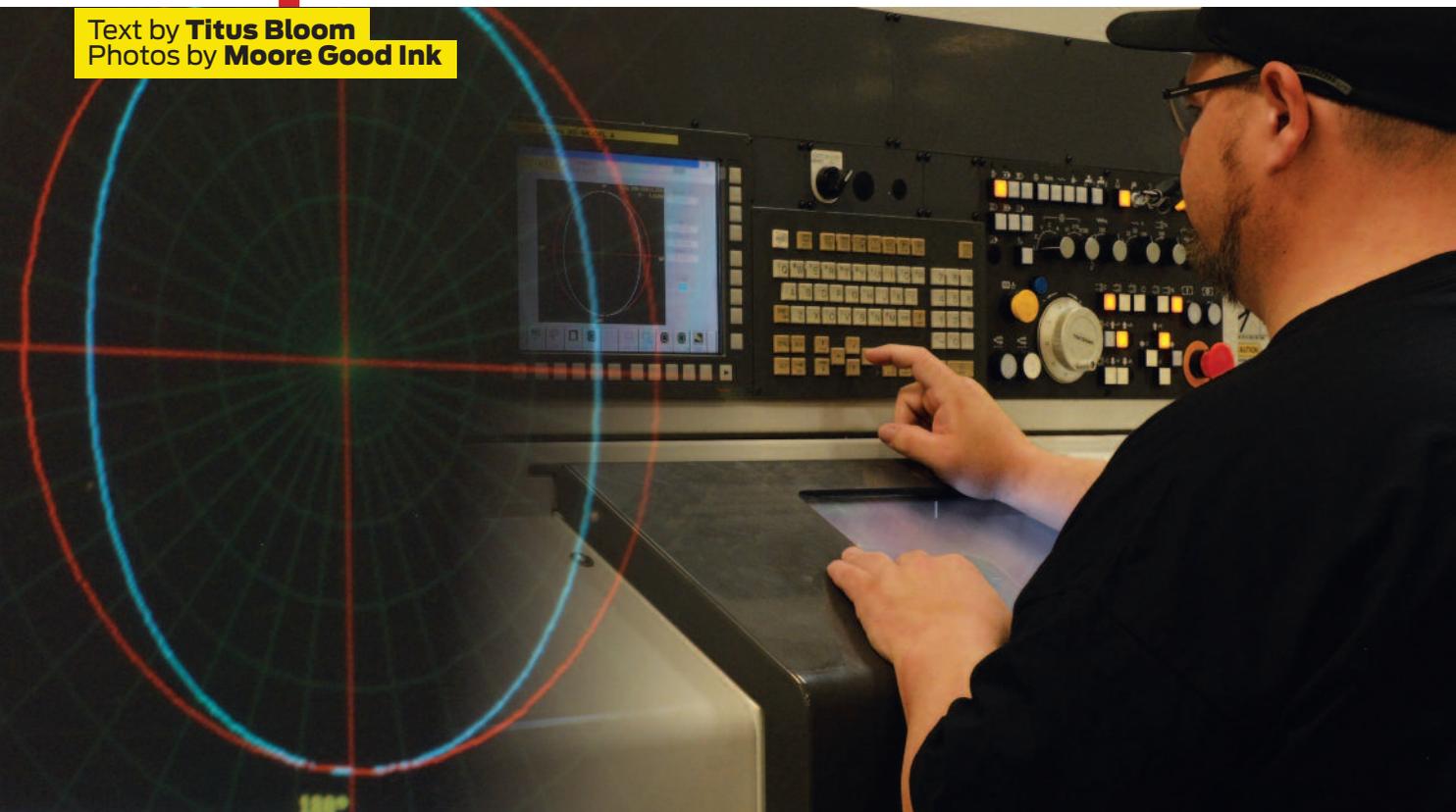


# Ovality and Other Guarded Racing Piston Matters

Piston  
Talk With  
Gibtec

Text by **Titus Bloom**  
Photos by **Moore Good Ink**



**P**istons are neither round nor do they have parallel sides, instead they have a larger diameter towards the bottom, usually between the base of the piston and the piston pin hole, and become progressively smaller toward the top of the piston. This design logic allows for greater expansion of the piston crown because it's the region closest to the heat source.

"Ovality," which means "out of roundness," is necessary in all pistons to allow for thermal expansion. It also compensates for deflection of the piston skirt caused by side loads. Pistons are manufactured with single, double or triple ovality, and the ovality is best measured by a precision roundness form measuring instrument.

Gibtec Piston's Nick Plantus says, "Ovality in simple terms means the piston is narrower along the piston pin axis [the minor axis] than the thrust axis [the major axis]. Because ovality is a function of heat—and therefore the growth the piston is likely to encounter—it is the amount of ovality assigned to a piston that's the clever part." Ovality values differ, depending upon whether the engine is naturally aspirated, supercharged, turbocharged or charged with nitrous oxide. Obviously, heat, cylinder pressures



/// ABOVE. Plantus maintains Gibtec's specialty lies in the rapid design and production of single sets of custom billet pistons. "We have a formula for swiftness; it's where we shine."

/// LEFT. Ovality, which refers to a piston's "out of roundness," is necessary in all pistons to allow for thermal expansion. The piston is narrower along the piston pin axis (the minor axis) than the thrust axis (the major axis), and the amount of ovality is determined by factors such as heat, cylinder pressures and side loadings.

and side loadings are much less in a naturally aspirated engine; hence, less piston ovality is required.

"Adequate ovality," explains Plantus, "is not only apparent in the piston's dimensional disparities between its major and minor axes but also the skirts exhibit a bearing area." This is the area in the middle of the piston skirts that rides in the cylinder, and it is surrounded by a boundary of piston skirt that should not touch the cylinder wall. Doubtless, if the boundary area does make contact it creates friction. Plantus went on to explain that a similar situation exists higher on the piston at the ring belt, which is the thicker area that accommodates the piston rings.

## BACKGROUND

Plantus' life has been a series of bright ideas, mainly in piston design because he is a man well-acquainted with the stresses of racing engines. His career stretches back to 1968 when he cofounded Diamond Racing. Now acting as design engineer at Gibtec Pistons in Denver, things haven't materially changed; he is still dissatisfied with anything less than the best as he considers the myriad shapes of contemporary racing pistons. Gibtec's specialty is the rapid design and production of single sets of custom billet pistons. "It's where we shine," says Plantus, "we have an extensive setup—a formula for swiftness.

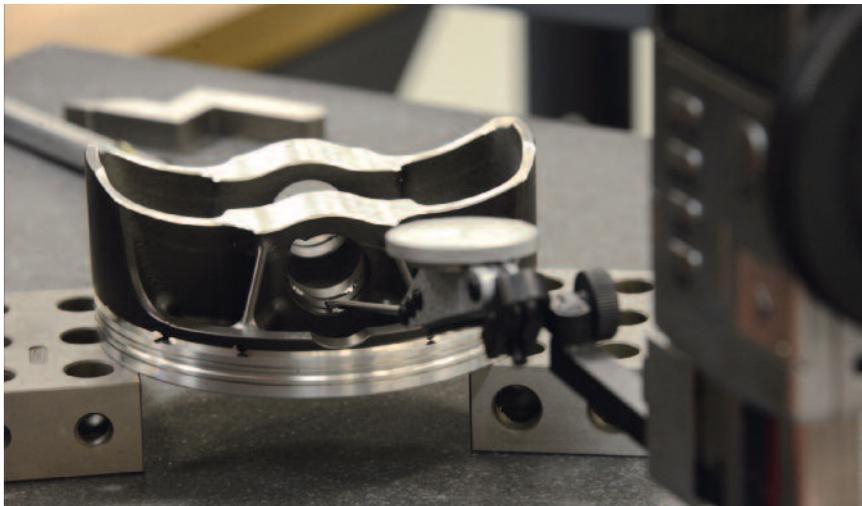
/// They last longer today because ring manufacturers achieve better surface finishes on the top and bottom sides of the rings. Also, piston makers can now not only achieve flatter ring grooves than before, but also much better surface finishes than 10 years ago. ///



/// A further form of ovality can be found in the middle of the piston skirts. A bearing area rides in the cylinder and is surrounded by a boundary of piston skirt that should not touch the cylinder wall to avoid friction.



**Aluminum billets are cut, heat-treated and machined. Those for big-block Chevrolet typically measure 4.750 inches, small-block Chevrolet and Ford 4.250 inches, Hemi 4.650 inches, and 4.800x2.600 inches tall is the preserve of Pro Stock and Pro Mod.**



**For race engine builders, the advantage of the billet custom piston is its propensity to accommodate change: valve sizes, angles, compression ratios and skirt profiles. If a race team concludes their bores are too wet or too dry, they'll intervene and change the number, size or shape of the drain holes.**



**Designer Nick Plantus will admit: "We produce a lot of conventional, full-round piston designs, but unlike the inboard competition piston [pictured] it's worth knowing that the full-round style contains unproductive weight without any additional stability."**

**Unlike inboard racing pistons, the full round style contains unproductive weight without any additional stability.**

"In the late 1960s, my colleagues and I believed we were at the cutting-edge of competition development, and in those days, 47 years ago, our best piston shape was the tapered skirt, then the best technology our machines could produce.

"With regard to materials, 2618 is still in widespread use. For some applications, though, like NASCAR and some road racing cars where fatigue life is an issue, we recommend a blueprinted 2618A.

"We used to do a ton of 4032 but stopped using it unless it's intended for street applications. It is an alloy with good wearing properties, but as engine speeds and cylinder pressures increased we found it unreliable in engines producing over 600 horsepower."

To questions about ring grooves, he replies, "They last longer today because ring manufacturers achieve better surface finishes on the top and bottom sides of the rings. Also, piston makers can now not only achieve flatter ring grooves than before but also much better surface finishes than 10 years ago. That said, with today's thin rings most Sportsman drag racers don't run an engine longer than a season."

On the topic of conventional full round piston designs, Plantus will tell you that Gibtec produces them daily, but unlike inboard racing pistons, the full round style contains unproductive weight without any additional stability.

Plantus, like Rob Giebas, head of Gibtec, is intelligent and straightforward. With 12 years of Pro Stock championship-winning piston-making in their background, they will withhold certain information, and if you challenge them, they'll confess to withholding it because they have to protect the interests of the teams. **DR**

#### **SOURCE**

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