Report on CnC Machining of Cheetah Ports

2nd Sept 2008
Amended 22nd Sept 2008

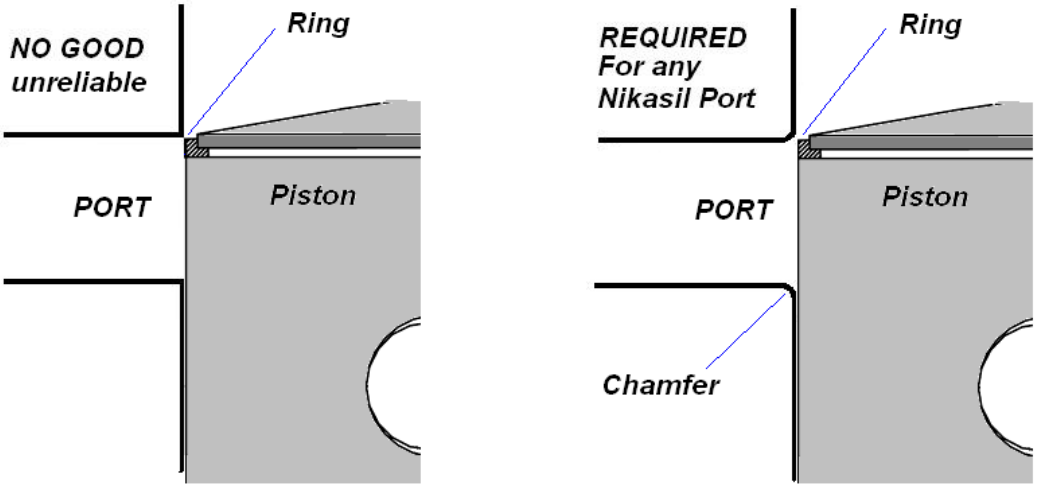
No Cheating with a CHEETAH
VERSION 2.00

Looking up the cylinder
Below is a close up

In the picture at the bottom shows the cylinder which is now vertical, looking from the outside of cylinder into exhaust port, you can see the tops of the ports have been machined. Fine circular machine lines are just visible on the measurement machined radius even thou it's now completely coated with Nikasil. Trying to cheat this by matching this machining after the Nikasil coating would be extremely difficult, almost impossible.

NO GRINDING in the ports, but there is a light chamfer on the edge. This is required for two reasons

1. To stop any chance of ring pickup on the port opening edge that runs parallel to the piston ring, this can cause piston rings to break which could destroy the engine.

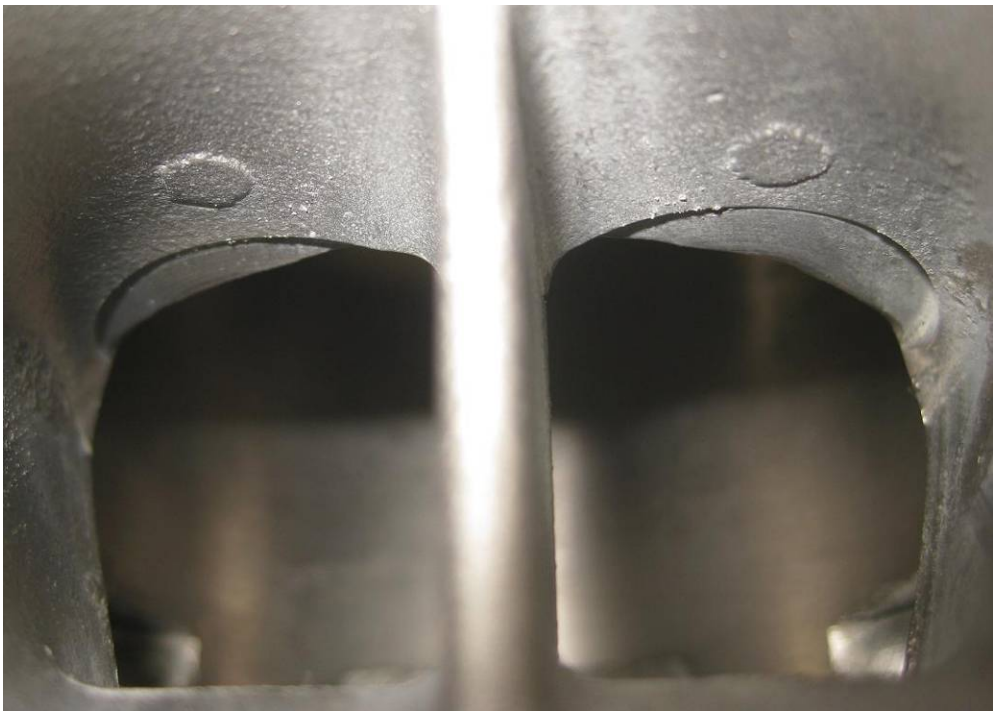


2. Nikasil is required to be " wrapped " over a small radius on edges, and should not to make sharp turns on high wearing surfaces, also Nikasil should not be machined off flat at the end of a section. e.g. The top of bore there is a small chamfer to allow the Nikasil to roll over the top. This is to stop possibility of pick up or flaking off of the Nikasil coating.

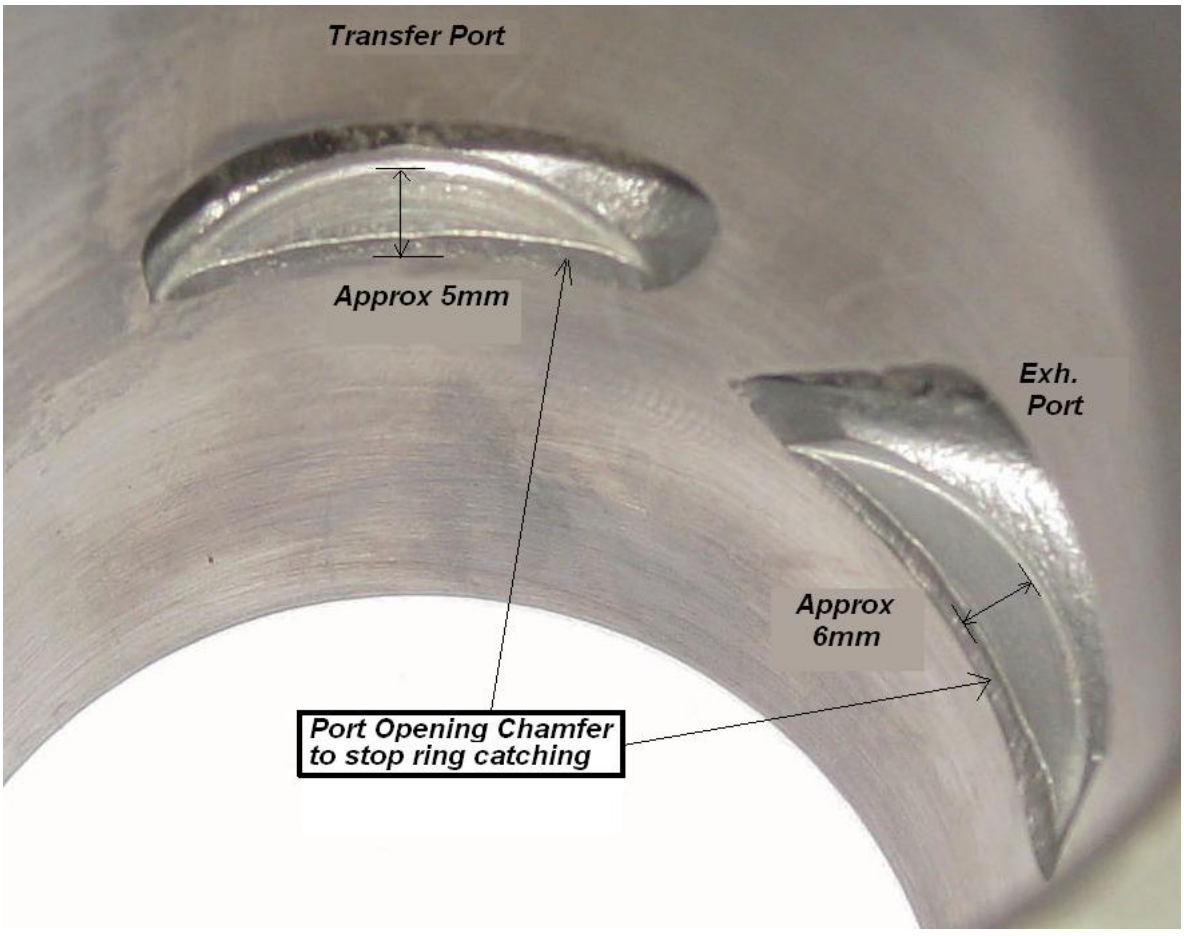
The machined radius sets the port width, as the very tips of the radius extend out to the specified width of the port, therefore any attempt to widen the port will be exposed this indicator.

The small step in the exhaust port made by the machining is so minor that it will not restrict performance.

A trivial point which may be of interest is the 2 circular casting marks in the top section of the picture below. These marks made by mould dowels that hold the exhaust port plug in place whilst the mould is being poured.



Transfer Port



As per the instructions of the AKA/NKC, SQ Racing has prepared these samples for discussion.

Martin Brien in technical discussion with SQ Racing CnC Manager, holding barrel cut in half

Background

The following background information was relayed to me by Richard Erdmann the AKA president, and is my understanding of his view of the current situation.

The AKA/NKC was made aware of cheating in the TAG class mainly with the Rotax engines. It is now so rampant that people are now openly advertising Rotax barrel/cylinder modifications that are " UNDETECTABLE " by tech inspections.

This undetectable claim was backed up by the AKA asking BRP (Rotax) to inspect cylinders which they knew had been modified and even BRP themselves could not state categorically that the barrel/cylinders had been modified.

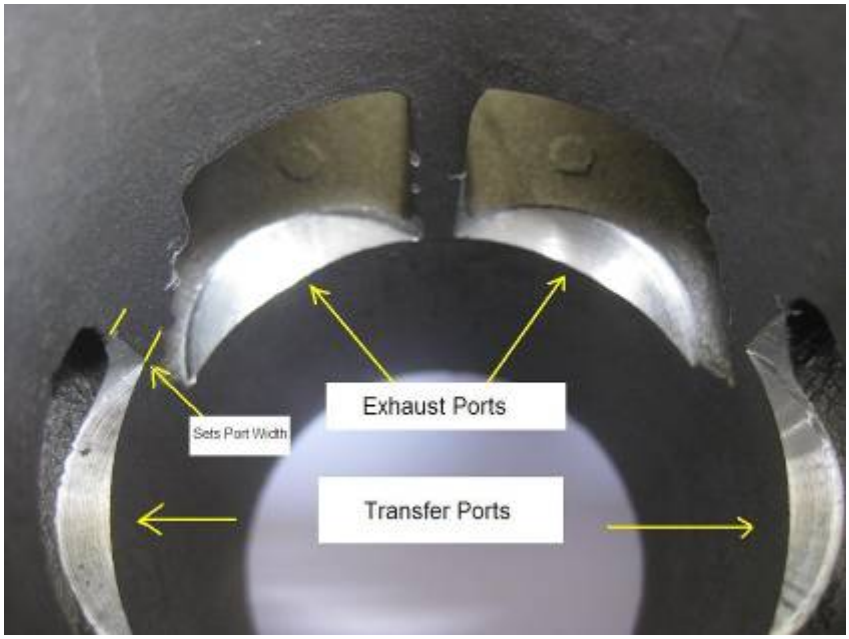
Therefore the AKA/NKC has been working with BRP and IKD (the Australian Distributor) to produce CNC measuring points in the exhaust of a new version Rotax cylinder, that all competitor will have to change to if they wish to compete in the TAG class.

The PRD Fireball previously had a cast liner but in the last 6 months has moved to a full CNC liner, as they were informed of the problem and asked to change, and they did so. The IAME/Parrila Leopard is already a full CNC liner and therefore doesn't have this issue.

CNC the Ports

When you think of CNC port you first think the entire port is CNC'd but this is not the case in what we are doing. We are just making all the TOPS of the ports a consistent measurement, and perfectly horizontal to give a closer parity in performance and it also gives an extremely difficult manufacturing process to cheat.

This is not an easy process as a Cheetah barrel is one piece cast ports with no removable liner, so all machining has to be done down the length of the bore of the barrel, again making it harder to cheat,



View of the machined sample looking UP the bore, (view of top of ports)
Please Note: This cylinder has **NOT** been bore out and is a ruff casting
This is first attempt and closer tolerances will be achieved in production

A cast surface can be easily electro spark eroded but a CNC surface with a set machined radius is hard to machine in these difficult locations, and even harder to match if trying to re-machine these surfaces. Is it possible? of course, but now we have made it an order of magnitude more difficult, as any machining would have to match the radius perfectly, the barrel with need to be completely de-nikasiled, etc etc.. basically extremely difficult.

We first attempted to CNC a port that was already plated with Nikasil, The cutting tool failed to cut correctly as the Nikasil is eleven times stronger than steel, so any attempt to just simply machine the port would be next to impossible, without leaving tell tail signs of re-machining.

We moved the test machining to a rejected cylinder casting as it had not received the Nikasil coating, as all the production A grade cylinders had already received the Nikasil. Finally with 3 hours of machine setup, custom made cutting tools (which took 2 days to manufacture), we were successful in CNC porting the cast barrel.

The method we have designed can be easily incorporated into the manufacturing process, but extremely hard to reproduce after of the manufacturing process.

As you can see from the picture on the previous page, basically we create a radius across the width of the top of the port, so in the middle of the port is a point which is easy to measure, allowing tech inspections to be carried out without the need to check all the highs and lows of a cast port. This will save time for tech inspectors in large race meetings.

Things to note when considering this report

- The CHEETAH engine is still within homologated specifications
- There is no performance increase
- There is close parity between one CHEETAH engine to another
- There is no grinding of the ports only machining.
- No cost increase to the competitor.
- This will help stop those who can only win by CHEATING and therefore is better for the sport.

If you have any question please contact me via Email martin@sqracing.com.au

Yours truly,

Martin Brien