

# Borescoping an Extruder

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Borescoping an extruder - Is this a worthwhile expense or a myth?

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Let's start at the beginning of this method of finding out whether an extruder is correctly aligned right from the gear box, feed section and barrel. To do this, one must have some means of finding a center line through the exact center of the extruder. This has to be portable as it would be costly to set one up in every plant.

Back in 1967, we purchased a K & E alignment telescope and a K & E target, then different adaptors were tried until a good working set of tooling was developed that could be used on extruders.

Let's look at why do we need a center line of the extruder? Most extruding machines are built with the thrust bearing and shaft assembly and the output shaft of the gear box is considered to be one unit. Now think about what holds and turns the screw, right, the thrust shaft. So what it appears then, is one should build the machine around the center line of the thrust shaft. If the thrust shaft is going to hold the screw in a certain position, doesn't it make sense then to align the feed section and barrel around this center line? Sure it does.

Now why the need to build this so close to the center line? Let's start with the close tolerances between the barrel and screw, most of these will average only an .008" total clearance, this is only .004" clearance on a side, pretty close don't you think? Being that the extruder is designed to shear, melt and mix the plastic material to give a good uniform flow, let's think about a machine that is way out of alignment. In one place the screw is hard against the barrel, no shear, no mixing, but we do have a hot spot generated from frictional heat from the screw rubbing against the barrel that will melt the material hotter and faster, now we have an area of material that is of a different consistency, hold that thought a minute, and think about the other side that has all the clearance, now we have material rolling over the wide gap, not shearing or mixing as well, now this material is cooler and harder than the area we were talking about a minute ago. Think about what happens when you have material flowing that is an uneven temperature, pulsating and surging has to take place, it may be a very small amount or you may have seen this so bad that it was hard to hold a size.

Another area of concern, think about the cost of a barrel and screw. Would it not be worth the cost of aligning this machine and extending their life? The longer you can keep your machine running without repair cost, the more profit you make.

A misconception that so many people have is that they figure that the machine was built by professionals and the big steel base will keep it aligned no matter what. This is a long way from the truth. I can and have (to prove my point) set up the scope, and moved the end of a barrel as much as an inch or more while holding the rear of the base solidly in place. Another misconception is to get the machine level and it will be in alignment, this is a good place to start, alignment and level are two completely different operations. Although it is good to level the machine, that does not mean that it is in alignment. The only way to check alignment is with the proper equipment that is designed to do just that.

This is so critical that whenever a machine is moved or the gear box, feed section or barrel has been disturbed in any way, it should be aligned again.

After aligning a machine, I always like to put the screw in as a final check. I often have the hardest time trying to convince the customer that we do not want to heat the barrel first. I often am told that you can not get the screw in without heating it first. Think about this, what has happened here is that the machine was out of alignment, a heated barrel is a little larger, the screw is cold and on size, so it will go in easier. And when I slide the screw in, by hand, all the way with no bind, they are finally convinced.

If your machine is a large one and has a center barrel support, this can be tricky, you have to keep readjusting the center and end support until you reach what you want in all locations.

If the machine is an older one, before you even start to align it you must first check the lift in the front and rear bearings, if this is excessive, the gear box needs to be repaired first. You don't want to align a machine around a center line that is in fact not really the center line.

Another thing that I have found, is a customer installs a new barrel, puts the machine together, runs it and tears up the new barrel and screw. The customer is in a tough position at this point, he calls the supplier for help and all he hears is was it aligned properly before running it? On the other hand, I have checked some barrels over the many years I have been doing this and found that a few were bent by the supplier, now the customer has no problem. the supplier has had to replace it at no cost to the customer. Wouldn't you rather be in that position, than be responsible for some if not all of the costs involved?

Also, if you are installing a complete line, your center line is quite often very important. with the scope set up on your extruder center line, what better method of finding your center line could there be? The scope can find the center line to within .0005" anywhere along the line that you may want. And it is accurate for several hundred feet in front of the extruder.

This means checking a machine can also be used to find out if the floor it is on has moved, I have found a few extruders that the heavy hopper has caused the machine to sag in the middle, and caused excessive wear on the barrel, feed section and screw.

Be careful as to who you get in to scope your machines, just because a man comes in carrying \$10,000 worth of bore scope and tooling, does not mean he knows how to use it. I have had the opportunity to watch some people scope a machine and they have no idea what they are doing.

— Malcolm J. Stinson Jr.

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- Barrel and screw wear
- Borescoping
- Extruder alignment
- Machinery installation
- Misalignment

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