

## Automotive Engine Rebuilder Improves Quality With Flexible Honing Tool

A leading manufacturer of automotive parts over the last several years has pioneered a metal finishing system that has improved the quality of the surface lining in the cylinders of its rebuilt engines. The new method incorporates a special deburring/finishing tool used to finish the cylinder wall after they have undergone a rigid honing operation. Results indicate that the company's rebuilt engines have experienced less engine failure due to improper seating of piston rings with poorly finished cylinder wall.

RMP, a Holman Enterprise (Pennsauken, NJ), remanufactures car and truck engines and related parts, including master cylinders, water pumps, carburetors and alternators. An authorized Ford and Chrysler remanufacturer, RMP sells its products through three outlets along the eastern seaboard. These outlets, in turn, sell to Ford and Chrysler dealerships. With over 300 employees, the company has an annual sales volume exceeding \$20 million.

During a typical month RMP remanufactures approximately 1300 gasoline powered engines (70% are for trucks, 30% for automobiles). The company warrants its truck engines for 12 months or 12,000 miles; its car engines for 6 months or 6,000 miles.

In the past, RMP was honing the engine cylinders with a standard rigid honing machine, but found that the surface finish did not meet the company's set of specifications. The engines' cylinders range from 6 in. to 7 in. in depth and from 3 in. to 5 in. in diameter.

According to Dale Houghton, RMP's engine department supervisor, the cylinder walls of the engines were receiving a peaky finish, with cut, torn and folded metal remaining along the cylinders'



surface. This type of finish, he noted, could eventually lead to engine failure. This problem could begin during the break-in period of the newly rebuilt engine when the peaky finish could adversely coat with the piston rings.

The principal of coating metals states that the pressure on the surface of the cylinder wall is equal to the load divided by the projected bearing area. For example, if there is a pressure of 500lb./sq. in. on the lower surface of two coating metals and, in theory, both surfaces are flat, the pressure on the surface is 500 lb./sq. in. Since no surface is perfectly smooth, there is bound to be some abrasion between the surfaces of the cylinder walls and piston rings. If the surface has an 80% smooth, or plateaued, finish, the pressure is 625lb./sq. in. If the surface is 10% plateaued, the pressure becomes 5000lb./sq. in., leading to severe engine damage.

Looking for a solution to its surface finishing

problem, RMP turned to Brush Research Manufacturing Co., Inc. (Los Angeles, CA), which supplied the company with a novel deburring/finishing tool known as Flex-Hone®. This System consists of a resilient-based hone with abrasive laminated to the ends of high-density nylon filaments. At RMP the hone is placed in a hand-held air tool and secured by a standard key chuck.

The improved honing operation at RMP works as follows: engines arrive at the company through a dealer exchange program or from core suppliers. The engines then are completely taken apart, cleaned and inspected several times. The engine block, after passing various tests, is bored. Between .001-in. and .006-in. is taken from the cylinder wall.

After boring, the engine block is then taken to a semi-automated rigid honing machine, which hones .0001-in. out of the cylinders. It is immediately after this step that the Flex-Hone system is used. To break the metallic peaks still remaining in the cylinder walls, an operator applies three or four strokes of the tool to each cylinder.

The hones vary in diameter from 4 1/8-in. to 4 1/2 in. and are 120-grit silicon carbide. RMP is using an average of 280 Flex-Hones per year or 60 engines per hone. Cost of the units is merely a few cents per engine.

As a result of using the Flex-Hone tool, RMP has been able to maintain high quality standards at minimal cost. According to Houghton, RMP's rebuilt engines, because of the plateau finish inside the cylinder walls, have a faster break-in time, better oil retention and reduced blow-by.

RMP is so pleased with the Flex-Hones, says Thomas Carter, the company's Director of Purchasing, that it is using them to finish its remanufactured master cylinders. In this operation operators using air-driven tools hone in with 1-in. to 1 1/2-in. diameter, 180-grit silicon carbide units.



A smaller diameter Flex-Hone Tool is used in the finishing of master cylinders at RMP.