

Expanded SU needle selection!

I bet you thought there were two types of needles?

By Tony Rhodes, Delaware Valley Triumphs

If you have ever improved your Triumph engine, you probably had to grapple with the issue of fuel mixture. In general, a higher performance engine needs a somewhat richer mixture, and a somewhat richer needle setting, than the same engine with lower performance. Almost always, the stock needle on the SU or Zenith-Stromberg carburetor is not correct. Often the problem can be partially masked by simply running the carbs richer, but almost certainly this results in suboptimal mixture settings at some throttle positions.

If you then looked for new needle profiles which may suit your carburetor better, you may have gotten lost very quickly. The ZS carbs have a fairly limited set of needles. SU needles more much more varied. We will discuss the SU needles here.

SU needles come in two basic flavors; Fixed and Biased. A fixed needle is rigidly locked into the piston which travels up and down in the suction dome (Figure 1). The pointed end of the needle sticks into the jet. The taper of the needle allows a gradually richer mixture as the piston rises in the dome and exposes a narrower needle cross section at the jet orifice. The fixed needle is required to be precisely centered (within a few thousandths) in the jet. If it is misaligned or bent, then it will bind against the side of the jet. This binding will hinder motion of the piston and needle, and will create rapid wear of the needle and jet. Since it requires such precision, it is easy to mess it up when you clean and rebuild the carburetors.

To make the carburetor needle and jet alignment less prone to problems, in about 1968 they designed a new style of mounting of the needle. The impetus for this change was NOT that it made a better carburetor. Instead, it was emissions regulations. A binding and worn needle and jet can have worse tailpipe emissions. So, they made this new design that has a soft-mounted needle that is spring loaded and tipped a few degrees to one side. This forces the needle to be in contact with the jet wall, but the contact is supposed to be rather light so that binding is not encountered.

The problem with this design is that it requires ANY contact of the needle and jet. With contact, there will inevitably be wear. When there is sufficient wear,

then the mixture will be wrong and emissions will be worse. The benefit to this design is that instead of a few REALLY badly aligned carburetors making REALLY bad emissions, the new design will only gradually have ALL the carburetors go off. Since most of these cars were expected to have limited service lives, and with “routine” maintenance, the carburetors would have reasonably accurate settings. Our cars are all past their expected service life. Also, who knows what “routine” maintenance of the carburetors is? Where does one GET routine maintenance? I guess we are supposed to go back to the dealer....



Photo 1) Various SU carburetor needles and other needle attachments. From the left: The biased collar attachment removed from a biased needle. The bushing that loosely holds the biased needle. The spring that gives the biased needle its spring action. A biased needle with the collar in place. A biased needle with the collar removed (note the knurled top to retain the collar). A fixed-type needle.

We probably do give our cars better maintenance than most owners were expected to have done when these cars were new. However, carburetors still remain a “black box” to most of us. Carburetor rebuilds are rather expensive, so carburetor maintenance, of all sorts, is placed on the back burner until there is an obvious problem. For the most part this is a practical approach. For carburetors with fixed needles it is the very best approach! Fixed needle carburetors can go virtually forever with no maintenance of the jet and needle. Unfortunately, biased carburetors do need maintenance of the needle and jet. It is actually not

too hard to do this maintenance, but it is usually never done.

This gets me to the crux of the article. In a previous article I wrote about fitting UK-specification carburetors to a US TR7. That conversion worked great! However.... I think you could see the "but" coming. I had to re-profile the needles because I was getting a lean misfire at maximum throttle and high RPMs. I made the needles richer in the high rpm region. The misfire was solved. When I took out the needles to work on them, after 1000 or so miles, I saw definite wear on the side of the needles. So I got new needles to re-profile.

This wear issue got me to thinking that it is possible to get/make an adapter which is like the bushing used for spring-loading the needle, but instead holds the needle rigidly. There are two types of needles, as you may have guessed from the discussion up to this point. On the tapered section of the needle, the two types are essentially the same. Biased and fixed needles have different bases for the different mounting designs. The fixed needles have a plain 1/8" diameter shaft. The biased needles have a flange at the very end to control how far to the side they are biased. Additionally, a similar bushing could be made to hold a fixed needle rigidly in the piston as well. An adapter to mount a biased needle in a fixed manner would have to be flat on the top to accommodate the flange. It would have to be fairly precisely machined to length to exactly match the base of the needle. A similar adapter could be made to hold a fixed needle rigidly as well.

I had other projects (and articles) to do, so this problem was set aside. I recently got some new SU carburetors for my TR4a in hopes that this may help my persistent mixture tuning problems (which they did NOT fix). Since my original carburetors were made in 1966, they were of the fixed needle type. The new carburetors have the same identifying number tag as the originals. I took off the suction dome to check the numbers of the needles to verify that are the correct profile for my car. You can imagine my surprise when I found that these carburetors had BIASED needles! The correct needles for my carburetor are a fixed type of needle. So, what gives? When I removed the needles, they had the flange for biased applications as expected from the fact that they were soft-mounted. But the numbers on the needles identified them as TW which is correct for my car. Something interesting was going on. These were fixed-type needles with a biased collar. I strongly doubted that they machined a run of these

needles with a biased base flange. I had always thought that the flange was machined directly on the needle. Now I was suspecting that the flange was a separate part which was press-fitted in place.

At the same time, I did some checking and found nothing on the Internet describing any such adapters. After an arduous search, some helpful souls on the Internet Triumph bulletin board steered me in the right direction. This eventually led me to Joe Curto as a source of such parts. I had actually started the search with him several months prior, and he seemed to say that such an adapter was not available. I think I was not clear about what it was that I was looking for. Once I knew what to ask for, his only question was "how many"! He also helped me by telling me that the jet bearings are different for the biased and fixed needles. The neck where the jet fits in the carburetor body is smaller diameter for the fixed needles allowing some centering adjustment. He recommended a lathe, but I have no such thing. Instead, I was able to mount the bearing in my drill press and then I used a fine file to turn down the diameter by about 0.020". It worked very well! These adapters are only to fit fixed needles in a biased piston. There is no adapter to mount a biased needle in a fixed manner for either biased or fixed pistons.

This brought me back to the question of whether the flange is a separate part of the needle. I drilled a hole in some metal just the size of the root of the flange. I took a punch and tried to drive out the needle from the flange. POP! Out it came. Biased needles are made the same way as fixed needles (probably from the same blanks) and then have a flange pressed on! The end of the 1/8" base of the needle has a knurled section which probably needs to be turned flat again, but it is possible to use biased and fixed needles interchangeably for all applications. All you need to do is add or remove the flange!