

I'd say about 75% of the tractors I have bought had a blown head gasket. This is a very common problem among Kohler K-series and KT and Magnum engines because the aluminum head and iron cylinders have different thermal expansion rates. The K161 and K181 are particularly susceptible because they don't seem to have enough head bolts, in my opinion. A blown head gasket whistles and blows oil out of the compromised area of the gasket, and if this is left uncorrected, the head can eventually erode, meaning that the head must be welded on or replaced. The oily mess also coats the cooling fins on the cylinder and reduces their effectiveness. Replacing a blown head gasket is simple, but must be done correctly to avoid blowing it again.

Before starting, the usual 'disconnect the battery and remove the spark plug wire' applies, as it does to most repairs. Remove the plug now, as it's easier than after the head has been removed. Next, remove any sheetmetal covering the head and preventing its removal. QL tractors will have to have the muffler box loosened so that there is room to remove the head through the top.



Remove the head and note the number and type of washers, length of the bolts, and locations of any studs. A picture taken prior to disassembly helps. Below is the head after removal.



This particular engine didn't have too much carbon buildup, which I've found to be rather unusual. Most engines have so much carbon that I wonder how the engine was operating at all. The failed area of the head gasket is obvious; notice the oil around the exhaust valve area of the head. This is the most common head gasket failure area that I have seen. The spark plug looks pretty good:



There really wasn't a whole lot of carbon buildup on the piston or valves (the light color of the exhaust valve is normal).



Next, clean the top of the piston, valves, and combustion chamber. I typically use a wire brush, razor blade (take care not to scratch the piston) dental pick, and brake cleaner. If you use brake cleaner, be careful. It's great stuff because it dissolves nearly any type of dirt (including carbon buildup) but it has NASTY fumes and will also wash oil off the rings, so re-oil the piston after using it. This can be seen in the picture below:



Also notice the eroded area of the piston near the valves. This is why air-cooled engines should be run slightly rich; I believe a too-lean mixture burnt the piston, which I'll have to replace at some point.

Clean the head just like the block. It isn't really necessary to get it surgical-instrument clean. I remove the big chunks and as much as I can, without taking everything off to bare metal. Oven cleaner and brake cleaner work good. The head can also be bead blasted, but do NOT sandblast it; sandblasting aluminum roughens the surface and creates a bunch of stress risers that can initiate cracks. If you'd like to measure how badly the head is warped, set it on a flat sheet of glass and try to stick a 0.003" feeler gauge under it. If it can be slid under anywhere, the head needs resurfacing, which will be demonstrated below. I used to measure them, but I found that if the head gasket is blown, the head is warped more than 0.003" and I no longer bother measuring.



This is what I use to flatten my heads. It is simply a 1/4" thick sheet of tempered glass that used to be a shelf for something. Don't use an old, swirly-finish pane from an old house or barn; it won't work. Modern glass that is made by pouring molten glass on a bed of molten metal is needed. I attached it to a piece of particle board with a couple wooden clamps. I used similar wooden clamps to attach the sheet of sandpaper. Use 180 grit wet/dry sandpaper to start, and finish with 220. If only 220 is used, it'll take 4 or 5 sheets. Wet sand to make the sandpaper last longer. Use a circular motion, and occasionally rotate the head.



After awhile, the head will start to look like this:



Notice that some areas have been touched by the sandpaper, and others have not. This process must be continued until the entire gasket surface is of a uniform finish. (Aside: Others may recommend the use of a flat file instead, but this takes some practice, and I feel that my method is a bit more foolproof for those of us with less finesse handling a flat file) When the gasket surface looks like this, it should be essentially perfectly flat:



Recheck the head with the sheet of glass and feeler gauge if you like-- I have never been able to slide a 0.001" feeler gauge under any of mine after completing this process.

Next, a short lesson on head gaskets. I typically buy aftermarket gasket sets because they are significantly cheaper than the OEM gasket sets, except for one problem: The included head gasket is often a POS. Below are two nearly identical head gaskets for K241-K321 engines. On the left is the aftermarket gasket, and on the right is the OEM Kohler gasket.



They look very similar, but have a significant difference. Below is a close-up of the inside edge of the aftermarket gasket. Note the exposed three layers of material:



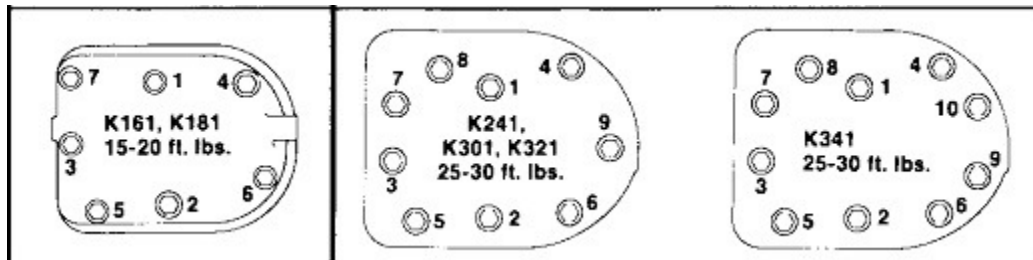
Here is the Kohler gasket. Notice the 'fire ring' around the inside edge:



The 'fire ring' gasket was recommended to me long ago, and now when I buy a gasket set I buy an OEM head gasket. I think these are a much better design. The K161 and K181 head gaskets do not appear to be available in this style anymore, so this only applies to the larger engines.

Some people replace head bolts when a head gasket is changed; others do not, and for various reasons. If I twist one off, I replace all of them; otherwise, I wire-wheel and re-use them. Some people also use Kohler head bolts; others (myself included) use ordinary grade 8 bolts. I have never had a problem with the grade 8 bolts, and this is what I find in half the engines I come across anyway.

It is a good idea to chase the threads in the block to allow the bolts to be torqued accurately. Oil the threads of the bolts, and then put them all in finger-tight. Tighten in the appropriate sequence in steps, i.e. 10, 20, and finally 30 ft.-lbs. The proper sequence and torque values are important, and a torque wrench is required. Below is the sequence for the K-series singles:



After reassembling all of the sheetmetal, run the engine for 20-30 minutes at 1/2-3/4 throttle and then retorque. I have heard of others retorquing after the first hard pull with good results, as well. There are two schools of thought on head retorquing: One, to retorque when hot, and the second, to retorque when cold. Retorquing when hot doesn't make sense to me because the aluminum has a greater thermal expansion rate than the steel head bolts, so retorquing it hot will result in a looser head after it cools and shrinks than if it was torqued cold, so I always retorque cold. I've done at least a dozen heads and never re-blown a head gasket with this method.