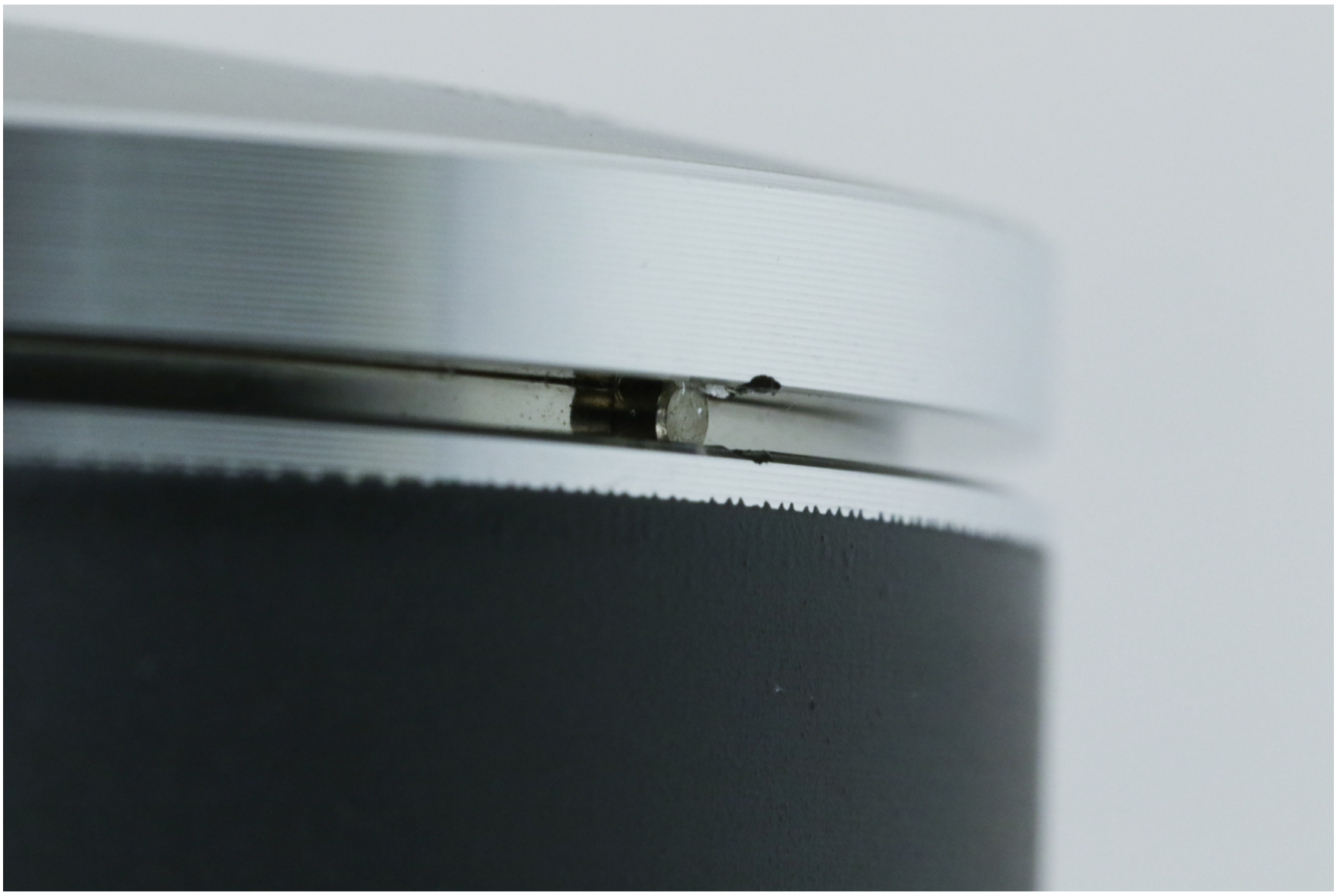
# Locating Pin: Defense Against Two-Stroke Piston Ring Destruction

John Basher

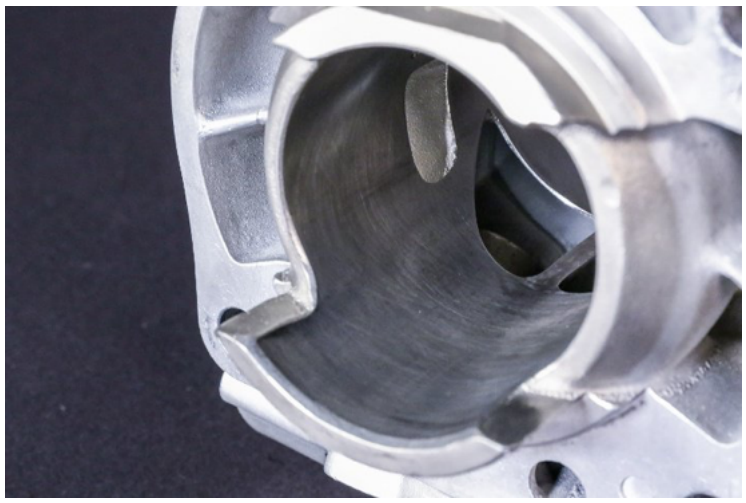


*2-stroke pistons have a very small feature that is unique to 2-strokes only: the locating pin. Here, Wiseco takes an in-depth look at what a locating pin is, what its function is, and why 4-strokes don't need it.*

Comparatively speaking, four-stroke piston rings have it easy. That’s because a four-stroke cylinder is essentially a hole, void of any ports or openings. The piston ring floats in a circle. It can spin around, and there aren’t any openings to grab the ring. A two-stroke piston ring, on the other hand, has a very demanding workload. Danger looms at every revolution.

Two-stroke cylinders have holes and openings. The piston passes by these

openings as it travels up and down in the cylinder. If not for a very specific and often overlooked piece of two-stroke piston design, your motorcycle's engine would be kaput. Fortunately, piston designers long ago developed the somewhat mysterious piston locating pin.



*Unlike 4-strokes, 2-stroke cylinders have ports in the cylinder wall. If the ring end gap were to pass over one of these, it would allow for expansion, collision with the edges, and failure-causing damage.*

"The locating pin's job is to keep the end of the ring from moving so that it does not end up in an opening or a port hole," explains Dave Sulecki, Global Powersports Product Manager for Wiseco. "If it did that, then it would cause engine failure. Anybody who has seen a blown-up two-stroke engine knows what I'm talking about."

## Locating Pin Material

Given that a two-stroke piston is aluminum, piston developers must rely on harder material for the locating pin. Such an intricate part isn't crafted out of inexpensive mild steel.

*Locating pins must be made from high-strength material.*

“It’s a high-strength, hardened steel that’s about the same as a roller in a bearing,” states Sulecki. “A two-stroke top-end bearing has rollers all of the way around the perimeter. That pin has the same material and same basic construction as a bearing in a flat roller bearing. One of the reasons those are very nice to use is because they’re a very strong material. It’s an alloy steel that has been hardened.”

### *Locating Pin, Meet Piston*

The modern way to insert a locating pin into a piston is by drilling a hole in the piston, and then pushing in the pin. Using an interference fit – where the locating pin is slightly larger than the piston hole – the pin is forced into place so that the piston can tightly grip the locating pin.

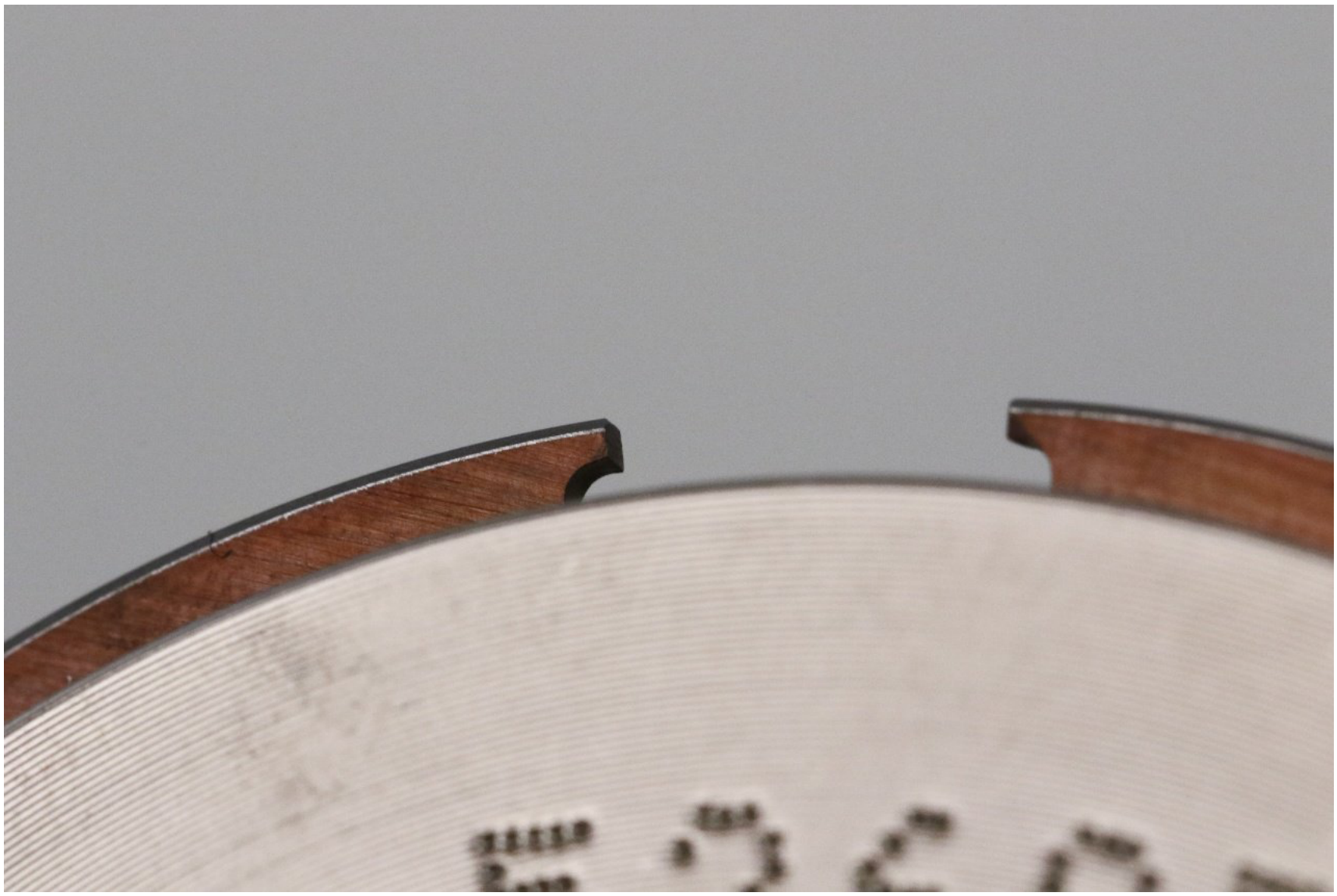
***Locating pins are inserted using an interference fit, so machined dimensions on both the piston and the pin are critical.***

Inserting a locating pin into a piston presents a variety of challenges in the manufacturing process. The tolerance on the diameter of the locating pin hole is extremely tight. It’s less than one-thousandth of an inch in diameter. To compare, the diameter of a human hair is about seven-thousandths of an inch. The depth of the hole is also critical. When the locating pin is pressed into the piston it needs to stop on the back side of the hole, that way it cannot move farther into the piston.

### *A Locating Pin's Biggest Foe*

While a locating pin’s purpose remains the same regardless of two-stroke engine bore and stroke, not all applications are the same. Some, in fact, can potentially wreak havoc on a locating pin in short order. Engines that typically run under extreme duress and create excessive internal heat are the piston locating pin’s biggest foe. Performance snowmobile and

outboard marine engines present the toughest challenges. These internal combustion systems are forever under a load due to their lack of transmissions. The heat is always on, so to speak. Consistently high temperatures create a challenge for piston designers, as they must find ways to keep the locating pin bedded firmly in the piston.



*Especially in high-performance 2-stroke engines, it's important to have strong material that resists wear from heat stress. This is why all Wiseco 2-stroke pistons are forged. You don't want that ring end gap spinning and causing complete engine failure.*

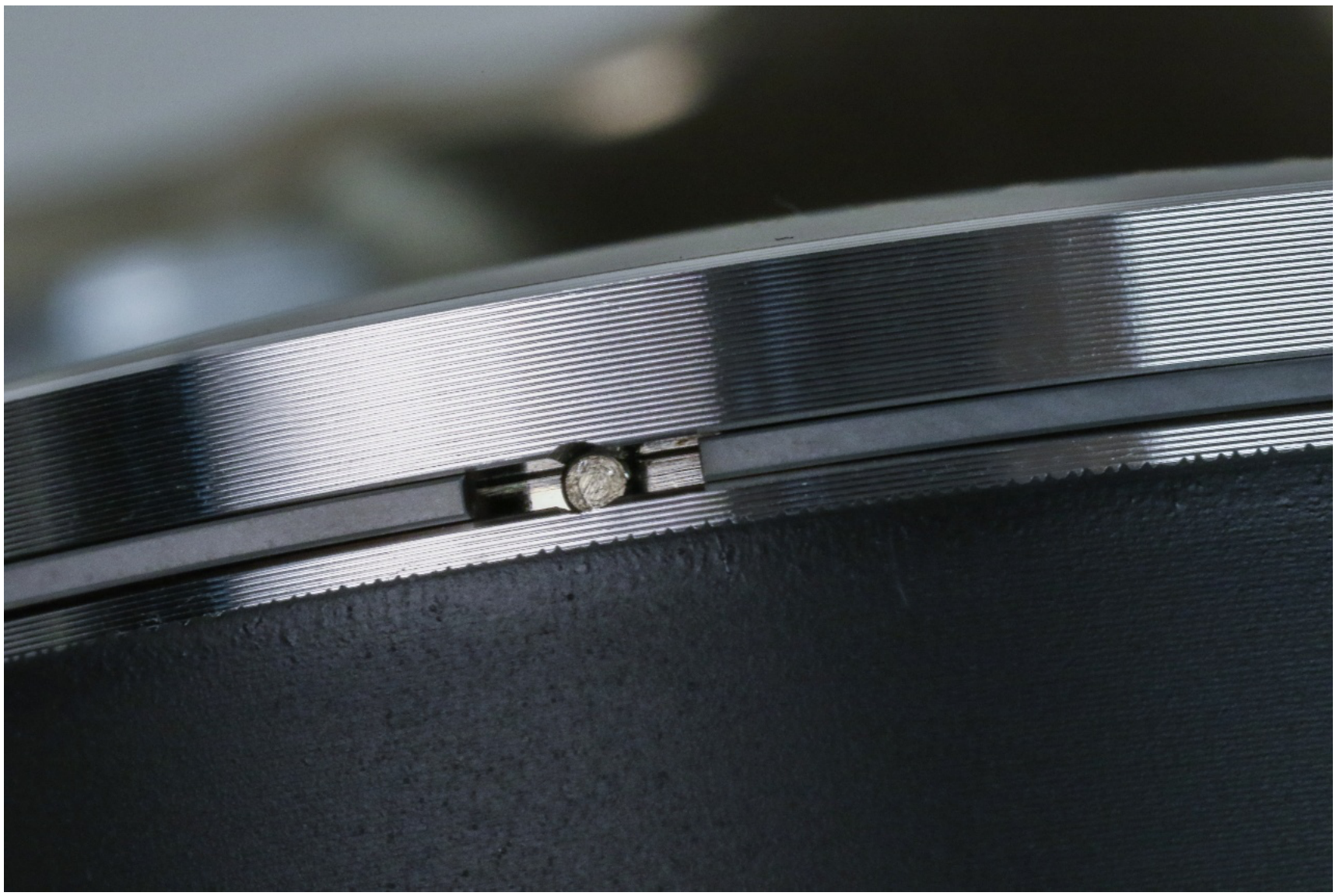
In general, two-stroke engines run hot. Over time a piston can start to lose hardness due to heat, which is called annealing. As the material anneals, the strength of the material holding the locating pin becomes weaker. That's why it's critical that the piston is constantly gripping the locating pin tightly.

**Find Wiseco pistons for your 2-stroke here.**

***Cause & Effect of Increasing Port Size***

One way engine tuners create more horsepower is by increasing the size of the cylinder transfer, exhaust and/or intake ports. This causes more air and fuel to flow through the engine. However, upping the port size lessens the material that will hold the locating pin in place. This can have a detrimental effect on a piston pin.

Sulecki explains, “As the ports get larger and the piston ring passes through the larger port opening, it’s easier for the piston ring to expand into the port and get pulled back in again as it’s going up and down in the cylinder.”



*If the piston ring expands while passing over a port, it can put excess stress on the locating pin, potentially breaking it and leading to catastrophic failure.*

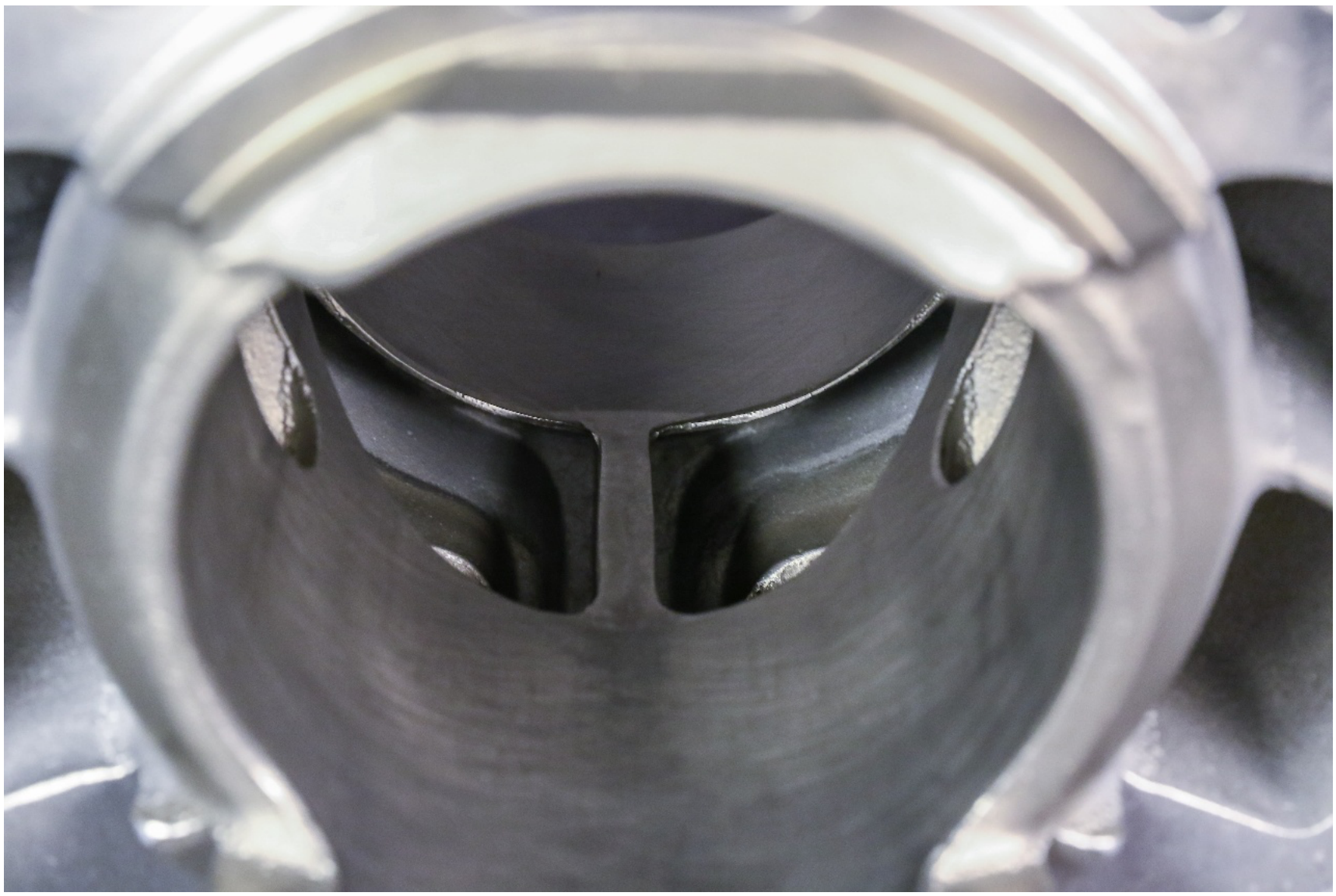
Why is this problematic? More ring movement will generate a load between the piston ring and the locating pin. The excessive up and down movement puts severe stress on the locating pin. There have been instances, such as on high-performance snowmobile racing machines, where the piston pin will sheer off at the end and allow the ring to move. This results in

catastrophic engine failure.

***Prevent Locating Pin Failure***

A porting job is not properly finished until after the modified ports in the cylinder have been chamfered. This process essentially eases the transition for the piston ring when it passes over the ports. If the port chamfers don't allow the piston and ring to gently move out and in again as the piston goes up and down, it will put an excessive load on the locating pin.

"Be sure to check the condition of the port chamfers when you have your two-stroke cylinder off the bike," states Sulecki. "If you're not sure, then I recommend that you seek advice from a reputable motorcycle shop that builds a lot of engines, or an engine builder that specializes in two-strokes."



***Notice the chamferred edges of the ports. This is critical to prevent 2-stroke piston ring/locating pin failure. Need tips for your cylinder? Read our complete guide to cylinder prep here.***

Generally, anyone who does cylinder work or replating is usually very good

at understanding the importance of the port chamfer and how to do it properly. Otherwise, the locating pin will suffer. It's an indirect relationship, but a port chamfer being wrong passes directly through the piston and can wreak havoc on the locating pin.

*Relieving the exhaust bridge is another critical component of 2-stroke operation.* [*Get all the details here.*]

***What it all Means***

The two-stroke piston locating pin is an essential component of your motorcycle's combustion system and should be routinely inspected. Don't let an inexpensive part ruin your race weekend. Lastly, don't underestimate the importance of a piston locating pin. It's the first, last and only line of defense for keeping your bike's piston ring from port destruction.

Topics: featured, PISTONS 101, Powersports, Tech