

An Idiots Guide to Adjusting Glow Plug Engines i.e. As written by an Idiot (me)

Now this article must provoke some response from the experts ... especially the black art of adjusting the idle mixture! However this is what I do and it works for me.

Running In:

A new engine needs to be run in according to the manufacturer's instructions or else you will invalidate the warranty. During this time the engine should be run richer than normal to prevent overheating.

Safety:

The following procedures are undertaken with the engine running. However if it is not possible to safely make the adjustments with the engine running then the engine should be stopped, the adjustment made, and the engine then restarted.

Ensure that the aircraft is suitably restrained when starting and running the engine, and make all adjustments from behind the aircraft (unless it is a pusher!).

The propeller is virtually invisible when running. Treat it as though it is a circular saw as this is how it will treat your fingers ... as a number of modellers have discovered to their costs. To date I have only lost the tip of a glove worn during winter months, but it could have been worse.

Please read the BMFA handbook for the current safety guidance.

Main Jet Adjustment:

Adjusting the main jet is done by the needle valve adjuster, with the throttle fully open, and the engine running.

Note that turning the adjuster clockwise will make the engine leaner whilst turning it anticlockwise will make it richer. The optimum setting is about 10 degrees anticlockwise from the setting that gives peak revs. Whilst running in you will need it richer than this setting, usually about a quarter to half a turn anticlockwise, but again follow your manufacturer's instructions.

Once the mixture has been set using this technique then carefully hold the aircraft with the nose up as if in a steep climb and check that the engine does not slow down when on full throttle. If it does then adjust the mixture richer by turning the adjuster anti-clockwise until the speed no longer drops when it is tilted up. If the engine is running rich it may speed up when the nose is raised.

Why hold the nose up? (okay so you didn't ask!) - When the plane is level then the of the fuel in the fuel tank is typically higher than carburettor creating

positive pressure which in turn creates a richer fuel air mixture. As the fuel level drops the mixture becomes leaner which could cause the engine to lose power and/or overheat. Lifting the nose up simulates the emptying of the tank by lowering the fuel level relative to the carburettor and also helps to ensure that your engine will not lose power in the climb. One piece of advice received suggested that you should actually set up the carburettor with the tank half full to obtain an average setting and this may have some merit when adjusting the idle mixture below.

Idle Mixture Adjustment:

With most new engines the idle mixture is usually already set rich and you should not adjust this until the engine has run for a couple of hours, in order to allow it to fully run in first. However, I have had one that ran too lean and would not idle from new, which therefore required adjustment.

To do this, run the engine as slow as possible and then pinch the fuel line. If the idle setting is rich then the engine speed will pick up (increase) before cutting out. If it is too lean then the engine will simply cut out. You should always adjust so that there is a slight increase in speed with this test, but again when running in you should keep the mixture slightly richer. Reduce the idle speed further (if possible) and again pinch the fuel line to observe the change of speed, and adjust as above. Repeat this until no further speed reduction is possible whilst still having a reliable tick over.

Note that some carburettors have an idle throttle stop adjuster to set the minimum idle speed. This is not wanted on RC planes as you need to be able to stop the engine using the transmitter to close the carburettor fully. You should adjust the throttle stop screw so that the barrel of the carburettor can fully close.

The method of idle mixture adjustment depends on the type of carburettor i.e. air bleed or twin valve. The former is generally fitted to more basic engines such as the OS LA46 whilst the latter is generally fitted to higher specification (although not necessarily more expensive) engines:

- The air bleed type carburettors have a small air hole visible on the body of the carburettor and a screw threaded into the body, at right angles to this hole, is used to restrict how much air is allowed to flow through it, the less air the richer the mixture. This screw will normally have a coil spring fitted over the threads to act as a locking device. Turning the screw clockwise will make the mixture richer by closing the hole whilst turning anticlockwise will make it leaner (note that this is the opposite to normal mixture adjustment).
- Twin valve type carburettors have an idle mixture screw adjustment at the opposite end side of the carburettor to the main needle valve, which works in the same way as the main valve adjustment i.e. turning this clockwise results in a leaner mixture whilst turning this anticlockwise will make it

richer. You will need a suitable screwdriver to make this adjustment and, for safety reasons, it is usually done with the engine stopped. Note that the screw turns with the barrel of the carburettor so you should note the number of degrees you have moved the adjustment screw, in case you need to undo it.

Incidentally, I replaced an air bleed carburettor in my Thunder Tiger GP61 engine with a twin valve ASP carburettor from Just Engines, only because the alternative was less than half the price of the original's spare. The original carburettor body was damaged when the elevator linkage on the plane failed at a great height (I now prefer models that have a separate linkage to each elevator half ... although the fault was all mine!). This engine is still flying, following an ultrasonic clean and checking that the main shaft was not bent, and is a good starter.

Starting the engine:

Follow the manufacturer's instructions when starting the engine. Some advise to prime the engine (sucking fuel up into the carburettor) before starting whilst others (such as OS 46AX) advise simply using a starter motor to start the engine, relying on the engine to self prime ... which is how I now start all my engines.

If you are having trouble priming the engine and cannot block the carburettor's air intake then you can block the exhaust outlet instead. This only works when using a pressurised fuel system where a nipple fitted to the exhaust is connected to the fuel tank using a length of fuel tubing. Most two stroke engines use this system to maintain a more consistent fuel flow to the engine, whilst four stroke engines tend to be non-pressurised or have their own pump.

Remember to turn down the glow plug current on your flight panel when connecting the lead to your engine to prevent accidentally burning out the glow plug element.

What if the Engine will not Start:

There are a number of reasons why an engine may not start they which generally result from an excess of fuel, lack of fuel, failure of the glow plug, or an engine or carburettor fault. The last two causes are outside the scope of this guide.

The initial test, after an abortive attempt to start the engine, is to remove the glow plug and connect it to the glow start circuit (battery and lead, glow starter stick or the glow output from your flight panel). After testing, disconnect the electrical circuit but do not touch the glow plug until the element has cooled.

If during testing:

a) The element glows orange immediately - then it is likely that there is no or insufficient fuel getting to the engine, but you know that the glow circuit is working. Try resetting the needle valve as explained further below.

b) The glow plug element smokes for a while and then glows orange then this shows that the engine was flooded, but again you know that your glow circuit is working. With the plug out spin the engine using the starter motor to expel excess fuel, reinsert the now dried plug into the engine and try to start it again, If it floods again then the engine is probably far too rich, try resetting the main needle setting as described below.

c) If the glow plug does not glow orange then there may be a problem with the glow plug supply setting (if adjustable), the electrical circuit or the glowplug itself. Try a spare glow plug to see if this works. If it glows white and then stops suddenly then the supply is too high and you have just ruined a good spark plug ... turn the current down first! If the glow circuit was faulty then it is likely that you have also flooded the engine whilst trying to start it so you will need to expel excess fuel before inserting the glow plug for another try, after fixing the fault.

Resetting the main jet needle setting:

The following process should only be needed for a new engine. If the same engine ran okay last week but not today then you should be considering what has changed, for example is the glow plug loose, has the exhaust or cylinder head bolts come loose (it happened on my OS46LA), is there an air leak or a blockage in the fuel system, have you reconnected the pressure tube to the exhaust after filling, is there a kink in the fuel line, did you fill the fuel tank etc.

Pressure testing the fuel system will identify leaks which could otherwise take some time to identify, but is not easy to carry out at the field. I have spent several sessions with one model that refused to run reliably only to discover that there were pinholes in the fuel tubing. These are more difficult to identify when these leaks are inside the tank and even the brass tubing inside tank can corrode.

A blockage can be cured by forcing air through the tubing, the tank and through the carburettor (I use a car foot pump!) or at the field try winding the needle in until it stops (do not force) and then winding it back the same number of turns in case the blockage was due to dried fuel/oil residue in the main valve.

If the engine will not start then screw the adjuster all the way in clockwise until you feel resistance as the needle meets the opening into which it fits but no further. Wind the adjuster anticlockwise 2 turns (or the amount recommended in the manufacturer's instructions) and try to start it again.

If all else fails ask someone at the club for help!

Hydraulic Lock:

Be aware that if you trap fuel in the cylinder head and try to turn the engine over then here is a danger that the force required to do this will break something. This is called a hydraulic lock and if detected you should remove the plug, drain the excess fuel, and heat the plug to dry it, as above, before trying to start.

On Board Glow Circuits:

I have had a couple of engines that would just not run reliably, including my Super Tigre 2cc two stroke currently fitted in my largish Extra 330. Try as I may I could not get it to complete a tank of fuel without stopping, especially when doing aerobatics. The problem with this model is that it does not fly very well without the engine and doesn't like heavy landings! It's an older design model that's a bit on the heavy side for its short stubby wings and spends more time in the repair shop than it does flying (mostly due to dead stick landings) ... this is now my winter hack!

To solve the problem I fitted an on-board glow circuit. The one I use is from South Herts Models and this type monitors the resistance of the glow plug element to identify when it starts to cool and then supplies current from a NiMH cell to the glow plug to keep the engine running ... problem cured. If you are using one of these glow circuits follow the set of instructions which allow the engine to be initially started with an external glow circuit. I find that once the engine has started the first time of a session it can then usually just be restarted using the onboard battery beware of this when priming the engine for a second run! The South Herts system does allow the use of a magnet to boost the glow current for starting.

That finishes my rambling having just touched the surface of this huge topic, with many more expert than me. I hope this has helped in some way.

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