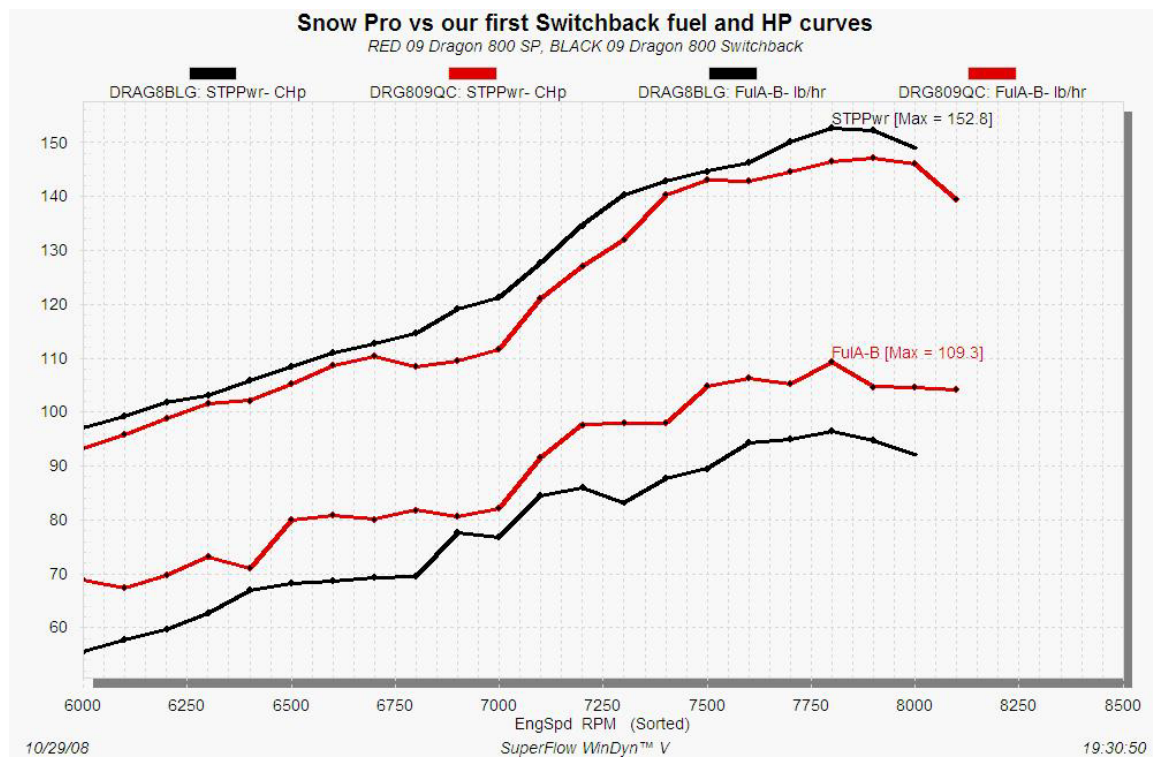
Our first “warmup” test, with coolant temp beginning at only 80 degrees and pipe peaking at 900 degrees shocked us with 155 HP. This was our warmup pass, to bring the engine rotating parts and crankcases up to operating temp. We were surprised to see 95 lb/hr fuel flow, and low .60s BSFC, even with air temps 10 degrees lower! We usually discard the first “cold shot” run like this, but it is significant enough to discuss here. Subsequent heat soaked tests with the stock pipe repeated tests like the one posted here. With coolant at 90, and pipe cool (beginning at 5-600 and ending well below 1000) this is a typical test with the stock pipe:

EngSpd	STPTrq	STPPwr	FulA-B	BSFA-B	AirTmp	LAMAF1	TsTim2
RPM	Clb-ft	CHp	lb/hr	lb/hph	degF	Ratio	second
6000	85.0	97.1	55.5	0.59	44	14.8	0
6100	85.4	99.2	57.7	0.60	45	14.7	0.6
6200	86.2	101.7	59.6	0.61	46	14.3	1.3
6300	85.9	103.0	62.7	0.63	44	13.8	1.9
6400	86.8	105.8	66.9	0.66	45	13.2	2.6
6500	87.6	108.5	68.3	0.65	45	12.7	3.3
6600	88.3	110.9	68.6	0.64	41	12.5	4.2
6700	88.4	112.7	69.3	0.64	42	12.4	5.1
6800	88.5	114.6	69.5	0.63	43	12.3	5.5
6900	90.6	119.1	77.6	0.67	43	12.4	6.1
7000	91.0	121.2	76.8	0.66	43	12.5	6.3
7100	94.5	127.7	84.4	0.68	44	12.3	6.9
7200	98.2	134.6	86.0	0.66	45	11.9	7.5
7300	100.9	140.2	83.1	0.61	43	11.7	8.7
7400	101.4	142.9	87.6	0.64	44	11.8	9.3
7500	101.3	144.6	89.5	0.64	43	11.8	9.7
7600	101.1	146.3	94.3	0.67	43	11.6	10.1
7700	102.4	150.2	94.9	0.65	43	11.3	10.6
7800	102.9	152.8	96.5	0.65	44	11.3	11.4
7900	101.2	152.3	94.8	0.65	44	11.4	12.1
8000	97.8	149.0	92.2	0.64	44	11.4	12.8

Because we were operating on limited coolant, we were unable to get the pipe as hot as we did on Casey’s sled (with unlimited 95 degree water, we could hold it WOT as long as necessary to heat the pipe without overheating the engine). I’m sure that if we got the pipe hotter with cool coolant we could have slid the HP peak up to 8000 where the leaner 92 lb/hr could have easily gotten us 154 HP with the stock pipe.

Mike had a BMP pipe mod with him, and after following our testing of the SnowPro versions had a Boondocker fuel controller he planned to reduce fuel flow with. But after seeing the lean baseline of the Switchback it was obvious that fuel would have to be added to support the higher airflow and horsepower. We spent some time Boondocking extra fuel in the midrange to eliminate knock there, and some on top end as well. While not insignificant, the BMP mod ultimately got us 156 plus peak HP at 8000, with about 155 plus for about 600 RPM, a flat HP plateau from 7800 to 8400 RPM.

But most importantly, this Switchback version had excellent stock fuel flow calibration. Here is a graphic comparison of Mike's Switchback compared to Casey's SnoPro, both tested with 95 degree coolant. Note that, as discussed here, the Switchback pipe temp was lower than the SnoPro, hence the HP peaking at lower revs.



So what gives?

Based on this lean fuel flow and high HP, it appeared that this Switchback has high altitude calibration like SkiDoos use. But I recently heard from Polaris' Darren Hedlund that all 09 Dragon 800's (SP, SB and RMK) have identical calibration.

While not shown in our data, fuel pressure was perfect.

Also there are several sizes of color coded stock injectors, which should be combined with proper ECUs. Even if we had the smallest injectors combined with the leanest ECU (the one for the larger injectors), it's not likely that we could have a 10% reduction in fuel

flow. We tried mixing and matching three injector/ ECU combo's in the early EFI F7 Firecats with no meaningful change in net fuel flow.

One new theory is that the TPS was set incorrectly, perhaps causing the ECU to deliver $\frac{3}{4}$ throttle fuel flow with the throttle wide open. I retrospect, this engine seemed to have a midrange much leaner than the previous Dragon 800s, which is what would happen if the TPS was set improperly (ie: $\frac{1}{8}$ th throttle's worth of fuel flow at an actual $\frac{1}{4}$ or $\frac{1}{3}$ throttle could be bad during cruise possibly creating excessively lean and hot 15/1 A/F ratio instead of 13/1).

The wrong TPS setting might create excessive timing, too, which would cause the HP peak to occur at lower revs, and be more likely to detonate.

Mike, the owner of this Switchback is coming back from Albany to retune a new supercharged Nytro that he tuned here just prior to tuning the SB. The Nytro was leaning out beyond 200 HP due to the inadequate stock fuel system. He's acquired a new fuel system to retune, and I will ask him to bring that powerfully lean Switchback with him so we can check his TPS setting.

Stay tuned for more on this.