MODERNIZATION OF WORKING BLADES OF THE CONSTRUCTION GLASS SHELL MIXING DEVICE

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Abstract
In the article " KVARTS " JSC of the enterprise mixing of glass fillers in the raw materials shopAn improved design of the apparatus with high efficiency, energy saving, changed shape of shovels and slope angles was proposed.

Keywords: shovels, shovels, aging process, mixing zone, impact forces, critical angular velocity.

Introduction

Many mixing devices are used in chemical and building materials industries. The mixing process is at Kuvasoy "KVARTS" JSC, and it is widely used in the raw material shop of the enterprise for mixing the aggregates added to the glass. In various technological processes, it is important to mix several components and make their composition into a homogeneous mass [1-5]. Mixing the first few components in glass production is one of the conditions for obtaining a homogeneous mass and producing quality glass. The main task of the mixing process is to evenly distribute one component in another component or to create a homogeneous mixture from different components. The mixing process is based on the mechanical properties of the mixing medium, due to mixing, the intensity of heat exchange, substance exchange, biochemical and biotechnological processes in industry increases [5-11]. As a result of the analysis of the construction structures of the equipment used for mixing

various granular aggregates in the process of production of construction glass, a new shovel construction is recommended for the equipment to improve the quality of mixing, increase the service life of the equipment and reduce energy consumption [12-19]. The construction of the recommended shovels and the change of the installation angle relative to the horizontal plane and the forces acting on it, theoretical studies were carried out to select the optimal modes of the mixing process [20-27]. As a result of the following studies, the construction of the hardware shovels was changed and its optimal slope angles were selected. The structure of the mixer blades is shown in figure 1. According to the results of theoretical studies, we recommend the main shovel part of the mixing machine as shown in figure 2 to improve the aging process [28-33].

Advantages of the recommended shovel:

- By speeding up the process of mixing the mixed mass during the mixing process, the work efficiency of the device is increased.
- It ensures that the mixed mixture is mixed in a lumpy state.
- The rheological properties of the composition of the mixture are improved.

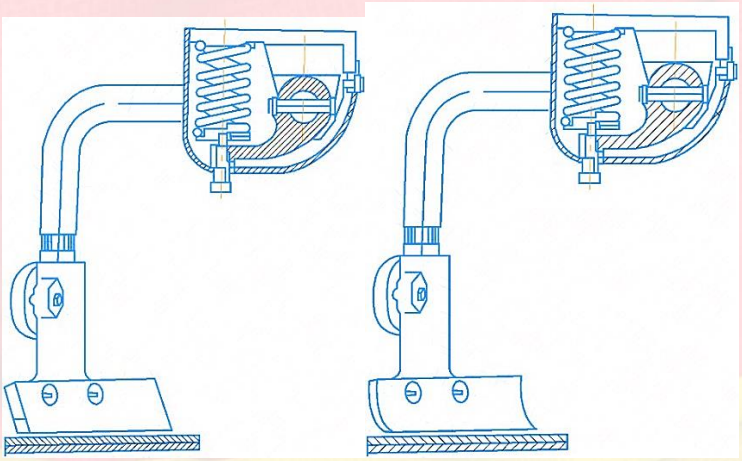

Figure 1. The old look of the spade Figure 2. The new look of the spade

During the kinematic analysis of the moving parts of the mixer, it was found that the installation position of the blades in relation to the horizontal and vertical plane cannot be changed. Therefore, the main task of the ongoing scientific research is to install the shovels at an angle and develop its calculation scheme in accordance with the effective mixing mode of the concrete. The impact forces on the mixing mass shovels during the mixing process are presented in figure 3.

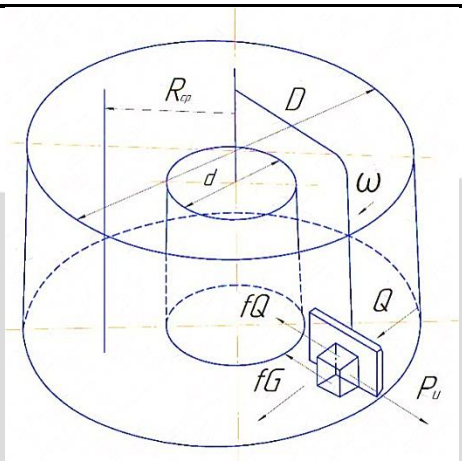

Figure 3. Forces in the mixing process

The impact forces and its critical angular velocity are determined by the formulas below.

Total active area of spades. (m^2)

$$F_{ac} = \sum F_i \cos\alpha_i \cos\beta_i = \lambda V/\vartheta_{av}$$

here: shovel separately, the angle of placement of the shovel in the horizontal and vertical planes $F_i - \alpha_i - \beta_i - \alpha - \beta$the radius of the corners and the corners should be changed in such a way that intensive circulation of the shovel apparatus should be ensured [34-41].

The edge of the front spades should be closed to the edge of the spade that comes next.

The mixture retained in the shovel of the horizontal mixer is calculated according to the following condition.

$$R_i \leq F + G \sin\alpha.$$

Centrifugal force, frictional force and gravity force are given in the above formula, and using angular velocity and radius, they are used by the following equation

$$\frac{G}{g}\omega^2 R \leq fG + G\cos\alpha \sin\alpha$$

From above, the critical angular velocity of the horizontal mixer shaft is given.

$$\omega_{kr} \leq \sqrt{(f\cos\alpha + \sin\alpha)g/R}$$

The degree of mixing of particles is determined by the following equation.

$$I = 1 - \frac{\sum_1^m \frac{\Delta x^1}{100 - x_c} + \sum_1^n \frac{\Delta x^{11}}{x_c}}{m + n}$$

here - and the number of samples when the concentration difference in the mixer is positive, $m\Delta x^1 > 0\Delta x^1$

Δx^1- positive concentration difference in the mixer,

x_c- the concentration of particles in the mixture in ideal mixing

where n is the number of samples. This in E_q $\Delta x^{11} < 0\Delta x^1$

$$\Delta x^1 = x - x_c$$

In turn, it is determined using the following formula in the equation x_c

$$x_c = \frac{100\ V_k \rho_k}{V_c \rho_c + V_k \rho_k}$$

V_k- the volume of solid particles distributed in the mass

ρ_k, ρ_s- density of solid and main mass in the mixer

V_c −the size of the main mass

The quality of the mixing process is characterized by the degree of mixing of the intermixed aggregates [42-47].

Through these formulas, the forces were calculated and the angle of location of the blades of the mixing machine was determined. This is shown in figure 4

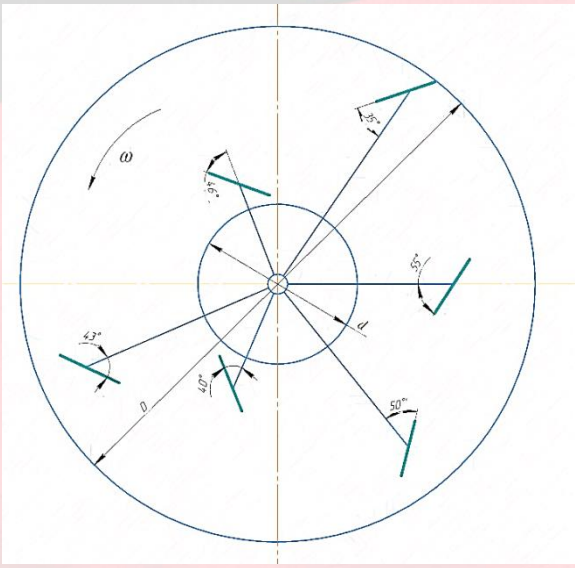

Fig. 4. Scheme of arrangement of paddles of the mixer

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