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Establish an Acceptant Type of Excavators in Cleaning and Reconstruction of Open Collectors

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Abstract

Currently in the whole Bukhara region 295783.85 hectares irrigated area is available, with a strongly saline area of 4.5%, an average saline area of 26%, and a weakly saline area of 56% per hectare. In order to reduce salinity and groundwater levels in these areas, the total area across the region 2844.48 km. There are collector drains. Including inter-farm collectors 2097.45 km, the internal collectors of the farm is 4728.9 km.

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According to a number of researchers, the repair and reconstruction of collector-ditches accounts for 25-30% of the total length each year. Observations show that in the territory of Bukhara region, cleaning and reconstruction of collector-ditches with different hydraulic parameters are carried out with excavators of different models. To date, no scientifically based recommendations for the use of excavators based on the hydraulic parameters of the collector-pipes have been developed and the required number of them has not been determined. This requires substantiation of the optimal number of excavators in accordance with the hydraulic parameters of the excavator models and specifications, as well as the volume of work. This increases the productivity of the work performed and reduces the cost of the work performed. In order to keep the reclamation condition of lands at the required level, it is necessary to predict the demand for the composition and number of machines (to know the annual demand) in order to ensure that the required content, number and types of machines are constantly working. Therefore, in this article we will consider a method of theoretical determination of the need for modern excavators only in the composition of reclamation machines for the repair and reconstruction of collector-ditches in Bukhara region. The main indicator of excavators is productivity. Calculation of excavator productivity using expressions and norms. There is a need to predict the demand for the composition and number of machines (to know the annual demand accurately).

Procedure Of Research-Using the existing theoretical formulas, we are substantiate the number of excavators required during the season in the Bukhara region to determine the productivity of the excavator XE-215CLL for groups 1 and 2 of the group.

It is known that the operational efficiency of an excavator in a shift is calculated using the following expressions and standards. These are q - the capacity of the excavator bucket, m3; Suppose n is the number of operating cycles per minute of the excavator, Ke - is the coefficient of utilization of the excavator bucket capacity, Kv - is the coefficient of utilization of the excavator in time during the shift. The work done in this case is found as follows [2,3].

Excavator shift performance is calculated using the following expression.

$$P_{esm} = 492 \cdot q \cdot n \cdot K_e \cdot K_v = 492 \cdot 0{,}5 \cdot 2{,}58 \cdot 0{,}8 \cdot 0{,}75 = 380{,}808\ m^3/sm \quad (1)$$

Where, q is the capacity of the excavator bucket, m3;

n is the number of excavator cycles per minute,

Ke is the excavator bucket capacity utilization factor.

Kv is coefficient of time use per shift

When digging the soil in natural moisture, the hourly operating efficiency of the excavator is found using the following expression.

$$P_{es} = P_{esm} \div 8{,}2 = 380{,}808 \div 8{,}2 = 46{,}44 \quad m^3/hour \quad (2)$$

If the soils in the channel section are different, then the hourly productivity for each of them is calculated separately and recorded in the specified table.

If the excavated soil is mined, wet or submerged, the hourly work rate is calculated as follows.

$$P_e 1_s = P_{es} \div K_{es} = 46{,}44 \div 1{,}25 = 36{,}4 \quad m^3/hour \quad (3)$$

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Where the coefficient depending on the depth of water in the Kes-Zaboy is taken from the "Building norms and rules". Cut = 1.25.

During the excavation of the canal, the excavator bucket includes soils with natural moisture and very wet (excavated under water), with different resistance to digging (different groups), so the average measured productivity of the excavator is calculated as follows.

$$P_{euu} = (P_{es} \cdot W2 + P_e 1_s \cdot W1) \div (W1 + W2) \text{ m}^3/\text{hour} \quad (4)$$

Specific working volumes of 1 meter in length, calculated on layers W1, W2, m3 (or for simplification of calculations , , $W_1 + W_2 = 1$ $W_1 = \frac{W_1}{W_1 + W_2}$ $W_1 = \frac{W_2}{W_2 + W_2}$

values are dimensionless, the sum can be used in the form of the values of the additions of one). Note: Hydraulic excavator bucket capacity 1.0 m3 is less than, the excavator is operated by one machinist, so the machinist's labor consumption rate is equal to the excavator's time consumption norm, if q>1.0 m3. If it is greater than, then the machinist and assistant machinist will work on the excavator, so the machinist's consumption will be 2 times higher than the excavator's time consumption norm. Using the normative documents, the hourly productivity of the excavator is calculated as follows:

$$P_s^e = \frac{gauge}{V_m}, \quad \text{m}^3/\text{hour} \quad (5)$$

Where, “gauge” = 100 m3, volume of soil at natural density; Vm - the time consumption rate of the excavator is obtained depending on the type of work, the group of soil and the capacity of the excavator bucket [3].

Under the given conditions, the average hourly productivity of a modern excavator is calculated using existing theories and literature.

Excavator brand - XE-215CLL

There is a Group III soil in the cross section of the canal.

Groundwater level - 0.8 m

Wet soil makes up 30% of the volume of earthworks.

The soil is dug up and dumped on the ground. Using Annex 14 of the Departmental Standards for Repair and Reconstruction and Construction of Land Reclamation Systems and Structures, we record the following in accordance with the above excavator [2].

Digging the ground, leveling the sides and bottom of the canal, draining water from the ditch, digging ditches, and forming rollers to prevent water from flowing. Measuring 100 m3.

XE-215CLL Excavator hourly productivity is calculated using expressions (5), (3) and (4). Here the productivity is calculated using the expression (5) for the second group of soil.

$$P_s^e = \frac{100}{V_m} = \frac{100}{2{,}02} = 49{,}50 \quad \text{m}^3/\text{hour};$$

For wet soils, (3) can be found as follows:

$$P_s^{el} = \frac{P_s^e}{K_{es}} = \frac{100}{V_m \cdot K_{es}} = \frac{100}{2{,}02 \cdot 1{,}25} = 39{,}60 \quad \text{m3 / hour}$$

The average hourly performance of the excavator is calculated using expression (4).

$$P_{uu}^e = \frac{P_s^e \cdot W_2 + P_s^{el} \cdot W_1}{W_1 + W_2} = \frac{49{,}50 \cdot 0{,}7 + 39{,}60 \cdot 0{,}3}{0{,}7 + 0{,}3} = 34{,}65 + 11{,}88 = 46{,}53 \quad m^3$$

Results Of Research.

Calculation of the number and service life of excavators.

When designing a project for the organization of canal construction, it is important to find the number and service life of excavators and as follows

$$N_E = V \cdot 12 \div D \cdot D_s^e \cdot K_v \cdot T^{ou}{}_{as} = 96915012 \div 2000 \cdot 46{,}53 \cdot 0{,}75 \cdot 12 = 13{,}88 \in 14 \text{piece} \qquad (6)$$

In this regard, the following reclamation techniques imported from abroad are used in the region for cleaning and reconstruction of open collector-ditches.

Excavators are currently used in water management organizations and state unitary enterprises in Bukhara region for cleaning and reconstruction of open collector-ditches, taking into account the hydraulic parameters of the collectors partially restricts access. With this in mind, the selection of an excavator in accordance with the hydraulic parameters of open collector-ditches ensures the quality of subsequent cleaning and repair work and efficient use of excavators. The results of the calculations show that

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