Dynastart – Hesitation Resolved

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For the past 45 years I have been involved with working on and restoring the Isettas. This started back in 1969 when my father brought out of storage the Isetta 300 he purchased new in 1957 and we got it back on the road again. Since replacement parts for these cars were not readily available (or we didn't know where to get them), we spent many hours rebuilding an engine with a damaged crankpin. We found we could press this crankshaft apart and install a brass bushing in the aluminum rod and somewhat restore the fit so the engine would run another 1000 to 2000 miles. But, then that is another story!

Over the years I have seen a lot of issues with these cars resolved. The issue we had with that crankshaft was resolved when I was speaking to Marylyn Felling one day and found that she sold the parts to replace the damage crankpin and a steel rod / rollers to permanently fix this problem. This was back in 1980 and since that time I have not had to touch my engine's crankshaft!

For about the past 14 years I have been assisting other Isetta and BMW 600 owners in restoring their drive-trains and brake to operating condition. In these years I have repeatedly run across one issue that has constantly baffled me. Why do some Isetta engines hesitate on the first revolution and then spin normally? The first thing that I look for when I would run across this situation is to eliminated the normal possibilities like shorted coils, bad solder joints and internal grounds. Many times I would find one or more of these issues and correct those deficiencies. But many times even after these issues were corrected, the dynastart just didn't seem to have the necessary torque to spin the engine over on the first revolution. Most of the time I would simply "write it off" as ageing insulation that breaks down under load allowing some loss of system efficiently. As seen in the next picture, it was not uncommon to see aged insulation that was cracking and missing some sections. The coil in the lower right of the picture is an extreme case!

There was just one problem with assuming that it can't be fixed, I can't stand to be defeated! Possessing a Bachelor's degree in Electrical Engineering and having a lot of experience with DC machines at work, I was determined to come up with a solution to this problem. So over the past few years I have spent a significant amount of time trying to resolve this issue and put it to bed for good. This has lead me to work through a number of issues with the dynastart. The first was to make my own replacement coils

for the generator section of the dynastarts. This seems to be the coils that are most often burned up and needing replacement. After trying to purchase these from various vendors only to find no one had any, I decided to start making them myself. After a couple of tries, I have perfected this process. This is the same process a motor repair shop would use. It would involve winding the coils on a mandrel, wrapping with motor insulation, dipping the coils in motor varnish, forming the coils to the contour of the dynastart housing and finally baking the coils to cure the varnish.

New generator field coils for Dynastart

The next concern was there seemed to be many of these dynastarts that had damage to the outer insulation of the starting coils. Since I had already developed the process for making the generator coils – I decided that refurbishing the starting coils would be the next logical step. This also was a logical step in eliminating partial grounding issues as one of the possible concerns with the first revolution of the engine having its noted hesitation. I have also successfully accomplished this task as well, but even this didn't completely eliminate the hesitation issue.

Three coils with new outer insulation

All coils wrapped, dipped and baked

At this point, I felt I had eliminated all the possible causes that could contribute to this hesitation, but yet it still existed. Here are the things that were checked and corrected. All solder joints including the joints between coils were checked and in good condition. The connection between the main post and the

first starting coil was in good condition. The solder joint between the last starting coil and the brush connections was in good condition. The armature was checked on a growler and found to be in good condition. I even went as far as to check the contact resistance and connections between the battery, starter relay and between the engine ground and the negative battery connections to make sure there was nothing elevating the resistance in any of those components. All checked good.

So what was left – the carbon brushes? From my professional work, I know that there are many different grades of carbon brushes that are used for different applications. I began to wonder if maybe the carbon brushes we are using on the Isetta could be introducing a variable that is reducing the torque the dynastarts can produce. I know for basic electrical theory that the following formula relates voltage, current and resistance:

$I = V/R$ Current = Voltage / Resistance

I also know that in a DC machine that current is directly proportional to torque.

The voltage we are using is the same as it has always been (12 volts DC from the car battery); therefore, the current will be dependent on the resistance in the circuit. Since the coils are known to be good and the armature tested good and all solder joints are in good condition, this left only one part that may be different. Are the carbon brushes we are using today the same as what was manufactured in the 1950s for these cars?

With all the work I do for various individuals, I frequently run across brushes that I know are original to the engine. I took one of these brushes and a brush that is currently available today and sent it to a brush company's laboratory for analysis. What they told me was no surprise since I was fairly sure by this time that there had to be a significant difference. Yes, the brush compounds were significantly different and the brushes used today have a considerably higher resistance than the ones used in the 1950s.

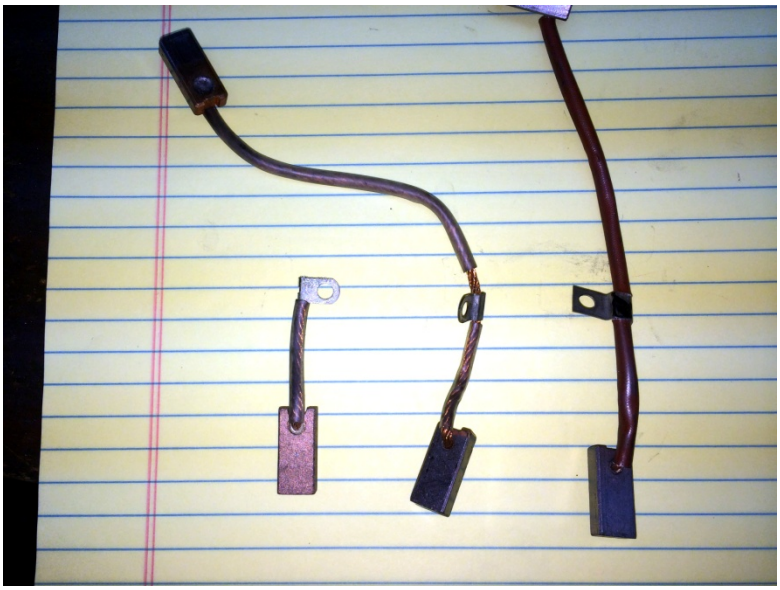
I asked if they could duplicate the compound used in the brushes from the 1950 and the answer was positive. I had them manufacture a set of "test" brushes so I could actually see the difference it would produce on a customer's dynastart I currently had in the shop. Those brushes arrived a few weeks ago and the difference is amazing! The dynastart with the currently available brushes hesitated every time on the first revolution of the motor. The same dynastart with the "test" brushes in it spun the motor like a top!

Conclusion:
The motor brushes that are generally available from various suppliers are not the same as the brushes that were manufactured in the 1950s. My guess is that like many other things, substitutions have been made and the consequences of those substitutions are not always immediately realized. I for one hated to see this as I have about 60 sets of these modern brushes on my shelf that are now trash!

Provided that you have corrected the other issues (solder connections, insulation condition, etc.) and are still having trouble with hesitation on the first rotation of the engine, I believe these new brushes will

solve this problem. If you have interest in these brushes or other services I offer, you can contact me at roge1033@bellsouth.net. You can also see some of my work at www.isettadoc.com.

Below is a picture of the new brushes I have for sale and the modern substitutes that are being made available by most parts suppliers. The new brush is the one on the far left. It is somewhat difficult to see in the photo, but the one on the far left has more of a copper color than either of the other two.



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