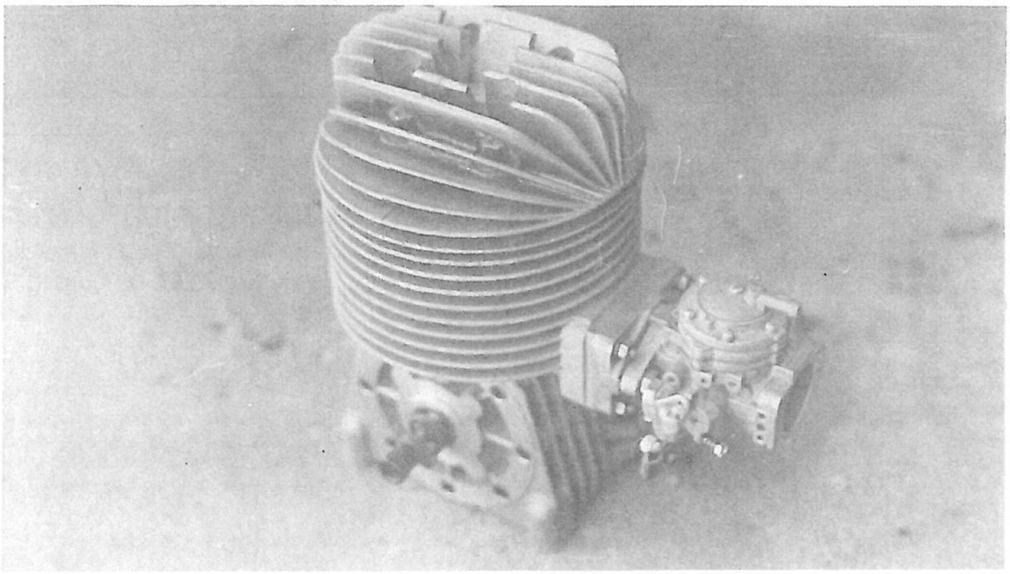


AN OWNER'S GUIDE TO REBUILDING THE CURRENT ROTARY AND REED ENGINE. PART 1.

Both the current Reed valve and Rotary valve engines can, if correctly prepared, give both excellent performance and a good service life. Many karters will not tackle these engines, believing that they have to be a mechanical genius to do so.

It is mainly the fault of the manufacturers of these engines that many karters are reluctant to run their engines. The supplying of a comprehensive service manual with each engine and a thorough predelivery check by the dealer would take most of the bug bears out of owning a reed or rotary engine. But the manual does not exist and unfortunately, most engines are sold in the carton with absolutely no predelivery check. So, tip number one is that when you purchase your new treasure, check it thoroughly before running it. The following information is designed to help you know what to look for and to make it possible for you to carry out a large percentage of the maintenance necessary to run one of these European engines without suffering from early major disasters.

THE CYLINDER HEAD

Before starting, I would like to explain that all the available reed valve and rotary valve engines depend on similar clearances and set up procedure. There are of course slight differences between reed and rotary and long and short stroke versions and these will be explained as we progress.

The first thing to check on your engine is the cylinder head capacity to the top of the plug hole. This can be done by using a dial indicator through the plug hole to find top dead centre. Using the indicator, wind the engine over until the piston is at top dead centre and then, with the use of a .4mm feeler gauge inserted between the motor plat rotor and stator, lock the engine in this position. Withdraw the dial gauge and using a syringe filled with normal racing oil, proceed to fill the combustion chamber with the oil, taking readings off the syringe calibrations. It is important that all air is excluded from the syringe before proceeding.

For the rotary valve engines, measured to the top of the plug hole, the capacity should be from 8.3cc to 8.5cc. The reed valve engine can run safely down to 8.2cc as it does not generally run as high in the rev range and benefits from a little extra compression. The higher the compression, the higher the horsepower that is extracted from the engine, but there is a limit for safe running and the sharp edges of the 'L' top ring and the piston crown edge will detenate if the compression is too high. NB! The head capacity should be checked with the cylinder head correctly tourqued down.

The next item is to check the piston to head clearance (squish clearance). This is a vital measurement as many a piston and ring failure has occured due to the squish clearance being too close. Nearly all engines with a shrink fit liner into an aluminium cylinder have the problem of the liner sinking in the cylinder casting. So it is important to keep an eye on the squish clearance throughout the life of the engine.

The long stroke rotary valve engine should have at least .75mm, the short rotary and the long stroke reed valve engine should be set at .7mm and it is fairly safe to go down to .65mm with the short stroke reed valve engines. But remember, the higher the compression you run, the greater the squish clearance has to be.

The measurement of the squish clearance can be taken by inserting a piece of soft, resin core solder down the plug hole until it touches the cylinder wall and then turning the engine over top dead centre. The solder will squash into the shape and size of the cavity left and can be easily measured with a vernier calliper.

It is also very important to check this measurement on a new engine as all makes that I have inspected are very unreliable in assembly as regards the squish clearance.

The best way to correct either the cylinder head capacity or squish clearance is by machining. This is best left to a tradesman. It is possible to correct the squish, and to a certain extent, the compression by the use of a thinner base gasket (if the clearance or capacity was too great) or with additional gaskets if the clearance or the capacity was too tight. But it must be remembered that excessive use of thick cylinder base gaskets will be detremental to cylinder to crankshaft alignments.

THE PISTON AND CYLINDER

All important for both reliability and performance is the trueness of the cylinder. It cannot be argued against that the only fast cylinder is one which is both exactly round and true throughout it's length. Most of the European engines are particularly good in this respect when purchased new.

A new cylinder should give good performance for about six race meetings before requiring honing. In the case of the reed valve engines, it is not uncommon for the cylinder to go as long as eight to ten race meetings before starting to show a drop off in performance.

When the cylinder starts to show wear, there are two methods that can be used to recondition it. The first and most used is to bore and hone the engine. This job is best left to a machine shop which has the facilities to carry out such an operation. But when giving your precious cylinder to such a workshop, make sure that the cylinder is bored square to the cylinder base. This requires that the cylinder is located on the machine on it's base and not the top surface of the cylinder. No matter how foolish you may feel about telling a tradesman how to go about his job, impress upon your man that he must locate the cylinder off it's base.

The second method, and this is to my mind the best way is to first hone the cylinder on a parallel hone and then through the base to the honed cylinder on a mandrel. Once again this is an operation that is best left to a machine shop that is suitably equipped. Under no circumstances, use one of the hand held hones to increase the bore size. This type of hone should be used for emergency use.

The piston to bore clearances for the various engines are as follows. Long stroke rotary – .8mm, long stroke reed and short stroke rotary – .75mm and the short stroke reed valve engine can be set as tight as .7mm if carefully run in. The longer the stroke of the engine the higher the piston speed and thus the greater the piston to bore clearance required.

Some karters that at present run the reed valve engine are in fact revving their engines like a rotary. For those karters, I recommend the use of the rotary valve clearances.

Continued next month.

AN OWNER'S GUIDE TO MAINTAINING THE CURRENT REED AND ROTARY VALVE ENGINES.

PART 2.

Last month we finished this article on the subject of piston to bore clearance. This month we will start off with the piston and a few hints on keeping this small, but sometimes fragile component in one piece.

THE PISTON

Both the Rotary valve and the Reed valve engines use identical pistons. The most important thing to remember is that no modification at all of the piston, when fitted to a reed valve engine that is to be run in the Stock 100cc class, is allowed.

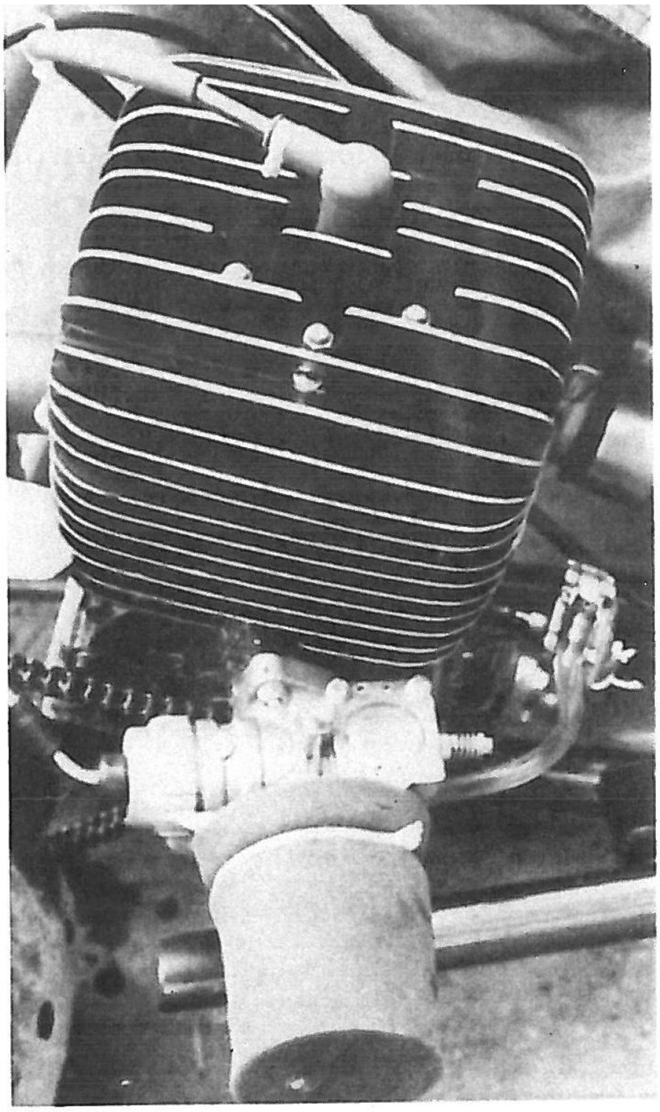
But there are a few little things that can be done to the Reed valve engine piston to ensure longer life and, probably slightly better performance without bending the rules.

The first important step is to polish the piston crown. I feel, that this in no way violates the Stock 100cc rule and it certainly cuts down on the possibility of detenation at the piston crown. When polishing, it is beneficial to polish a very slight radius on the outer rim of the piston crown, thus eliminating a major hot spot in the engine. Sharp edges always run a lot hotter than flat or curved surfaces, so any such relieving of sharp engines will allow the engine to be tuned to greater performance and at the same time increase the reliability of the engine. Legally, this relieving of the sharp edge must be kept in line with the stock appearance of the piston.

The second item on the piston that effects both performance of the engine as well as reliability is the correctfit of the piston wrist pin to the piston. In so many engines that we pull down, the wrist pin has to be driven out of the piston with a puller. The piston to pin assembly was designed to be fully floating. So to achieve this, it is in many cases necessary to hand hone the piston pin hole as many pistons are supplied new with the pin to piston clearance too tight. To achieve this, it is best to take a piece of dowl, which when wrapped with emery paper, is a neat fit through the piston hole. Then, inserting the dowl right through both sides of the piston, gently rotate back and fourth. Do not be harsh as it is all too easy to spoil the pin hole alignment. Hand hone in this manner only until the pin is a gentle slide fit into the hole. A loose pin fit is as bad as an overtight fit, so be careful to only remove enough material for the correct fit.

THE LITTLE END ASSEMBLY

The piston to pin fit is an important part of the little end assembly. So too is the thrust clearance between the little end spacers and the piston to conrod assembly. This should be set at between .2mm and .25mm. If too tight, the problem may be solved by lapping the little end spacers. If too loose, the only real cure is to sift through a number of spacers and pistons until the correct combinaton is found.



The European engines sometimes suffer from blueing or overheating of the conrod little end eye. I.A.M.E. have overcome the problem fairly by providing extra lubrication notches at the bottom of the eye. The standard DAP conrod (which uses only two steel thrust washers) responds well to the use of the Yamaha KT100S little end cage to help reduce any overheating. This system can only be used on the knife edge rods if special spacers are made up. As yet we are not quite sure as to what is the best material to use, so it would at present be wise to use the original rollers and spacers. If the little end thrust clearance is correct, then overheating should not occur. If it does, careful notching of the bottom of the little end eye will help. This is best done by grinding the notches in and then stoning off the sharp edges. It would be wise to have a look at an I.A.M.E. conrod before attempting this task.

THE CRANKCASES

There is not a lot the average karter with limited facilities can do to improve the crankcase assembly. But what can be achieved is correct and careful assembly.

When stripping the crankcase halves, be careful not to force the halves apart. Separate them gently. When removing the main bearings for replacement, do not attempt to belt them out while the castings are cold. This removes metal from the bearing housings and will spoil the bearing to case fit. It is even worse to try to fit bearings to cold castings. For either, removal of, or replacement of the main bearings, heat the crankcase halves to 450 degrees F. At this temperature it is possible to gently tap the mains from their housings. When refitting the mains, they will drop into place at this temperature.

Before starting to assemble the crankcases it is important to make sure that all surfaces are clean and burr free. Any dirt or burring of machined surfaces will cause missalignments within the finished assembly. Once the halves have been thouroughly cleaned and deburred and the bearings and seals fitted, place the crankshaft in position and using the standard gasket, bolt together and check the crankshaft endfloat. On C-3 bearings, this should be .2mm. Next month we will deal with the remainder of the engine to complete this series. In the meantime, be careful.

AN OWNER'S GUIDE TO PREPARING THE CURRENT REED AND ROTARY VALVE ENGINES. — Part 3.

Last month we finished part two of this series on assembling the crankcases. We now reach the most critical operation in the whole engine assembly and that is the heart of any engine, the crankshaft assembly. All operations that go into assembling an engine are important, but it is all wasted if the crank is not true.

THE CRANKSHAFT

The first thing to say about the crankshaft assembly is that it is a specialists job. The pressing apart and together of the shaft must be carried out with the greatest of care. When pressing together the shaft halves, it is all important to line both halves very accurately. Any misalignment on either or both halves may be permanently damaged with little or no hope or ever again achieving perfect alignment.

When assembling the shaft, the final width at the thrust faces should be set to give the crank .2mm endfloat when fitted in the crankcases. But care must be taken to ensure that the big end cage has at least .5mm end clearance. If it is found to be impossible to achieve the correct combination of big end cage end clearance and crankshaft end float, then there are several methods of overcoming the problems.

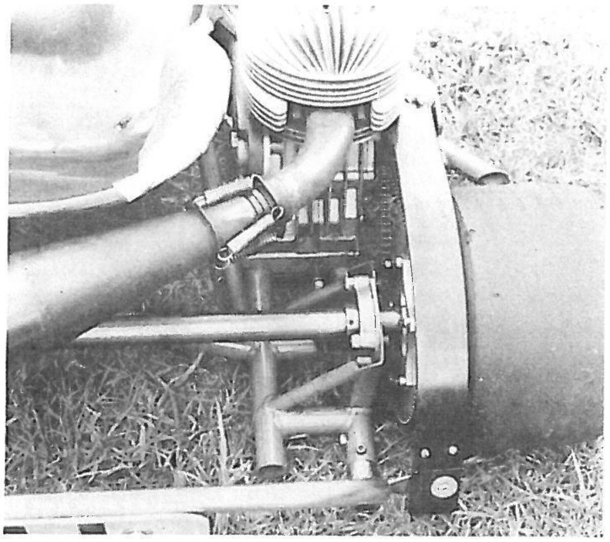
If to achieve the correct endfloat, the cage clearance is too tight, then either the bearing housings should be machined deeper, or as a poor alternative, a thicker crankcase gasket may be fitted to achieve the same result. But, remember, the thicker the crankcase gasket, the greater the risk of crankcase misalignment.

The final operation when assembling the crankshaft is to true the shaft. Runout should not exceed .02mm. But for an engine that is to perform at it's peak, the runout should be no greater than .01mm. Sometimes it is not possible with a well used shaft to obtain this amount of accuracy. The thing to remember though is that as much as is necessary must be spent on getting the shaft to run as true as possible.

FINAL ASSEMBLY

When all the components are ready for final assembly and the crankcases have been bolted together, place the cylinder into position with neither the piston or the base gasket fitted. Then fit the cylinder head and tighten the cylinder down, using the cylinder to pull the crankcase halves into correct alignment. This operation should even be carried out if the crankcase halves are dowled.

After this aligning operation, remove the head and cylinder and proceed to assemble the engine, referring to the points previously mentioned in this series, remembering that cleanliness and care are of prime importance.



TIPS FOR SETTING UP

Once assembled and fitted to your kart, your engine should be correctly run in. The amount of running in will depend on the piston to bore fit and whether or not the engine has been bored. For a new cylinder bore about one hours running is usually sufficient. A new piston in an old bore will require around half an hour. If you prefer to fit the engine a little tighter than is normal, longer running in periods will be required.

Ignition timing for the long stroke engine seems to work best between .25 and .28mm. For the short stroke engines, settings between .22 and .25mm B.T.D.C. seem to work well. Exact timings will depend on the port configuration of the particular engine.

Exhaust length for most engines seem settled between 80cm and 81.5cm. But again this depends on the particular combination of gearing, porting and ignition timing and can only be set after track testing.

Items such as carburetion, valve timings and gearing are closely related to particular operators and engines and there are so many variables that work that it is pointless to try to deal with these subjects. Testing in a methodical manner is the only solution to finding the correct combinations. This we will begin to deal with next month.