



ДОНСКОЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ

ЦЕНТР ДИСТАНЦИОННОГО ОБУЧЕНИЯ И ПОВЫШЕНИЯ
КВАЛИФИКАЦИИ

Кафедра «Научно-технический перевод и профессиональная
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МЕТОДИЧЕСКИЕ УКАЗАНИЯ ПО АНГЛИЙСКОМУ ЯЗЫКУ

для самостоятельной работы студентов

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Аннотация

Методический указания для самостоятельной работы студентов по специальности 150802 Гидромашины, гидроприводы и гидропневмоавтоматика. Настоящие указания предназначены для студентов специальности 150802. Цель методических указаний - развитие навыков чтения и говорения, развитие языковых знаний студентов в сфере профессиональной коммуникации.

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UNIT I

What is fluid power?

Fluid power is the technology that deals with the generation, control, and transmission of power-using pressurized fluids. It can be said that fluid power is the muscle that moves industry. This is because fluid power is used to push, pull, regulate, or drive virtually all the machines of modern industry. For example, fluid power steers and brakes automobiles, launches spacecraft, moves earth, harvests crops, mines coal, drives machine tools, controls airplanes, processes food, and even drills teeth. In fact, it is almost impossible to find a manufactured product that hasn't been "fluid-powered" in some way at some stage of its production or distribution.

Since a fluid can be either a liquid or a gas, fluid power is actually the general term used for hydraulics and pneumatics. Hydraulic systems use liquids such as petroleum oils, water, synthetic oils, and even molten metals. The first hydraulic fluid to be used was water because it is readily available. However, water has **many** deficiencies. It freezes readily, is a relatively poor lubricant, and tends to rust metal components. Hydraulic oils are far superior and hence are widely used in lieu of water. Pneumatic systems use air as the gas medium because air is very abundant and can be readily exhausted into the atmosphere after completing its assigned task.

Fluid power systems are designed specifically to perform work. The work is accomplished by a pressurized fluid bearing directly on an operating fluid cylinder or fluid motor. A fluid cylinder produces a force, whereas a fluid motor produces a torque. Fluid



cylinders and motors thus provide the muscle to do the desired work. Of course, control components are also needed to ensure that the work is done smoothly, accurately, efficiently, and safely.

Задание 1. Прочтите и переведите текст.

Задание 2. Переведите на русский язык следующие термины:

power-using pressurized fluids, fluid power, drills teeth, a relatively poor lubricant

Задание 3. Составьте 5-7 специальных вопросов к тексту

Задание 4. Ответьте на вопросы:

What is fluid power ?

What liquids do hydraulic systems use?

What types of fluid systems are ?

How is the work fluid power systems accomplished?

UNIT II

Closed-loop versus open-loop systems

Fluid power systems can be either (the closed-loop or open-loop type). The following describes these two types of fluid power systems.

A closed-loop system is one that uses feedback. This means that the state of the output from the system is automatically sampled and compared (fed back) to the input or command signal by means of a device called *feedback*. If there is a difference between the command and feedback signals, action is taken to correct system output until it matches the requirement imposed on the system. Closed-loop systems are frequently called *servo systems*, and the valves used to direct fluid to the actuators are typically called *servo valves*.

An open-loop system does not use feedback. The output performance of the system therefore depends solely on the characteristics of the individual components and how they interact in the circuit. Most hydraulic circuits are of the open-loop type, which are generally not so complex or so precise as closed-loop systems. This is because any errors such as slippage (oil leakage past seals, the magnitude of which depends on system pressure and temperature) are not compensated for in open-loop systems. For example, the viscosity of a hydraulic fluid decreases (fluid becomes thinner) as its temperature rises. This increases oil leakage past seals inside pumps, which, in turn, causes the speed of an



actuator, such as a hydraulic motor, to drop. In a closeu-loop system, a feedback transducer (for example, a tachometer, which generates a signal proportional to the speed at which it is rotated) would sense this speed reduction and feed a proportional signal back to the command signal. The difference between the two signals is used to control a servo valve, which would then increase the fluid flow rate to the hydraulic motor until its speed is at the required level.

Задание 1. Прочтите и переведите текст.

Задание 2. Переведите на русский язык следующие термины:

closed-loop, a feedback transducer, servo valves, oil leakage past seals

Задание 3. Составьте 5-7 специальных, вопросов к тексту, используя термины из задания 2.

Задание 4 . Ответьте на вопрос:

What is the difference between a closed-loop and an open-loop fluid power system?



UNIT III

Nonpositive displacement pumps and positive displacement pumps

A pump which is the heart of a hydraulic system converts mechanical energy into hydraulic energy. The mechanical energy is delivered to the pump via a prime mover such as an electric motor. Due to mechanical action, the pump creates a partial vacuum at its inlet. This pennits atmospheric pressure to force the fluid through the inlet line and into the pump. The pump then pushes the fluid into the hydraulic system.

There are two broad classifications, of pumps as identified by the fluid power industry.

1 .Nonpositive displacement pumps: This type is generally used for low-pressure, high-volume flow applications. Because they are not capable of withstanding high pressures, they are of little use in the fluid power field. Normally their maximum pressure capacity is limited to 250-300 psi. This type of pump is primarily used for transporting fluids from one location to another.

Positive displacement pumps: This type is universally used for fluid power systems. As the name implies, a positive displacement pump ejects a fixed amount of fluid into the hydraulic, system per revolution of pump shaft rotation. Such a pump is capable of overcoming the pressure resulting from the mechanical loads on the system as well as the resistance to flow due to friction

Hydrostatic or positive displacement pumps. This type of pump ejects a fixed quantity of fluid per revolution of the



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pump shaft. As a result, pump output flow, neglecting the small internal leakage, is constant and not dependent on system pressure. This makes them particularly well suited for fluid power systems.. However, positive displacement pumps must be protected against overpressure if the resistance to flow ' becomes very large or infinite. This can happen if a valve is completely closed and there is no physical place for the fluid to go. The reason for this is that a positive' displacement pump continues to eject fluid (even though it has no place to go), causing an extremely rapid buildup in pressure as the fluid is compressed. A pressure relief valve is used to protect the pump against overpressure by diverting pump flow back to the hydraulic tank, where the fluid is stored for system use.

Positive displacement pumps can be classified by the type of motion of internal elements. The motion may be either rotary or reciprocating.

Задание1.Прочтите и переведите текст.

Задние 2.Переведите на русский язык следующие термины:

positive displacement pumps, no positive, displacement pumps, piston pumps, gear pumps, vane pumps, low-pressure, high volumetric efficiency, pressure relief valve, oil tank.

Задание3. Ответьте на вопросы:

What is the difference between positive displacement and no positive displacement pumps?

What types of positive displacement pumps do you know?



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What do pumps produce?

What prevents any additional pressure buildup?

Are pressure relief valves needed when pressure- compensated pumps are used?

Задание 4. Найдите в тексте ключевые термины и составьте с ними свои предложения.

Задание 5. Переведите на русский язык следующие предложения:

A. fixed displacement pump is one in which the amount of fluid ejected per revolution cannot be varied. In a variable displacement purhp, the displacement can be varied by changing the physical relationships of various pump elements.



UNIT IV

Pumping theory

All pumps operate on the principle whereby a partial vacuum is created at the pump inlet due to the internal operation of the pump. This allows atmospheric pressure to push the fluid out of the oil tank (reservoir) and into the pump intake. The pump then mechanically pushes the fluid out the discharge line.

This type of operation can be visualized by referring to the simple piston pump of figure I. Note that this pump contains two ball check valves, which are described as follows:

Check valve 1 is connected to the pump inlet line and allows fluid to enter the pump only at this location.

Check valve 2 is connected to the pump discharge line and allows fluid to leave the pump only at this location.

As the piston is pulled to the left, a partial vacuum is generated in pump cavity 3, because the close tolerance between the piston and cylinder (or the use of piston ring seals) prevents air inside cavity 4 from traveling into cavity 3. This now of air, if allowed to occur, would destroy the vacuum. This vacuum holds check valve 2 against its seat (lower position) and allows atmospheric pressure to push fluid from the reservoir into the pump via check valve 1. This inlet flow occurs because the force of the fluid pushes the ball of check valve 1 off its seat. When the piston is pushed to the right the fluid movement loses inlet valve 1 and opens outlet valve. The incompressibility of fluid, displaced by the piston, is usually ejected out the discharge line leading to the hydraulic system. The volume of oil



displaced by the piston during the discharge stroke is called the "displacement volume"⁵ of the pump.

From the operation of the simple piston pump; it can be seen why a pump does not pump pressure. Pumps produce flow. The pressure developed is due to the resistance of the load, which is being driven by the system hydraulic actuators.

Задание 1. Прочтите и переведите текст.

Задание 2. Переведите на русский язык следующие термины.

Pump inlet, discharge line, hydraulic system, prime mover
force, inlet valve, outlet
valve, displacement, volume, simple piston pump.

Задание 3. Ответьте на вопрос:

Explain the operation of simple piston pump.

Задание 4. Найдите в тексте ключевые термины и составьте с ними свои предложения.

Задание 5 Переведите на русский язык следующие предложения:

A pump operates on the principle whereby a partial vacuum is created at the pump inlet due to the operation of the pump. This allows atmospheric pressure to push the fluid out of the oil tank and into the pump intake.