Andy Griffiths electric motors guide book part 3

How to make it faster

You've had the basic theory and also how to maintain your motor, now comes (judging by all your e-mail messages) what you've all been waiting for - how to make your motor go faster.

Stock Motors

I'm going to start with stock or standard motors as there is less scope for adjustment and are therefore more straightforward to explain.

A few of your messages complained about not being able to understand why some peoples stock motors are faster than others. Well to be honest, unless the fast guys are cheating (and we know that nobody would do that don't we) some of the performance difference will be down to production tolerances. Quite simply, stock motors are mass produced, the majority originating in Japan. It is just not economically possible to produce a top quality hand built stock motor and retail it for under £24.00. This means that the winding of the armature wire is not as accurate or consistent as those on a good modified motor so some will naturally be faster than others. The latest generation of stocks are better but this problem does still occur.

Try this

The other reason that some peoples motors may be faster is that they may be applying some of the following ideas. Try them yourself and I promise that you will notice some improvement.

Use high silver content brushes. These will give maximum power and rpm and their reduced lifetime is not a problem in stock due to the naturally short motor life.

Use pre run-in brushes. These brushes provide maximum brush/comm contact straight away which is what you need in a motor that is only competitive for 6-10 runs. They also mean that you don't need to run the motor in. (see next point!)

Don't run the motor in for long periods of time. With the high advance that today's stocks have, the motor generates a lot of heat in these circumstances and this can damage the magnets before the motor has even hit the track. Use run-in brushes instead.

Use extra heavy springs. These are necessary to reduce the arching and brush bounce that occurs with large amounts of advance, damaging both the comm and brush face. They also give more punch which is vital in stock racing.

Use comm drops. These improve punch by reducing the resistance between the brush and comm. Be careful to only use a reputable brand that will not go off during the race or leave deposits. Also only use small amounts and always remove any excess before applying more, otherwise you can end up with a rather unpleasant gunge factory inside the motor.

Get zapped!

Re- magnetising or zapping the magnets can help return the 'sparkle' to a motor that has gone off. The high advance on stocks generates a lot of heat that basically kills the magnets, resulting in loss of punch. This can happen in as little as two races or may never happen at all. If the magnets feel sloppy and not notchy when you rotate the armature (with the brushes removed) then the magnets have probably gone off. It's cheap and quick to solve - ring Power Products or MG Model Products who will be happy to oblige.

Be careful with gearing. Never gear to flatten your cells as you would in modified, you'll just kill the motor and loose punch. Sometimes a smaller pinion can actually increase top speed as it allows the motor to rev more freely. For a 36 degree motor, try around 9:1 but do not go beyond 8.25 or 9.25:1.

That's about it for stock motors. Follow the above and keep them clean (see last months article) and the performance gap will be narrowed. Mind you if you buy a descent stock in the first place you'll have no problems!

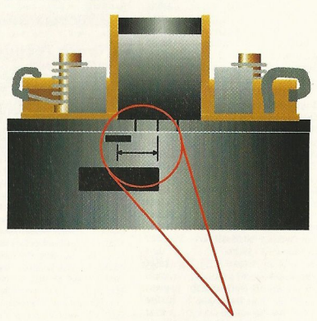
Modified

These are more complicated so you have more options.

Keep it clean

Skim the commutator as often as possible. It's better to skim often and only take small amounts off than to skim every month with a chisel. Most people have access to or know someone with a comm lathe these days so offer them a quid/pint/night with your girlfriend and I'm sure they'll oblige. Failing that, try Power Products or MG Models Products. This is the singularly most important part of the motor in terms of maintenance. I recommend skimming every 5-10 runs if possible, more frequently in on-road.

DIAGRAM 1



MEASURE THIS DISTANCE.
1MM=3 DEGREES

Only use top quality brushes

Use top quality brushes. This is second only in importance to the commutator. Old, burnt or worn brushes damage the motor and can reduce the punch and duration dramatically. In off-road, good quality brushes will last 5-10 runs at their peak. After this time the brushes go hard and start to loose performance. If the brushes change colour towards the contact face or look burnt, replace them - don't wait until they wear down. If this colour change occurs in less than 5 runs, you're using the wrong compound. Run hard brushes in Off-road, Silver in On-road.

On large tracks in on-road or all the time in 1/12, run cut brushes. These reduce drag and combined with lighter springs, give more duration. Never run cut brushes in Off-road - they cannot handle the current.

Run heavy springs in Off-road to reduce brush bounce and increase punch. Run medium/light springs in On-road to increase duration. Never run light springs in Off-road.

Don't use additives

Don't use motor additives in modified unless they are specifically designed (I haven't come across any I'd recommend) as the increased current can cause a nasty mess to occur.

Always fit 3 high quality 0.1 micro farad capacitors. These reduce motor arching and hence wear and radio interference. Some manufacturers supply caps that are too small in capacitance and these have little or no effect.

Use a good quality schottky diode.(only if your speedo is forward only) These help to increase the efficiency of the voltage regeneration under braking and stop the brake FETs in the speedo from overheating. Check your speedos instructions for details.

Check the magnets as described in the stock section. Magnets in modified tend not to suffer as much as those in stock as the advance is lower.

Check the bearings regularly by spinning an armature in them. If they are notchy, clean with motor spray and lightly oil, making sure to wipe off any excess. Bad bearings should be replaced as they can adversely effect duration.

It's all in the advance Setting the timing or advance on a motor is quite hard to explain. Basically the advance refers to the angle of the brushes in relation to the magnets. When perpendicular to the magnets the advance is said to be zero degrees. This is the point of minimum current draw and maximum torque. Altering the advance is done by loosening the screws that attach the endbell and rotating the endbell in relation to the can. Increasing the advance means holding the can still and rotating the endbell in the opposite direction to the rotation of the armature when the car is moving forward. (anti - clockwise if looking at the motor from the can end) This sounds rather complicated but take a look at the diagrams and everything should become a little more clear.

Changing the amount of advance effects all the characteristics of the motor, although fairly subtly. The changes do follow an exponential curve however so only ever make small changes. By altering the advance and the gearing you can sometimes tune the motor to suit the track.

Low timing/advance (0 degrees) = Low rpm, low current draw, high torque, peak efficiency and power at low amps

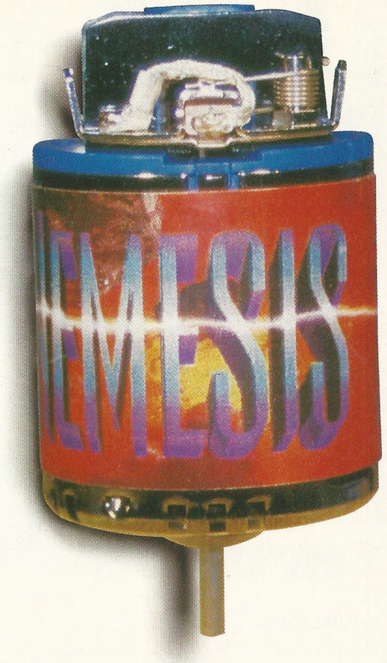


DIAGRAM 2

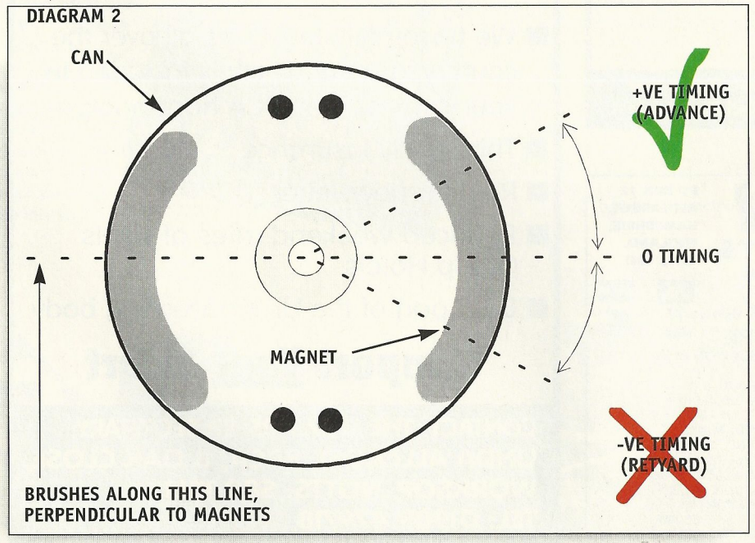
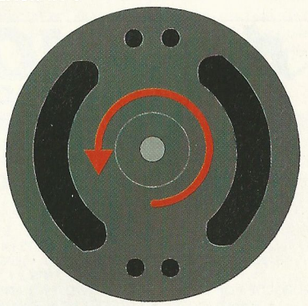


DIAGRAM 3



ARMATURE SHOULD SPIN THIS WAY WITH BATTERY + VE TO MOTOR + VE

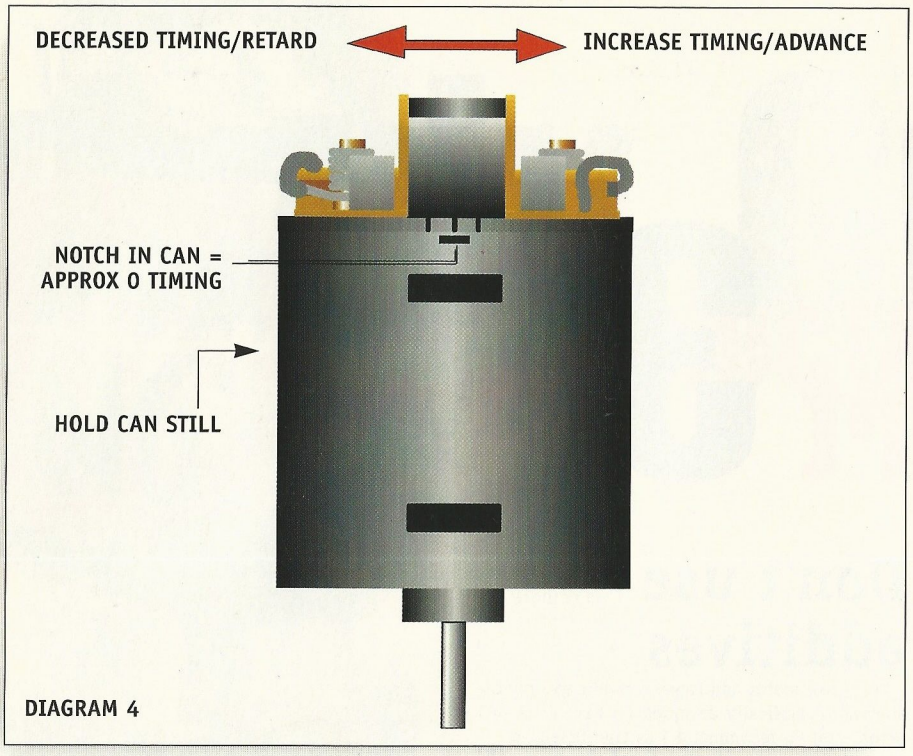


DIAGRAM 4

This setting is best used on big tracks when combined with a larger pinion.

High timing/advance (15 degrees) = high rpm, high current draw, high power, peak efficiency and power at high amps. This setting is best used on short tracks when combined with a smaller pinion.

As a rule of thumb, 1mm movement around the can = 3 degrees. In general, motors with a high number of turns require more advance than motors with a low number of turns. These are reasonable starting points :

10-11 turns - 3-5 degrees
12-13 turns - 8-12 degrees
14-15 turns - 10-15 degrees

Never go beyond 0 (negative timing) or above 20 degrees or the motor will over heat. Bear in mind that moving the endbell through 180 degrees will change the direction in which the armature spins - in other words you'll shoot off the start line backwards and look a prat. Always mark the can and endbell with a pen or suitable sharp implement so that you know that you can set the motor as supplied if everything goes wrong.

Unless you are sure that you know what you are doing, I would not recommend altering the advance. All good modified motors are factory set on specially designed equipment and making any adjustments could cause the motor to over heat and be damaged.

If you motor goes off or looses performance :

CLEAN IT.
CHECK/REPLACE THE BRUSHES
SKIM THE COMMUTATOR
CHECK THE BEARINGS
BUY A DECENT MOTOR!

If you've got any questions you want answering next month, e-mail me at teamagr@dial.pipex.com or write to the Ed.

Apparently a few people have been asking who the silver nail varnished hands from the previous article belong too (the Ed seems particularly keen to get a full length photo!). Well to be honest I think that it's nobody's business what colour nail varnish I wear in the privacy of my own home (silver cloud if you really want to know).

That's it for now. Next time - how to build your own motor. **RRCi**