

# Wixom Performance Build Center Open House, July 23<sup>rd</sup>, 2007

Early this year, even before the date was announced, I set a goal of attending the Open House at the Wixom Performance Build Center. The Performance Build Center is where GM assembles the LS7 engine for the C6 Z06. This was going to be my chance to see where the engine for my 2007 was assembled and I intended to be there if at all possible. I knew GM was going to limit the number of attendees so I made sure that I was online the day registration opened.

July turned out to be a busy month. At the beginning of July I attended the two day High Performance Driving Event at Virginia International Raceway which was organized by the NCM. That really turned into a four day event because of the drive to and from VIR. Now I was looking at a trip to Wixom Michigan in the same month and to keep things relaxed I decided to make it a five day trip allowing two days each way for travel and one for the open house.

A little background information may help. I decided to go for the full Corvette "experience" with the purchase of this car because I had a very long wait for it. This is my first Corvette although I nearly bought one forty years earlier. I got married instead of getting the '67 but it was the right decision in the long run because I still have the wife and there is practically no chance that I'd still have the '67. I have owned a number of high performance cars along the way but this C6 Z06 was going to be special. My wife and I made two trips to Bowling Green for this car. The first big day was August 8, 2006 when we had an opportunity to watch the car being assembled and actually get out on the line and help assemble it. The second big day was August 23, 2006 when we took delivery of our new 2007 at the NCM.

Our third big Corvette day would be the opportunity to see where the engine was assembled. While I missed out on the chance to own a big block I was not going to miss out on the chance to have a Z06. I bought this car largely because of the SBC 427 engine. I had been in touch with people at Wixom through the Corvette Forum and I was able to get some background information on my engine even before the trip. All LS7 engines are assembled from start to finish by one person. I knew my engine builder was Tom Morrissey thanks to his nameplate on my engine. I already had Tom's autograph on a poster of the team at Wixom. By contacting the Wixom folks on the forum I was able to learn that Tom assembled my engine on July 25, 2006 on Line 2. It was the fifth engine of the day at Wixom which meant that it was probably completed just before the lunch break. Unlike the car itself, I was unable to witness my engine being assembled but my goal was to be able to walk Line 2 during the Open House.

I arrived in Wixom early enough to have a chance to get out to the plant on Sunday afternoon when things were quiet to be able to figure out the lay of the land. Below is a picture of my car in front of the building.



Monday the 23<sup>rd</sup> turned out to be somewhat more crowded to say the least. Below are two pictures taken in front of the plant the day of the Open House. My car is the black 2LZ in the center of the first picture. You can see from the second photo that there was a good turnout for this event. I heard from the GM folks that over fifty C6 Z06s made it to the event. I'd estimate that there were another fifty or so Corvettes from all generations on hand as well.



The Open House was kicked off with an introduction by the plant manager who provided some of the background on the Wixom facility. When the plant was originally opened in 2004 they focused on small quantity builds of prototype engines as part of engineering development for the Powertrain division. It was that experience that proved to them that they could efficiently hand build engines in limited production quantities. The Wixom facility is very small compared to Bowling Green. They have about 50 employees and slightly more than half of them are engine builders. The balance of the people are support and administrative.

Today they build both the LS7 for the Corvette and the LC3 supercharged Northstar for the Cadillac. During the tour we were able to see both assembly lines.

Below is a picture of the LC3. It is a 4.4L supercharged intercooled engine producing 469 HP and 439 torque. The striking thing about this engine is that it is physically much larger than the LS7 although it only has a 267 cubic inch displacement. From what I was told by one of the engine builders they are only assembling a few LC3s each day due to low demand. On the other hand they produce approximately 20 of the LS7 engines each day.





Above is a picture of my wife Evelyn standing next to a LS7 in the lobby display area. I'm not sure if you can tell from these photos but the LS7 really looks small compared to the LC3.

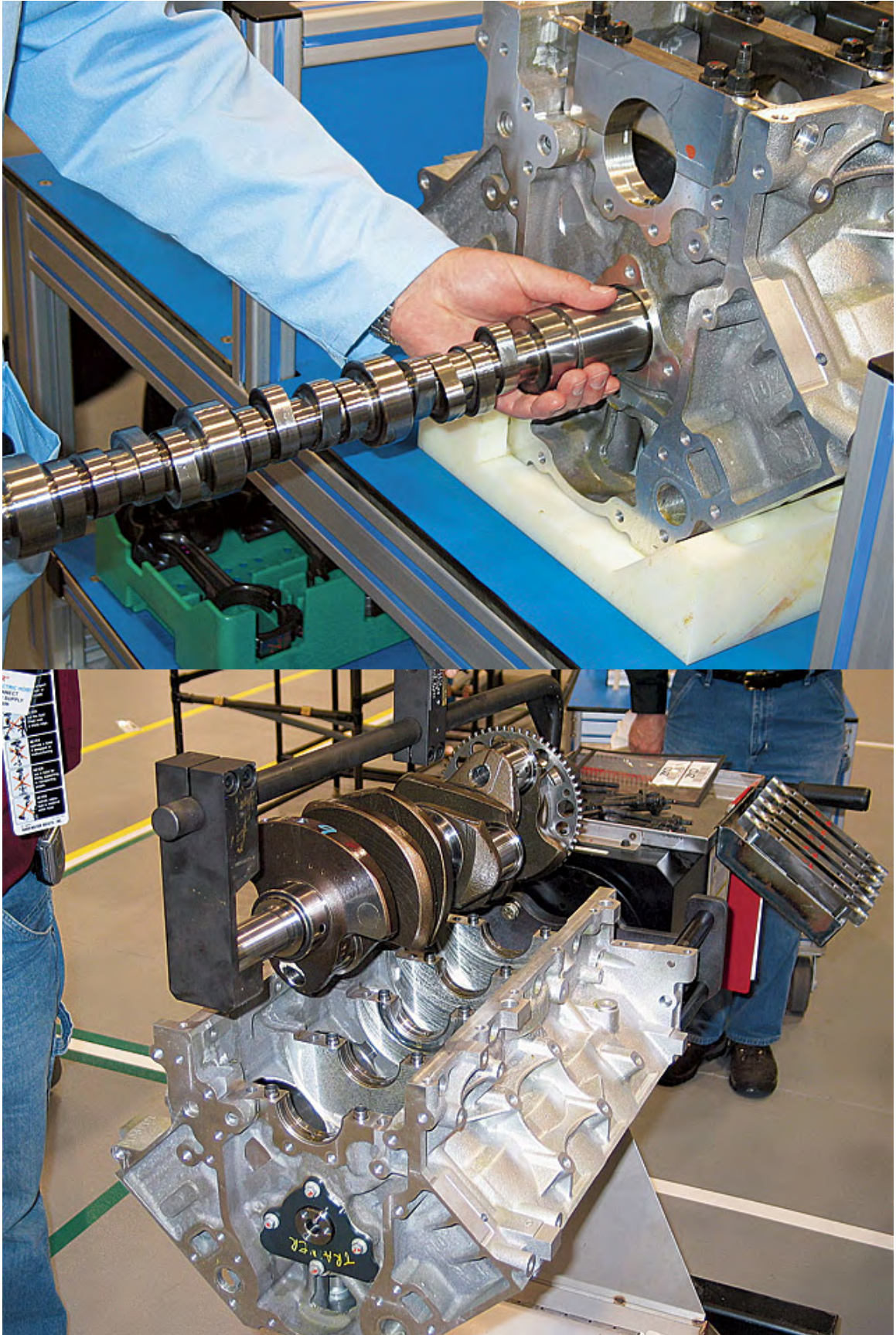
I was unable to take any photos on the manufacturing floor due to GM restrictions. However a number of magazines have posted photos on the web of the assembly lines so I'm including a few of them here.

They have two lines for the LS7 and one for the LC3. Below is a photo of Line 1 for the LS7. This view shows the final assembly point at the end of the line but the full line is actually "U" shaped. The starting point for the line is just off to the right of the photo. Engines pass down the line to the right of the blue columns that you can see. Then they make the bend at the far end of the line and come back toward the completed engine that you can see sitting at the end of the line. Each side of the "U" is about 150 feet long. Normally five builders are working on each line. The engines are moved from station-to-station along the "U" shaped line and the engine builder moves along with it.



On the top of the next page is a picture of the camshaft being installed early in the assembly process. You can see that the six bolt main bearing caps are temporarily installed at this point to help provide dimensional stability for the block.

In the second picture on the next page you can see the forged crankshaft being lowered into the block at another station. Parts are kitted for each stage of the assembly process. In this view you can see the bearing caps and bolts sitting in trays on the rear side of the engine stand.



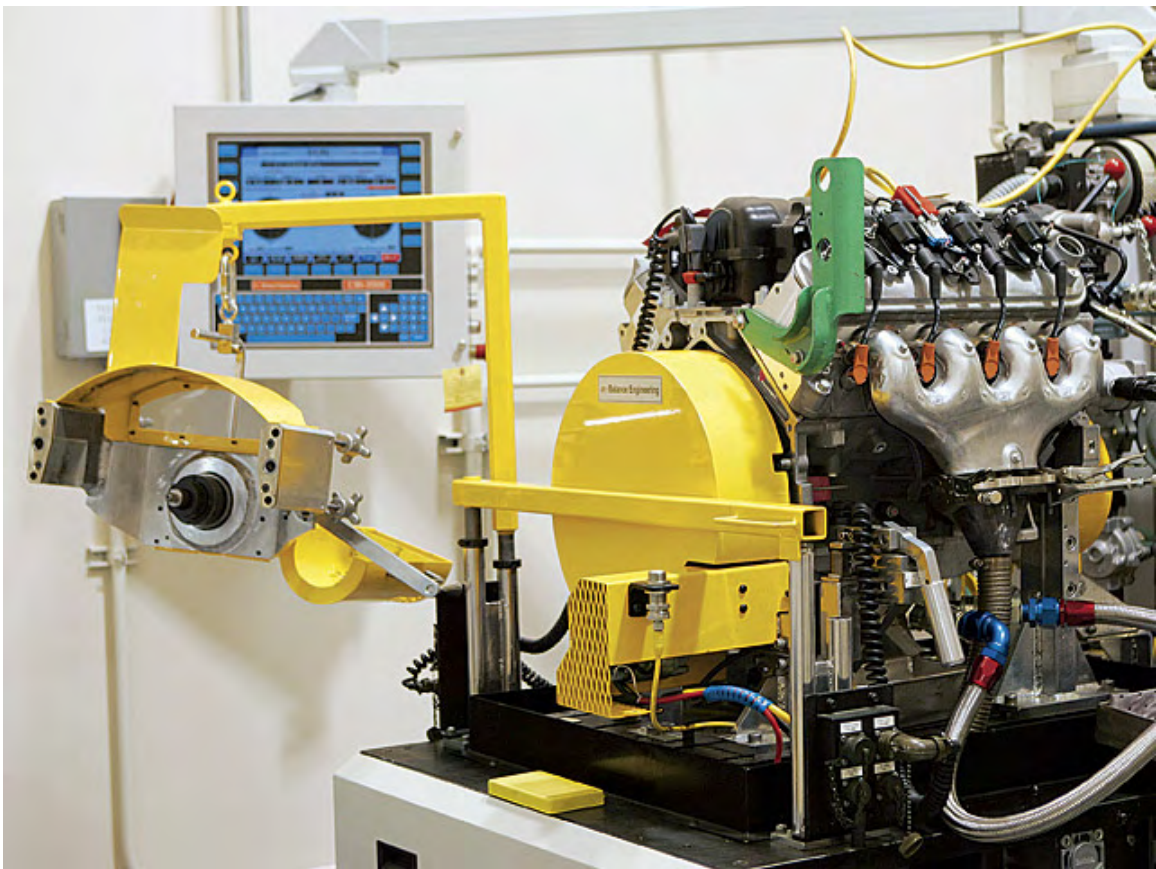
Below is the station where the head bolts are torqued. One interesting thing about the engine assembly is that nearly every nut and bolt on the engine is tightened by a computer controlled torque wrench and every torque is recorded. Many of the critical fasteners, such as head bolts and bearing cap bolts, are tightened using a “torque-to-yield” method that is only possible with computer monitoring. With this method both the torque and the resulting angular displacement of the fastener resulting from that torque (the yield) are monitored and recorded. It allows for very tight control over the assembly process.

Some torque readings are recorded for purely diagnostic reasons. For example the torque required to spin the camshaft is checked following installation of the cam as a test of the bearing clearances. Likewise, the crankshaft is rotated and the torque monitored long before the heads go on the engine to verify bearing clearances. In general, each step of the assembly process has some sort of torque related monitoring of the moving components at that stage.

As you can tell from the picture below these are not your average Craftsman or Snap-on torque wrenches! The computer driven multi-spindle tool below automatically sequences the tightening of the head bolts using the torque-to-yield method and also records the final torque values required to produce a specified angular movement of the fasteners.



The final stage of the process at Wixom involves briefly running the engine on propane in a test cell. This is the one area we were not allowed to enter during the tour. I don't think there were proprietary issues involved. I think the main issue was probably just that it is a very small room and difficult or unsafe to have a lot of people moving through it. We were able to see the room through an observation window. Running the engine allows a computer to determine what weights need to be added to the damper and flywheel in order to balance the engine. The engine is only run through a small portion of the RPM range at this point but HP and torque values are recorded for quality control purposes. I believe the reason for the two load cells in the photo is that the same stand is used to check the LC3 engines. They probably swing the other one in place if they are checking out the Northstar engine.



After balancing, the engine is shipped to another Michigan location where it is run on a dyno for about twenty minutes. During this final test the engine is run at full output and thoroughly checked for leaks. Leaks at this stage are very unusual because the oil galleries, cooling passages, and crankcase are all individually pressure tested in Wixom before the engine is started for the first time. The final test is done with the actual engine control computer that will be installed in the car. As one of the builders said, "Bowling Green is not happy when a LS7 won't start at the end of the line." Break-in oil is used for the test above and even the oil is analyzed as part of their process control. The oil is changed for the twenty

minute dyno test and again the oil is monitored. Finally, the oil is changed a third time for installation in the car at Bowling Green.

Whenever possible GM has the vendors provide sub assemblies in order to speed up production in Wixom. For example, the intake manifold arrives from the vendor with the injectors, fuel rails, and throttle body already installed. On the other hand one thing that surprised me is that they have a large area at Wixom where they pressure wash every engine block before assembly. They monitor the fluid after washing to check for metal chips. It is almost like they don't trust their block vendor <g>.

One thing that made this Open House particularly interesting is that the tour guides were the engine builders themselves. They made no attempt to rush us through either. I had an opportunity to spend well over an hour on Line 2 where my engine was assembled. The guides answered every question that was asked and were even candid about reliability issues that have been raised in Corvette Forum and other places. It is very clear to me is that the whole team in Wixom takes a tremendous amount of pride in the LS7 that they produce and they want to provide the best possible product. As good as the computerized manufacturing controls are they cannot replace the skill and knowledge that these builders have. While an engine cannot proceed to the next station if it fails a computer based test, the builders themselves routinely pull an engine off the line if they spot something that is not perfect. Most of the builders have twenty years or more of experience within GM before even starting on the LS7 line. The results speak for themselves.

GM took great care of us during the Open House. Some of the engine builders were kept busy running grills and so we had terrific food through out the afternoon. We also got laminated cards identifying our car and the engine builder. This allowed everyone to get to know everyone else when we were walking around the cars out in the lot. We also received dash plaques and goody bags from GM. If you have an opportunity to sign up for a tour at Wixom in the future I'd highly recommend it. It is a great way to spend a day whether or not you have C6 Z06. At least half of the people attending were not Z06 owners. All that is required is an appreciation of Corvettes and an interest in engines in general.

If you have any questions about tours of the Performance Build Center or assembling an LS7 don't hesitate to contact me.

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