Spark Plug Helicoil Repair

How Do *You* Spell Relief? / RAA

YOU KNOW the sinking feeling – you are trying to tighten a spark plug but it will not tighten. The threads in the cylinder head are gone and there is no pretending that the plug will be tight enough to stay in the head once the engine heats up. The solution is to tap it out and install a Helicoil.

There are many types of inserts but a Helicoil is the least intrusive thread repair method. The damaged thread is tapped out to an oversize using a proprietary Helicoil tap. The Helicoil itself is a thin steel spring of wire that has a diamond cross section. The Helicoil is wound into the tapped hole, and when inserted it will result in a thread that is better than new.

The question with a cylinder head is always whether it is necessary to remove it, or whether the thread repair may be done while it is in place. There is always the possibility that the tap could contact one of the valves or the piston, and there will inevitably be a lot of aluminum chips from tapping out the hole. If you choose to tap the hole in situ you should ensure that both valves are closed but the piston is far enough down the bore that its crown will not encounter the end of the tap.

First thing is to determine if there is already some sort of thread insert in the hole. Heads are aluminum and inserts are almost always magnetic steel, so check with a small magnet. If there is already some sort of insert but its threads are damaged, try reforming the threads with a thread chaser. If this does not work the repair becomes a job for a good machine shop.

The drive square on a Helicoil tap is probably too large for the tap wrenches that most of us own but a 12 point socket can be used, with the square fitting into every third notch of the socket. A T-handle is preferred for driving the socket. A bit of WD-40 works well as a cutting lubricant on aluminum. The lead of the tap will catch the threads that remain in the head and this will draw the larger diameter in, and the thread will be square to the seating surface of the spark plug. Squareness is important to ensure that the plug gasket will compress properly and transfer the heat of the spark plug to the head.

If the threads are completely reamed out this becomes a more difficult proposition, but not impossible. However it would be easier to ensure

squareness by removing the head and blocking it up so that the tap will enter the hole vertically. In the example VW head the lead end of the tap could be threaded into the second spark plug hole and the shank of the tap could be used as an indicator while clamping the head in an angle vise.

Helicoil inserts come in different lengths. The VW uses ½" length but many engines use ¾". Using too short an insert means that carbon will subsequently be able to coat the exposed threads of a spark plug, and removal can become impossible. It is better to use too long an insert and cut it down to length either before or after installation.

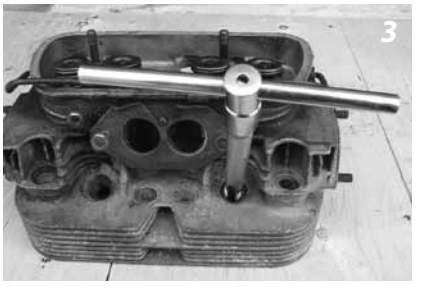
The Helicoil insert is springy and has an OD larger than the hole produced by the Helicoil tap, but the insertion tool corrects this by compressing the insert to the correct diameter. There is a drive tang on the insert that gets driven by a projection on the end of the tool. Wind the tool until approximately ¼ turn of thread protrudes beyond the end of the tool. If you go too far you cannot back up. Instead just keep winding clockwise until the insert falls out and start again.

Present the tool to the tapped hole and slowly rotate the body of the tool clockwise until you can feel that the protruding Helicoil thread has just found its way into the first newly-cut thread in the head. If you pull back gently and find that the tool will not come back, this means that the insertion has begun. Wind the handle of the tool clockwise while pressing the body of the tool gently against the head. After a few turns of the handle begin gently pulling back on the body of the tool. As soon as the last thread has entered the head, the body of the tool will come free.

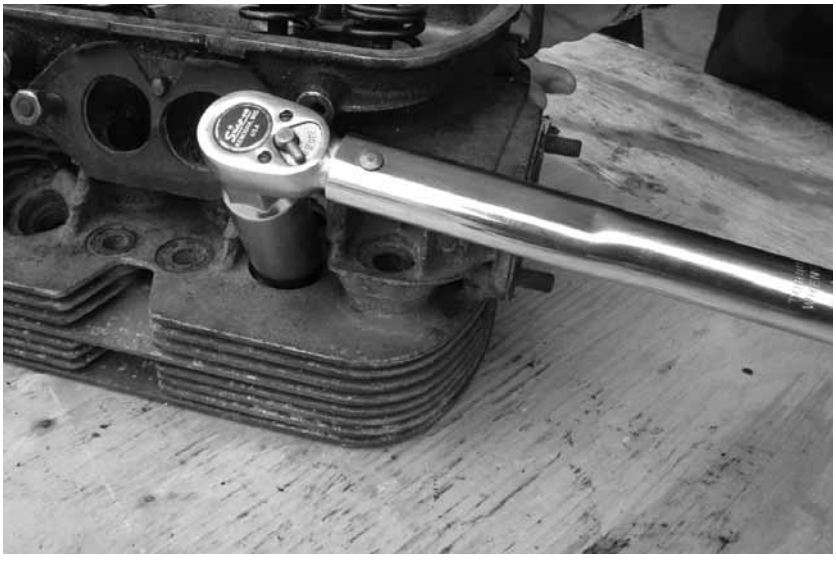
Check that the top thread is sitting just below the seating surface of the spark plug hole. If necessary wind the Helicoil in a bit further using the driver of the tool.

The lower end of the Helicoil has a drive tang that must be removed. Right next to the tang the Helicoil has been factory-notched and if you reach down with a needle nose pliers and wiggle the tang it will break free. This is where it is better to have removed the head, so keep a firm grip on the broken-off part.

Opposite: The inserting tool, special Helicoil tap, and two inserts of different lengths.
Below, upper left: 1) A thread chaser might straighten the threads if only a few are damaged.
2), Check the threads with a magnet. If they are magnetic there is already some sort of insert
3) a T- handle and 12 point socket may be used to drive the Helicoil tap.
4) the Helicoil insert is placed over the driver of the tool
5) wind it in until the drive end projects slightly beyond the body
6) present the tool to the head and begin winding the handle to insert the Helicoil



Below, from the top down: 1) Break the tang off at its notch by twisting with a needle nosed pliers; 2) If the head is still installed, it is possible to reach the tang from the top side, but be careful not to drop it into the combustion chamber; 3) Here is the problem when the helicoil is too long - some of the helicoil can protrude into the combustion chamber; 4) A small triangular file can be used to notch the excess. Then break it off by twisting with pliers.



Top: lubricate the threads of the spark plug and wind it in by hand;
Above, get the torque spec for your engine and use a torque wrench to tighten. All done.

An insert that is too long for the hole will result in some of the Helicoil protruding into the combustion chamber. This must be avoided, and there are two ways to correct this. First is to cut it to length beforehand by pulling the spring open and notching the upper end with a triangular needle file, then breaking off the excess. This is the only way it can be done with the head still installed on the engine. If the head is on the bench it is also possible to install the too-long Helicoil, and then notch and remove the excess that protrudes into the combustion chamber. Either way there must be nothing hanging into the chamber or it can cause a hot spot that will glow and cause preignition.

When installing the new spark plug make sure that you use a tiny smear of antiseize compound on the threads, and use a torque wrench to ensure that the plug gasket will be compressed properly.

Helicoil kits and replacement inserts may be purchased at most automotive jobbers, from Sears, Ebay, and many other outlets. RF