# The design of ore overloading and reclaiming warehouse at application the cyclical and continuous method of ore transportation

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**Abstract.** In the article performed an analysis of ore reclaiming and overloading point characteristics at modern opencast mines. Advantages and disadvantages of using mechanical shovel excavator and hydraulic excavator "backdigger" as a reloading and reclaiming equipment were compared. Ore reclaiming and overloading point construction at cyclical and continuous method of mining using a hydraulic excavator "backdigger" is proposed. Parameters and method of formation this warehouse are shown.
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**Keywords:** ore reclaiming point, ore overloading point, cyclical and continuous method of mining

## Introduction

Increasing with the depth of opencast mining is a preservation problem of high mining equipment productivity arises [1, 2]. For this propose combined transport systems can be used at opencasts. Which can be used with a view to operate the equipment at peak performance and minimal operating costs [3, 4, 5, 6]. The connecting link of cyclical and continuous parts of the flowsheet process is the intermediates ore overloading point. It also performs the functions of ore overloading point and buffer capacity. Using new technology - mobile crushing plants and high-angle conveyor complex is expanding capability of cyclically-stream transport [7].

All advantages of using fullest combined transport scheme can be achieve by correct substantiation of its application areas and providing the necessary consistency level of product.

Improving the efficiency of traffic flows delivery mineral subject to the necessary organization averaged-dock warehouse is an important task in these conditions. The paper proposed the construction of the warehouse [8] describing the technology of its creation. Ore reclaiming represents the most effective way of stability support of power-intensive and expensive technological dressing process, and, consequently, of maintenance of the optimal production and set-up parameters of extraction and quality of finished product [1, 3, 9, 10].

## The main part

Schematic diagram of a reclaiming for the cyclic and continuous technology of transportation at opencast shown in Figure 1.

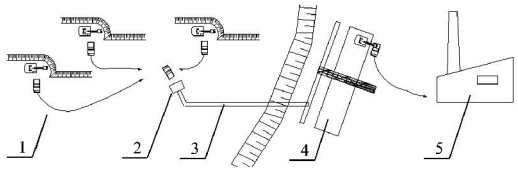


**Figure 1. Schematic diagram of a reclaiming for the cyclic and continuous technology of transportation at opencast, where is:**
1 – opencast mine; 2 - crushing plant to prepare for transportation by conveyor. 3 - conveyor system (high-angle conveyor system); 3 - ore reclaiming and overloading point (warehouse); 4 - factory.

The most distribution on Russians opencasts has backhoes reloading points with application a mechanical shovel excavator. This may be due by the following reasons: the possibility of receiving and shipping large volumes of rock mass, independence of an equipment, simplicity of the device, high speed of construction, the ability to sort and ore reclaiming. However, there are certain disadvantages excavator overloads that reduce the effectiveness use combined transport system and limiting depth of its introduction into the opencast.

An analysis of the scientific literature shows, that despite the widespread hydraulic excavator "backdigger" [11, 12] in mining enterprises, the possibility of their use as a warehouse equipment been investigated bad. The hydraulic backhoes are universal. It is suitable for developing rocks, both above and below its level installation. The most efficient scheme with the lower digging and unloading of rock in means of transport standing below installation level of excavator. Savings are achieved by reducing angle

of excavator rotation and lift height of excavator bucket.

General view of the warehouse with a location of roads [8] (as the third part of the transport system) is shown in Fig. 2.

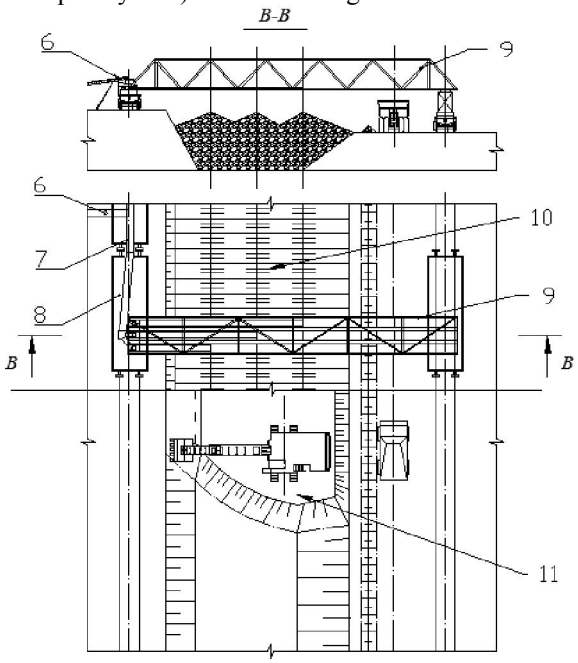


**Fig. 2. General view of the warehouse with a location of roads**

First of all ore is loaded in a number faces of opencast in motor transport which deliver ore to ore preparation point (crushing plant (2)) for preparation for transportation by conveyor (fig. 1.). Further, the ore is transported by conveyor system (3) to the warehouse (4).

An ore is not located in the piles, the ore is located in a trench below installation level of excavator in this warehouse design. Preparation works at construction the warehouse consist in formation of a receiving trench. The receiving trench parameters are determined by the operating parameters handling excavator required warehousing capacity and free space available. Parameters of over the cross section (width and height) are fixed and determined by parameters of loading equipment. Length of the trench (L) is determined from the necessary warehouse storage capacity. From the conveyor (6) ore stream reloaded on mobile conveyor (7) [13] which is delivering the ore to transport bridge with flow divider. Mobile conveyor (7) completes platform (8) with the flow divider (flat-bottomed vibrating feeder). The division performs traffic separation by longitudinal trajectory of free falling, for the necessary number of flows (in this case it is three). Increasing the number of rolling away cones of rock leads to a decrease of the length rolling cone prism each of these separately. This in turn has decreases a segregation of rock and increases indicators of ore averaging. The platform (8) is also provides support for the pillar of the transport bridge (9). The second pillar of the transporter bridge also is mobile and has a drive for a move together with mobile conveyor along the warehouse by a railroad tracks. This construction moves simultaneously with the delivery of ore from the opencast mine. Thus, the ore is stowed by layers over the warehouse's length. It looks like a layer cake. After filling warehouse area #1 (11) the whole structure (the mobile conveyor and the transporter bridge) is moved along the rails to the site #2 (12) (fig. 2). The operation of warehouse is repeated on the warehouse site #2. Along with filling of warehouse area, shipment of the rock mass is processed. The generated surface of area #1 is leveling by bulldozer in order to create site for hydraulic excavator backdigger. The process of ore averaging is carried out using a hydraulic excavator by cutting perpendicular to the layers of the "layer cake" warehouse. The averaged of rock mass is loaded by excavator in road transport.

The parameters of warehouse's trench are shown in Fig. 3.

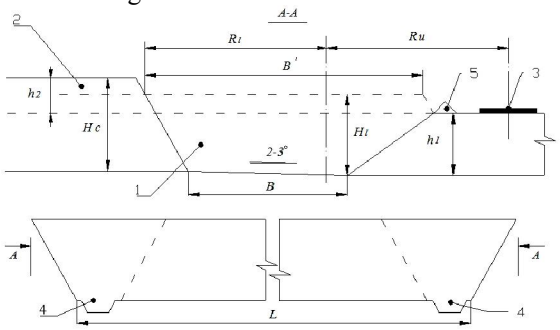


**Fig. 3. The parameters of warehouse's trench**

Initially, preparatory work should be carried out, which is consists in formation warehouse's trench (1) (fig. 3.) with a length equal to (L). The value (B) is the width of the trench at the bottom. The value (B') is the width of the trench at the surface. (B) and (B') is determined by the performance characteristics of the loading equipment. This is operating parameters of the excavator: digging reach at floor level (Rl), unloading radius (Ru), maximum digging depth (Hl).

Recoverable rocks that were extracted in the process of digging warehouse's trench is stowed along the top part one of the sides of the trench. Platform for mobile conveyor structure is formed of them (2). The total depth of the warehouse (Hc) is composed of platform height (h2) and depth of a trench (h1). Accordingly, solution to water drainage

make bias towards the loading site at formation of the warehouse's trench. It support constant through excavating. At each end of the trench is formed water intakes (4), the parameters of it depend on the value of water inflow. Along the loading site of dump trucks previously is formed safety shaft (5) to prevent a collapse of the rock mass.

**The conclusions**

The article suggests the design of the ore reclaiming and overloading point (warehouse) using a hydraulic excavator "backdigger" with application my own design formation of a stack of warehouse.

- Application of hydraulic excavator backdigger is rather perspective at ore reclaiming and overloading point. The hydraulic backhoes are universal and have many benefits.

- The formation of the ore reclaiming and overloading point of three cones (instead of a single) decreases segregation of rock particles by size. Consequently, division of ore chemical composition is decrease.

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