By: Peter McDowell

Setting The Timing

Don't "Set It And Forget It"

The idea for writing this story came to me after some recent work for a wooden boat shop that I often restore motors for. He called in need of some emergency work. He had a 1957 Johnson 35hp electric start that belonged to a customer of his. It had been at a local marine repair shop that he used for minor work like tune-ups. The mechanic had the motor for over a month and was unable to get it running satisfactorily. The mechanic was giving up. He asked me if I could have a look at it. The customer was all over him wanting to know what was taking so long. He dropped off the motor with the following report, motor starts and idles well, was lake tested and would not go to full power, seemed to be running on one cylinder. The mechanic says it has good spark on both cylinders.

I did some tests, removed the spark plugs and checked compression, 120psi on each cylinder, very good. I removed the carburetor and intake manifold to look at the reeds, all was well. Then I attached external spark gaps and pulled over the motor with the manual starter. Occasional weak spark on one cylinder and nothing on the other. Outboards should have a clean blue spark that will jump a 3/8" gap at manual starter speeds. I spoke to the mechanic, he used one of those inline neon testers that connect between the spark plug and the plug lead, to confirm the presence of spark. If any of you have one of these throw them in the garbage. The problem with them is this, if you have good high voltage at the plug it will (correctly), light up. If you have very low or no voltage at the plug it will (correctly), not light up. However, if you have a low to medium voltage available at the plug it will light up (incorrectly), indicating a good spark when, there is not a good spark. A healthy voltage to get a spark in a cylinder under compression is at minimum about ten thousand volts. I re-installed the plugs and placed my neon testers in place. Turning the motor over with the hand starter lit up both testers. I still have these things though I never use them. They are just not reliable.

Removing the flywheel I found the following: one new coil, one old but not original coil of late 70's vintage, points and capacitors looked new, boots looked to be original, wires were not new or original, the older coil had the ground wire abraded half way through by contact with the centre hub of the flywheel, poor routing to blame here, point gaps were .020 but the surfaces were badly oxidized, not pitted just oxidized, a dull grey colour. I replaced the old coil, the wires and boots and polished the points with 1000 grit sandpaper. I tested both coils and both capacitors on my Mercotronic and all tested OK. So nothing seriously wrong under the flywheel. Just to confirm that it wasn't the oxidized points I reinstalled the flywheel and manual starter and still had poor spark.

So what could it be? Brand new boots and wire, Mercotronic testing proved all coils and capacitors to be good and the points were polished clean. Coils were installed with the correct installation tool for proper spacing from the magnets. No wires are pinched or grounded out. I don't have a magnetic field strength tester (who does) but when I placed a wrench near the magnets it held on pretty good. Most if not all motors after the second world war use Alnico magnets which won't need recharging for probably a hundred years or more. On some of the smaller HP OMC motors the timing cam has a slot cut in it, that goes all the way from top to bottom, and they can be put on upside down. This is something that needs to be checked on the smaller motors and is why those cams have "TOP" cast into the top surface. I think, but am not sure that all the 3hp to 18hp motors have this kind of cam on them. The 25-30-35hp motors have a cam where the slot only goes part way through so it cannot be installed upside down, so that's not it.

So what's left? The only thing I can think of is shown in Picture #1 below. All the OMC magplates have these two vertical lines cast into the front of them (the front when it's mounted on the motor).

These are the timing marks. They can be used a couple of ways. One is with a timing light and two corresponding marks on the flywheel. On some flywheels the marks are cast into the sides of it and on others they are cast or stamped into the bottom of the rim (see Picture #2 below & Picture #3 to the side). The marks on the flywheel are 180 degrees apart, one for each cylinder. With the motor running and a timing light connected the mark on the flywheel should be in-between the two cast marks on the magplate when the plug fires. In the middle is perfect, slightly off is OK, outside the marks is bad.

Picture 2

Another way to use it is with a timing fixture (see picture #4 below). Along with the timing fixture you need a multimeter with an audible continuity function or a battery and buzzer, light or bell. I also recall seeing in an old service manual, plans on converting an old flashlight to suit the task. After

Picture 4

Picture 3

removing the switch from the flashlight and soldering wires to the two terminals, also solder alligator clips to the other ends of the wires. Whatever you choose, multimeter, modified flashlight or battery and bell etc, they are used as follows. Remove the flywheel, and install timing fixture. Remove all wires from the points. Rotate the flywheel until the mark on one end of the timing fixture is centered between the two marks on the magplate. Attach the two leads from whatever testing device you are using, one to the magplate and the other to the points. Make sure you are connected to the correct set of points. The ends of the timing fixture are marked "T" or "B" for top cylinder or bottom cylinder. With this setup the points are now acting as a switch to turn on and off the device you have connected to them. That way, with the timing marks lined up, you can close the points with the adjusting screw, turning on whatever you have connected to the points. Then by again turning the adjusting screw, turn it so the points just open, indicated by the device attached to the points turning off.

The idea here is that you want the points to open when the induced current (from the passing magnets) in the primary winding of the transformer (ignition coil) is at it's maximum, regardless of point gap. That point is when the mark on the flywheel or timing fixture is between the two marks on the magplate. If everything is built exactly to spec a point gap of .020" will do this. Contrary to popular belief, **POINT GAP DOES NOT MATTER!** The only thing that does matters is that points open when the primary current is at maximum. With large scale mass production sometimes things slip up and point assemblies are not built exactly to spec, or the point mounting post is not located in the correct spot on the magplate. It doesn't have to be off by much to make a difference. That turned out to be the case in this particular motor. With the points on it set to .020" the points didn't open up until about 2" past the timing marks. Without getting out my old high school protractor (even if I could find it) and measuring it looked to be about 30 degrees too late. That's a huge error and why this motor could not reach full power.

I reset the points using the timing fixture, ignoring gap. Then re-assembled the motor and ran it in my test tank, it reached full power no problem. I still used the timing light just to confirm it. So that was it all along, the timing was off. So what did the mechanic do wrong? He used the Ron Popeil "Set It and Forget It" method with the points (I think Mr. Popeil was selling turkey ovens when he came up with that slogan). If you want to be successful at repairing motors everything must be suspect, even brand new parts. He should have used a timing light on the motor and he would have seen how far off it was.

I'm sure some of you are thinking, "I don't have one of those fixtures, what can I do? The timing fixture is basically like a narrow strip cut from the flywheel, including the hub and keyway slot and the two timing marks. If you don't have the timing fixture (I have 4 of them, 3hp, 5.5-18hp, 25-30-35hp and 40hp, there may be others) you can use the flywheel. Remove the flywheel and all the wires from the points. Then lightly replace the flywheel without the nut, and then rotate it until one of the timing marks on the flywheel is centered between the two timing marks on the magplate. Then remove the flywheel making sure not to rotate the crankshaft, and use the flashlight-multimeter or whatever to set the points. Lightly replace the flywheel and rotate it 180 degrees to line-up the other timing mark and then remove the flywheel and adjust the other set of points. After reassembling and running the motor you should still check it with a timing light.

You should never "Set It and Forget It". I always use a timing fixture to set the points, never the gap method. I figure that the little bit of extra time it takes to do it this way is saved many times over by not having to disassemble everything and redo it.

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