

T-7 Pumps, flowmeters, dispensers, filter equipment

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INTRODUCTION

Handling PHM includes a variety of activities that require the use of prescribed technical equipment. Right and safe handling with the fuel requires appropriate security techniques and tools in quality working order. Types and composition is dependent on realised activities.

1. BASICS OF HYDROMECHANICS

To understand the basic functions of the pump is essential to clarify some basic rules for fluid mechanics.

Hydromechanics is part of the mechanics that deals with the balance and movement of the liquid and the interaction of liquids and solids.

Hydromechanics are divided on:

hydrostatic, which explains the conditions of fluids balance and their effects on solid materials in rest;

- Hydrodynamics, are occupied by movement of fluids and their effect on solid materials during relative movement.
- Hydromechanics are used in various fields of engineering, such as pumping equipment, energetics, etc.

1. BASICS OF HYDRODYNAMICS

Density

Share of the weight and volume.

$$\rho = \frac{m}{V} \quad [\text{kg} \cdot \text{m}^{-3}]$$

The density depends on the composition of the fluid, temperature and pressure. When increasing pressure density rises slightly.

1. BASICS OF HYDROMECHANICS

Compressibility

Is ability of the liquid to shrink and swell under pressure. It is characterized by a coefficient of compressibility (delta).

$$\delta = \frac{dV}{V_0 \cdot dp} \quad [\text{Pa}^{-1}]$$

δ - Compressibility, coefficient of compressibility of the liquid $[\text{Pa}^{-1}]$

V_0 - original liquid volume before compression $[\text{m}^3]$

dV - Reducing original volume at pressure increase $[\text{m}^3]$

dp - Pressure increase $[\text{Pa}]$

Liquids exhibit significant resistance to reducing its volume.

2. PUMPS

The basic operating parameters of pumps :

- Specific energy of pump,
- Pump power,
- Pump efficiency,
- transport pump pressure (hydrostatic pumps)
- Allowed geodetic height.

2. PUMPS

Pump flow

It is the amount of fluid that flows through the discharge port of the pump per unit time.

According to the method of measurement, we are talking about mass or volume flow.

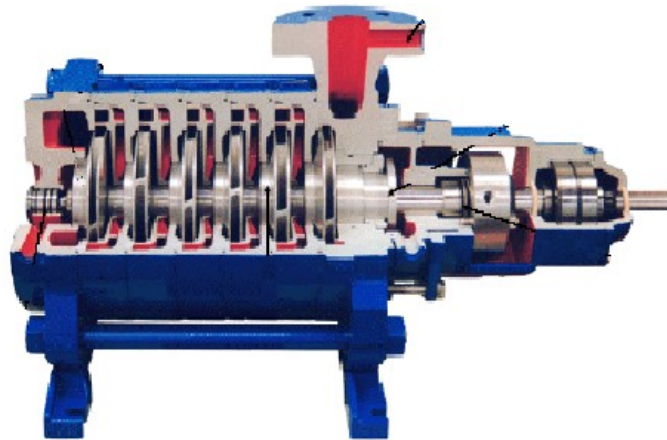
Volumetric flow rate is the volume of liquid flowing through the cross sectional area per unit time. We call it Q.

$$Q = \frac{V}{t} \quad \left[m^3 \cdot s^{-1} \right]$$

2. PUMPS

Centrifugal pumps

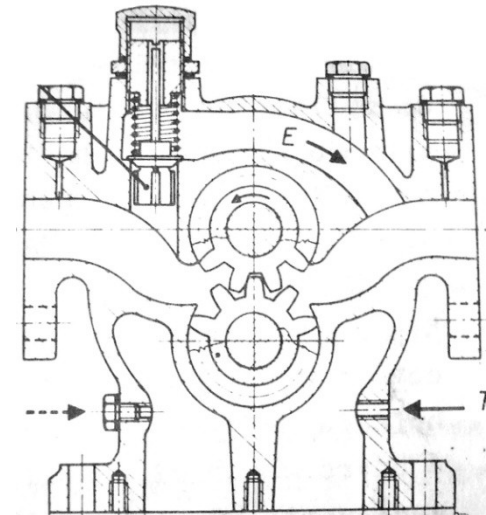
Pumps are multistage, centrifugal, horizontal, with radial impellers and radial cabinet. They are combined with self-suction stage, which is moved in front of suction unit and it allows independent operation of both parts of pump in one time. Pump is composed from rotor and stator with seals and deposits.



2. PUMPS

Gear pumps

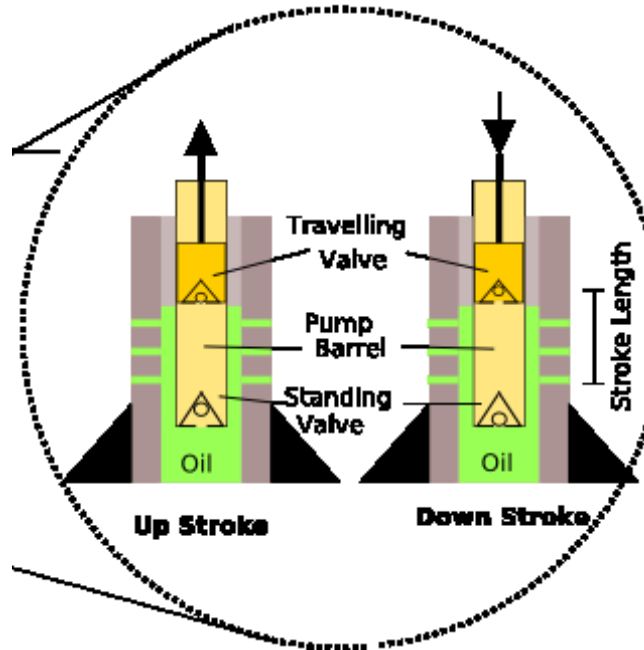
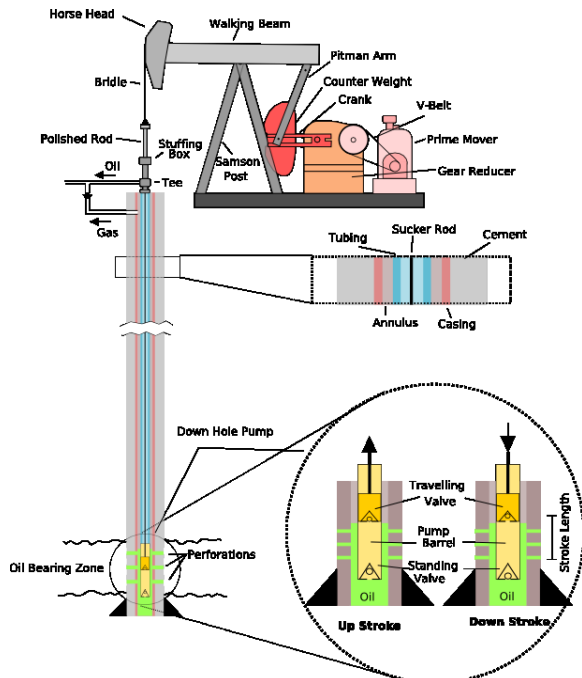
Gear pumps are among the most widespread of rotating hydrostatic pumps. They are used in hydraulic systems, lubrication systems in machinery and equipment as well as major technological pumps in the chemical and petrochemical industry. They are relatively simple design (a minimum of moving parts, virtually driving and driven wheel), have little weight, small dimensions and compact.



2. PUMPS

Piston pumps

Piston pumps are among the oldest types of pumps. The quantity of liquid pumped by pump piston determining the volume created by the movement (stroke) of the piston in the cylinder.



3. FLOWMETERS

3. Flowmeters

They are an important part of the technology at a fuel station. Accurate measurement of the volume of the product, its temperature and continuous volume correction to standard temperature of 15 C is an essential prerequisite for inventory management. Thanks to the integrated water recognition is a system of quality assurance. In combination with the amount released from dispensers can be detected possible leaks. Through the POS system can be monitored and given the amount of losses as telemetry using a highly valuable and versatile tool for managing storage of fuels and oils. Highly accurate measurement of tank contents has been designed especially for use at petrol stations.

3. FLOWMETERS

Volumetric flow rate

Volumetric flow rate Q_v denote the volume of fluid which passes through conduit per unit of time (e.g. $\text{m}^3 \cdot \text{s}^{-1}$). To determine the volumetric flow rate through the use of differential pressure measurement or calculation of the rate of fluid flow in a pipe of known diameter. We assume, however, that the fluid fills the entire pipe, which may not always correspond to reality. When measuring the flow of liquids is sometimes necessary to perform correction of volume flow to changes in temperature and pressure. For flow measurement of gases and vapors must always perform these corrections due to the compressibility of the flowing medium.

3. FLOWMETERS

Mass flow rate

Mass flow rate Q_m indicates mass of fluid which passes through the pipe per unit time. For direct measurement, there are two basic methods - flowmeters based on the Coriolis principle and thermal mass flowmeters. Indirectly, the mass flow rate can be calculated from the volume flow and the known values of the density of the flowing fluid ρ :

Total volume - a volume or mass of fluid has passed a certain point of the pipeline for some time. Among the flowmeters that measure the total volume include gas meters and water meters in homes.

Source: <http://www.tzb-info.cz/4624-mereni-prutoku-tekutin-principy-prutokomeru>

CONCLUSION

Technical resources are an essential part of security through fuel.

Knowledge of technical design and control is a necessary requirement for reliable and safe operation.