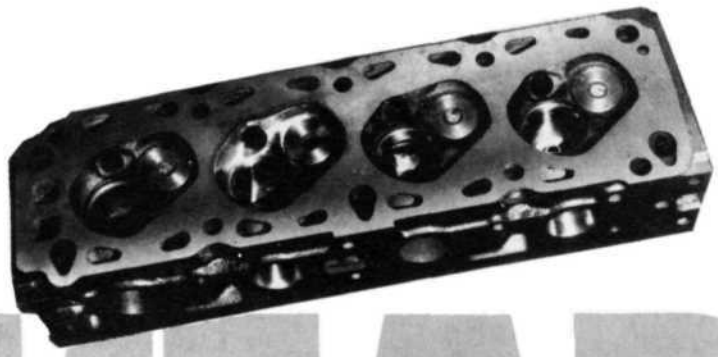


HEAD Development

Dave Walker takes up a challenge to produce a Pinto head for an engine kit.

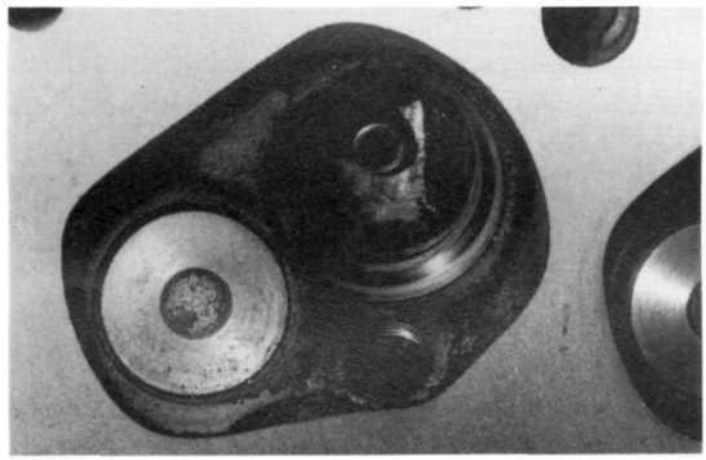
Over the last few months we have had several features on Pinto cylinder head flow. Burton had a kit with a cylinder head that flowed 107 cfm (at 500 thou lift and 10 ins depression) and David Vizard also featured another head with near identical flow. David stated that this flow was achieved without any fancy polishing or trick head components.

My own attempts at flowing the Pinto had resulted in a rather measly 100 cfm from a similar big-valve head, so it would be fair to say that I was somewhat off the pace as far as Pinto big-valve heads went. The RJD head that I tested many months back was making around 103 cfm, depending on which port was tested.

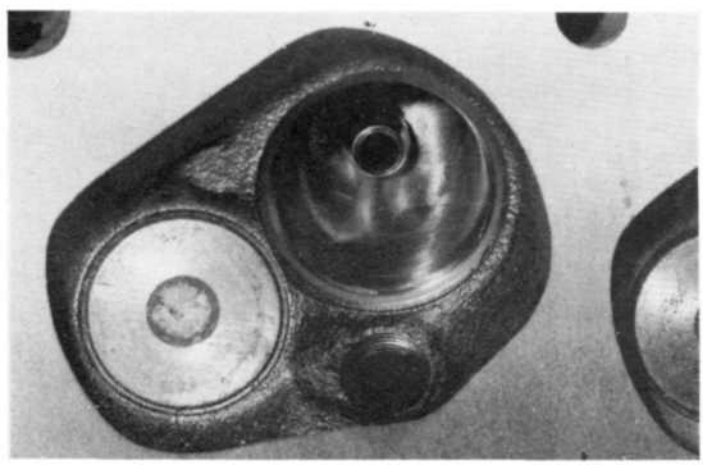
All the same, my 100 cfm head in a Capri 2.0 litre did produce 100 bhp at the back wheels on a stock Weber carb, Kent cam, standard compression ratio but with a Janspeed exhaust and system. The car was pretty rapid compared to its previous state of tune.

But now I had been set a challenge: produce a specification for an engine kit that was as good as, or better than, anything else on the market. Emerald Engines are a new company in the tuned engine market, but the engineers behind them aren't new in the engine world.

For more than fifteen years Emerald's engineers were producing exchange engines for Ford Motor Company, working closely with Ford engineers regarding specification and quality control. They know an awful lot about Ford's products, but not much about tuning and flowing cylinder heads. The company can produce the engine kits, but they needed me to come up with a tight specification that they could work to.



Modified chamber with big valve, but absolutely the minimum of port grinding required to generate flow.



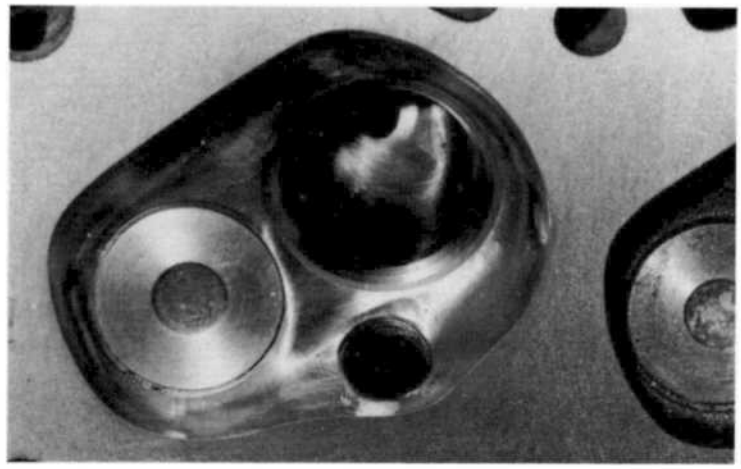
Finished port with aluminium/Bronze guide insert. Guide does not restrict flow with the right shaped port.

Since I'll do just about anything for money I accepted. However, I had a lot to learn about Pinto head flow myself, and Pinto heads with standard valves, and we no time to learn the hard way. However, like the man on the telly says: "but I know a man who does". Enter Glyn Swift of Swiftune. Glyn agreed to help me and suggested that you didn't really need a big-valve head to get a Pinto going quite quickly.

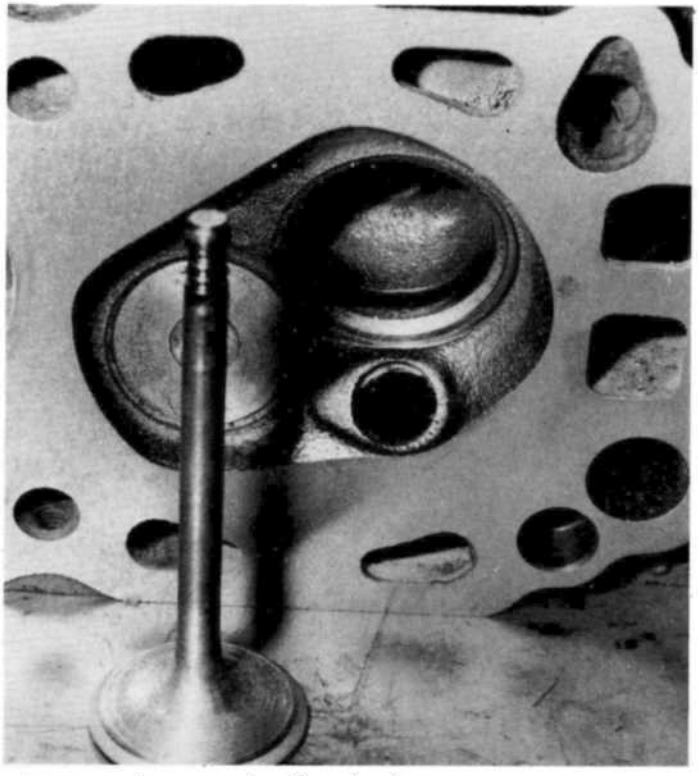
To prove a point Glyn did one port on a Pinto head with standard valves and we

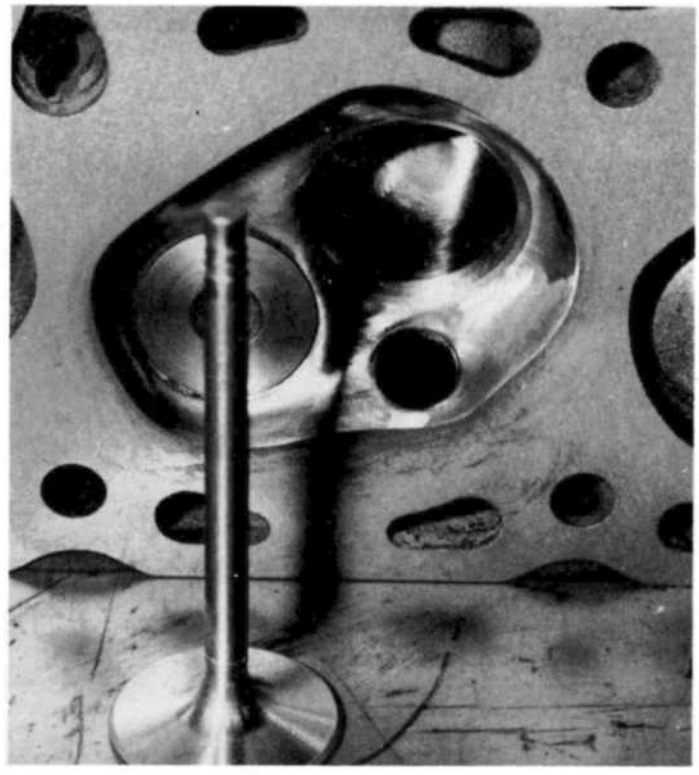
fitted it up on the Superflow. The computer crunched the numbers and we had 107 cfm peak flow at 500 thou lift! That's better than my own big-valve attempts and as good as just about anything else on the market currently offered with big valves.

I couldn't quite believe my eyes so I asked Glyn to do a full race big valve port. This took a little longer, but when we had it back on the flow bench the results were amazing. A flow at 500 thou of 114 cfm with still more to come at higher lifts. Glyn says that with some work and the right cam you can get 550 thou lift on a Pinto, at this point the full race big-valver was flowing 117 cfm!



LEFT:
"Standard" big valve head with the guide boss totally removed. Maximum flow was just under 102 cfm.





However, for a completed head to this spec running aluminium bronze guides Glyn charges £475 plus VAT. There is so much work in them that he can't do it for less. That price is almost as much as some complete engine kits, but then as Glyn Swift is fond of saying: "you generally get what you pay for".

Having been shown the way, my task was now to come up with a shape for an engine kit that flowed well, did not cost the earth and could be produced without the need for 25 years experience at the head bench. I decided to take Glyn's full race porting and work backwards.

What I did was to measure up the full race port shape and then flow test at every stage as I worked towards it from a standard port. Some areas appeared to be more important than others. I had to do this twice on different ports until I had found out what was essential and what wasn't. The result was more than just interesting.

As David Vizard is always saying, it's the port shape that matters, not the degree of shine. To prove the point I took a standard cylinder head and prepared each port in a different way. The first was

LEFT ABOVE:
Standard valve and chamber was de-coked completely, plus the valve back was polished prior to flow testing.

RIGHT ABOVE:
The same Pinto Group 1 valve was used for all big-valve flow tests. Note polished chamber which does nothing!

left stock, but de-coked and the valve polished up. During polishing I removed some of the stock valve so it actually flows a bit better than it should.

The next port got the big-valve treatment, but with the port modified along conventional lines. I went to some trouble to polish the walls of the port, plus the combustion chamber, smoothing off the walls as well as the roof area.

The next port was left carboned. The only place carbon was removed, was where I had to grind it to increase flow. Even the combustion chamber was left with 100,000 miles worth of carbon accumulation in it. The area around the seat for the big valve was left as undisturbed as possible. This port also had the guide boss bored out and an aluminium bronze guide was fitted, left protruding into the port.

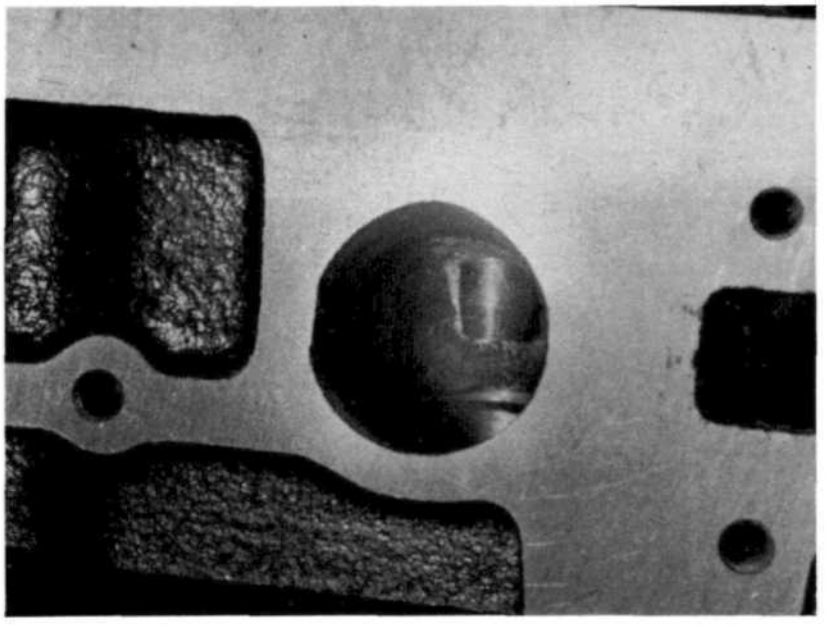
The last port was shaped to the final kit spec. A big valve was fitted with the same three-angle seat as the other two big-valve ports. A bronze guide was fitted, again left protruding into the port, but the port was fully finished.

Flow testing was carried out with the same valve in the three big-valve ports to keep the results consistent.

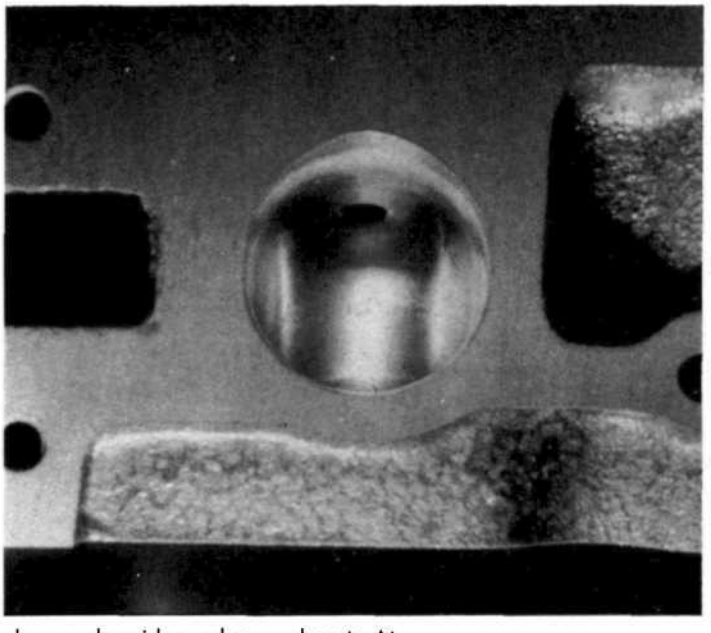
Basically the stock port showed up a little better than most flowing nearly 90 cfm at 500 thou lift. The conventional big valver was making just about 102 cfm while the carboned up port with just the minimum of shaping was doing 107 cfm!

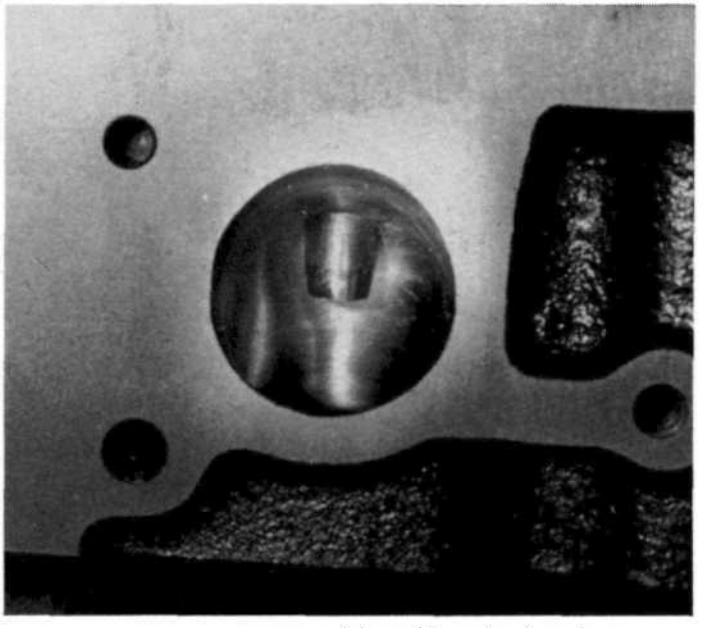
Finally the port that is being used for the new engine kit flowed 115 cfm at 500 thou lift. Without welding, that flow truly represents the state of the art in Pinto big-valve heads. A set of templates are used to keep the port shape consistent and a very expensive Serdi machine is cutting the seats and the throats. This is the machine that Burton use and if you want the best for your machine shop it will cost you around £19,000.

So much for the port shape, but a head



LEFT:
Shaped port was not even de-coked but gave better high-lift flow than shiny port & chamber combination.





also needs guides, valves and seats. At least, as far as I am concerned it needs hardened seat inserts on the exhaust.

In the USA the premium quality valve seat insert is the Martin Wells cast insert. Each seat is individually cast so as to maintain the consistency of the material mix. These Martin Wells seats are designed to run unleaded petrol, butane or propane gas, in fact just about anything that will burn inside the combustion chamber.

The trouble is, they are not made in a size to suit the oversize exhaust valve that I wanted to use. No problem, damn the expense and have them specially made.

Now I had to find a spec for the valve guides. Being very extravagant with other people's money, I opted for the K&N thick-walled aluminium/bronze alloy guide. Not cheap, but certainly the best around. Many big-valve heads run without a guide, or with a repair insert ground back to the port roof. This makes the actual guide bore very short.

Two things happen when you do this. First, you get a bit more flow at 500 thou lift (unless you have exactly the right port shape). Second, the guide bore wears out rapidly. Guide wear does not just result in a smoking engine, the valve tips over in the guide and contacts the seat at an angle as the valve closes.

LEFT ABOVE:
"Standard" big-valve head has the guide boss removed to promote flow, but guide life suffers as a result.

RIGHT ABOVE:
Finished Emerald Engine port showing bronze guide at full length still flowing 115 cfm at 500 thou lift!

At high speed this causes the valve head to bend slightly.

Since the valve rotates, this bending continues in alternating directions, until the valve gets tired of this game and the head drops off!

With the Emerald spec head, the guide is left long and the port shape means that you do not lose any flow because of it. The bronze guide lets the valve run at a cooler temperature thanks to better heat transfer, plus it doesn't wear out like a shortened cast guide since the material is very hard as well as longer.

Finally, as far as the head spec is concerned, I need to sort out a valve. From a flow point of view, the results given here are for the Ford Group One valve. The ports seems to quite like the tulip shape of the valve. However, I don't like the stem length.

The Group One valve has a longer than standard stem, which reduces valve lift for any given cam. I know that Paul Ivey at REC is about to introduce a new Pinto valve with some very trick features.

By next month the rest of the spec for the Emerald Clubman engine kit will have been completed. Apart from the unleaded head spec above, it will also include a crank ground to no less than 10/10, lightened flywheel with new ring gear, fully balanced including rods and pistons, plus brand new oil pump, water pump, cam belt, spray bar, top quality gasket set, etc, etc. In fact, everything you need to put a top quality engine together for club competition use, or a very quick road car.

By the time you read this, Emerald Engines should be in a position to quote firm prices and delivery dates. They can be contacted on 01-401 3767.

Dave Walker