

# Manufacturing Of Portable Vertical Honing Machine For Small Diameter Bores

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**Abstract** – The paper discusses a portable honing technology by describing the new prototype machine with its specificity. Honing is material removing operation where a large area of the stone comes in contact with the work piece at relatively slow speed and low pressure. It is finishing operation not only to produce high surface finish but also to correct out of roundness taper and axial distortion in work piece. Honing is a machining process that can economically produce very exact bores regarding form geometry and surface quality. It is mainly used as the final finishing operation for ready made parts and typically conducted on inner surface of cylinders. The structure parameter of the Honing wheel have an effect on the machining accuracy in precision honing. In the present work influence of different parameters of rough honing process on surface roughness and material removal rate where studied. Honing is mostly the last step in the production process for precise elements and thus has to comply with high standards for the resulting quality regarding form, measurement and surface quality. Tolerances are currently even further reduced [3].

**Key Words:** Honing, Portable honing machine prototype, Micron finishing

## 1. INTRODUCTION

This paper focuses on investigation of the process dynamics of the internal long stroke honing process [1]. Honing can obtain good form accuracy as well as good surface roughness, it is one of the best alternatives as the finishing technology in manufacturing [4]. In interior honing processes, honing head provided with abrasive stones is used for removing material from the internal surface of material [2] [6]. Honing is employed to improve shape, dimensional precision and surface finish of previously machine parts [6].

Main advantages of interior honing are high material removal rate up to 0.6 mm/min, much higher than that obtain in lapping processes, with typical values of 0.5µm/min. The fact that a lower pressure is usually employed than in grinding processes, making it possible to control roundness and dimensions of the parts, and improved surface texture [6].

### 1.1 Honing process

Honing or to hone is an abrasive machining process that produces a precision surface on a metal work piece by scrubbing an abrasive stone against it along a controlled path.

Honing is primarily used to improve the geometric form of a surface, but may also improve the surface texture. Typical applications are the finishing of cylinders for internal combustion engines, air bearing spindles and gears. There are many types of hones but all consist of one or more abrasive stones that are held under pressure against the surface they are working on.

Honing is particularly used at the end of the manufacturing process during the work piece manufacturing. It finishes surfaces so that they become functional. During the mechanic load of the work piece, the functional glides, seals and guides. Therefore, high demands regarding size, space form and surface quality must be fulfilled. Mostly, the production tolerances lies within the submicron range with a high repeatability at the same time.

The honing process includes the overlap of three movement components that take place simultaneously. The first one is a rotational movement in tangential direction, the second one an oscillating movement in axial direction and the third one is feed motion in radial direction [1] [3].

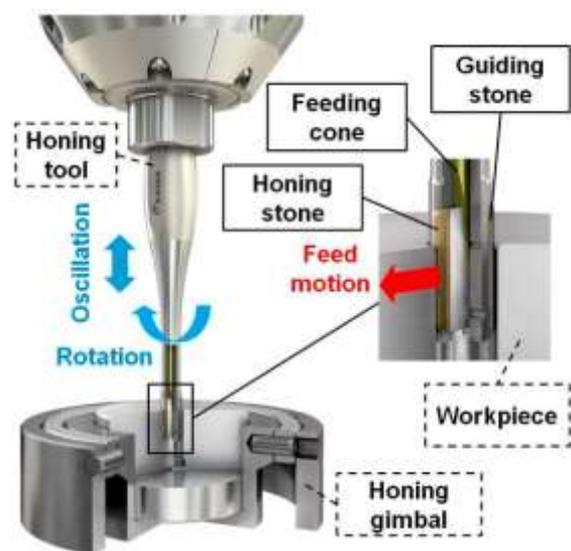


Fig. 1. The Honing Process [1]

### 1.2 Types of honing machine

There are two types of honing machines

1. Vertical honing machine
2. Horizontal honing machine

A vertical honing machine normally incorporates a mechanism not only to rotate but also to reciprocate the honing tool or tools and expands the stones until size is reach. It may have a single spindle or a number of spindles for production, similar to vertical boring machine.

In horizontal honing machines work piece is reciprocates on the rotating honing tool. The reciprocation of work piece can be done by using power stroke.

## 2. PORTABLE VERTICAL HONING MACHINE

The dimensional and geometrical accuracies by normal methods of machining like turning, milling, etc. are limited. The geometrical errors include circularity, cylindricity, flatness and parallelism of function surfaces. Also the surface finish has a vital influence on most important functional properties such as wear resistance, fatigue corrosion resistance and power losses due to friction, poor surface finish will lead to the rupture of oil fills on the peaks of the micro irregularities which lead to a state approaching dry friction are employed in machining the surface of many critical components to obtain a very high surface finish or high dimensional and geometrical accuracies.

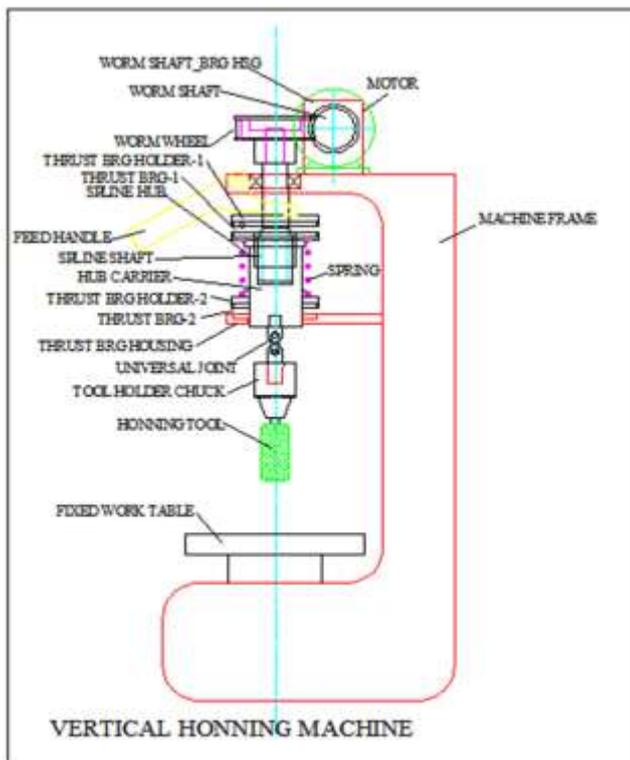


Fig. 2. Portable Vertical Honing Machine

Honing tools are usually of the floating type as they must followed a previously machined bore. When operation either the hone or the work piece is permitted to float so that the relative adjustment between the hone and bore is provided.

### 2.1 Construction

1. Output shaft of motor carrying pulley is connected to the input of worm shaft.

2. The gears of the worm wheel are continuously meshed with the gear.
3. Worm wheel is connected to the spline shaft and spline hub is covered on spline shaft.
4. Spring is mounted between thrust holder 1 and thrust holder 2 on the spline hub for compression.
5. At the end of spline shaft, tool holder is connected with the help of universal joint.
6. Tool holder is provided for holding the tool in proper manner.
7. Table is provided for holding the work piece for further process.
8. Clamping mechanism is provided for holding the work piece.

### 2.2 Working

The general procedural steps in the working of vertical honing machine are as follows:

- a) Mount the job to hone on the table.
  - b) Fixture the job on the table.
  - c) Adjust the tool holder such that it easily passes through the job.
  - d) Start the motor to take light cut.
  - e) Operate the reciprocating arrangement using feed handle.
- On finishing release the tool holder & remove from job.

### 2.3 Advantages

1. Simple in Construction.
2. It's require less space.
3. Manufacturing cost is less.
4. Maintenance required is less.
5. It gives good accuracy & surface finish.

### 2.4 Disadvantages

1. Not suitable for high scale industry.
2. Production rate depends upon the honing tool.

### 2.5 Applications

1. For super finishing of the internal side of circular hole.
2. Any Material can super finish.

## 3.HONING TOOLS

Honing tools are usually of the floating type as they must follow a previously machined bore. When operation either the hone or the work piece is permitted to float so that the relative adjustment between the hone and the bore is provided.

### 3.1 Tools For Manual Stroking

A tool for manual stroking consists of one or more abrasive stones, a mandrel, a wedge and guiding shoes. The purpose of providing unequal angular spacing of the stones with respect to the shoes to facilitate removal of stock from the high spots until roundness is attained. The wedge which controls feed out of the stone, can be actuated manually or by an automatic mechanism. The parallel shoes stabilized and guide the work piece. The shoes are made of a wear resistant material with respect work piece material. Bronze cast iron, steel and plastics are the commonly used as shoe materials. Sometimes sintered shoes are also used as they can retain oil.

Tools for manual stroking of long bores have two or more short stones mounted in a line. Tools and stones should be long enough to permit abrading of common irregularities such as tapered bore bell mouth bore misaligned tandem bores.

Manual honing tools described above can be modified to suit holes with interruptions such as key ways cross holes and blind holes with and without relief when honing blind holes, the stone and the shoe should be of equal length and shorter than the depth of hole.

### 2.2 Abrasive

Selection of the abrasive depends mainly on the composition and hardness of the metal being honed the finish required and cost. Normally aluminum oxide for steels and silicon carbide for cast iron and non-ferrous materials are used as abrasive. Diamond is used for honing extremely hard and wear resistant materials such as tungsten carbide or ceramics for honing nitrided case, or chromium plated surface, diamond has often been more economical on the basis of metal removed in unit time. Diamond hones are also used for blind end holes, and intermittent and interrupted bores.

## 4. MACHINING PARAMETERS

### 4.1 Honing Speed

Honing stones should be kept cutting at all times to ensure conditions breakdown and the grits and the bond and to prevent altering. The aim should obtain free cutting with a minimum of pressure of heat generation.

Cutting conditions for honing are specified in terms of the spindle and the reciprocating speed. The cross-hatch angle depends on the ratios the spindle speed to the reciprocating speed is important in honing.

### 4.2 Spindle Speed / Rotational Speed

The spindle speed depends mainly on the diameters of the bore to be honed. The choice of spindle speed is influenced by the following factors.

- 1) Material being honed-Higher speeds are used for, metals that shear easily as cast iron and non-ferrous metals.

- 2) Hardness –The harder the work piece, the lower the honing speed.
- 3) Surface finish –Round surfaces that dress the stone mechanically allow higher speeds.
- 4) Number and width of stones in a tool- speed should be decreased as the area of abrasive per unit area of bore increases.
- 5) Finish requirements- Higher speeds usually results in finer finish. Excessive speeds contribute to decreased dimensional accuracy, overheating of the work piece and glazing or dulling of the abrasive.

### 4.3 Reciprocating Speed

The reciprocating speed which depends mainly on the length of the honing tool and depth of the bore is expressed in meters per minute as the product of number of strokes per minute and twice the stroke length. Since reciprocating speed, rotary speed and cross-hatch angle are related function, the cross-hatch angle can be controlled by varying the reciprocating speed has considerable influence on the finish of the job. If the reciprocating speed is high the dressing action is greater and consequently results in a rougher finish on the job.

## 5. SUMMERY

In this paper we can summerised that, we can manufacture and fabricate the portable vertical honing machine for small sized diameter bores. Mini honing machine is used in mass production of component. The honing machine can be used in small scale industries. The Machine production which is depend upon the type of honing tool used. This process is used for super finishing process. It is simple in working, and the maintenance required for this machine is less.

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