
The Honda Hawk Experiment

In January of 1992, I first studied the effects of porting on my own race bikes, and made a huge discovery. It worked so well, that after a summer of working on other people's bikes, I could show up at the local racetrack in August with no practice and easily win races.

At Daytona in 1993, I was able to test my idea against the best in America. Like every fast Hawk rider at the time I had the 700 cc (3 mm over) piston kit, a pipe and the popular racing cams. My carburetors and everything else inside the engine was stock, except for my secret porting trick.

The competition ?? The top racers had their Hawks built by a company called Two Brothers which, based on their huge success with Hawks, went on to become a semi factory Honda race team.

Gridded on the very last row, I came out of turn one in last place out of 43 riders !! (I always freaked out on starts) Once the tires warmed up, I realized I could easily out accelerate the Two Brothers bikes as well as everyone else in the race. At one point, without using the draft, I passed 11 of my fellow Hawk riders at once on the fastest part of the banking. In the short 4 lap race, I passed 38 riders to take 5th place Expert in my first time at the track.

Since then I've ported about 100 heads from every major brand and type of 4 stroke engine. The result has been shattered lap records, countless USA roadracing championships, and another 2 in Europe. On the street, I've built a few real "sleepers" in the USA, and created a genuine "street legend" in the Dominican Republic !!

There was no way I could hide the evidence of this porting technique, and it's amazing results, so I thought for sure that it would only be a matter of months before everyone else caught on. I was convinced that the advantage of my new "secret weapon" would be over by early 1994.

It's been exactly 10 years since my discovery, and with very few exceptions, no one else has gotten it.

How could that be ?? Motor sports are supposed to be so ultra competitive that no one can hold an advantage for long. With the vast manpower & financial resources of the big racing teams, how could 1 guy from Wisconsin hold onto all the chips for 10 years??

It made me realize that there are similar situations like this in every endeavor all over the world. That's why I came up with the motto "get past the cutting edge". I'm here to tell you that the "cutting edge" is artificial, and whatever you do, you can beat the best. No one's unbeatable at anything, once you truly understand the power of thinking outside of the box.

I've realized that the answer to how easily I was able to protect my "secret" ... really lies in an understanding of human nature.

The information I'm going to share with you will certainly change the face of engine performance & technology. I also sincerely hope it will inspire you to look deeper into the ways that we "automatically think" ...

... without ever actually thinking.

The Magical Myth of Flowbench - Porting

Once upon a time...



The flowbench is a machine that measures the airflow through the ports by sucking air thru like a vacuum cleaner. The vacuum gauges on the bench actually measure the resistance to the flow thru the ports, and the result is converted into **CFM**. That means "how many **Cubic Feet** of air will flow through the port per **Minute**."

Anyone who buys a flowbench and a dremel tool is "qualified" to flowbench - port heads. The Superflow flowbench owner's manual says that:

**" For every 1 CFM of increase in intake flow,
you'll gain .43 horsepower. "**

If you want more water to flow through a pipe, just make the pipe bigger.
There's something wrong with this though.

It's easy to understand why so many people automatically think Flowbench - Porting, or "more is better" is a way to improve power.

Without closer examination,
it seems quite logical.

Okay, Let's examine it a little

closer !!

We were all taught to think of a 4 stroke engine by the traditional textbook explanation of Intake, Compression, Power & Exhaust.

Textbooks and magazines achieve a sort of instant credibility that comes from the association with \$\$.

Example:

"This source must be right ... after all, there's obviously some big money behind it ..."

Because of this association, the vast majority of people never question the things they learn in school, or read in mainstream publications.

In the last issue of Power News you learned to think of a four stroke engine in a whole new way... **8 Phases !!**

In the 8 phase engine article, you'll remember that the intake "stroke" actually consists of 3 phases.
(Overlap, Suction and Charging.)

Think:

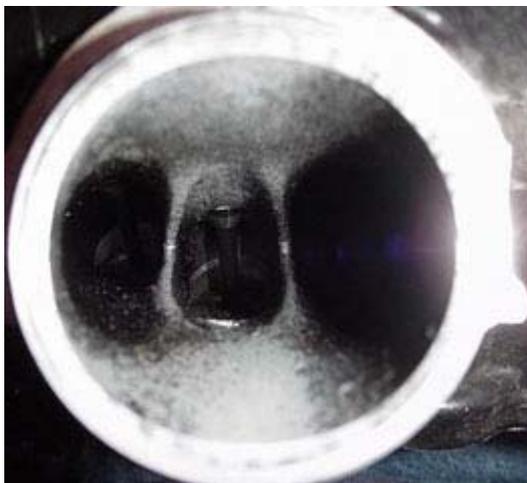
Outside of the Box !!



Stock Yamaha R6 Intake Port

Uh - Oh ...

It turns out that a flowbench measures the least important aspect of intake cycle efficiency !!



Stock Yamaha R1 Intake Port

It's true !!

When you stop to think about it, a flowbench only measures the efficiency of the "suction phase".

That's not the right thing to measure.

Why ??

Because, it doesn't matter how well the cylinder is filled at that point in the intake cycle !

What ... that sounds crazy !!!

It's 100% true ... it's simply a matter of the sequence of events ! The success of the last event, the charging phase, determines the success of the entire intake process.

What happens when a low velocity port fills the cylinder really well, but too early ?? The result is a slower intake charge that stops flowing into the cylinder. Then some of the charge gets pushed back out of the cylinder and into the port as the piston returns up the bore during the intake charging phase. The gain in flow doesn't offset the loss in port velocity.

Here's an analogy:



It's just like a roadrace; you can lead for 3 laps, then run out of steam and end up in 7th place.

In racing, only the last lap counts, because the one who leads at the checkered flag wins.

In the intake cycle "race" the last lap is the charging phase, and the checkered flag is the intake valves closing.

So in the final result, the first 2 phases don't matter if the 3rd phase is unsuccessful !! The total intake volume that will be burned is determined by the amount that remains in the cylinders **after** the intake valves close. That means that an early gain during the suction phase can be easily lost during the charging phase. And, if the intake charge returns back into the port during the piston's upstroke, the result is going to be a net loss !!

It gets worse !

On a carbureted bike the reversing charge will create an effect called double carburetion, which means the mixture will become even richer with fuel as it passes back over the main jet nozzle for a second time.

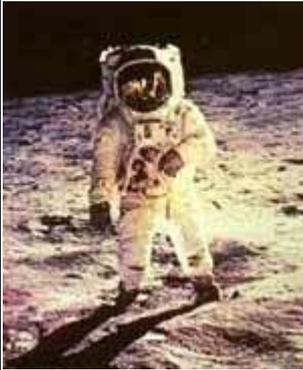
Have we lost enough power yet ??

Wait... it gets even worse !!

Here's a real "out of the box" idea: high flow ports also flow really well backwards !!! All that work on the flowbench comes back to haunt you when the piston now has even **less** resistance to pushing the intake charge back into the " high flowing port " !!!!!!! When you begin to consider the consequences of all this, the whole idea of "more flow is better" comes crashing down like a lead balloon.

What's The Secret ??

Using the race analogy, if you increase the **Port Velocity**, by making the port **smaller**, the intake cycle "race" starts out slower, gains momentum and makes a tremendous charge on the "last lap" to overtake the high flow port and win the "race". The interesting thing is, this type of port will always lose in a flowbench contest !!!



Remember
The Scientific
Method:

Evaluate
one set of
conditions. Make
only one change,
test the result and
compare it to the
first set of
conditions.

Hey MotoMan,

If "they" could put a man on the moon, why hasn't anyone else thought of this before ?!?!

One reason is that people only think of "Scientists" as scientists. Everyone can and should be a scientist !! That means you !!

In real world situations, many people forget to apply the simple principle that all productive science is based on: The Scientific Method.

When someone builds a superbike engine, they usually port their cylinder heads and make other modifications like higher compression, valve job, different cams and big bore kits.

The combination of all these modifications usually results in a net gain in power. The problem with attributing a gain to the porting in this scenario, is that it goes against the scientific method, because there are 4 other variables coming into play.

Know the difference between **association** and **causation** !

In this case, flowbench porting of the cylinder head has been **associated** with horsepower gains for so long that no one bothers to question it. That doesn't mean the porting actually **caused** any of the gain.

Could More Flow = Less Power ??

Flowbench Porting has always been **associated** with more power... Superflow even says more flow equals more power in their official owner's handbook !!

Yet, in most cases, Flowbench Porting motorcycle heads actually results in less power!

(Actually, a few creative thinking tuners in Europe do already know about this. They're not anxious to reveal this info, because their success on the racetrack is somewhat dependent on it remaining a secret.)

What happens when we apply the scientific method to intake porting ??

To find out, let's test 2 progressively smaller porting specs against a stock head,
without changing any other variables ...

I chose the Yamaha R6 for this test,
because it has the **least** flow and the **smallest** valves of all the current 600's !!

Then I asked the question:
Are the stock ports still way too big ???

The Verdict ??

Smaller Volume = Higher Velocity

=
Better Power

By reducing the intake
port size by 30
percent:

The Yamaha R6 increases 5 hp.
from 103.1 to 108.3 That's a **5
percent** gain in top end
power !

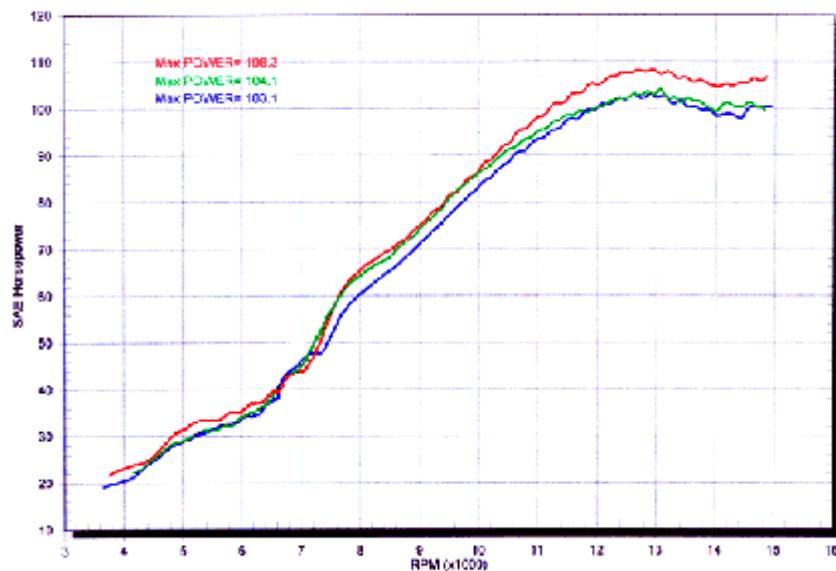
Notice that the power gain at
8,000 is from 60 to 65, also 5
hp...

That's the same hp increase,
but it's actually an **8.4 percent**
gain where it makes the biggest
difference, at the turn exit.



**30% Smaller Ports make
the most midrange & top
end power !!**

- **Stock Ports 103.1 HP**
- **20% Smaller Ports 104.1 HP**
- **30% Smaller Ports 108.3 HP !!**



[Click Here For The Full Size Version](#)

How do High Velocity Ports work on the racetrack ??

" Incredible !! "

With **most** common superbike modifications, the rear tire either spins up too fast and threatens to highside you, or it grips and ungrips, which makes the bike drift wide and run off line.

Either way, the rider has to wait longer to roll on the throttle !!

What's the point of modifying an engine if you can't actually use the new found power ?

The enhanced power delivery of the High Velocity Intake Porting allows
for
perfectly controlled rear wheel sliding, which is actually
more important than the gain in peak power !!

600 Lap Record Smashed on a Borrowed R6 !!

In May of 2000, Derek Shoeberle borrowed an R6 from one of my customers. On that super windy Sunday in May, the races were dominated by the man on the mysterious red bike. Not only did Derek smash the 600 record, he came within 0.88 of a second of the overall motorcycle lap record ...

... which was set in 1993 by
an FZR 1000 with Mototune High Velocity Ports !!

High Velocity Intake Porting

A power improvement that enhances your suspension, and dramatically improves rear tire traction !!

In addition to the overall peak power gain, the biggest advantage of Mototune High Velocity Intake Porting is its perfectly linear power delivery. When you open the throttle two percent, you get exactly two percent more horsepower, then when you want ten more, you get exactly ten percent.

When you look at the photo, notice how Derek's confidently turning the throttle on while he's still at his outrageously steep lean angle ... through one of the bumpiest turns in road racing. That's smooth power !!

Super - predictable mid range power delivery makes it easy for anyone from novice to expert to get incredible drives off of turns, since the power doesn't break your rear tire loose like it does on most superbikes. It doesn't take much practice to turn the throttle harder, it just intuitively feels right when the power is so smooth.

That Confidence Makes a Huge Difference in Your Lap Times !!

The increased driveability and top end speed from the High Velocity Intake Ports allowed Derek to ride at an entirely new level. During this race he absolutely smoked 2nd place, and turned an incredible **1:13.88**, lowering the Blackhawk 600 lap record by over 1 second on a very windy day !!

Derek Shoeberle Powers Through Blackhawk Farms Raceway's Notoriously Bumpy Turn 4.



" High Velocity Intake Ports Are Incredible !! "

What if your head's already been flow bench ported ??

CBR 600F3

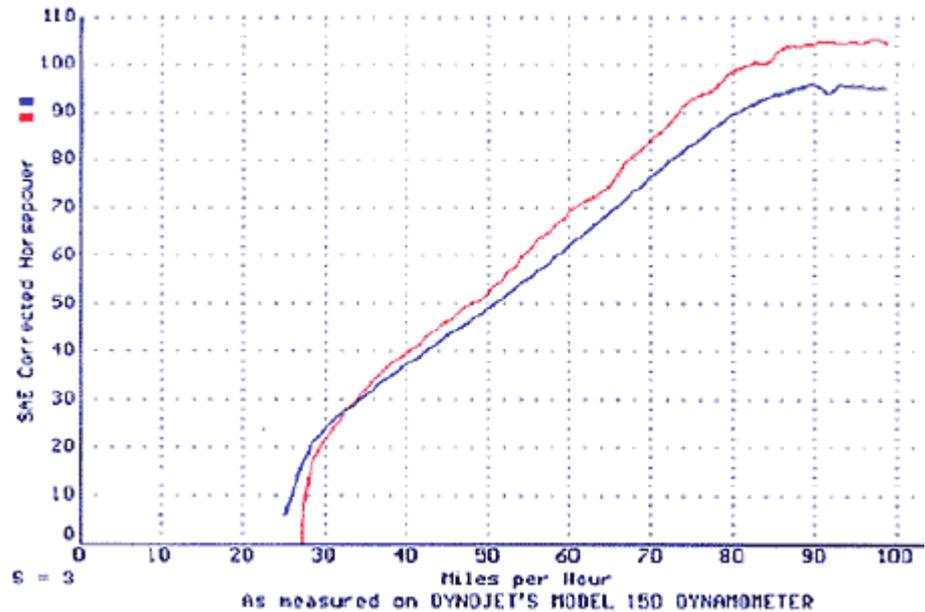
Before & After

Flow Bench Porting usually costs around \$500 - \$1,000 ...

Think Fast Intake Porting
Line Shows that after fixing the "flowbench ported" head by making the ports 35% smaller... this CBR 600F3 gained more than 10 HP !!

Since **The Blue Line's** head ports were already "flowed out" even bigger than stock, there was about an extra 3 horsepower recovered.

In this case, a stock head would have worked better than the flowbench ported head.



Remember:
 More Flow Doesn't Always Equal More Power !!
But
 Less Velocity Usually Equals Less Power !!!