IMPROVEMENT OF THE SCHEME OF THE DRYING DEPARTMENT OF THE UNITARY ENTERPRISE "DEHKHANABAD POTASH FERTILIZER PLANT"

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Abstract. *In this article, the improvement of the scheme of the drying department of the unitary enterprise "Dehqonabad Potash Fertilizer Plant" and the innovation of the project is that it is planned to produce potassium chloride as a mineral fertilizer based on sylvinite from the Tubegatan mine located in the Republic of Uzbekistan and to apply it in agriculture.*

Keywords: *sylvinite, ore, Dehqonabad potash fertilizer plant, Tubegatan mine, drying drum, desilting, potassium chloride.*

The technological regulation of the potash production shop of the Dehkhanabad potash plant provides for the processing of sylvinite ore containing 31.93% potassium chloride and up to 3.25% water-insoluble residue (s.e.q.). The technological process of deliming was calculated on the ore with the above composition. Two-stage desilting is provided at the Dehkhanabad potash fertilizer plant, which is s.e.q. effectively de-sludges sylvinite ore up to 3.25%. However, the results of the analysis show that recently the content of potassium chloride in raw ore has decreased to 23% and s.e.q. there are cases where the amount exceeds 5%. Currently, more than 40,000 tons of such ore is stored in the raw material warehouse of the mining complex.

Special attention was paid to conducting an active investment policy in terms of modernization of operating enterprises, technical and technological re-equipment and acceleration of new production based on modern high technologies.

On May 1, 2007, the decision of the First President of the Republic of Uzbekistan I.A. Karimov "On the organization of the construction of the plant of potassium fertilizers at the base of the Tubegatan mine of potassium salts" was issued. Based on this decision, the Dehkanabad potash fertilizer plant was launched in 2010 for the purpose of producing potash fertilizers.

The production of nitrogenous and phosphorous fertilizers has been started in the Republic of Uzbekistan, now potash fertilizers have been added to the list. There is a raw material base of potash fertilizers in our republic, which is the reason for increasing the production capacity.

The novelty of this project is that it is planned to produce potassium chloride as a mineral fertilizer on the basis of sylvinite from the Tyubegatan mine located in the Republic of Uzbekistan and to use it in agriculture.

The drying section is designed to dry cake concentrate with a moisture content of not more than 7% potassium chloride to a maximum moisture content of 1%.

A ZTts2.5x22 brand drying drum made in China is used for drying. Table 1 below shows the main technical specifications of the ZTts2.5x22 drying drum with a length of 22 m and a diameter of 2.5 m.

As a heating agent for drying, the burnt gas produced by burning natural gas is used. For this, a gas heater with a heat generation capacity of 1662 kJ/h is used, which provides natural gas combustion with a maximum consumption of 450 m3/h, and is included in the drying drum complex. The calorific value of natural gas is calculated to be 8100 kcal/m3 hour. In this mode of combustion, the temperature of the burned gas is 500-6000C at the entrance to the drying drum. Cleaning of the gas-dust flow of the burnt gas coming out of the drying drum is carried out in two stages. In the first stage, the gas-dust stream is roughly cleaned, and this cleaning is carried out in a centrifugal cyclone with a production capacity of 3600 m3/h for the cleaned air. In the second stage, the gas-dust stream is finely cleaned, and this cleaning process is carried out through a PGM 128-6 brand filter equipped with an impulse cleaner with a production capacity of 3600 m3/h. The cleaning effect of the first stage is 90%, and the cleaning effect of the second stage is 99%. The amount of dust emitted into the atmosphere is 0.8-1.0 kg/hour. Air pollution does not exceed 20 mg/m3.

Table 1

The main technical specifications of the ZTts2.5x22 brand drying drum

Production capacity of wet cake, tn/h	**Initial cake moisture, %**	**Moisture content of the dried product,%**	**Drying temperature, ^{0}C**	**Production share of the drum in terms of dried product, тн/м^{3}соат**
25,16x1,15*=28,93	At most 7	At most 1	550	0,23

*1,15 – technical reserve coefficient of the dryer

The dust caught in the stages falls into the dried product conveyor in the amount of 1.248+0.0066 = 1.314 kg/h, and is sent to the cooling device, added to the dried product.

Table 2

Design material flow of drying drum for drying potassium chloride in nominal mode

Initial concentrate, тн/соат	**Dust caught in step 1, тн/соат**	**Dust caught in step 2, тн/соат**	**Output of the dried product, тн/соат**
Recalculated dry salt weight 25.163 (excluding 6.5% moisture)	Recalculated dry salt weight 1.247 (excluding 1% moisture)	Recalculated dry salt weight 0.065 (1% moisture excluded)	Recalculated dry salt weight 24.933 (excluding 1% moisture)
Recalculated phys 26.80 (6.5% moisture included)	Recalculated specific gravity 1.248 (1% moisture included)	Recalculated phys 0.066 (assuming 1% moisture)	Recalculated phys 24.958 (1% moisture included)

The drying mode is direct, and during drying according to this mode, the wet concentrate being dried falls on the surface of the metal nozzle located inside the drying drum heated at a temperature of 5000C and on the front part of the drying drum (the contact zone of the wet product with hot burnt gas).

The design material flow of the drying drum for drying potassium chloride in the nominal mode is presented in Table 2 below.

In this case, the organized drying scheme has the following disadvantages:

1) Causes wet concentrate to stick to the drum itself and its metal nozzle surface. Over time, the thickness of the adhesion increases and the inside of the barrel becomes a "pipe" and destroys the metal nozzles. The drying intensity of the drying drum decreases and the production

capacity decreases. Increases the amount of heat required for drying the mass fraction of the product to be dried. This leads to unplanned downtime of the drying section 1-2 times per month, standing for 10-12 hours at each stop for cooling the drying drum, getting people (manpower) into the drum, and carrying out mechanical cleaning of its interior. The moisture content of the concentrate being dried is around 7%, and the liquid phase is mainly solutions of potassium chloride and sodium chloride salts. These solutions form a corrosive active, i.e. aggressive (salty corrosion) environment when in direct contact with the surface of the drying drum and the metal nozzles located inside it at a temperature of 5000C. Corrosion occurs primarily in the welding seams of drum and nozzle structures. Over time, it was observed that the nozzles of the corroded metal constructions were broken as the strength of the metals eroded. Thus, on January 1, 2012, 98 nozzles inside the drying drum were cut off and forced to stand still for the re-welding of the same number of nozzles. All this not only increased unplanned downtime, but also led to an increase in costs for the repair of technological devices in the drying department.

Every time re-welding of corroded nozzles requires the use of electric welding equipment, which causes repeated welding to destroy the microscopic structure of the metal walls of the drying drum, and lead to the loss of strength and failure of the valuable parts of the drying drum.

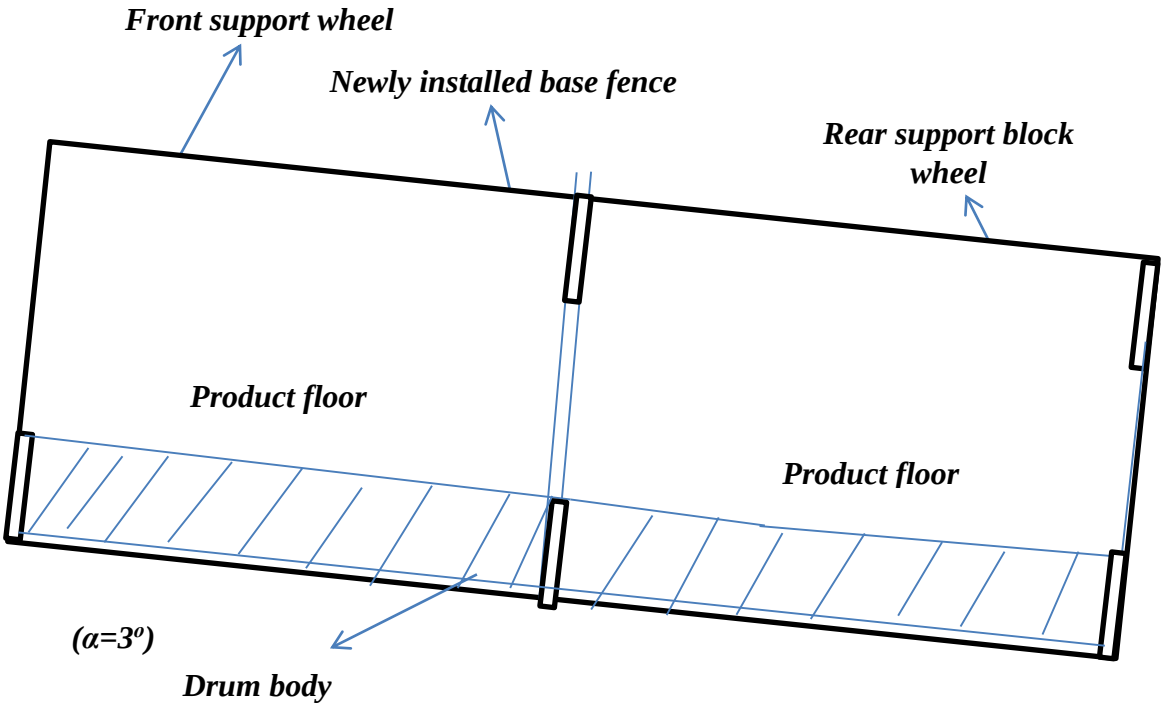

Figure 1. A profile cross-section of the product floor with a newly installed support fence and product floor in the drying drum.

Based on the above, the following suggestions were made to find these solutions:

1. Planning and installation of the transition to the recirculating drying scheme. With the return scheme, it is envisaged to return a part of the dried product to the auger zone where the wet cake product falls.

2. installation of an additional wheel at a height of 50 mm from the right nozzle at a distance of 3500-4000 mm from the front wheel of the drying drum. This wheel does not affect the aerodynamic regime in linear flow and does not increase the total drag, on the contrary, because the wheel is mounted higher than the nozzle, the wet concentrate falls on top of the dry mass and the phenomenon of sticking in the nozzles is avoided.

The following technological improvements will be made when implementing the proposed proposals:

- direct contact of the surface of the internal structural elements of the drying drum with the wet product is prevented;
- dramatically reduces the rate of salt corrosion of the drying drum, its nozzles and metals;
- dramatically reduces equipment downtime and repair costs.

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