

# Borescoping

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Borescoping

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First, one must understand that borescoping an extruder is not going to guarantee that this will correct all problems. Many other areas must also be looked at as will be suggested here. And everyone knows that many extruders have been running for years without borescoping. What I am trying to do here is to show you that by aligning an extruder with a scope, you stand a much better chance of running better product with less down time, less scrap and extending the life of the barrel and screw, these being the heart of the machine and being very costly. Most extruders can be adjusted in alignment in one day. The cost is really small, especially if we can extend the life of the extruder 25% and more. If you figure an average barrel will cost \$12,000 and a new screw cost \$9,000, your looking at about \$21,000. If we can extend this life only 25%, you just saved over \$5,250 in replacement cost alone, plus better quality and more production..

I think what you should be looking at is not that you can make an extruder work without aligning it, but that you can improve production and extend the life of the machine if you do align it. Alignment involves a small cost compared to the savings you can achieve.

With an alignment scope, we can tell exactly what the shape of a barrel is at any point, whether it is straight, curved or even "S" shaped. The clearance between an average barrel and screw is about .008" total, this is only .004" on a side. Small diameter screws, say up to 2" in diameter, have the flexibility to align themselves some what with the compound being processed as long as your compound is at the correct temperature. However, it has been my experience that an extruder 2-1/2" in diameter and larger should be aligned properly, not just leveled, but aligned.

The larger the extruder, the more critical it is that it be borescoped. The larger the barrel and screw, the stronger and stiffer the screw is, and it does not flex with the compound it is moving as easily, therefore, if it is not aligned correctly, it can rub on the barrel generally in the weaker area such as where the root diameter is the deepest and near the output end.

There are several factors to consider, especially when working with a used barrel, first, the barrel must be clean. One way of doing this is to bring your temperature down to about 200 degrees F, open the front of the barrel and slowly pour P.V.C. pellets or regrind into the feed section and run at a slow speed watching the amp load being sure not to overload it. Do this until the compound comes out as it was put in. This will wipe out almost all of your material and leave the barrel and screw quite clean.

If you still have material in the barrel, or part of your screw has rubbed off and is stuck to the barrel, then you should use a hone and clean the I.D. before aligning it. Sunnen makes an excellent one that I use. The price varies with the size of the extruder, but it is not expensive and does a good job. If the barrel is not clean, you will get a false reading as you will be measuring the material instead of the barrel.

After cleaning the barrel, you now need to measure the I.D., this can be done several ways. I like and use an electronic measuring device that I built. First you mike the end of the barrel. (The last 1/2" or so does not generally ware as the screw flight does not extend that far. You will find in most cases that it will be nominal size there.) Now, because some extruder manufactures make the barrel to size and screw under cut, and some make the screw to size and the barrel over size to achieve the clearance, you will now know what your machine is. At this time set up and adjust the electronic mike to the I.D. and now are ready to measure the entire length of the barrel.

If, lets say, you measure 4.500", you set the electronic mike to read 4.500", then slowly push the mike sled to the feed end of the of the barrel, with a string attached, slowly pull the mike 4", 6", 8" at a time, watching the electronic meter and recording your readings. Checking your readings against nominal, you now know the condition of the barrel, these I.D. readings you need to consider when you scope the extruder. If you have a worn barrel say, .012" oversize, and your scope reads .010" low, in reality, the centerline of the barrel is only .004" low. This is because the mike is measuring the total I.D. and the scope is measuring a center line resting on the bottom of the barrel, or 1/2 the I.D., 1/2 OF .0 12" is .006", and from your reading of .010", you are really only .004" low from center line.

If you have a fairly straight barrel, but it goes off in some direction, up-down, left-right or both, now it gets tricky. There are many ways to correct the alignment, the problem is, without an actual situation, I can not say this is what you do. You may be able to simply adjust the barrel support to correct the alignment, or you may have to do things like, use shims under barrel supports, feed sections, or part of the entire gearbox. Keep in mind, that just setting the output end in alignment is only part of the procedure, you must keep checking the feed end and center sections along with the output end.

In adjusting the barrel, you want to have a slight droop as you move away from the feed end.

The larger the machine, the more droop. An average is .010" for a 4.5" extruder. The reason for this is because when the machine heats up, it can only go up as it is bolted to the floor and cannot go down. If you have a large metal support like a Davis Standard machine with a large barrel flange, you need to allow a little more droop, if it is a small metal support against the barrel O.D. like a Prodex, then you need a less amount of droop.

You may find that on some extruders that have a cut out in the spacer between the gear box and feed section, that the high pressure over the years has actually bent the spacer in a direction opposite the cut out. The only thing you can do to correct this is to remove the spacer and have it machined true again. After you adjust the extruder into alignment, a finale check is to install the screw, this should go all the way in by hand with no bind.

- Malcolm J. Srinson, Jr.

See also:

- Barrel and screw wear
- Borescoping an extruder - is this a worthwhile expense?
- Extruder alignment
- Misalignment
- Where's the wear? Part II

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