МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ МІСЬКОГО ГОСПОДАРСТВА імені О. М. БЕКЕТОВА

МАТЕРІАЛИ

XIX ВСЕУКРАЇНСЬКОЇ НАУКОВО-ТЕХНІЧНОЇ КОНФЕРЕНЦІЇ ЗДОБУВАЧІВ ВИЩОЇ ОСВІТИ «СТАЛИЙ РОЗВИТОК МІСТ: ПОСТВОЄННИЙ ПЕРІОД»

ЧАСТИНА ІІ

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Матеріали

XIX Всеукраїнської науково-технічної конференції здобувачів вищої освіти «Сталий розвиток міст: поствоєнний період»

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Розглядаються питання розробки та впровадження технічних засобів експлуатації електротротранспорту, електропостачання та освітлення міст, які підвищують їх експлуатаційну надійність.

Представлено широкий спектр досліджень в галузях автоматизації, робототехніки, машинобудування, інформаційних технологій.

Висвітлюються актуальні питання хімії та фізики, розвитку хімічної інженерії, інноваційних досліджень у сфері матеріалознавства та нанотехнологій

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of computer technologies makes it possible to identify potential weak points of the rotor already at the design stage.

Compact plastering stations, like any technical equipment, have their own advantages and disadvantages that should be taken into account during their selection and operation. Such stations are usually easy to move and transport, which allows them to be used at different construction sites, including those with limited access [3-4]. Their compact dimensions make it possible to efficiently utilize limited space on construction sites or in storage facilities. In addition, they are typically quick to install and ready for operation, requiring less time and effort for setup compared to larger equipment. Due to their limited dimensions, such stations may also have fewer functional capabilities or options compared to larger models.

In this study, the screw of a pumping unit for compact equipment used for applying construction mortar by the shotcrete method was modeled using the example of the SO-150 plastering unit.

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DEVELOPMENT OF A HYDRAULIC TRACTION WINCH WITH A FREQUENCY-CONTROLLED VOLUMETRIC HYDRAULIC DRIVE

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At the present stage of development of evacuation equipment, traction winches with electric drives are the most widely used. Their widespread application is conditioned their relatively simple design, ease of operation, and comparatively low maintenance cost. However, electric winches also have several significant drawbacks, primarily related to the necessity of using a powerful power supply. During the operation of a tow truck, it becomes necessary to keep the internal combustion engine running continuously, since the capacity of the battery is insufficient to ensure stable operation of the electric winch. As a result, increased fuel consumption occurs, which is explained by the low efficiency of the internal combustion engine when operating at idle speed. In addition, during prolonged operation of the winch, the electrical power consumption becomes so high that the vehicle generator cannot compensate for the battery discharge, leading to its accelerated wear.

In order to eliminate these disadvantages, it is advisable to apply an alternative drive system capable of ensuring more efficient utilization of energy resources and improving the traction characteristics of the winch mechanism, especially at low rotational speeds. A promising direction of improvement is the development of a hydraulic traction winch with a frequency-controlled volumetric hydraulic drive.

The proposed design scheme involves the use of a hydraulic motor that directly drives the winch drum. The working fluid is supplied to the hydraulic motor by a hydraulic pump, which is driven by an electric motor with frequency control. The electric motor is powered by the vehicle battery, which accumulates charge during the operation of the internal combustion engine while the vehicle is in motion.

The use of a frequency-controlled drive provides several important technical advantages. In particular, high precision of speed regulation is achieved, which allows the vehicle to be pulled smoothly without jerks or impact loads. In addition, the operating range of the power unit is expanded and a high starting torque is ensured, which is especially important when initiating vehicle movement under difficult conditions. Additional advantages include electrical energy savings under variable loads, smooth start-up of the drive system, stabilization of the rotational speed under changing loads, and the possibility of implementing automatic protection systems against overloads and emergency operating conditions.

An important feature of the proposed hydraulic traction winch is the possibility of rational arrangement of the hydraulic system components. The main units of the hydraulic drive can be placed in convenient locations within the vehicle structure, while only the hydraulic motor is installed

directly on the winch drum. Monitoring and protection of the system can be implemented using pressure sensors in the hydraulic system.

At the same time, the disadvantages of the proposed technical solution may include the higher cost of hydraulic drive equipment, which is due to the high manufacturing precision required for its components. However, this disadvantage is compensated by the increased reliability, durability, and stability of operation of the hydraulic drive under proper operating conditions and timely maintenance.

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RESEARCH ON MORTAR MIXER DRIVEN BY THE TRANSMISSION SHAFT OF A WALK-BEHIND TRACTOR

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Modern construction practices increasingly demand mobile and energy-efficient solutions for preparing building mortars. Traditional stationary mortar mixers provide high productivity, but their use is limited by the need for stable power supply, significant transportation costs, and restricted mobility on construction sites. In this context, the application of mortar mixers driven by the transmission shaft of a walk-behind tractor represents a promising alternative, combining mobility, simplicity of design, and cost-effectiveness.

In this study, the design and operation of a mortar mixer powered directly by the transmission shaft of a walk-behind tractor were investigated. This approach allows construction teams to utilize existing equipment already available on-site, reducing the need for separate power sources and ensuring autonomous operation. The analysis focused on mixing efficiency, energy consumption, and ease of use under conditions typical for small- and medium-scale construction projects.