BRUSH RESEARCH MANUFACTURING

CASE STUDY

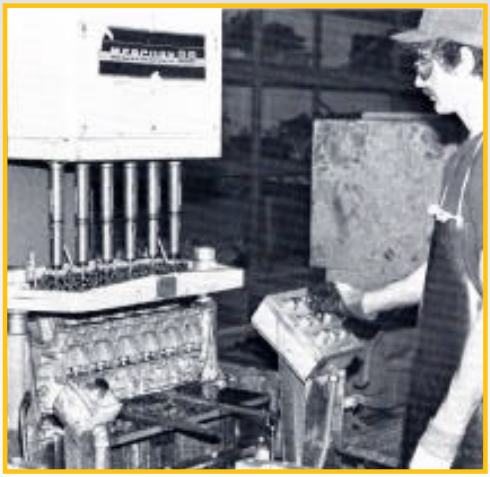
PRODUCT - FLEX-HONE® TOOL

APPLICATION - MARINE ENGINE MANUFACTURER

Mercury Marine improves quality control with Flexible Honing Tool- Company designs special machine to operate the tool

A leading international manufacturer of outboard engines has developed a new method of honing the burrs created during the boring of its engines' cylinders. The new system incorporates a special deburring tool mounted on a custom-designed machine. Results indicate that the system has improved quality control over previous methods of deburring. The new technique is in operation at the block machining plantof Mercury Marine, a Brunswick Company, Fond du Lac, WI. The plant machines most cylinder blocks, gear cases, dry shaft housing, and most of the larger parts of the outboard engines, which are sold under the Mercury and Mariner trademarks. The engines range in displacement from 5.5 cu. In (90cc) up to 207 cu. In. (3393cc) and have from one up to six cylinders.

According to a company spokesman at the facility, the company maintains very rigid standards in finishing and deburring the engine blocks, which are die -cast aluminum. It was in deburring the port area of the cylinders that the company faced a critical quality control problem. A burr is raised after a cylinder is bored.



Operator pushes a button to start machine. Hones oscillate inside cylinders and expand as they exit, removing burrs created at port area during boring.

In the past Mercury Marine has been using emery cloth mounted on a fixed spindle machine to produce a radius at the port area. This process, however, often proved to yield uneven results. Looking to gain better control over the quality of the radius, Mercury Marine adopted an innovative deburring/finishing tool known as Flex-Hone. Manufactured by Brush Research Manufacturing Co., Inc., Los Angeles, CA, the system consists of a resilient-based hone with abrasive laminated to the ends of high-density nylon filaments. To operate the Flex-Hones, the company had designed and built a special reciprocating machine, which has a vertical head that slides up and down on a way. The head holds six Flex-Hones. Powered electrically, the machine ahs a hydraulic unit to force the head up and down.

The cylinder deburring operation at Mercury Marine now works as follows: engine blocks arrive at the plant from the company's adjacent die -casting facility. The blocks go through tow milling operations, drilling and tapping until they are ready for boring. A special machine then bores the cylinders; depending on the engine size, form 2- in. (51mm) up to 3. 74-in. (95mm).

After boring, the blocks are taken to the Flex-Hone machine. There an operator loads a block on a fixture and actuates the machine by pushing a cycle start button. The Flex-Hones next oscillate inside the cylinders for about one minute. During this time the head runs in one direction, the automatically reverses itself.

The spokesman points out that diameter of the Flex-Hones slightly exceed the bore size of the engine block. This, he says, is because when the hones exit the cylinders, they expand and strike the burrs created during boring. This flexing action puts the radius on the port. The hones are 180 grit silicon carbide.

As a result of using the Flex-Hone system, the spokesman says that the company can now hold tolerances on the radius to within 0.005- in. minimum to 0.015-in maximum. Without this control, he explains that a burr at a cylinder's port could eventually lead to engine failure due to excessive ring wear. This system, he concludes, is one example of how Mercury Marine's engineering has been a standard setter in the outboard industry.

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