By Bob Merritt - WAM 10-2012

I must confess that some days I wonder how some of my first engines ever lived!

As a vo-tech student in high school I did an internship in a Dodge Dealership in the fledgling Iacocca years. There was a 440 6Barrel GTX with a 4 speed and a Dana on the back row sitting next to a 70 Challenger RT/SE 383 4 speed car. These were abandoned for work done that the owners could not afford and who knew how people were going to afford gasoline when it skyrocketed past 50 cents a gallon…musclecars were not in great demand. I remember my dad trading a 64 nova 4 door that ran for a 64 300 K dual cross ram car that did not…due to a broken timing chain. He still smiles on that one even at 82 years of age!

The first engine I built was a 318 with about 106,000 miles on it. It had .006" taper and just barely enough that I had to use a ridge reamer to get the pistons out. By the time I got done honing it, (My first time) I am sure the cast iron rings thought they were running in a funnel. The 2 bbl heads were also the unlucky recipient of my first valve grinding efforts but that is the source of a future article! Suffice it to say the valve stems were at enough different heights that it resembled a roller coaster rail rather than a straight line…

Sometimes you get lucky though, That engine with the help of a 340 cam and windage tray and a 3.54 Dana pulled a 3600 lb roadrunner to 95 mph trap speeds! I just sold that steel crank short block to a friend and he is boring it for his son's first car. I took it out to prep the 383 hp as part of restoring the roadrunner and it was still running strong.

What I think about on that cylinder preparation is that I had a good cross hatch pattern and the rings did in fact seal…the lucky part was that I did not check **ring end gap** or **skirt clearance** just in case.

This topic is very involved but can be boiled down to some simple application questions and with attention to detail can be very rewarding for a car lover.

When you decide it is time to rebuild a musclecar there are some things you need to ask yourself.

First, what are your goals with the car? I remember building a 60k standard bore 340 as a re ring job once. I purposely chose cast rings with no chrome face so that the cylinder wall wear would be minimal.

The thought was that as time went on the standard bore block would be able to be rebuilt more times and as the cars values rose…might be kind of nice to do that. (I drive em).

Second, if you have definite performance plans for the car or truck…you will need some good pistons and a great machine shop. For moderate performance with under 6000 rpm operation and no plans for nitrous…get the compression you want and the smallest bore size that will clean up the wear you have.

A cast aluminum piston is fine for this. I usually look thru the catalogs to find the best factory application. For example, a '71 360 piston is readily available and is very cheap…and has no compression lowering dish like the '72 and up versions.

So you have picked your pistons, in this case a cast one and we can follow up in subsequent columns on forged, or hypereutectic…basically wherever the readership has questions …

Now on to the machine shop, you can ask around in your county of the Mopar™ nation and see if your buddies have a good one they use….what you need is a good reputation, price list and hopefully they already own the torque plate!

My goal with this article from here is to get you to thinking about the options and specifications that need to be selected and checked so that your engine stays together a good long time. It is no fun to wear the bolts out taking things apart you just put together! The .030" over 340 I built is still sipping a sparing diet of Mobil 1 after a careful build in 1980. I used the best methods, forged TRW pistons and a fantastic machine shop…and it is still running great… so that is an economy engine build!

The technical items that you need to think on are **piston skirt clearance** and **ring end gap**.

There are two trains of thought on skirt clearance checking. Some folks like using a feeler gauge and snake it in between the skirt and cylinder wall from the oil pan side with the engine on a stand. I am ok with that having actually done it enough…to know the pitfalls. If you think of a .0035" spec for cylinder wall clearance (Turbo Dodge cars use this as the actual wear out limit!) there is not a lot of feeler gauges that are less than a half inch wide. By the time you fold

and wedge the thing in there it is taking up sometimes a third more space than its marking standard represents. Think of wadding up tin foil to make it fit in a bigger space!

Most machines shops will provide you this spec for each cylinder wall they deal with. They will assign a piston to a bore when finish honing the block just in case there is a half thousandths' difference from one piston to another. They will actually measure the piston and finish hone the cylinder it is going to run in while the torque plate is still attached.

BTW, I have watched and measured a few of them while unbolting out of the torque plate and a half thousandth to a full thousandth of an inch *wider* bore is actually pretty normal. For years until I started looking at this in depth I thought the torque plate just allowed the distortion (caused by the head bolts pushing out into the cylinder as it pulled) to be ground out in honing. In actuality there is a greater gain. The entire cylinder can become slightly football shaped when the cylinder head is bolted on. The torque plate method gives a perfectly repeatable and straight bore for the piston to run on.

I think I just said that the most accurate method for determining piston skirt to cylinder wall clearance was to use micrometers and make an accurate measurement of each! Now I also understand the concept of the go no go gauge! If I can stick a .0035" feeler gauge in there it probably means I have more like .005" or a bit more…so If I am worried about the engine being too tight..fugedaboutit!

Now we are ready to install some pistons…and the first thing is to take the rings out of the package and check ring end gap. One way to do that is to use a piston with no rings on it as a gauge to make sure the ring is square in the bore. Put the top ring in the cylinder with the markings up. Then carefully push it down in the oiled cylinder. Pull the piston out & use a feeler gauge to measure the ring end gap. Start with the one that fits easily and increase .001" at a

time till it is a snug fit. Write your measurement down and move on to the next cylinder and ring. I usually leave them in the bore to avoid confusion. The general rule of thumb for rebuilds is to allow .003" to .005" per inch of cylinder bore. A good middle of the road number for a 4" bore would be .004" or 16 thousandths of an inch of clearance at room temp. This is a great compromise between cylinder wall sealing / blow by and having them too tight. In the event the gap expands and closes up…the ring butting will prevent the ring from sealing. Now you have a high rpm horsepower loss that was totally avoidable.

You might ask, how do I change the way the ring is? The answer is as simple as buying an inexpensive ring filer and get after it. Practice on your old rings and file on just one end so you can use the other as a standard to see if your cutting it off square with the good side.

Here is the one I have bolted to my bench. Proform is the manufacturer and it was 57 bucks off amazon.

Most machine shops get upwards of 60 dollars an hour for this so if you want to take a stab at it…by all means… go for it. I have a few different manufacturers' clearance specs and you're welcome to them if needed. I will tell you however just like my 7th grade wood shop teacher told

me…be careful to measure twice and cut once…So you don't cut it off two times and it have it still be too short!

The coolest bit of dyno work I have heard of lately comes from SpeedPro™. It concerns making the gap on the second ring larger than the top one. They have documented that when you trap cylinder pressure between the rings…it floats the top one off its seat and allows high load horsepower loss!

But when you use say a .004" spec for the top ring and a .005" spec on the second ring…there is no pressure trapped and the top ring actually seals better as it is slammed down on the piston land firmly and there is no pressure differential or Inter-ring pressure as it is called.

Here is a clip from the SpeedPro™ Ring installation guide that expounds on this:

"This larger "escape" path prevents inter-ring pressure from building up and lifting the top ring off the piston allowing combustion to get by. Many engine builders have reported lower blow-by and horsepower gains at the upper RPM ranges with wider second ring gaps. Also, almost every new car made is using this inter-ring pressure reduction method to lower blow-by and emissions and to increase engine output.

The more potential power and loading the engine is capable of, the more the potential loss.

Did you notice that last sentence in the Speed Pro clip that said OEM's are doing this to new cars engines? I have seen some sneaky (read way cool) things in the assembly plants for engines and effectively they are blueprinted now right off the line.

Maybe that's how they can make 'em so good and sell 'em so cheap!

Bob

fixitfirstime@aol.com