tech tips

THE DYNO DOESN'T LIE
Part II

I began this project way back in the fall of 1995 when I first put my 82 custom on the road. I thought it would be interesting to accurately measure the results of different modifications on a Dynojet dyno. To insure that the means of measurement remained constant, I worked exclusively with only one dyno operator. I'll first list the results, then offer my opinion about what has happened over the past five years of development.

Engine Specifications

In all instances, the engine was equipped with a Dynojet Stage III kit, individual filters, Dyna ignition, Dyna coils, Taylor plug wires with Autolite 4153 plugs and a 6:6 exhaust.

A. A stock 1982 CBX engine.
B. The same 82 engine with 79 cams, 1147 Big Bore and casting marks removed from the ports (no actual porting work).
C. Same as "B." but with chokes removed from the original CBX carbs.
D. Same as "C" but with all internal welds removed from the header system and careful attention to exhaust flow. Welds were smoothed and turns were radiused.

RPM	A	B	C	D
4500	41.7	48.9	50.0	51.4
5000	45.2	55.8	55.0	58.0
5500	45.4	61.4	60.6	63.7
6000	51.3	68.7	69.3	70.6
6500	59.2	77.0	79.1	80.6
7000	68.9	85.6	88.4	89.7
7500	78.1	92.4	95.6	96.8
8000	83.4	98.2	100.9	102.1
8500	86.5	103.7	105.5	107.3
8700	--	104.3	--	--
9000	89.5	103.6	106.3	109.1
9100	--	--	106.9	109.2
9500	90.1	101.7	105.2	106.3

Opinions & Observations

1. All four tests were run on a 6:6 system using 1 1/4' (31.75mm) outside diameter header pipes. This was done so that the differences could be accurately measured with a constant outlet size.
2. Horsepower readings have been corrected for temperature and other conditions.
3. These tests confirm the old belief that an engine is just a big air pump. Any restriction, and flow is interrupted. Removal of the choke plates and rods is a perfect example. Each plate and rod is 5mm thick and extends the entire inlet of the carb. Not only does this reduce flow, but it also disturbs its smooth entrance. The result? 2.6 additional peak horsepower.

4. Once it was proven that the engine was sensitive to both flow area and turbulence, it was time to look inside the headers for more free horsepower. I inspected several systems and found the pipemaster 6:6 to be the worse for welds that restricted exhaust flow. In some cases the welds intruded .220" (5.6mm) into a 1 1/8" (28.6mm) inside diameter header! Most manufacturers weld the headers from outside and a little of the weld will penetrate the inside of the pipe. You should inspect exhaust systems for restrictions and eliminate them for maximum efficiency. Careful attention to this area produced another 2.3 free horsepower!
5. But all this tedious work has just not produced the results I expected. Choke removal and careful attention to internal flow patterns have produced 4.9 horsepower, or 4.7% more. You're probably saying "That's a lot of work for 4.9 horsepower!" You're right. Before the chokes were removed, (engine "B") I ran this bike with a 1 3/8" (35mm) Kerker 6:2 and it produced 110.5 horsepower. That's a 6.2 H.P. (5.9%) gain by simply changing pipes. Although no tests were performed on the "C" or "D" engines with the Kerker 6:2, you can easily see that these motors would have responded quite well to the larger diameter pipe. So what now?
6. It's now apparent that although the inlet flow was increased considerably by the removal of the chokes, this improvement was not balanced by an equal improvement in exhaust flow. Remember the air pump theory? The air was getting in, but it wasn't able to get out as quickly.
7. Now that the carbs have been opened to allow greater flow, the use of a better matched, larger diameter header is necessary to maximize performance. There's no doubt that the 6:2 or 6:1 1 3/8" (35mm) pipes would produce more horsepower, but it might also be at a higher rpm. There are two basic factors that affect where a header system produces its greatest performance:
   A. Header diameter
      Small diameter, low end power
      Large diameter, high rpm power.
   B. Length
      Long pipes - low end power
      Short pipes - high rpm power

So although big, short pipes may produce more peak horsepower, they may do it where you don't drive. Also, the guy with the small and long pipe may be too far ahead to catch by the time your monster header with no baffle finally gets to work. That's the reason why a CBX with stock pipes "feels" so fast. The double-wall headers result in a very small inside diameter and the mufflers extend all the way to the rear wheel. But after about 5,000-6,000 rpm's, the aftermarket header system will out-run it.

Conclusions

1. I thought that this would finish my dyno work, but it seems like it has opened another chapter. I'm installing the Kerker 6:1 (1 3/8", 35mm) system this year and will complete (?) my tests next spring and report back to all of you.
2. Be careful when comparing numbers on a dyno. I used the same operator and machine because he was able to store all my previous data in the computer including altitude, barometric pressure, vapor pressure and, most importantly, air temperature. From this, he could generate both "measured" and "corrected" readings. In one case, the two readings varied by as much as 4 horsepower at 9500 rpm's.
3. Also be aware of dyno operators that work at some rallies and charge by the run. He can "correct" his computer to generate nearly any number he wants. If your numbers seem too good to be true, they probably are.

All of this dyno horsepower stuff may not seem too important to you right now. But as these bikes get older, original parts are becoming more difficult to find. With this, you'll be forced to replace the tried and true Honda parts with products from the aftermarket. And that is when careful selection, tuning and overall balance will make a big difference.
As always, call any time.

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