

Cylinder Head Maintenance

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There are two objectives of cylinder head maintenance. The first is to maintain peak performance by identifying and repairing normal wear. The second, and most important, is to preserve the head by detecting early signs of problems and preventing them from becoming destructive.

Cylinder head maintenance begins with a series of inspections to determine how often the heads should receive maintenance. Setting up a regular maintenance session schedule is nothing to take lightly. When first starting, it takes quite a bit of work. Once established, though, it will return volumes in terms of consistent performance and reduced failures. Note the emphasis on "regular schedule." This is so important, we will first look at how to set a schedule for cylinder heads that have been in use and then cover the actual maintenance. By rule of thumb, the need for frequent maintenance increases as engine output is increased. A low output engine, for moderate drag racing with an automatic transmission, could be expected to last all season without cylinder head maintenance. A much higher output engine, for all-out racing with a manual transmission, will need head maintenance scheduled several times throughout a season. It experiences high rpm, heavy valve spring loads and hard shifts. Normal wear, weakened valve springs, valve and valve seat wear, etc., occurs rapidly. On the extreme end of the maintenance and output scale are nitro Hemi heads. Their operating conditions are so severe that crews check valves, springs and valve jobs after every run. Sometimes, the components or complete heads must be changed after every run. Many nitro and alcohol teams send their Hemi heads to Total Flow Products after every race weekend, as part of their regular maintenance schedule. In these three examples, the actual maintenance is not important. The examples just illustrate how maintenance is scheduled according to application and use. How can you set up a maintenance schedule, if starting out with a brand new engine? Using the examples above as a rough guideline, consider inspecting your heads after every pass or after every race weekend. Keep a detailed logbook. When the heads show wear or a power loss, make a note in the log and send the heads out for maintenance. When they return, start the inspection and log process over again. Eventually, the inspect-log-maintenance cycles will reveal how long you can go between needed maintenance. In other words, if nothing is found until the sixth race, and six races becomes a pattern, your regular maintenance schedule is apparent – after every fifth race. Generally, the inspection is a close look at the valve train. Signs of fluid or compression leaks, cracks or wear patterns on rocker arms and spring seats, worn valve tips, etc. all indicate a need for maintenance. Mechanical tests should also be included. A cylinder leak-down test will reveal leaking valves and seals and an on-engine valve spring test will find weak or failing springs. This type of spring test isn't as accurate as bench testing, but it is easier and can reveal spring problems. If you believe maintenance is needed, Total Flow Products will thoroughly and precisely inspect, measure and test the head assemblies. If maintenance isn't needed, we will advise you and ask for further instructions. If maintenance is needed, and you asked that it be done, we will do the work. If it becomes apparent the maintenance was overdue, we will recommend bringing the heads in sooner. Once a regular maintenance schedule is agreed upon, inspection is unnecessary – just remove the heads at the scheduled time and send them to us. In our maintenance process, we inspect and accurately measure valves, valve and seat faces (the "valve job"), valve guide clearances and check deck surfaces, valve springs, retainers, keepers and valve spring installed height. Worn or tired parts are replaced. Light machining is performed, only if needed, to return the head to its original, new race-ready specifications. We log all specifications and work performed, so your heads are exactly the same every time they leave Total Flow Products. Heads showing signs of failure, or already damaged, are set aside for repair, which our "Cylinder Head Repair" article covers. What can happen if head maintenance, regularly scheduled or otherwise, isn't done properly? A set of heads that Total Flow Products prepared earlier, came back to us. The customer had "maintained" the heads, but his car was running slower. After disassembly, the valve seats were found to be excessively – and improperly – machined. The valves sat too deep in the combustion chamber, which shrouded them and ruined the port flow. When told the seats were damaged and had to be replaced, the customer was baffled. "Why? All I had done was a valve job." Don't take the term "valve job" lightly. It's very important to an engine's performance. Unfortunately, as this customer learned, it is also a very ambiguous term. The valve and seats must seal combustion, yet promote airflow. Carefully designed and machined valve seat face angles ensure a good seal to the valve and enhance the rapid, smooth flow of air or exhaust. The position of the valve seat, in the combustion chamber, is critical to how well the angles work. By not precisely duplicating the original valve seat height and valve face angles, the customer's "valve job" essentially ruined the performance of the heads. Your cylinder heads were purchased, or prepared, for a specific reason. Regularly scheduled maintenance should not affect that reason. Whether Total Flow Products or a competitor supplied or serviced your heads, their original specifications should be exactly duplicated in any maintenance process. At Total Flow Products, we use a Serdi 100 and hundreds of Serdi pilots and seat cutters for much of our valve seat machining. It's a great machine, but it's only one element of our extensive "valve job" process. A wide array of other tools and equipment allow us to refinish precisely any feature of your heads to the exact, original specifications when you first bolted them on. If we don't have a specific tool, we will get it. Total Flow Products will never try to "make do" with something that cuts "close enough." Remember, in the wrong hands, a sophisticated Serdi can be as destructive as chucking a valve in a drill press and dressing the face with a hand file. With one touch, an incorrect tool or an inexperienced machinist can do serious damage to your expensive parts. Don't let just anyone maintain your cylinder heads. Trust the skilled maintenance performed by Total Flow Products AND a regular maintenance schedule.