(будь то фотон или волна, обладающая импульсом $\mathbf{j}_r = \rho A_в \nu \mathbf{c}$).

Таким образом, мы приходим к выводу, что квантуется не энергия как функция состояния объекта, а процесс энергообмена между ним и окружающей средой. При таком подходе отпадает необходимость прибегать и к другим постулатам, включая возможность деления энергии осцилляторов на равные доли, которые по непонятным причинам поглощаются или излучаются только «целиком», допущение о существовании некоей воображаемой полости с абсолютно зеркальными стенками, а также представление об излучении как некоей неизвестной субстанции со свойствами идеального газа, находящейся с ним в тепловом равновесии. Более того, исчезают и основания признавать существование специфической квантовой механики, не подчиняющейся законам классической физики.

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UDK.621.9

ACHIEVING ENERGY SAVINGS IN PERFORMING HOLE DRILLING ON MAIN WATER PRESSURE PIPES

https://doi.org/10.5281/zenodo.7140144

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Abstract

The main goal of the presented article is to optimize the possibilities of replacing outdated pipeline networks of existing enterprises in our republic, to improve time and quality indicators, and to ensure continuous production process. Creation of a hole-drilling device for connecting an additional pipeline network to surface and underground low-pressure water, oil and gas pipelines passing through the territory of our republic, designing and testing the project in practice, theoretically and mathematically analyzing the parameters of all indicators during the testing process, and finding more optimal method is provided by the current project. In order to prevent the negative effect of the water leaking from the pipe on the welds during the connection of the newly connected low-pressure small-diameter pipe to the low-pressure large-diameter pipes, resulting in the defective bridging of the crystal lattices of the welds. The article mainly provides theoretical information on creating a dry, comfortable workplace for plumbers who repair and install pressure pipes in cold periods of the year.

Keywords: Steel pipes, technological equipment, cooling systems, inter-department communication systems in the enterprise area, water used for technical purposes, improved pipe boring device of rational design, water blocking valves installed in pipes, worm gear reducers and their effective use, newly designed device, time and work efficiency.

Production equipment in enterprises wears out over a certain period and time, as a result of which there is a decrease in the production process, the main factors of which are explained by the progress of wear and tear processes in the parts of machines and mechanisms. In this regard, their current repair, capital repair or replacement is carried out by the enterprise. In connection with the establishment of new production enterprises, the replacement of obsolete machines and mechanisms in current enterprises with new ones as well as the need for cooling systems of these machines and mechanisms is increasing. It is a global problem for the engineering staff of the enterprise to connect the newly installed technological equipment to the main water pipelines under pressure passing through the surface and underground existing in the territory of the enterprise.

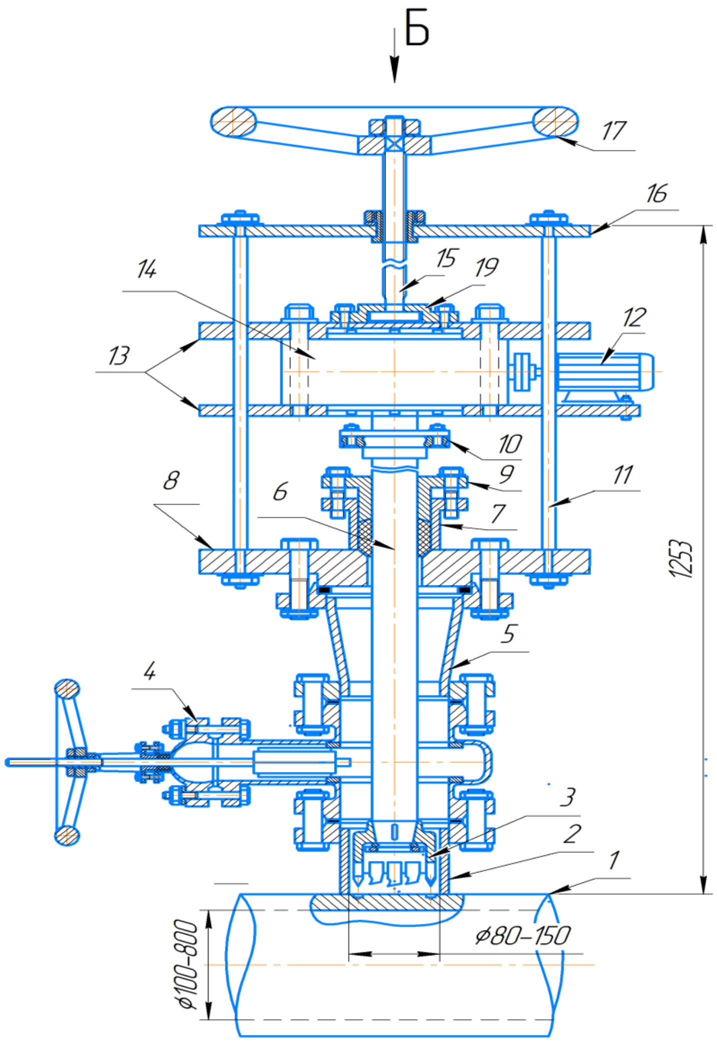
As we know, equipment heats up as a result of technological processes and mechanical actions, and cooling systems are definitely required to keep the temperature of machines and mechanisms at an acceptable level. It is known that the water-conducting pipes of the existing cooling systems at the enterprise are made of 08G2S metal by the pipe-making enterprises, manufactured and controlled according to the requirements of GOST 7831-78 and GOST 7832-78, and delivered to the customer. In industrial enterprises, water resources are used as a coolant for cooling systems of equipment, water resources in enterprises are divided into two groups, drinking water and purified water intended for technical purposes.

As we all know, drinking water is mainly used in industrial enterprises for household services, fire extinguishers in case of fire in buildings and emergency situations. Distilled water is water intended for technical purposes and is used to cool technological equipment and machinery. The water pressure in the pipes installed in the inter-industry communication systems (ICS) in industrial enterprises is always at a pressure of 0.5-0.7 MPa, therefore, the process of connecting additional water pipes to these pipes causes a number of difficulties for the workers. For example, carrying out various types of plumbing works on water pipes under pressure, repair and connection works are carried out with several difficulties due to the water pressure in the pipes. If we take into account the seasons of our republic, it is somewhat difficult to connect new network pipes to water pipes in industrial enterprises in autumn, winter, spring, and we can point to the air temperature as the main reason for this. Connecting newly laid pipelines to pressurized pipelines during the cold seasons causes considerable inconvenience to workers and welders.

In order to connect a new pipeline to the main pipe, it is not possible to fully stop the water because the water pressure of the main pipe is 0.5-0.6MPa., which leads to poor quality welds. Disruption of the melting temperature in the process of connecting the welds of two pipes to each other causes a poor-quality connection between the crystal lattices without the high-quality bridging of the metal crystal lattices. As we know, all water networks have installed water-tight valves, these valves are made of cast iron according to the requirements of GOCT 4832-95 and GOST 1412-85, they are corroded due to long-term exposure to water, and oxidized layers of iron are formed on the surface of the sealing details, with a hard coating a rust coating is formed, which prevents the valves installed in the network from fully closing the water pressure.

Large enterprises are the Navoi Mining and Metallurgical Combine, Gold Washing Hydrometallurgical Plants belonging to the Olmalik Mining and Metallurgical Combine, "Navoiyazot", "Fargonazot", "Maksam Chirchik", "Almalik Maksam" enterprises, which produce mineral fertilizers for agriculture. The above-mentioned enterprises are considered for continuous cooling of the equipment, the work of cutting a hole on the surface of the pipe and connecting a new pipe to this cut hole without reducing the water pressure of the water pipes installed in the underground and above-ground inter-industry communication systems (ICS) without lowering the water pressure, is waiting for its solution. These enterprises are inextricably linked ICS, and today's main urgent problem is the installation of devices designed to connect new pipeline networks without depressurizing or stopping the flow of water in pressurized above-ground and underground metal pipes existing in the territory of the enterprises of our Republic.

In order to eliminate these shortcomings, scientific research work was carried out. As a result of the research, metals and their composition, hardness, deformation, cases of slag separation during cutting were thoroughly studied and put into practice. As an output, the design of the device for drilling holes in pressurized pipes, shown in (Fig. 1), was designed and implemented in industrial enterprises.



1-operating pipeline
2-pipe
3-cutting head
4-gate valve
5-distance sleeve
6-shaft for transmitting rotation to the cutting heads
7-sealing cup
8-base
9-sealed lids
10-coupling halves
11-guide axles
12-electric motor
13-guide base
14-worm gear
15-lifting screw
16-top cover
17- steering wheel

Figure 1. General view of the position of the drill hole cutter installed in the pressure pipe.

In order to carry out the work of the workshop without stopping, it is necessary not to lower the water pressure in the pipes. The main task of the hole drilling device is to drill a hole from a small diameter pipe network to a large diameter water pipe without lowering the water pressure. The professors of the Navoi State Mining and Technological University created an optimized design of the device for drilling holes in pipes under pressure (Fig. 2), as a result of which work such as achieving time savings, ensuring high-quality welding of welds, and creating dry workplaces for employees were successfully carried out [1,2,3].

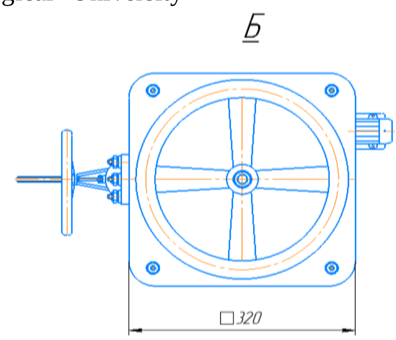


Figure 2. Overhead view of the installation of the device in the pipeline under pressure.

The device can be installed vertically and horizontally on metal pipes, depending on the operating conditions. We present the working process of the recommended device as follows (Fig. 2). Pipe under pressure 1, nozzle 2 installed by welding, valve fixed with bolts 6, 7, 8, 9, 10 on top of the valve and its details, gasket ensuring hermeticity is installed between nozzle and valve.

Bricks with fastening bolts were prepared based on the requirements of OST 26-2037-96, OST26-2037-96, OST 26-2038-96 (Fig. 1 and 2) [7,10]. Drinking water and deionized technical water are transported to production enterprises through underground and surface pipeline systems through pipes made of 08G2S metal, the chemical composition and mechanical properties of pipes are subjected to special laboratory tests based on state standards GOST 8731-74 and GOST 8732-78 for pipes of all diameters . Based on this standard, the hardness of the pipes is increased to NV-180-220MPa hardness by the "Normalization" heat treatment process of workpiece after rolling under the influence of external force [8,9,10]. To reconfirm this, we use the following formula:

$$HB = \frac{0{,}102F}{\frac{\pi D}{2}\left(D-\sqrt{D^2\, d^2}\right)} \qquad (1)$$

A top view of the device is shown in view A, in which the device is made of four-cornered metal plates and the position of the electric motor is opposite to the valve (Fig. 3). The device is powered by a 2.1 kW electric motor 22. The device carves the surface of the pipe by cutting a hole in the pipe 1 under pressure by moving vertically up and down. Flanged nozzle 2 with a length of L - 100 millimeters is installed on the pressurized pipe by welding, a valve 6,7,8,9,10 designed for the required pressure is selected and installed together with compression, the purpose of which is to ensure hermeticity. The compaction packing 21 shown in the drawing of the device (Figs. 1 and 2) is designed to hold the exiting water under pressure after the hole drilling process is completed.

It consists of 24 couplings that transmit the movement from the reducer to the cutting head, 11 axes of vertical direction, 22 electric motors that move the device, 10 reducers that slow down the movement, and 12 flanges that keep the axes vertical and ensure continuous operation of the device.

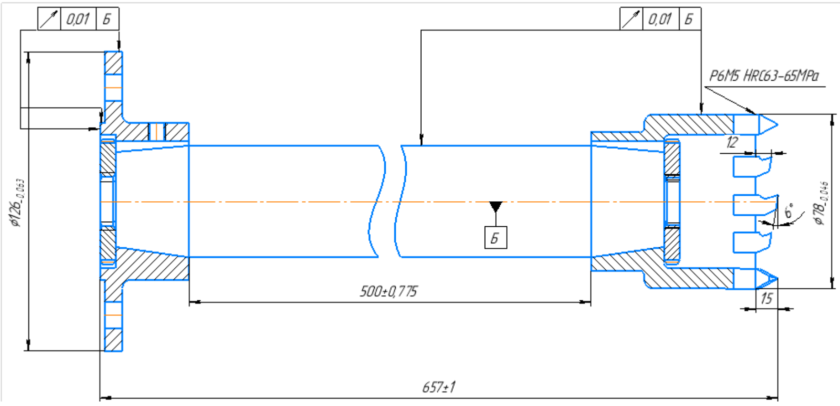


Figure 3.

General view of the device that drills a hole on the surface of the pipe by accepting the action of the reducer.

The hole drilling device has been proven to be the most effective device designed today in experimental practices. This device, made on the basis of a simplified design, is made of a simple metal structure, and it is possible to prepare it in repair mechanics shops with uncomplicated technological equipment. Based on the potential of machine-building and repair mechanics workshops in our republic, according to theoretical calculations, all of the above-mentioned local enterprises have the opportunity to manufacture this device.

The preparation and assembly of device details does not include expensive technological processes and machine tools, the cutters installed on the cutting head shown in (Fig. 4) are made of R6M5 high-speed steels based on GOST 1133-71, with a hardness of HRC 63-65 MPa after heat treatment, as a result, since the hardness of the pipe walls is NRC 20-23 MPa, the processes of drilling a hole in the pipe wall and separating slag from it were successfully carried out (Fig. 4).

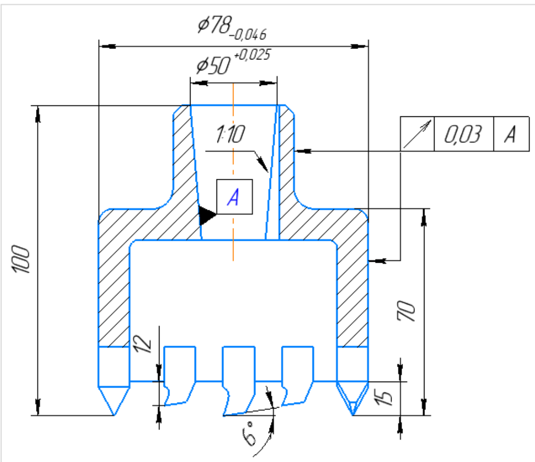


Figure 4. Assembly drawing of the cutting head.

It is advisable to use the worm reducer movement to rotate the cutting head, the reducer regularly takes the movement from the electric motor to rotate regularly, so we give an example of calculating the power of the electric motor by the following formula, taking into account the weight force falling on the electric motor during the cutting of the pipe surface:

$$P_{elect.motor} = \frac{P_{III}}{\eta} = \frac{4{,}5kW}{0{,}903} = 4{,}98kW; \quad (2)$$

where $P_{III}\ (kW)$ is the output shaft power of the electric motor, η – coefficient of useful work.

In the successful implementation of the process of cutting a hole on the surface of a water pipe under pressure, the rotational motion of the electric motor, whose power is found by formula 1, is transmitted to the reducer through the transmission couplings (Figs. 1, 2, part 22), so we can compare the number of revolutions of the electric motor in 1 minute , we need to determine the number of rotations of the reducer in 1 minute, for this we use the following formula, we show the angular speed of the reducer shaft by the following formula 3 as an example:

$$n_{vix} = \frac{30\omega}{\pi} = \frac{30\cdot 4{,}0}{3{,}1416} = 38{,}2\ rev/min; \quad (3)$$

Where n the number of rotations of the reducer shaft;

The rotary motion from the selected reducer is transmitted directly to the rotating spacer shaft shown in Fig. 1.2, view 5 through half-couplings shown in Fig. 1 and 2, part 5, which in turn transmits rotary motion to the cutting head. To move the cutting blades of the rotating cutting head along the vertical axis and touch the surface of the pipe lying on the horizontal axis, we use the steering wheel of Fig. 1, 2, part 16. In order to carve a hole on the surface of the pipe under pressure, the steering wheel of Fig. 1 and 2 is continuously rotated by the worker by manual force along the vertical axis at a speed of 0.1mm. we find the cutting speed along (formula 4).

$$\vartheta = \frac{\pi D n}{1000}; \quad (4)$$

where π = 3.1416; D - the diameter of the treated surface in mm; n - the number of revolutions of the shaft per minute;

From this formula, we conclude that the 360° rotation of the steering wheel shown in part 16 in Figure 1, 2 provides the cutting depth of the pipe surface in the vertical direction. The greater the depth of cut, the greater the force of gravity on the cutter mounted on the cutting head. We can find the shear force in the process of straightening the surface of the pipe wall by this analytical formula (*N/mm*):

$$P_{z(y)} = 10 \cdot C_p \cdot t^y \cdot S^y \cdot V^n \cdot K_p \quad (5)$$

where C_p- coefficient of processing form, t^y - cutting depth, S^y - vertical extension mm/rev, V^n - cutting speed, mm/min, K_p is the generalized correction factor

From this analytical formula, we conclude that the cutting head moves along the vertical axis with a depth of 0.10 mm on the surface of the pipe, and we determine the force on the surface of the cutter in *N/mm*. In order to continuously continue the movement along the vertical axis, we determine the thread pitch of the screw shown in Fig. 1, 2 and part 15.

As a result of applying the device for cutting a hole to the working pipe, the following efficiency is achieved:

1. It is possible to carve a hole on the surface of the pipe without stopping the pipe water under pressure.
2. When the products of the oil and gas industry are transported over long distances through main pipelines, it becomes possible to connect additional networks for receiving products from these pipelines, and to sell products to new customers without stopping these pipelines.
3. Time and energy savings are achieved when launching new technological systems.
4. There will be an opportunity to deliver liquid products in the central main pipelines to industries and organizations in a short time.
5. Drinking water supply to new high-rise buildings built in cities and small towns will be improved.
6. The labor productivity of workers servicing main pipelines will be increased.
7. Labor savings for enterprises are achieved.
8. Work productivity of workers working on water main pipes is ensured during the cold periods of the year.
9. During the period of connecting additional network lines in main pipelines, the degree of dampness and mudding of the workplace will decrease.
10. The quality of welding in welds is ensured, as a result, water leakage between welds is eliminated, water resources are saved.

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