

MIKE HASWELL

# RACING ahead

## MORE ADVICE FOR NEW RACERS

**T**here are a number of different brush sizes around, but there are only two types that are commonly used in RC cars and we will concentrate on those.

Firstly, there is the more common stand-up brush which is used on most modified motors and some stock motors. The other type is the laydown brush which is more commonly used in stock motors to get more wrap around the commutator.

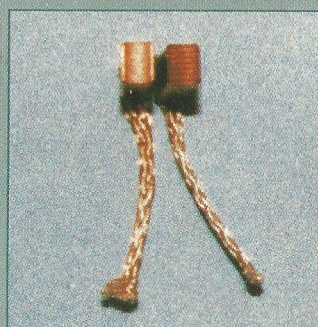
### What's in a Brush?

Brushes are made out of a combination of three materials:- carbon/graphite, copper and silver, these all have good points and bad points to them. The exact combination will depend on the manufacturer's specification. The manufacturers spend quite a bit of time trying to get the brush tailored for each different application.

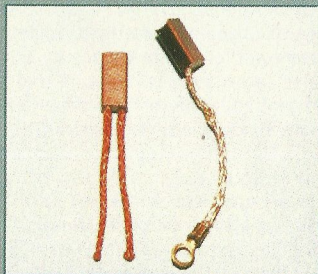
The carbon provides the lubrication between brush and the commutator but has high electrical resistance which isn't really what we want.

Copper reduces the resistance in the brush but will increase the frictional losses. It is also damaging to commutator and the brush as they are made from the same material.

Silver has the lowest resistance, although it is quite expensive, and is used with or as a replacement for copper. The disadvantage of silver is that it leaves a black deposit on the comm which can only really be removed by truing the commutator.



Full face brush (left) and serrated brush (right)



Twin braided brush - GM and a tagged brush

Brushes with a high carbon content will be easier on the comm and brush and will require less maintenance, one manufacturer has a brush which they reckon can do a 100 runs! High copper content brushes will be quite hard and will wear quite quickly, but have low resistance and are mostly used on modified motors. Brushes with a high silver content are really for competition use where that last ounce of power is needed and are not advisable for club use. Most manufacturers recommend that you use these brushes for 2-3 runs



Tagged brush (bottom) and untagged brush

before having a motor rebuild and this can add up to quite a bit of extra work.

### A shunt?

Brushes usually have a single shunt wire, but some do have a double shunt which gives slightly more power but increases the risk of having the brush stick (some drivers will cut off one of these shunts). The shunt is made of very fine strands of copper which are twisted together to be as flexible as possible to stop from hooking up the brush. The copper wire is more often 'tinned' and some manufacturers use a combination of tinned and un-tinned wire for their 'spec' brush. Most manufacturers offer the same brushes with or without an eyelet on the shunt wire. For the average club racer it is better to go with eyelet as it is easier to replace and eliminates any chance of a duff soldering joint. Most of the more experienced racers tend to solder their brushes as it gives a better contact and is electrically more efficient. If you want to do the same then make sure that you do not use too hot a soldering iron or use too much solder, as this can reduce the flexibility of the shunt. The advantages of soldering over used tagged brushes, is one of the questions I have been asked. To see how much of a difference it actually makes, I took a 13 triple and fitted it with a set of tagged Trinity 4383 silver serrated brushes (it was the only tagged brushes I had on hand

at the time) and ran it up on the dyno. I then cut the tags off the brushes, soldered them to the motor and ran the motor up on the dyno. The results showed a 1% gain in maximum rpm, nearly a 2% gain in efficiency and a 3.5% gain in power, albeit at a small increase in current draw as you can see in fig.1

Fig 1

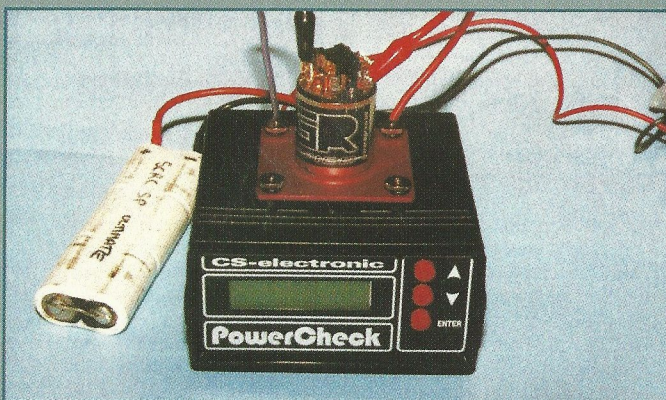
	Tagged Brush	Soldered Brush
Max. Power	96.56	99.98
Max. Efficiency	54.77	55.82
Rpm	31,198	31,523
Current Draw	8.71	8.84

However, most of these gains are under high load conditions and there was hardly any difference when the motor was drawing less than 20 amps.

### Faces

The normal brush has a smooth face, but there are also brushes available with different faces and these are usually for specialised uses. The serrated brushes are now becoming very popular with drivers as they have a shorter break in period and nearly all the manufacturers now offer this style of brush in their existing compounds. The important thing here is to have maximum contact so that motor delivers maximum power straight away. If there is too much of a difference between the radius of the brush and the comm, then you will get excessive arcing which damages the comm and reduces the life of your motor.

The CS dyno used in these tests



# this month Mike covers Brushes in the 540 clinic

In next months Racing Ahead, I will be looking at what the differing brushes actually do for you. As always if you have any questions or queries you can e-mail me at [Mike\\_Haswell@compuserve.com](mailto:Mike_Haswell@compuserve.com).

ARC