



Investigation of Influence of Honing Tool Input Factors on the Roughness Parameter

Urinov Nasillo Fayzilloevich

Candidate of technical sciences, associated professor
Bukhara Engineering-Technological Institute

**Saidova Mukhabbat
Khamroevna**

Senior Teacher

Bukhara Engineering-Technological Institute

**Mukhitdinov Mekhriddin
Muminovich**

Undergraduate

Bukhara Engineering-Technological Institute

ABSTRACT

The article presents a comparative analysis of tools and a study of the influence of input factors of a honing tool on surface quality.

Keywords:

Honing head, hole, tool, technology, diamond abrasive, roughness, circumferential speed, axial speed, microroughness, contact pressure.

The development of reliable machines and mechanisms with high performance is associated with an increase in the requirements for accuracy and quality in the manufacture of their parts. Among the common methods of finishing parts, the first place is occupied by abrasive processing, a variation of which is honing. Honing allows to obtain a surface with high dimensional accuracy and low roughness and allows you to correct spatial errors. Honing is one of the operations of the technological process, which produces the finishing treatment of internal cylindrical holes using abrasive tools. Mechanical engineering widely uses this type of processing to obtain high-quality surfaces in the cylinder block of an internal combustion engine during its manufacture or during major repairs [1,2].

The machining process is similar to abrasive grinding, but honing occurs at low speeds. The head performs two main movements: circular rotation and reciprocating movement along the vertical axis. The rotation

speed varies between 40-80 m/min, which is less than 100 rpm. The feed for such revolutions does not exceed 16–20 m/min.

After several double moves, the bars are bred. The honing head has a floating mount for even stock removal. Honing can achieve 5-6 accuracy classes and 10-12 roughness grades.

During the movement of abrasive bars, metal is removed in microscopic volumes. On the surface of the hole, a pattern is obtained from scratches, the angle of intersection of which is 120°. This allows lubricants to linger on the surface, reducing the wear of rubbing parts [2].

Among the reasons for using hons are the following:

- the shape of the machined internal holes corresponds to the geometrical parameters;
- high dimensional accuracy;
- low roughness;
- applying microscopic scratches that form the correct pattern.

The honing head is used to fix honing

stones, which have the ability to penetrate into the machined hole in the radial direction. The type and design of the honing head depends on the size and shape of the hole being machined, on the type of production. Depending on the ratio of the length of the hole to the diameter, three main cases are distinguished:

- honing of short holes;
- honing of medium holes;
- honing of deep holes.

For honing short holes, a machining scheme with a rigid honing head and a floating

workpiece is used. Medium length holes can be machined with rigid heads. For this purpose, double-hinged heads are more widely used. Deep holes are processed using double-hinged heads.

Comparative analysis of suppliers of tools-honing heads.

Data on the parameters of the tool of various manufacturers will be entered in table 1

Summary table about manufacturers
Table 1

Бренд, поставщик	Зернистость	Связка	Материал
Nagel Precision, Германия	80/63	Металлическая	АС
Rottler, США	63/50	Металлическая	АС
Delapena, Англия	50/40	Металлосиликатная	АС

The English company DELAPENA Honing Equipment Ltd is the most successful latest developments and projects in the field of honing. The work of the company is always determined by the needs of customers and is reliably supported by the high qualification of the company's personnel. DELAPENA has specialized in honing for more than 70 years, and during this time has gained experience and developed products that allow us to offer customers the best honing solutions. DELAPENA works with new and existing customers to provide the best end-to-end solution, selected from a wide range of machines available, both standard and automated, to ultimately meet any customer requirement.

In addition, DELAPENA provides a complete range of honing tools and proven technological solutions to ensure correct and efficient operation on all supplied machines. Proven by many years of practice, honing hole finishing technologies are equally important both in the production of various parts and in the repair of automobile engines. That is why the company DELAPENA, for the exclusive presentation of its machines and tools on the Russian market, has chosen the Specialized

Motor Center "AB-Engineering" as one of the leading repair and production companies in the development and promotion of the right repair and production technologies. Over the years of its work, DELAPENA has gained vast experience in the technology of efficient hole honing of a huge range of parts of any configuration. The implementation of these technologies in practice required the development of appropriate technical means - high-performance machine tools, precision tools and convenient equipment. How honing machines, tooling, mandrels, honing heads and honing stones are produced at the DELAPENA factory in England.

Despite the fact that DELAPENA honing tools and equipment were not widely used in the past years, these products are quickly gaining popularity due to their high quality at a relatively moderate price. Significant experience in the use of diamond abrasives in the field of engine repair has allowed ROTTLER to significantly improve their performance parameters, to achieve maximum durability and optimum surface finish.

ROTTLER diamond abrasives are capable of working twice as long as cheaper abrasives from other manufacturers. To achieve the best

possible processing quality, an appropriate coolant must be used. ROTTLER water-based coolants have been developed specifically to work with ROTTLER diamond abrasives. New synthetic coolants are environmentally friendly compared to traditional honing oils. ROTTLER MANUFACTURING is a leader in the use of diamond abrasives in the aftermarket. Diamond abrasives are the development of leading experts from many fields of science, they created the whole process that allowed diamond technology to enter motorsport, industrial engine remanufacturing and the market for small engine repair shops. The diamond abrasive process has proven to be the most economical of all available, as well as

providing consistently high results.

Nagel GmbH, a manufacturer of machine tools and tools, is one of the world's leading specialists in the field of honing and superfinishing technology. Common goal: excellent quality, highest precision, development and increase in production. As a globally renowned and active company with factories in Germany, UK, Brazil, USA, India and China, we understand our customer's problem and meet his requirements.

Experimental dependencies.

We investigate the empirical dependence of roughness on the circumferential speed of the honing head Figure 1.

Fig.1 - Dependence of roughness on circumferential speed.

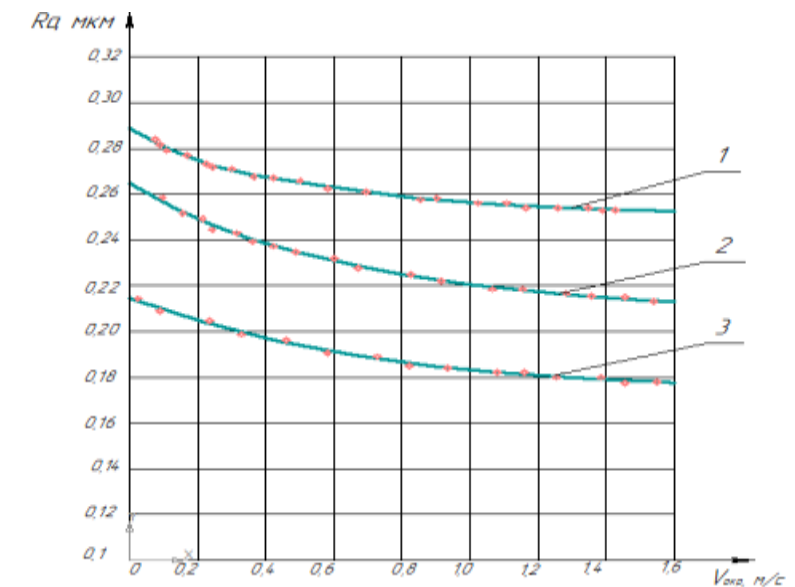
1 - honing head manufacturer NAGEL; 2 - honing head manufacturer ROTTLER; 3 - DELAPENA honing head.

As can be seen from the research, the most efficient manufacturer is DELAPENA. It can also be noted that with an increase in peripheral speed, the roughness of the machined surface decreases. This is due to the fact that the cutting grains of the bars pass

along the same path a significant number of times and leave behind less deep risks.

We investigate the empirical dependence of roughness on the axial speed of the honing head Figure .2.

1 - honing head manufacturer NAGEL; 2 - honing head manufacturer ROTTLER; 3 - DELAPENA honing head.



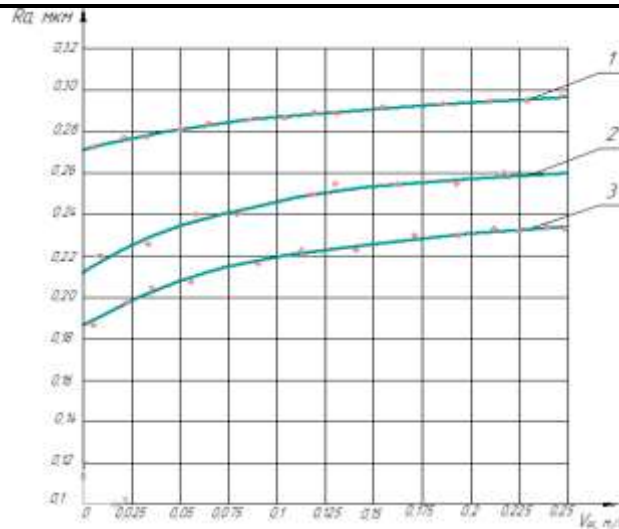
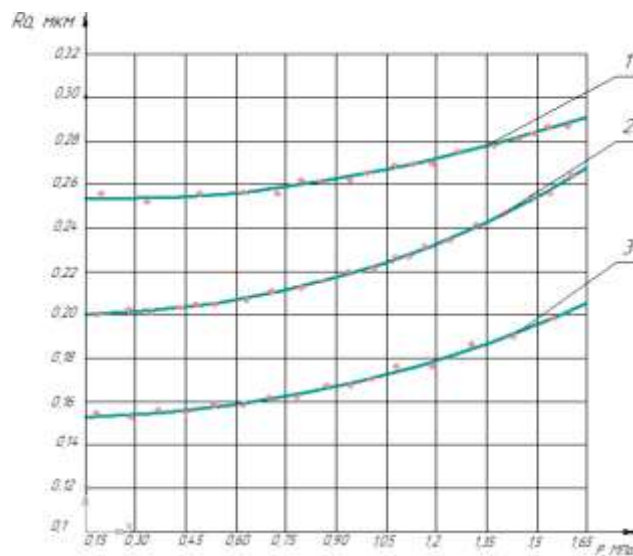


Fig. 2 - Dependence of roughness on axial speed.

The graph shows that the performance of the manufacturer DELAPENA is the best compared to others. As the axial speed increases, microroughness increases. This is due to the fact that when the direction of movement changes, the cutting edges of the

grains change to the opposite ones. This leads to an additional update of the cutting surface, a deterioration in quality.

We investigate the empirical dependence of roughness on the contact pressure of the honing head (Figure .3).



Rice. 3. Dependence of roughness on contact pressure

1 - honing head manufacturer NAGEL; 2 - honing head manufacturer ROTTLER; 3 - DELAPENA honing head.

The manufacturer DELAPENA occupies a position among the manufacturers in question. It should be noted that with an increase in contact pressure on the workpiece, the surface quality deteriorates. This is due to the fact that the grains penetrate to the depth of the treated surface and scratch it.

Literature.

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