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Centrifugal Pumps

Parpiyev Sayfiddin Fazliddinovich
Department of General Engineering, Andijan Institute of Mechanical Engineering

ABSTRACT

Improving the efficiency of use due to constructive changes in some parts of pumping units and the selection of optimal operating modes. Determination of the permissible installation geometric height of the pump shaft. Determine the permissible installation geometric height of the pump shaft from the level of water suctioned by the pump.

KEYWORDS: *Pump, pumping station, volume, resistance coefficient, open flow, velocity, live section, perimeter, channel, water flow, friction.*

Introduction

Enter. Pumps belong to the type of machines that provide energy to liquids and are usually used to draw water, oil, gasoline, kerosene, various oils and other liquids from the depths, lift them up, transfer them from one place to another, move and transport other objects with them. In this case, the energy of liquids increases as they pass through the pump. With the help of this energy, it will be possible to perform the mentioned work on the liquid. Pumps are divided into different groups depending on the energy they give to the liquid or how much liquid they can transfer, and they are named differently depending on the way they perform the task. Shovel pumps are common in the household; they are used to transfer liquids and gases. The pressure generated by shovel pumps is 2500 m above sea level. Exceeds and the productivity reaches up to 100,000 m^3/hour when working with liquids, and up to 1,000,000 m^3/hour when working with gases [1].

Experimental section

In practice, in water supply, submersible pumps are usually used together with centrifugal pumps. The advantage of such devices is that there are no rotating parts inside the well. The centrifugal pump and the electric motor are placed on the ground in a place convenient for observation.

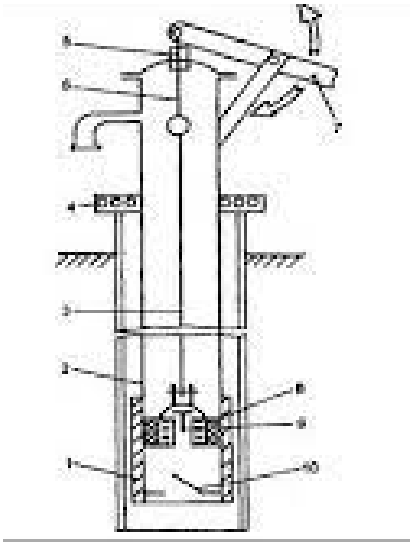

Figure 1: General scheme of the pump:

1-cylinder; 2-column riser; 3-barbell; 4-hook; 5-stuffing box; 6-stock; 7-balancer; 8-piston; valve; push valve.

Elements of the speed plan at the entrance and exit to the channel between the blades of the working wheel and the geometric dimensions of the wheel are designated by indices 1 and 2, respectively. Hydraulic machines: pumps and hydraulic motors, grouping of hydraulic machines, operation of hydraulic machines, hydraulic transmissions. Shovel pumps (centrifugal, Axial and reciprocating pumps). Scheme of displacement pumps, piston and rotor-plate pumps. Application of various types of pumps in industry and agriculture. The operation of pumps and conduits together, the operation of centrifugal machines, Euler's equation, theoretical pressure, the influence of the geometric shape of the working vanes on the pressure generated by centrifugal type machines. The working wheel of centrifugal type machines. Power and efficiency of centrifugal machines. These are the main indicators of pumps [2,3,4].

The shape of the impeller of centrifugal type pumps and their structural types. Efficiency and efficiency of centrifugal pumps. The main structural elements of centrifugal type pumps. Structural schemes, main details and working principles of axial pumps. Construction of two-stage axial pumps. Couplings for connecting the pump with the engine. It is very important that the main structural elements of axial fans work at the required level, being considered the main elements in operation and maintenance. Indicator diagram of piston pumps, their working principle and structural schemes. Performance, power consumption and efficiency of reciprocating pumps

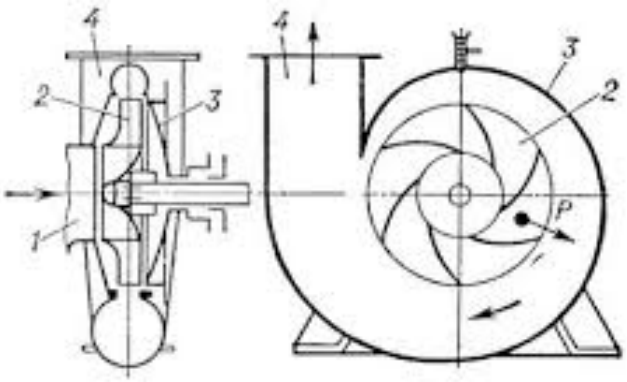

Figure 2: Kinematic scheme of the vane pump: 1-suction valve; 2-wing; 3-corps;4-emitting column

Figure 3. Water pump impellers

Determination of the permissible installation geometric height of the pump shaft. Determine the permissible installation geometric height of the pump shaft from the level of water suctioned by the pump. The pump is characterized by the following data: Q=1450m^3/h; n= 970 rpm; D_2= 855 mm; d_{suc} =500 mm; D_1=320 mm. Sizes of water at the entrance: P_0 =1.03 kG/cm^2; t_w = 200C; Σh_{suc}= 0.25

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m. If required, then the calculation is carried out according to: Saturated water vapor at T= 20 ^{0}C From the table, we determine the saturation pressure: P_{st} =0.024 kG/cm^2.

So: $H_{cav} = \frac{p_0 - p_{suc}}{\gamma} = \frac{1,03 - 0,024}{0,001} = 1006\,cm = 10,06\,m$

according to the formula: $H_{suc}^{cr} = 10,06 - 10\left(\frac{970\sqrt{\frac{1450}{3600}}}{1100}\right)^{4/3} = 5,46\,m$

Fixed suction height:

$$H_{suc}^{ad} = 5,46 - 0,25(10,06 - 5,46) = 4,31m$$

Speed at the pump suction pipe:

$$C_{SUC} = \frac{Q}{\Omega} = \frac{1450}{3600 \cdot 0,785 \cdot 0,5^2} = 2,05\,m/s$$

Velocity pressure in the suction pipe:

$$\frac{C_{SUC}^2}{2g} = \frac{2,05^2}{19,6} = 0,214\ m$$

Fixed geometric height

$$H_{FIX} = H_{suc}^{ad} - \Sigma h_{suc} - \frac{C_{suc}^2}{2g} - \frac{D_1}{2} = 4,31 - 0,25 - 0,214 - 0,16 \approx 3,7\ m$$

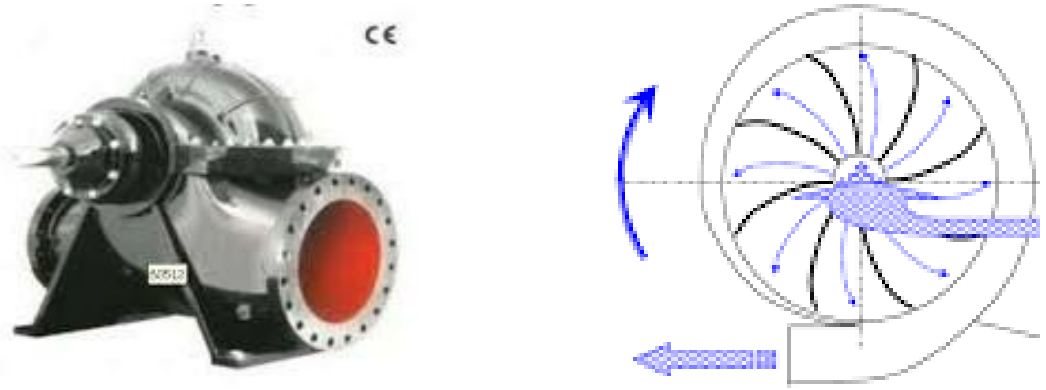

Figure 4: Centrifugal type pumps used in industry

The efficient use of pumps in the public sector is one of the main factors in the rise of the industrial economy [5,6].

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