

Machine Shop Market Profile

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Engine builders, remanufacturers and the machine shops they do business with are skilled at dealing with dimensions and tolerances that might seem impossible to achieve. In fact, when anyone questions their abilities to take performance even higher, *Engine Builder* readers not only meet the challenge, they usually set new standards.

Never has there been greater opportunity – or risk of liability – facing the custom and performance engine builder, automotive machine shop, light, medium and heavy-duty gas/diesel engine builders, diesel and production engine builders, and remanufacturers. Since 1964, *Engine Builder* has done its best to be a dependable guide through the rebuilding industry.

And for more than 30 years now, we have asked for our readers’ help in determining the path we take. By surveying the machine shop/custom engine rebuilder (CER) population of our readership, we have reported annually on the “state of the industry.”

This year, results of our survey are broken out into two special reports. This one, the annual “Machine Shop Market Profile” and

the accompanying Salary and Benefits Survey together shine a spotlight on some of the details of this industry – and we thank more than 400 readers who participated in these surveys.

The data generated for this year’s Machine Shop Market Profile was collected through survey questionnaires sent to a random sample of active *Engine Builder* subscribers who are shop owners and managers, many of whom are our fellow members of the Engine Builders Association (AERA). Our questionnaire was developed by Babcox Research to obtain the information contained in our profile. In all, we heard from nearly 225 locations that are performing machine work and building engines in the U.S.

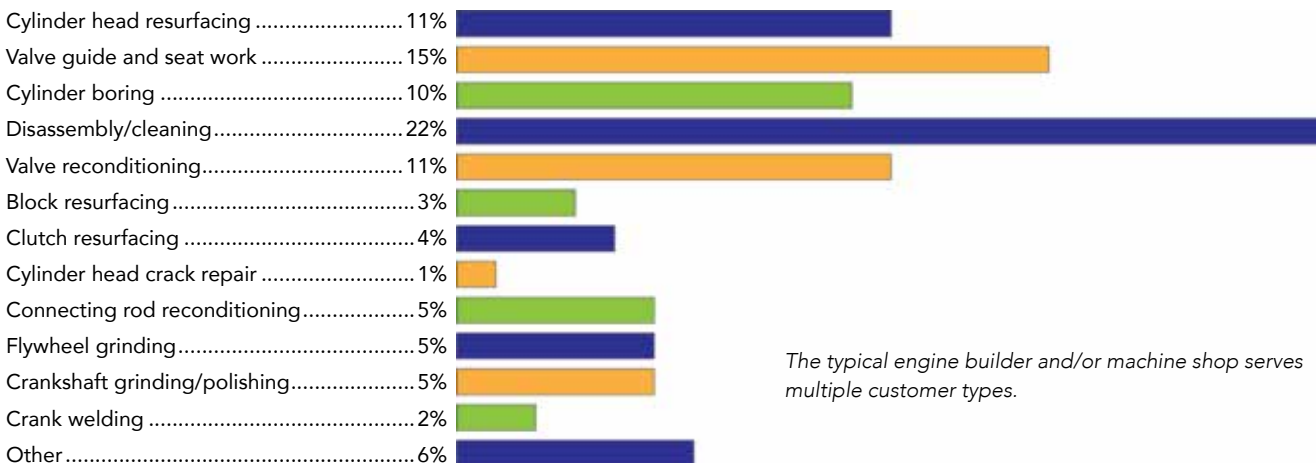
The survey information reflects data for production year 2016, so the use of the phrases “this year” and “last year” can be somewhat confusing. I’ll indicate production year wherever possible, or refer to “last year’s report” when making a contrast in some cases.

As we have in the past, our survey asked multiple questions about readers’ monthly production of engine blocks and cylinder heads, broken out by engine size as well as by

gas and diesel configurations, crankshafts, core sourcing, shop equipment ownership and purchasing, and total production time spent in specific engine building areas. In addition, some open-ended information was requested, allowing owners to go “off script” about topics they have a passion for. Some of these subjects may be used for editorial projects in upcoming issues of *Engine Builder*.

Nationally, the numbers look like this: the average machine shop produced nearly 25.5 gas and diesel engines monthly in 2016, even a little more than the 25.1 produced in 2015. This positive trend has continued for the past nine years, and the increases continue to be seen primarily on the gas side. A slight decline was seen in six-cylinder gasoline engines (down about half an engine per month from 2015), but four-cylinder gas engine production increased slightly per month (up to 7.2 per month from 6.8 per month in last year’s report) and eight-cylinder production increased from 10.2 per month in last year’s report to 10.6 in this year’s. “Other” engines stayed flat at 1.5 per month). The uptick is relatively small, but up is up – according to our survey, gas engine

Engine Machining/Rebuilding Production



The typical engine builder and/or machine shop serves multiple customer types.

production is higher than at any time since at least 2008.

Diesel stayed steady, year over year, despite increasingly negative reports about OEMs. An average of one four-cylinder, one six-cylinder and one eight-cylinder engine was built per shop per month in 2016, just as reported in 2015. Although three engines per month represents only a portion of overall production, diesel engines continue to be a profitable opportunity for engine builders, especially in the commercial, industrial, agricultural, and performance segments.

We know this industry has experienced

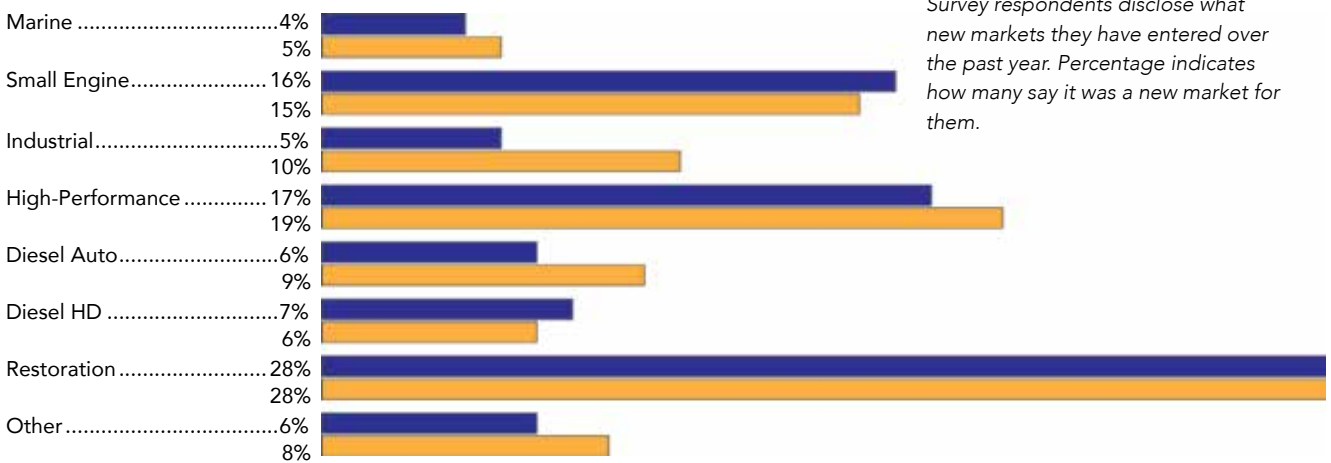
shop closures and business contraction at an often unsettling pace, but reports of negative numbers seem to be less frequent than in years past, so we believe the population of engine builders and machine shops to be somewhat stable. The demand for engines seems to be in a similar situation. An average national monthly gas and diesel engine production of 25.4 units translates to 305 engines produced annually. This is up, admittedly slightly, from the 301 reported last year. Projected onto a universe of 3,000 to 5,000 full-service machine shops, it's estimated that CERs accounted for between 903,000 to 1.525 million gas and diesel engines

built during production year 2016. Last year, we reported the market range for the same size universe was 902,000 to 1.505 million units.

An estimated 450,000 gas and diesel engines are remanufactured annually by approximately 30 North American production engine remanufacturers (PERs), so the combined total number of engines rebuilt in 2016 by CERs and PERs would be approximately 1.353 million to 1.975 million units. This compares to an upper range of approximately 1.955 million engines produced by PERs and CERs during production year 2015.

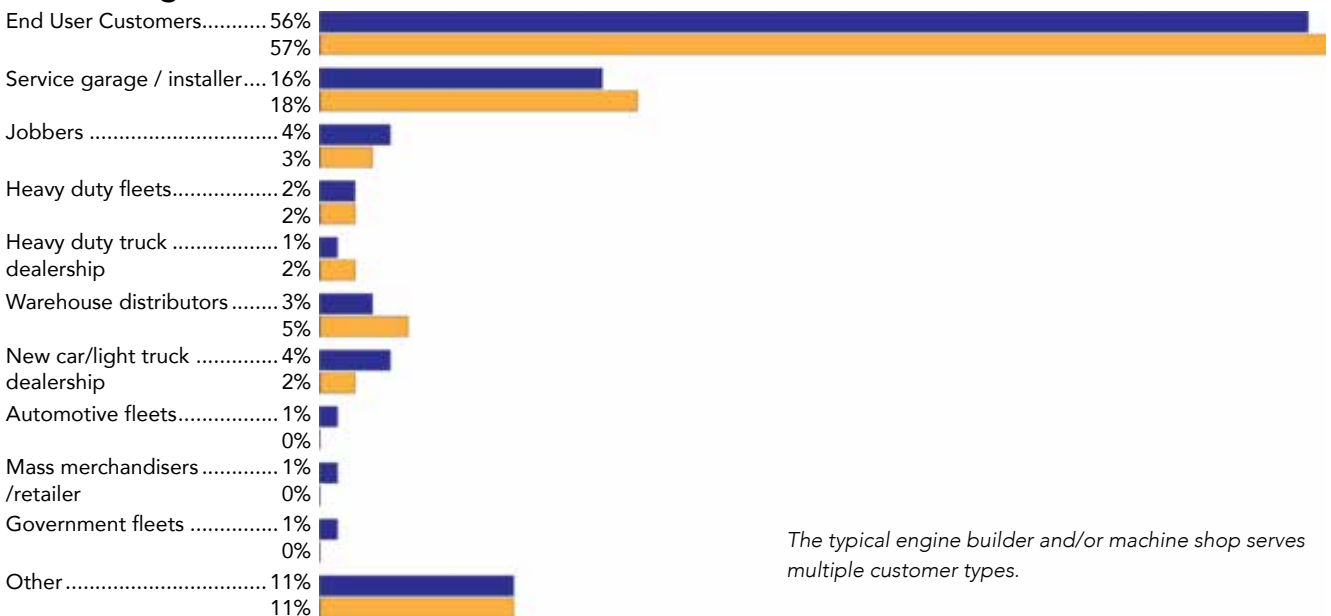
At an average retail cost of approximately

New Markets / Services: 2016 v 2015



Survey respondents disclose what new markets they have entered over the past year. Percentage indicates how many say it was a new market for them.

Rebuilt Engine Customers: 2016 v 2015



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\$2,600 per engine, we calculate that the total rebuilt/remanufactured engine market generated between \$3.52 billion and \$5.135 billion in rebuilt engine sales in 2016.

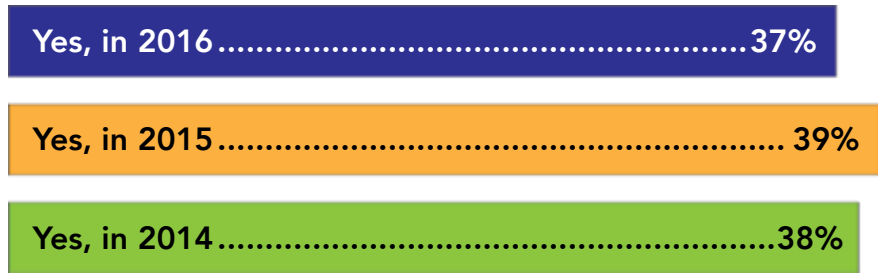
Our 2016 numbers show that more than 86 percent of our respondents offer machine shop services and 85 percent build OR rebuilt engines in their shop. This conjunction is important because 6 percent say they only build and 9 percent of our respondents say they only rebuild. It can be a fine distinction, but it's an interesting statistic to track – this is the first year we've asked the question this way. Most respondents (80 percent) do NOT keep engines in inventory, which isn't really surprising given the typical CER business model.

Here's what our readers say they build: 86 percent build standard passenger car and light truck gasoline engines (up from last year's 85 percent but still off the 96 percent we registered in 2013); 84 percent build performance gas; 32 percent build automotive diesel; 64 percent build marine engines; 39 percent do industrial engine work; 23 percent are active with medium-duty diesel builds; 40 percent do heavy-duty diesel; 14 percent build for performance diesel applications; 35 percent do small engines such as motorcycle/mower/other similar applications; and 10 percent do "other types" of engines.

Diversity remains key and when we asked survey respondents to clarify how much of their total engine building activity was made up of each type of engine. Answers had to total 100 percent, and the results were as follows: automotive gas – 39 percent; performance – 28 percent; industrial – 5 percent; medium-duty diesel – 2 percent; automotive diesel – 4 percent; performance diesel – 3 percent; marine engines – 2 percent; heavy-duty diesel – 6 percent; motorcycle/mower/other small – 6 percent; and other types – 5 percent. There were no huge changes for last year's report, but diesel saw a slight increase across the board despite the fact that the numbers of diesel engines built stayed flat. It could be that the complexity of these engines continues to require more time and attention.

The venerable Chevy 350 small block is celebrating its 50th birthday this year – and once again it is found at the top of the list of responses when we asked "What engine do you build most often?" As it has for nearly two

Did You Attend a Trade Show this Year?



decades in this report (and, frankly probably since its inception in 1967), the 350 continues its dominant position at the top of the chart – it is ranked as the number one engine built by 46 percent of our respondents, slightly up from last year. However, a GM engine of some kind is listed number one by almost 71 percent of our respondents. Fords account for 12 percent; Heavy-Duty and Commercial engines account for about 14 percent (down about 2 percentage points from last year's report); and "other

engines" make up 1 percent. Imports were listed number one by 2 percent of respondents.

Survey respondents provide information about their engine building business by breaking down their operation into five specific machining processes – production of short blocks, long blocks, complete engines, cylinder heads (not used on long blocks or complete engines) and crankshafts (also not used in long blocks or complete engines).

A moderate increase in the number of

six-cylinder gas heads rebuilt each month kept steady the average number rebuilt at around 39.4 (up a tick from 39.2 in 2015). Overall, diesel head production climbed a bit thanks to four- and six-cylinder increase – 11.5 diesel heads were rebuilt each month, up from 2014 and 2015 reports. Total monthly cylinder head production is almost 51, the highest we've seen since before 2013.

Respondents report that 58 percent of their head production is for performance or pure race applications; 63 percent are aluminum heads for gasoline engines and 31 percent are diesel.

Nearly three-quarters of all aluminum cylinder heads are deemed repairable while 69

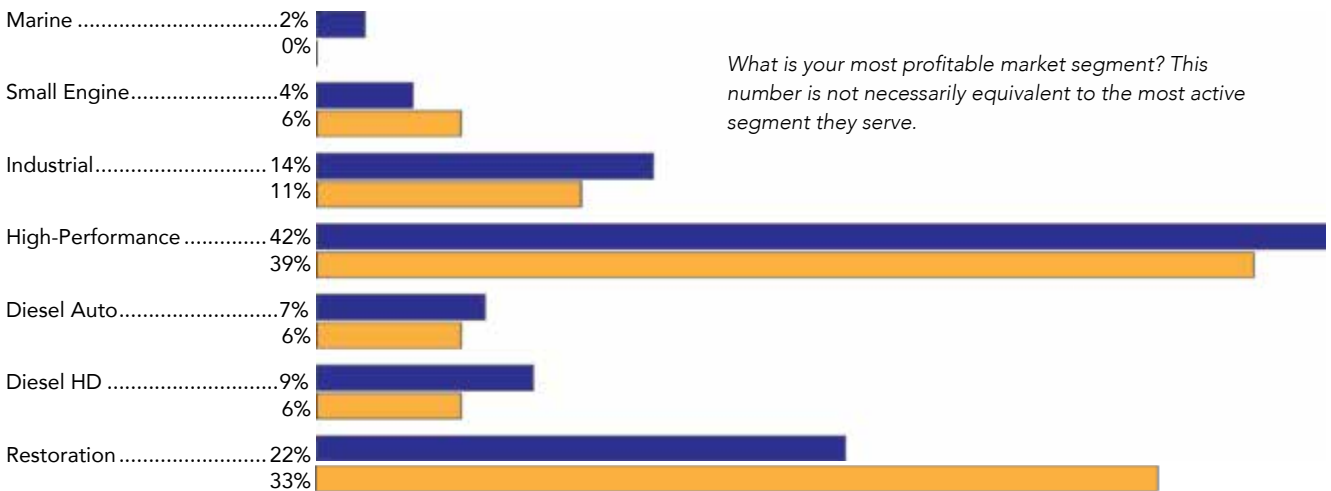
percent of diesel heads will be salvaged and not scrapped. For aluminum heads that require welding or pinning, shops do the work in-house 46 percent of the time; they send the job out 54 percent of the time. Diesel heads are done in-house 25 percent of the time and sent out 75 percent of the time. Cast iron gas heads are repaired in-house 37 percent of the time.

When repairs ARE made, a crack in an aluminum head is welded 78 percent of the time and pinned 23 percent of the time. Diesel head repairs are almost an even split: 51 percent are pinned, 49 percent are welded. And if heads can't be repaired, new castings are sourced more often than used (aluminum: 54% new/46%

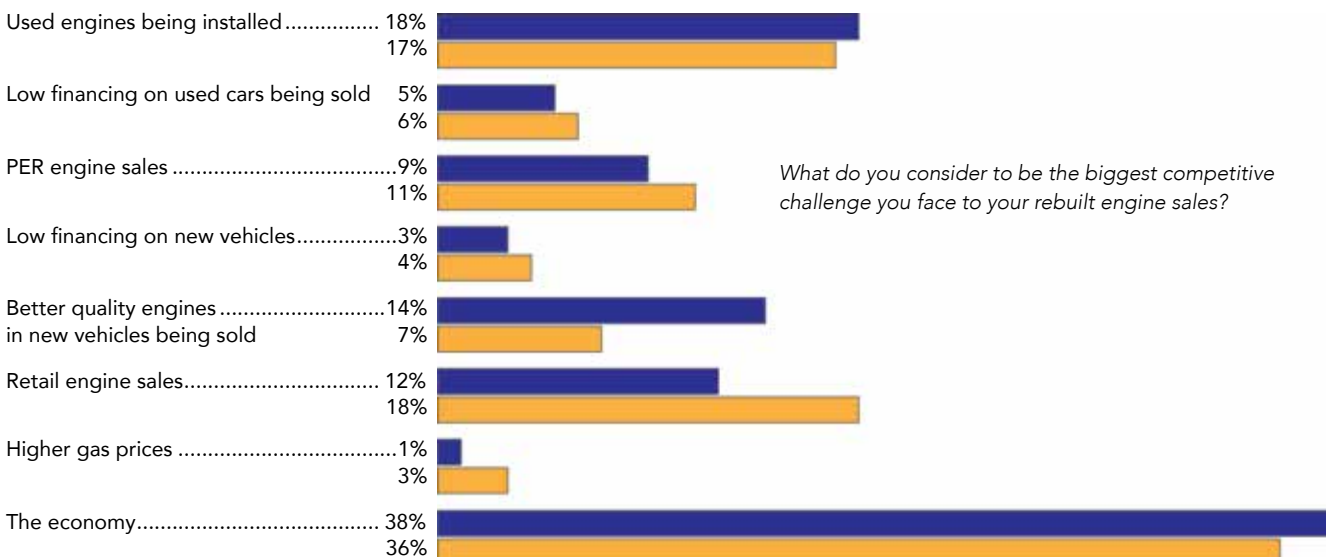
used; diesel: 55% new/45% used).

Speaking of cores, new engine blocks and heads are being sourced more often, say our respondents, though customer cores are the overwhelming choice for engine builds. Gas and diesel combined, customer engine cores are used 74 percent of the time; salvage yards are the source of 17 percent of the engine cores and 13 percent of the cylinder heads (in both cases, down 3 percentage points from last year's report); new engine blocks are used 7 percent of the time while new heads are chosen 27 percent of the time; and core suppliers provide 2 percent of engine blocks (a four year low) and 4 percent of

Most Profitable Market Segment: 2016 v 2015



Biggest Competitive Challenge: 2016 v 2015



cylinder heads.

As many readers tell us during interviews and in discussions at trade shows or shop visits, engine returns are rare. Only 3 percent of custom built or rebuilt engines are returned, and of those that are, 61 percent of the time it's the result of poor customer installation or diagnostic/misapplication. Can doing engine installations in-house solve some of these issues? Only 28 percent of survey respondents say they don't have installation bays - an upcoming issue of *Engine Builder* will address this topic.

On average, the present value of the typical shop's machining equipment is \$223,652 and respondents say they spent \$28,541 on new or used shop equipment last year. Of course, as mentioned in this article's introduction, the demands for quality only continue to increase. Shops will continue to balance the need to invest in cleaning and machining equipment with the interest of maintaining productivity.

On average, the typical shop spent \$93,107 on the purchase of internal engine components in 2016. Most of these were used for the engines being built, but approximately 23 percent of the parts were intended for redistribution at a retail level (in other words, sold separately or bought by walk-in customers).

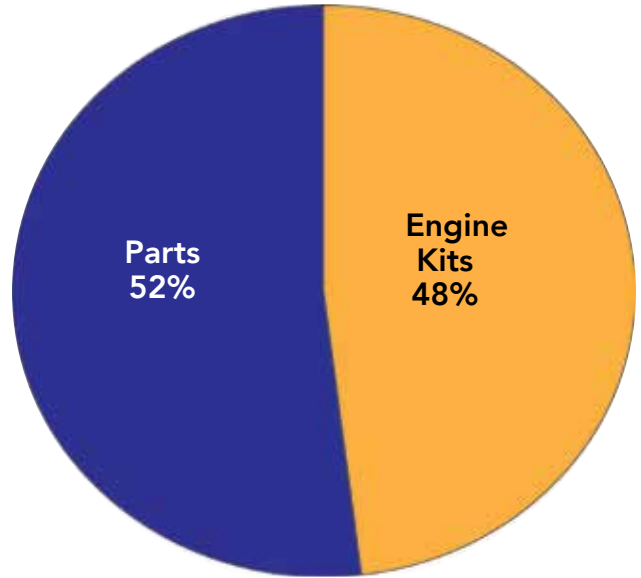
Overwhelmingly, shops prefer to shop around when it comes to buying parts. Perhaps it's a matter of convenience, availability or

price, but 69 percent of respondents say they prefer to buy from multiple suppliers; only 31 percent prefer a single source.

Smart shopping is, of course, part of a shop's success. Our salary and benefits survey explores one of the typical shop's most critical expense items - employee costs. Proper management of all business aspects will positively or negatively impact shop profitability. The typical shop's pretax profit (after all expenses but before taxes) in 2016 was \$41,700.

The most important factors shop owners believe matter to customers regarding their engines and engine work? Reputation is first, followed by the use of genuine brand parts and availability. Somewhat less important is price and last on the scale is warranty. Shops have told us they're not really building engines - they're building relationships. These factors bear that out.

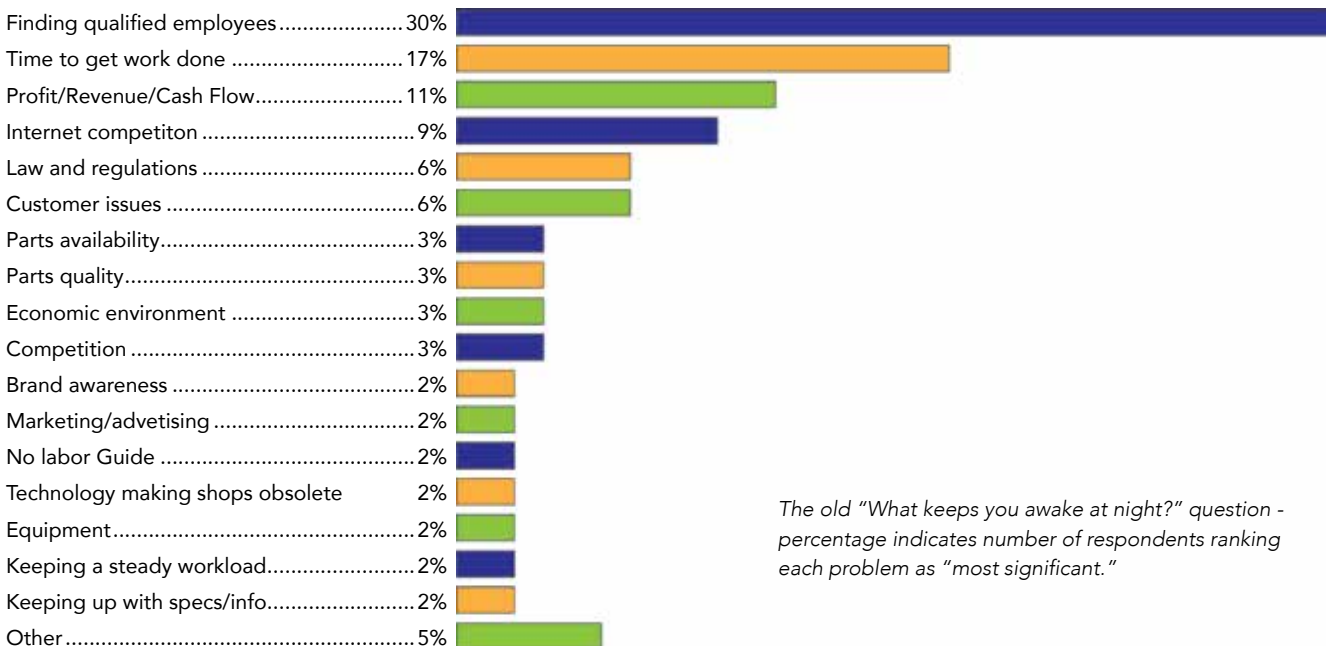
More than a third (36%) of respondents say they are actively planning to expand their



Do you prefer to buy individual parts or complete engine kits?

rebuilding operations in the next two years. How will they do it? Adding rebuilding equipment (34 percent), adding employees (26 percent), adding on to the production area (20 percent) and adding services (20 percent) are all in the plans, according to many respondents. It's knowing those plans that continue to help *Engine Builder* magazine structure our editorial plans each year. It's a win-win. ■

Biggest Current Problem



The old "What keeps you awake at night?" question - percentage indicates number of respondents ranking each problem as "most significant."