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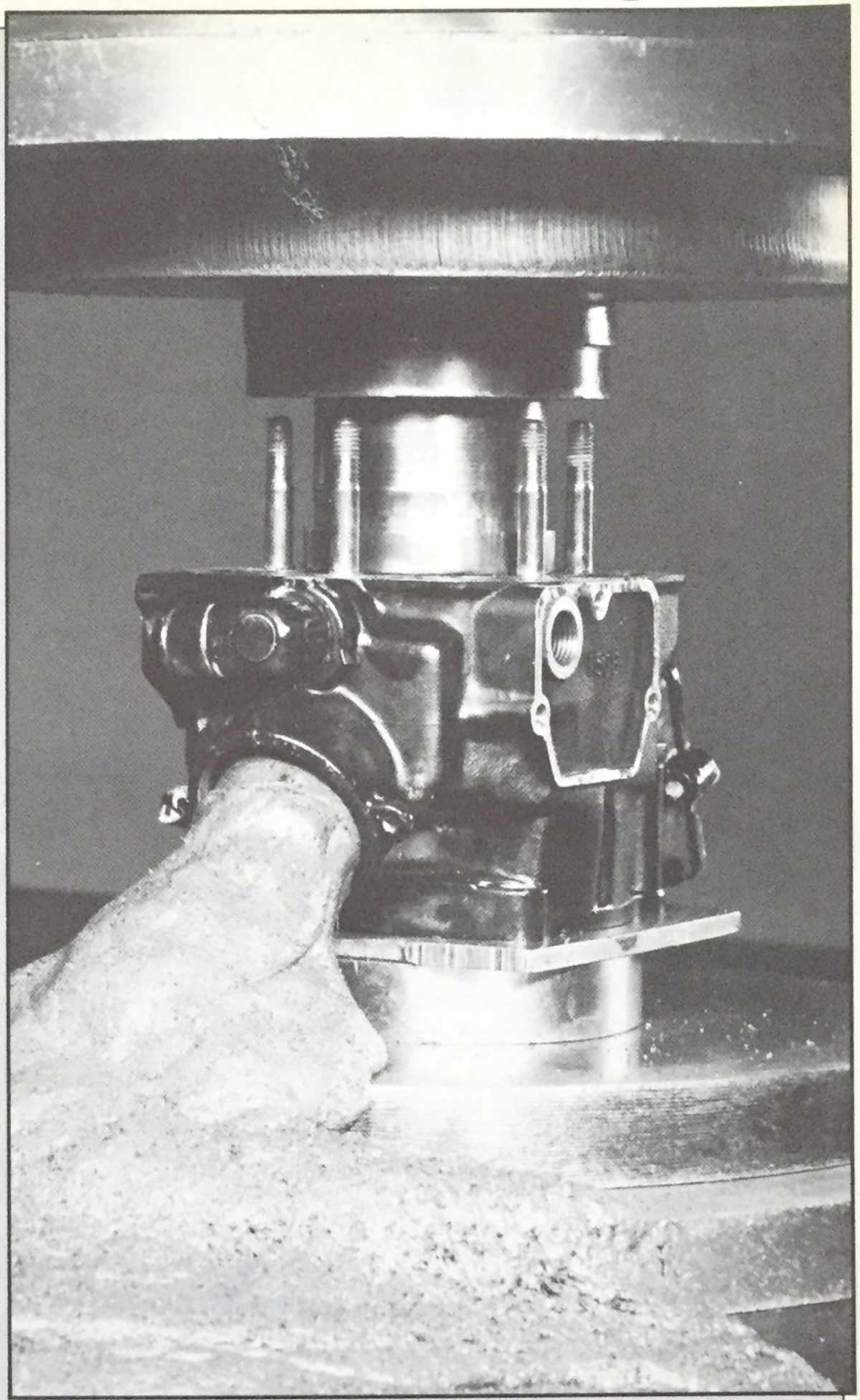
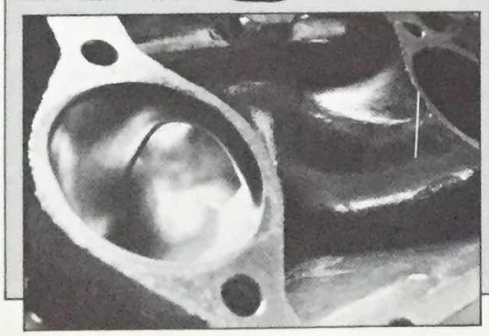


THE INSIDE MIRROR



In Paramount, California, there's a machine that can help but won't hurt. Extrude Hone is a tool for tuners who can't afford to kid themselves.
By Phil Schilling

PHOTOGRAPHY SCOTT DAROUGH

☐ For many years, the hallmark of a breathed-on engine was the mirror finish of its interior passageways. With appropriate drama, sage-like tuners ushered novices to the thresholds of bellmouths, the slides were thrown up, and the awe-struck initiates, gazing upon motorcycling's version of the Hall of Mirrors, were blinded into belief.

It was magnificent theater, though not necessarily great tuning. As the novices, especially those with access to a flow bench, quickly learned, engines and dynamometers respond far more readily to streamlined shapes than slick surfaces. Real sages, seemingly, had known that for years: "Sonny," they would say, "eyes don't see thin air, and air don't see mirrors." It might not have been the most elegant explanation of fluid flow, but it was true.

The basement tuner, working in the shade of a 60-watt light bulb, was—and is—more likely to instinctively port his way to disaster than higher performance with high-speed rotary files and unshakable courage. With a contemporary, high-output engine, the chances of reducing overall performance are much greater than the chances of improving on the work of factory technicians and factory flow benches.

Current-tech, high-performance two-stroke cylinders illustrate this point. The roof angles of the transfer/boost ports, the shapes of the transfer passages—everything inside of a modern, high-performance engine is the result of careful study, experimentation and delicately balanced compromise. Manufacturers are constantly altering and refining the casting cores of their engines to improve the flow of transfer areas, and today's cylinders, generally with Nikasil- or chrome-plated bores, typically exhibit excellent quality control.

As a rule, improving on these pieces will come only from getting the cylinder as close to blueprint specifications as possible. After the 60-watt tuner verifies that the cylinders are true, straight and properly sized, and that the port-timing and area figures are on spec, he is left with little else to check—simply because he doesn't have access to the factory's engineering blueprints which detail the ideal shapes of his engine's inner passages. He may stone the port windows, chamfering their edges to preserve the rings and improve ring seal; he

may attempt some clean-up in tight, constricted passageways. But more important, he must be patient, careful and cautious. He must avoid changing wall and roof shapes, particularly by excavating with a high-speed rotary file at right angles to the flow direction in the passageways.

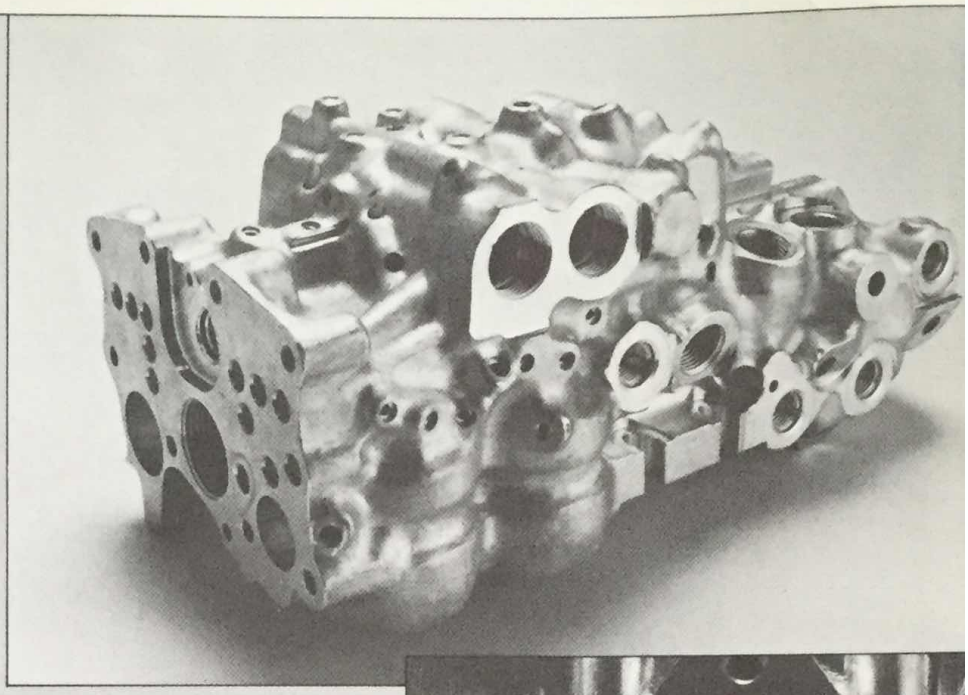
Here's an example from the world of 125cc cylinder design: Over time, the gross number of intake/transfer/boost and exhaust ports increase; in turn, much smaller passages are produced, each more carefully cast, more deliberately aimed. The smaller the passages, the greater the risk of altering shapes with a grinder—or even with the small files chosen by more cautious tuners.

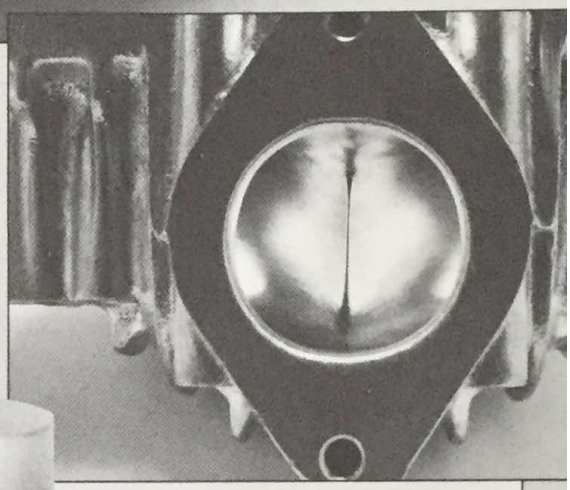
Ideally, you'd want a process that removes small imperfections in the wall surfaces, one that reaches the most constricted necks in the transfer passages, blends edges where the Nikasil or chrome plating meets the cylinder's base material. You'd want a non-destructive process that barely chamfers the edges of the port windows, does not introduce ripples and hollows that run crosswise to airflow, and does not fundamentally alter the shape of the passages. Furthermore, in the case of iron-linered cylinders, you'd want a process that finish-blends the backside of the liner with the cylinder at the port-window openings.

Here's where Extrude Hone comes in, a seemingly magical process which does all this, is quick, and costs about $150 per cylinder. Even if you already possess a classy and expensive grinding and polishing set, complete with right-angle drives and foot controls and blowers, it's probably more cost/time effective to send your motorcycle's delicate parts off and avoid the risks.

The Extrude Hone process forces a silly-putty/gel, carrying various grades of abrasives, through the passages of a two-stroke cylinder or a four-stroke head. To get uniform flow, Extrude Hone varies the carrier's viscosity and the pressure under which the carrier is forced through the engine's passages. Thus, port windows aren't reamed out oversized while the base of the transfers remain untouched. The Extrude Hone process abrades, smoothes and polishes all wall surfaces evenly, and that's its great advantage. Small irregularities disappear, but the original shape of the walls remain. Extrude-honing will likely produce a finished part that's as close to the original engineering drawing as the isolated tuner is ever going to get.

On the other hand, Extrude Hone finishing cannot rescue a botched job of hand- or power-cutting. If a wall has been gouged with a rotary file or left uneven, pocked and lumpy by file work, the irregularities will be smoothed on the surface, but not removed.

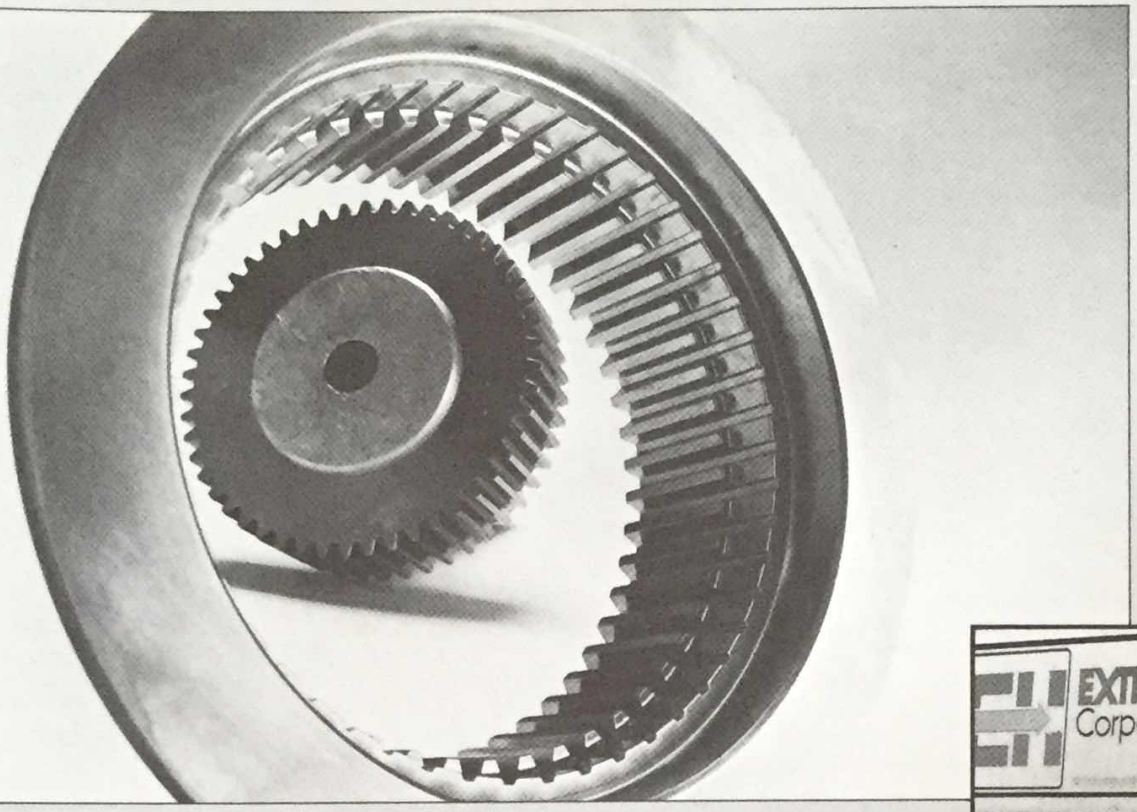




In the complex labyrinths of modern engines, Extrude Hone can radius corners and improve flow.

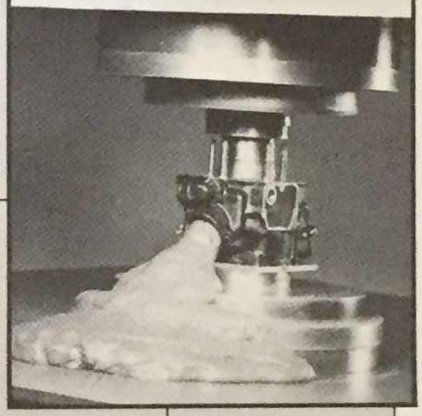
THE INSIDE MIRROR

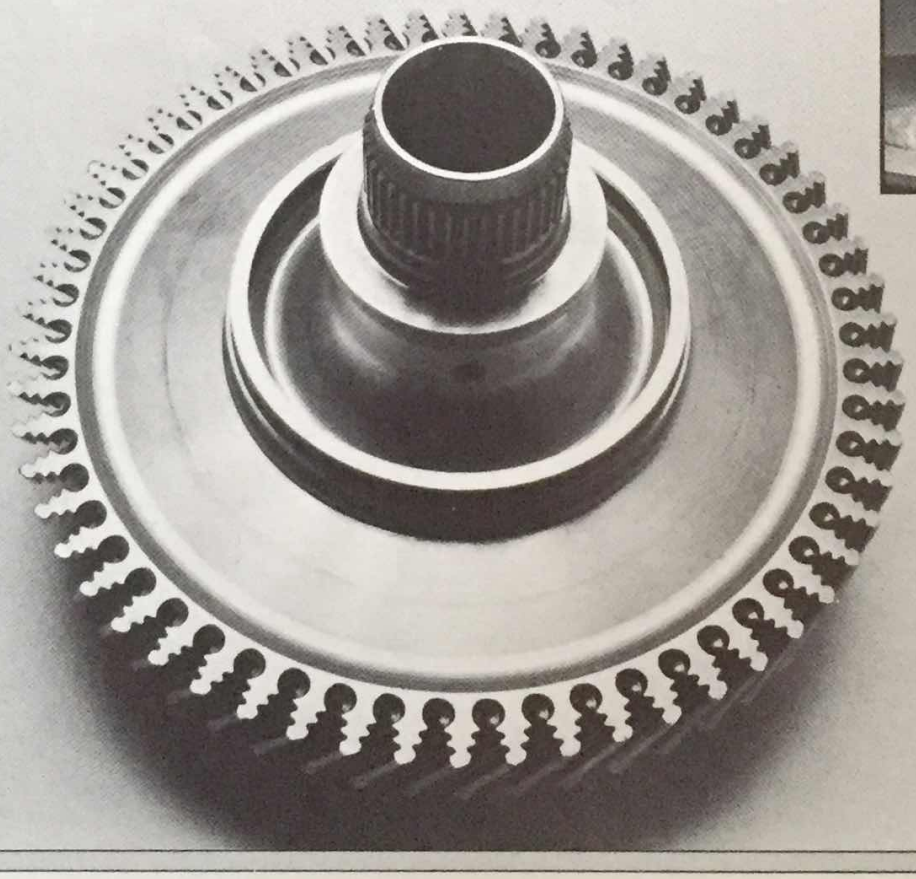
Extrude Hone can follow the compound curves of computer-designed turbine blades: easily, exactly.



This honing process is like face powder compared to serious nasal surgery: Extrude Hone can only improve what's already there.

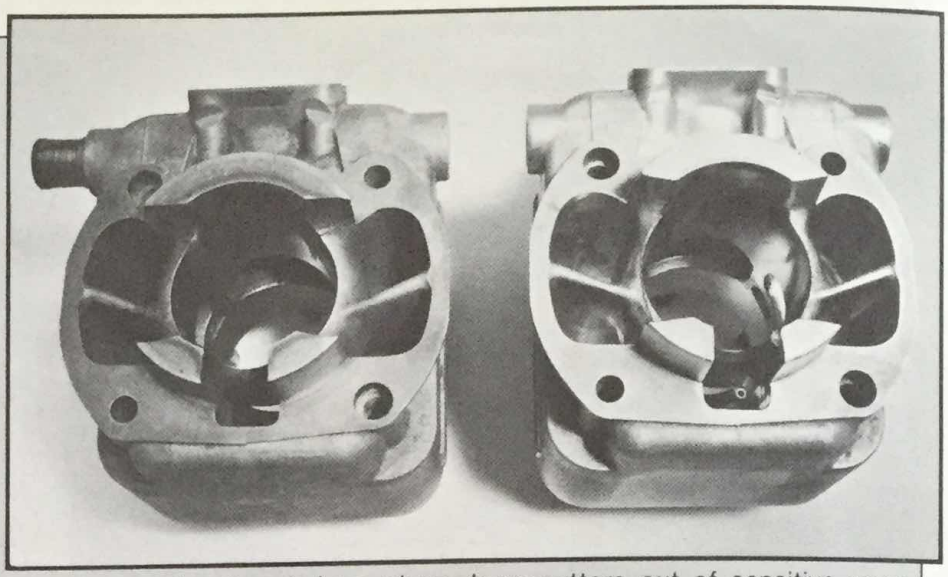
EXTRUDEHONE Corporation





By varying pressure and abrasive grades, the Extrude Hone machine can polish metals as hard as steel gears.

INSIDE MIRROR



Extrude Hone is a process that has numerous applications in the aerospace, aircraft, automobile and turbine fields. In extremely complex hydraulic labyrinths and manifolds, the process can radius corners and improve flow. In the case of very delicate-looking turbine blades, often created by computer-controlled machinery, uneven (and non-directional) hand polishing with power tools can destroy the tolerances of the parts. The Extrude Hone process is faster than hand work, more accurate, and always smoothes and polishes the surfaces in the direction of flow.

High-tech Silly-Putty is nice, but can Extrude Hone make engines produce more horsepower? In four-strokes, where any improved air flow from the clean-up process would translate to more power, the answer is affirmative. With two-stroke cylinders, there's no certain answer. By refining the transfer shapes (and raising flow) toward some presumed blueprint ideal, the Extrude Hone process *may* increase power. But always remember: Increasing flow in the transfer areas does not necessarily translate to more horsepower. Direction of flow is a more important issue than volume in the transfer areas.

In a two-stroke, the windows where the transfer passages open into the cylinder are the smallest, most critical areas. The potential for fouling the flow and direction of the air stream here is serious, sometimes outweighing the possible benefits of cleaning up the aluminum-base/plating-material junction or other slight surface irregularities. Here the Extrude Hone process is useful for two reasons: it clears and smoothes the imperfections in these very tight quarters without mucking up the flow direction, and it keeps the zealots and their buzz-cutters out of sensitive areas.

In sum, the Extrude Hone process offers the possibility of improving the performance of individual two-stroke cylinders with almost no chance for harming output: Likely upside benefits, no downside risks. For most tuners, that's a sufficient prospect for action. And the mirror finish has nothing to do with it.

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