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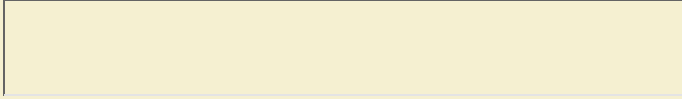
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Stop Making Sense - Wings For Flyin Miata

Article by: Don Redmon (Friday, June 22, 2001) (6107 reads)



This month's column is the short version of an article I wrote for Miata Magazine about a Mazda Miata cylinder head and intake manifold project we were contracted for by Bill Cardell of "Flyin Miata". Flyin Miata is a Miata high performance specialty house located in Grand Junction, Colorado. The full text version, pictures and dyno charts of this article are in the magazine version out this month.

The cylinder head and intake manifold was from a Miata 1.6-liter engine that had undergone a bit of Bill's turbo add-on magic. The subject in question is a streetcar and would be a daily driver. We would remain conservative here; this is not an all out race engine or car. Still, we could and would help make it stronger.

After receiving the head, we inspected it, cleaned it and I started to think about how I wanted to approach the modifications. I prefer to think about things for a while before I start to work on them. I like to think first and cut second. There is nothing exotic or magic about this head; it is a standard pent roof style four valve lay out. The combustion chamber is smallish and the cylinder walls shroud the valves. Because of the small combustion chamber diameter there is not much you can do about this safely. Because this is a streetcar, we deemed it of primary importance to improve torque and throttle response.

We put it on the pressure rack to check for leaks. We also give it a quick check for straightness, cracks, casting flaws, bearing saddle wear or damage. We like to make as sure as possible that we are not working on a damaged head.

After inspection, we blue the intake and exhaust port openings and the cylinder deck surface area. We carefully lay on the gaskets and scribe the openings on to the head. For this cylinder head, Bill requested that we open things up but stick to the stock gasket opening sizes. The widths of the ports were adjusted to the gasket size. I did use my discretion and moved things about slightly. We carefully shaped the ports paying careful attention to the entire port area. We always pay special attention to where the port ends in the bowl area. The bowl area is where the charge tends to collect itself while waiting for the valve to open. The area on both sides of the valve and valve seat, controls the amount of charge that fills the cylinder. The better prepared these areas are the better the port does the work of filling the cylinder.

One thing that became an annoyance was the unevenness and poor quality of the cylinder head and intake manifold castings. You cannot just straighten and/or clean all of this up. Some of the port walls cannot be made perfectly straight without becoming too large and facing a drop in velocity. We were able to straighten this out but it is a lot of work and not something that can be done by an amateur. Some of you may wonder whether an "Extrude-Hone" process could not more easily handle problems of this nature than porting by hand. Well Extrude-Hone works on the theory of hydraulics, which means that the applied pressure is the same in all directions. How then can the media make specific spot pressures adjustments to compensate for specific flaws and unevenness on one side of the wall and not the other in the same area? Everything is treated the same in this process and grit definitely does not know that it is only supposed to move against one wall but not another. I feel that this process has its place but it is not a "cure-all" panacea.

The cylinder head, now full ported was prepped and the Thermal Dispersant coating applied. After baking the coating into the metal we removed the head and admired our handy work. The question every cylinder head specialist now asks him or herself at the completion of a job, begging to be answered: Does the Pope live in the woods?

Flyin Miata received the head and intake manifold from Replika Maschinen, inc. and the rest of the related parts. Bill, using top of the line components assembled the engine. These included a lightened and balanced crankshaft, Carrillo connecting rods and one-millimeter oversize custom Wisco pistons, which were thermal barrier and friction reduction coated. The now fully assembled engine was installed in the car; the engine was started and carefully broken in.

Dyno testing was conducted on Flyin Miata's own Dynojet chassis dynamometer. In a chassis dyno test the engine and the entire drive train becomes part of the test. In an engine dyno test, the power readings are taken directly off the crankshaft and related drive train losses are eliminated. In a chassis dyno test, the engine drives through the clutch or torque converter, the transmission, the driveshaft and couplings, the differential, the axles to the wheels and finally to the tires which drive the weighted roller. As you can see, there are quite a few variables and places where power is robbed and lost through friction, slippage and parasitic drag. However, you can receive a much closer picture of what is really happening and what you are really doing when the rubber meets the pavement.



Miata RMI Cylinder Head



Miata RMI Cylinder Head Base



Miata RMI Intake Port



Miata RMI Polished Exhaust Port

Fortunately, Bill has been making dynamometer runs with this particular car for some time so he has a record dating back to when the car first appeared, untouched and stock, at Flyin Miata.

The first runs in full stock trim were:

89 horsepower, 84 pounds feet of torque

Flyin Miata's turbocharger kit, FMIII and related components garnered:

243 horsepower @ 15-psi boost, 218 pounds feet of torque

Flyin' Miata turbocharger FM III, fully prepared engine, with Replika Maschinen, inc. ported and thermal dispersant coated cylinder head and intake manifold:

251 horsepower @ 12-psi boost, 232.5 pounds feet of torque

The engine is making good strong usable power from 2000 RPM to its 7100 RPM redline. The power has not only been increased with less boost but it is also producing usable torque and power at low RPM's effectively increasing the turbochargers usable band width and virtually eliminating what most people refer to as "turbo lag". Many of you might be wondering why "Flyin Miata" went from 15-psi down to 12-psi boost pressure. It seems that we at Replika Maschinen, inc. did our job so well that the modified but still basically stock fuel system could no longer keep up with the improved airflow. The boost was reduced but power was increased nonetheless.

Yes Virginia, there are sensible, intelligent and much more efficient alternatives to just screwing down the turbo.

Bill reports that the owner will be spending some time driving the car at 12-psi boost level. This will allow the owner time to properly break in and get used to his new engine. This will also allow time to have a custom fuel rail built in order to carry enough fuel to allow for higher boost pressures. Flyin Miata will then test the engine again, raising the boost to the 18 to 20 psi range, stay tuned!!

Don Redmon is the owner of Replika Maschinen, inc. 831-461-0806 an airflow, porting and thermal coating specialty shop in Northern California.

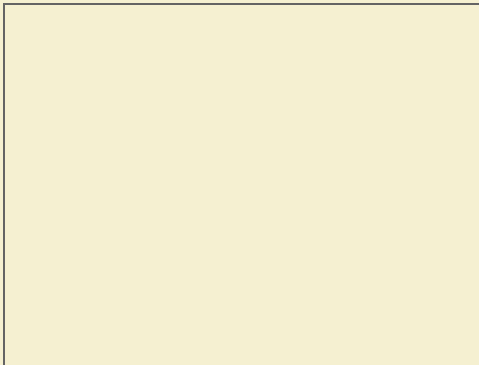
Bill Cardell is the owner of Flyin Miata 970-242-3800 located in Colorado, they specialize in Mazda Miatas

Replika Maschinen, Inc.

www.replikamaschinen.com

Tel: 831-461-0806

don@replikamaschinen.com



"Y'all be careful out there, yah hear."

Latest Comments

Posted by: **fe3t** (2/15/02 08:15:28 PM)

Wow.If this can give so much when done too a Miata 1,6 L engine im Really wonder what i would do with my 2,0 Doch engine in my 88 626 Coupe.

Posted by: **Nerd** (2/14/02 11:56:41 PM)

WOW, that's absolutely amazing. 200+ hp out of a miata??? And THAT MUCH TORQUE?? Christ what's it do in the quarter?

Posted by: **hiddenhands** (9/19/01 11:37:29 PM)

So i don't think this stuff is really worth it unless your gonna be getting a whole new internals' setup on your engine and it's gonna be apart anyway.

Posted by: **hiddenhands** (9/19/01 11:34:27 PM)

woah, wait a sec. He got that power gain (the power after the Turbo was on) from all the internals they did. Not that Thermal Coating stuff.

Posted by: **hiddenhands** (9/19/01 11:26:37 PM)

That's really kool. I never knew that you could do that to the internals of an engine. And it raises tq? Hell yeah. But about how much does that cost to do, and how long does it take to do?

Posted by: **redna** (6/28/01 03:14:07 AM)

geeze, if i had a miata i would do EVERYTHING listed here. 89 to 249(? forgot now that i am in the comment page). that is impressive!!!!!!

Posted by: **agent_noman** (6/25/01 07:57:47 AM)

So what exactly did you do to specifically make TORQUE & throttle response as opposed to high-end power??? Am I missing something?

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