

Achieve Valvetrain Supremacy

What you need to know about titanium valves, lash caps, and pressed-in hard tips.



Story by Sam Logan • Photography by Moore Good Ink

Lash caps increase the diameter of slender valve tips. On race engines running skinny 6- or 7-mm valves, lash caps allow the nose roller of the rocker arm a greater footprint on which to operate.

They are also synonymous with titanium racing valves (which are prevalent in dirt late models, dirt modifieds, and sprint cars), protecting their vulnerable valve tips from direct rocker contact.

Titanium valves improve engine acceleration. Long gone are the days of the heavy valvetrains and their attendant camshaft profiles. Lighter titanium alternatives cultivate the use of lighter valve springs, lighter retainers, and different camshaft lobe profiles that change ramp speeds and reduce valve lofting.

“Though titanium valves are expensive, at around \$140 per valve, with a hard coating, they usually last a full 2,000-lap race season,” says Mike Androwick, of Mike’s Racing Heads.

Androwick, whose racing cylinder heads can be found in some of the top-running DIRTcar modifieds in the Northeast, uses a chromium nitride coating on the valve for longevity.

“It adds hardness to the valve and consequently they last a lot longer, especially with unleaded fuels or E85,” says Androwick.

But when you hear of a lash cap that has been shed from its valve tip, you wonder how it happened and if such hazards can be averted.

Avoiding Issues

“With a lash cap, the nose wheel of the rocker must operate at its center,” says engine builder Jon Kaase. “If it operates too close to the edge, it can cause the lash cap to tip back and forth. As a result, it wears the end of the valve—the valve tip—in an arc. It also wears the sides of the valve stem where the lash cap operates.”

It follows therefore that the lash cap will be loose and dance around as there’s nothing to hold it properly in place.

If you break a lash cap during a racing weekend, you can usually fix it without dismantling the motor. But, if you have a similar mishap with a pressed-in hard tip, you are obliged to remove the cylinder head and install a new valve.



Inserting pressed-in hard tips in the valve's stem-ends is a critical operation. Drilling the hole too deep weakens the valve around the keeper groove—a transgression that promises imminent trouble.



“Achieving proper rocker geometry is crucial,” Kaase says. “As the rocker moves through its vertical arc of travel, the sweep back and forth of its nose wheel should be confined to a minimum in the middle of the valve stem. If you applied layout fluid to the lash cap, you would strive for the nose-wheel travel to be equal each side of center of the valve stem. Even if the nose wheel of the rocker is operating off center on a pressed-in hard tip, it could make it fail also.”

Lash Caps vs. Pressed-in Hard Tips

Pressed-in hard tips are also commonly used to protect the tip ends of titanium valves, and engine builders are divided in their opinions as to which one is superior.

“I generally use lash caps as my own experience suggests there is less to go wrong,” says Kaase. “I’ve seen hard tips break off sometimes—the head separates from the post. I’ve also seen them come loose. This usually occurs when the valve-train has been over-revved and the valve closing events get out of control, which results in a lot of hammering.

“But, if you break a lash cap during a racing weekend, you can usually fix it without dismantling the motor. You can file the valve tip down a little and replace the damaged lash cap with a new one. But, if you have a similar mishap with a pressed-in hard tip at the racetrack, you are obliged to remove the cylinder head and install a new valve.”

Lash Cap Troubles

“Some teams have experienced lash caps splitting across the top,” says Andy Anderson, of Trend Performance. “Though unlikely, I suppose it is possible to receive a batch that is overly hard and brittle as the result of poor heat treatment.

“But, much more prevalent is sloppy machining. The tops of the lash caps must be parallel—that is, the face that contacts the valve and the face that contacts the roller of the rocker arm. If the tops are not

parallel, the tapered surface causes an uneven loading—a side loading—that deflects the valve stem. And, if the lash cap isn’t flat and parallel, it won’t rotate on the valve. Worse still, are lash caps that are too big, those that are a loose fit on the valve tip.

“Some lash cap vendors emphasize the qualities of their precision machining and their ground finishes on the surfaces on their lash caps, but grinding is only necessary when machining tolerances are beyond their capability.”

At Trend Performance’s new North Carolina facility, they maintain flatness and parallel requirements by completing all of the machining processes in one clamping. Moreover, they found it pays to use a through-hardened premium tool steel for the manufacture of lash caps.

Although Trend produces their lash caps from through-hardened tool steel, as mentioned earlier, many others make theirs from alloy steels and then case harden them. Invariably, lash caps are supplied with around 0.001" operating clearance, which allows them to rotate on the valve stem tips.

To date, the Asheville specialist manufactures lash caps to suit valve stems of 7 mm, 0.310", and 0.311". All are available in three thicknesses: 0.060", 0.070", and 0.080".

Sources

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