

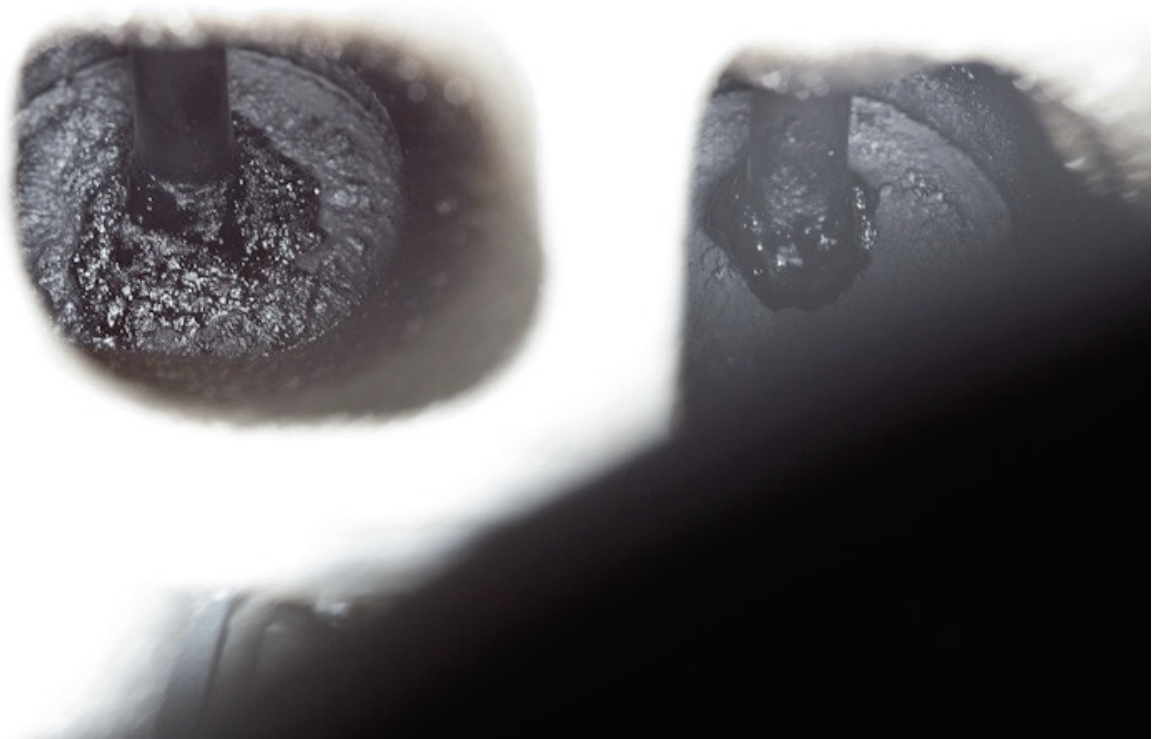
Service Bulletin Update - Intake Valve Cleaning

Brought to you by Evan Goldberg of



This update is a brief summary explaining how to clean the intake valves on a L3T Mazda DISI engine. This particular engine has just over 30,000 miles on it and has used only premium grade 93 octane fuel along with fully synthetic oil. The vehicle's EGR was deleted at 24,000 miles. The decision was made to clean the valves to get this motor into peak performing condition so we could use the vehicle as a COBB Tuning test vehicle. We also wanted to test our theories to see what role the condition of the intake valves have on the vehicle's performance.

During initial dyno tuning, we noticed that we were unable to reach the timing levels that are known to be attainable on other cars without seeing appreciable amounts of Knock Retard (KR) in the datalogs. It was also noted that the car's idle was rougher than it should be. The following pictures were taken previous to the cleaning. These valves had not been cleaned at any point prior to these pictures being taken.



Cylinder #4

These pictures represent cylinder #s 4-2, starting at driver's side of the car and working to the passenger side, where the timing chain is located. Although, as you can see, the intake valves

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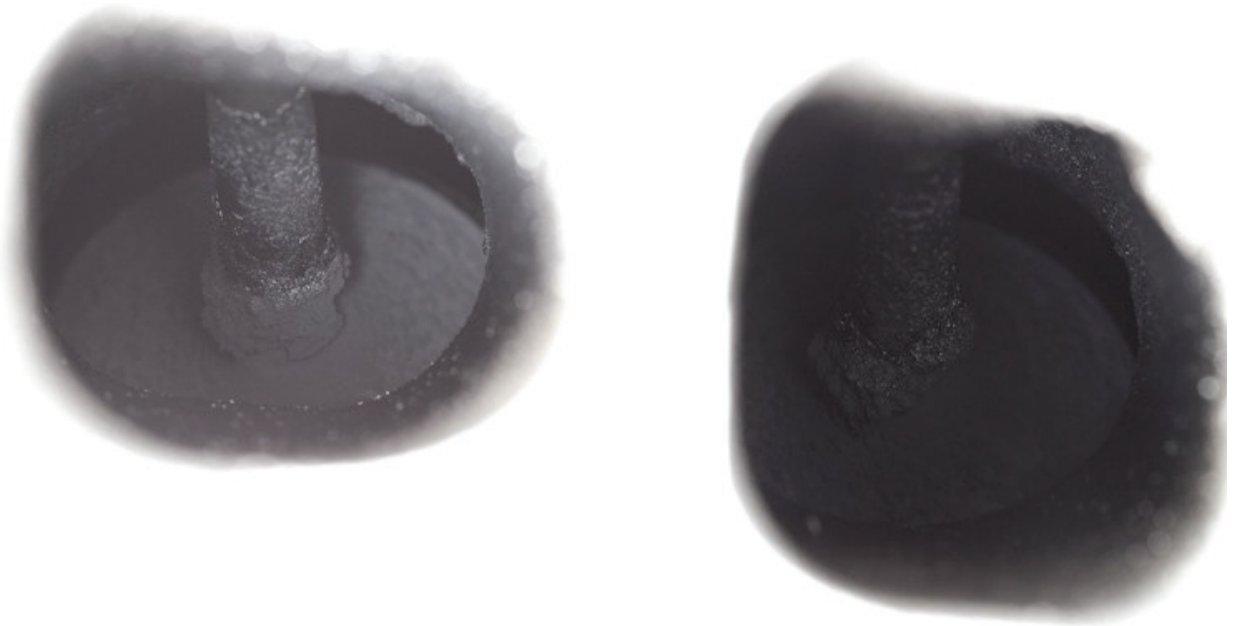
for the cylinder closest to the Exhaust Gas Recirculation (EGR) port, pictured above, have the greatest amount of carbon build up. This carbon build up is more common with DISI engines since a fuel injector is no longer located in the port, firing above the intake valves in order to help wash the carbon off of the valves. It can be assumed that the closer in proximity to the return for the EGR system, the greater carbon build up on the intake valves will occur.

The valves in this port were the only of the 8 individual ports on the vehicle that showed a thick, gooey type of carbon build up as opposed to a dried/charred looking carbon build up exhibited on the intake valves of the other three cylinders.



Cylinder #3

Less gooey carbon is present on the intake valves for this cylinder, but the carbon build up is still significant and unexpected for such low mileage.



Cylinder #2

Unfortunately, we managed to not capture a picture of the #1 cylinder before the cleaning. As we mentioned, the carbon build up was less intense on the cylinders that are located further away from the EGR return.

To clean the valves, a variety of solvents were tested. Each solvent was allowed to soak for 15 minutes inside the port before any brushing or physical cleaning took part. The following were our impressions as to how each solvent interacted with the carbon buildup on the valves.

Ranked in Order of Effectiveness:

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I. Denatured Alcohol - Had the strongest effect on the buildup and did the best job in turning the solution inside the port into a homogenous liquid saturated with the carbon build up. When scrubbed and siphoned away, the alcohol performed the best at removing the most buildup each subsequent "soak".

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II. Sea Foam - Had a strong effect on the buildup but unlike the alcohol, did not dissolve the build up as much as it broke it down into a removable “goop” that could be scraped away and removed from the port. Unlike any other solution, the Sea Foam allowed me to scoop up material that would stick to the tools.



III. Brake & Parts Cleaner - While after soaking and scrubbing, the siphoned liquid from the port was obviously saturated with carbon material, the overall affect it had on the valve surfaces was

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minimal compared with the alcohol and Sea Foam. The cleaning ability is similar to carburetor & choke cleaner.



IV. Carburetor & Choke Cleaner - While after soaking and scrubbing, the siphoned liquid from the port was obviously saturated with carbon material, the overall affect it had on the valve surfaces was minimal compared with the alcohol and Sea Foam. The cleaning ability is similar to brake & parts cleaner.

While none of the above tested solvents were “miracle” workers by any means, along with physical agitation these solvents were capable of eventually removing most of the buildup from the intake valves. We are open to suggestions from the community on other solvents that may clean the carbon on the DISI intake valves better.

While we did not capture any “during” photos taken of each valve after their initial soakings; in the end, all the valve ports received at least 15-20 minutes of vigorous picking, scraping, and scrubbing with a combination of all the solvents. Please be sure to not scratch the valve shaft surfaces too far above the valve head as this is where the valves glide inside the valve seals and a scratched valve shaft surface may cause premature wear of the valve seal. This caution also goes for the bottom of the valve head where the precise machining to match the valve seat takes place.

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To physically clean the valves, we used a combination of gun cleaning tools, consisting of various picks and wire brushes to agitate and remove the carbon buildup. The pick tool comes in handy when attempting to remove buildup on the back side of the valve. Some bending/flattening of your tools may be necessary to better accommodate the job.

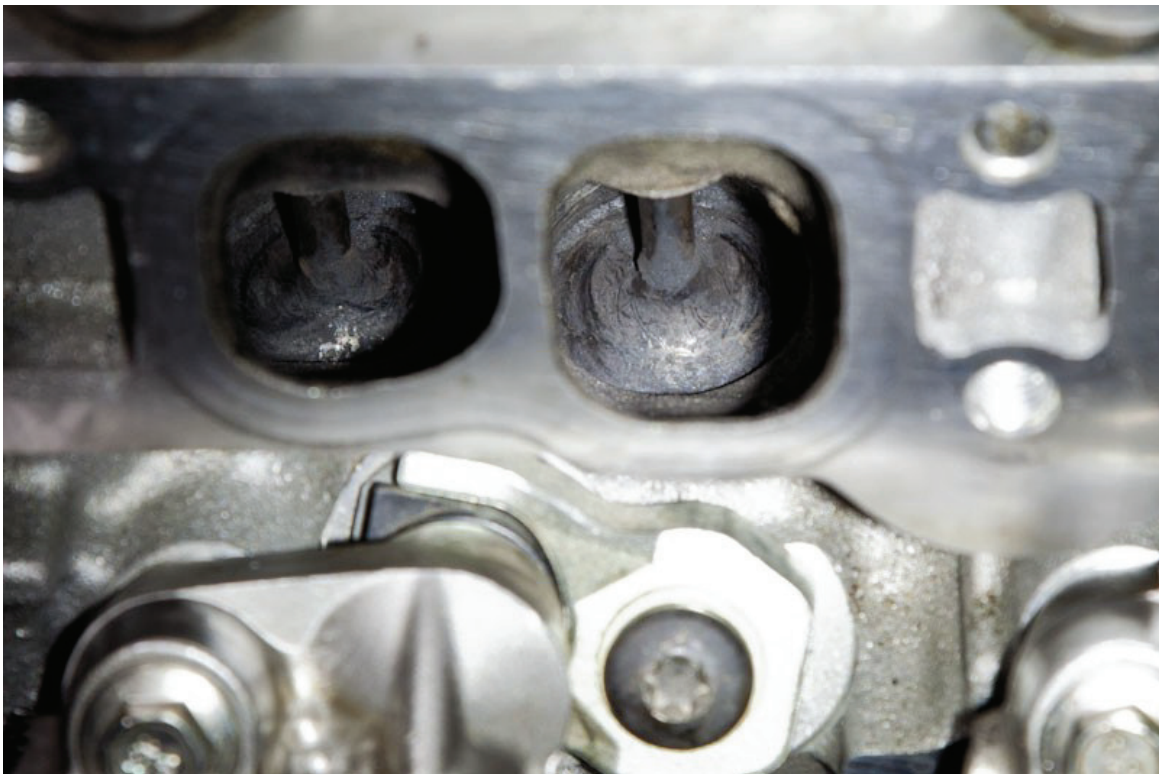
While in the end, the valves in no way resemble a new part, we can state that they were sufficiently clean for the task at hand. We were able to remove a large majority of the hard and soft build up on the valve surface, leaving only the most stubborn of buildup remaining. If more time had been allotted, we are confident that the remaining buildup could have been removed. Longer soak times and more diligent cleaning would also help remove the built up carbon. The more soaking and scrubbing time you a lot to this job, the cleaner the intake valves will get.

The following are pictures after the cleaning, with a better lighting than what was used on the "before" shots.

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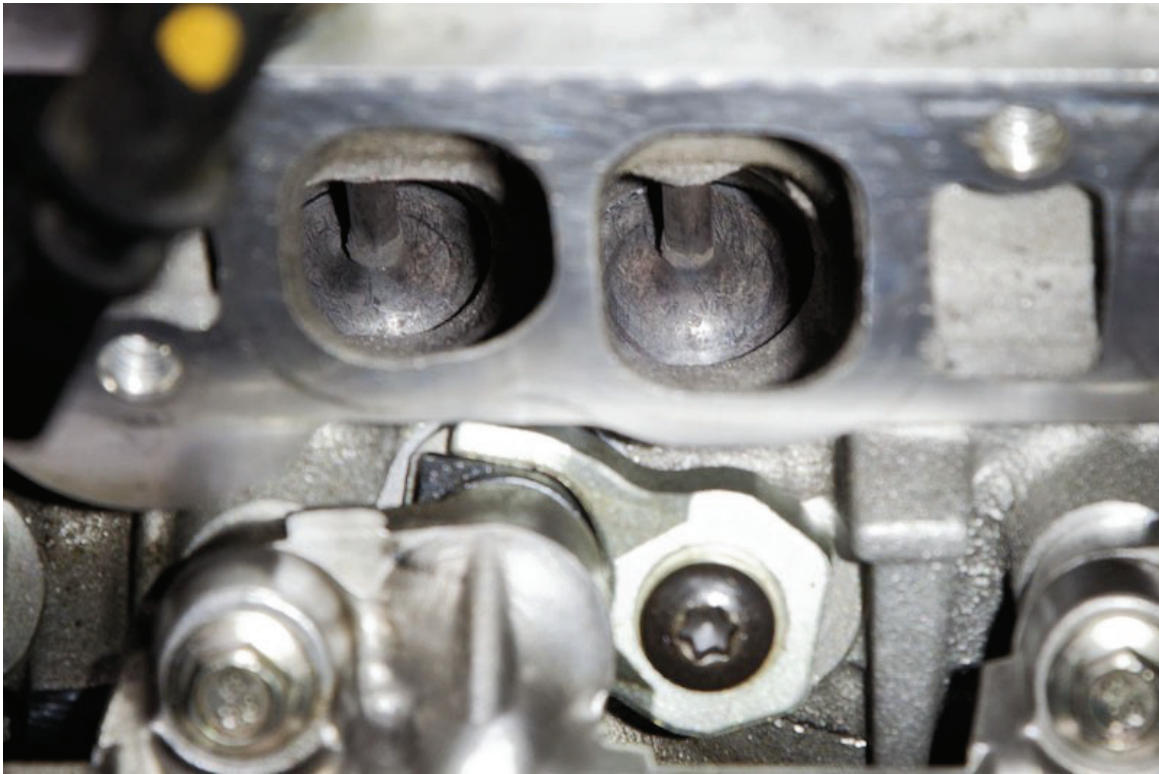


Cylinder #1 After

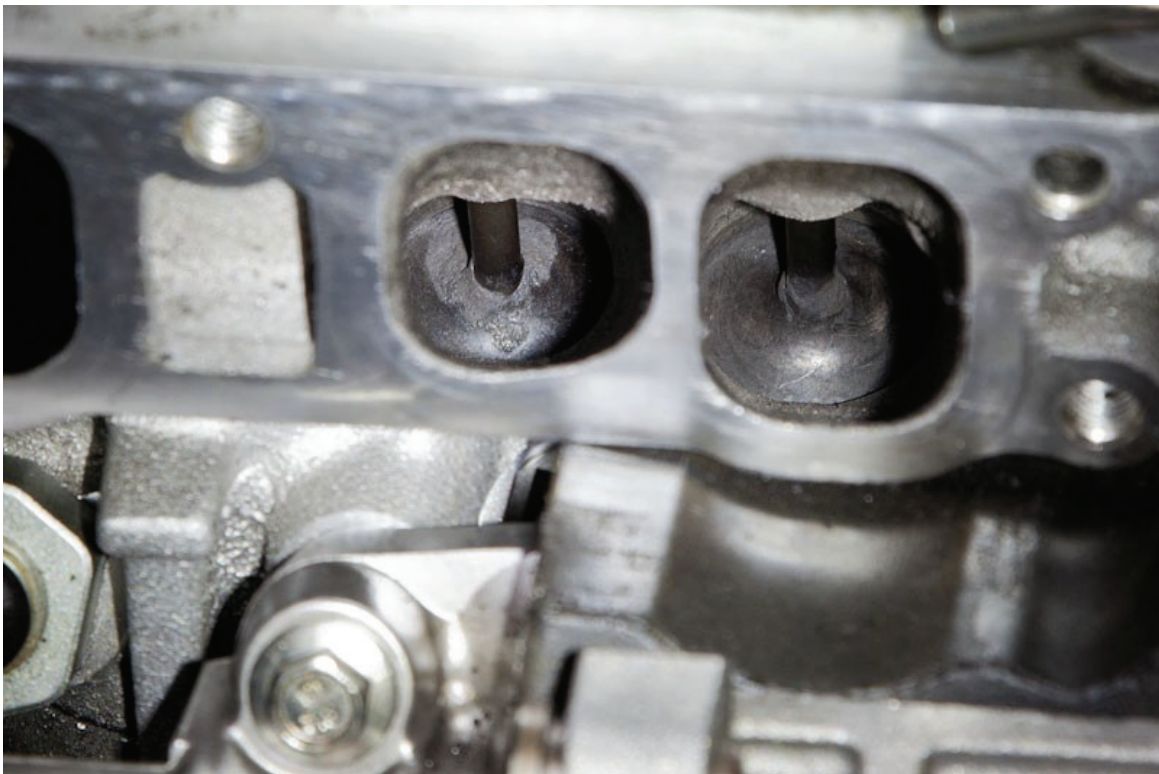


Cylinder #2 After

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Cylinder #3 After



Cylinder #4 After

After the car was put back together and started, it was immediately noticeable that a smoother idle was achieved. We also noticed that the engine was clearly breathing better due to the +18% LTFTs that were present after the cleaning. The MAF calibration curve had already been dialed in perfectly.

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