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Research Of The Operability Of The Plate-Shaped Springs Used In Improved Direct Gate Valves

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***Abstract*—The article devoted to the efficiency one of the main elements of the plate-shaped spring valve construction research. During the research defined that the determination of the advantageous seat of the plate-shaped spring width index provides its efficient operability in its socket, and also increases the efficiency of sealing the gate valve knot. As a result, was obtained an analytical formula to determine the socket width of the plate-shaped spring seat.**

Keywords—valve, plate-shaped, shield, saddle, seat,sealant, account thickness, seating

I. INTRODUCTION

Used in the existing constructions of valves the plate-shaped springs are used during their primary assembly for creating a seal on the clogging node and increasing the sealing effectiveness during exploitation.

The efficiency of this construction node used mainly in elevated pressures depends on the created strain of elastic deformations and on the perfect possibility of bending at the seat socket.

This organized realization of bending (elastic deformation) on the socket directly affects the efficiency of the constructions.The creation of effectiveness during primary sealing is the responsibility of plate-shaped springs.

A. PURPOSE OF THE WORK.

The plate-shaped spring should be seated on the sockets opened for them on clogging node in such a way that, depending on any increase in pressure, the plate-shaped spring could be completely deformed and his socket could gave him the opportunity to completely deform.

As, pressure subjected to the force, the plate-shaped spring, during compression, deforming could be fully deformed on the side surfaces.

The creation of the possibility for a spring on the seat socket of complete deformation leads to the full provision of a primary seal between the saddle-schieber pair. For the selected research object of the improved construction, the main condition of preserving efficiency including in its construction plate-shaped spring starting from the primary deformation to increasing the pressure (3).

The purpose of this article is the calculation of the running distance on the seat socket of the plate-shaped spring in the improved constructions [1]. On the basis of the obtained mathematical parameter, the geometric sizes will be determined which will allow full deformation of the plate-shaped spring on the seat socket. As a result, the seat of the plate-shaped spring on the socket selected on the basis of the correct geometric sizes will provide the efficiency of the improved gate valve constructions. solved [4, 5, 6, 7].

The scheme of a plate-shaped spring seat on the socket of the improved construction of the gate valve in Fig. 2

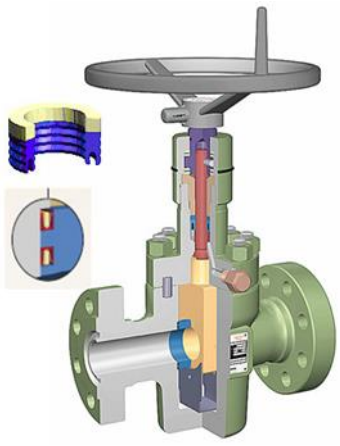

Fig.1. Gate valve “ZMS-65x21” [5]

B. SOLUTION

To solve the problem, consider the scheme of the running distance (Fig. 3), as can be seen from the figure, by the cosine theorem, we can determine the maximum running distance created by compressible forces**.**

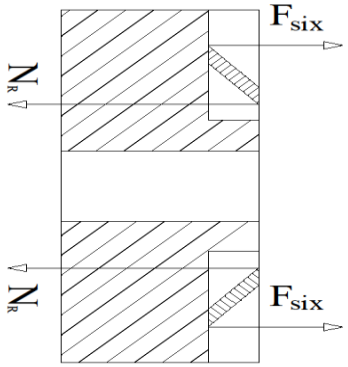

Fig.2. Constructive device

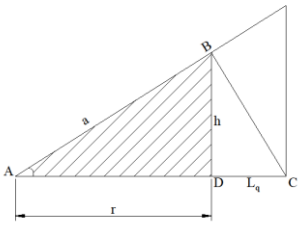

Fig.3. Schematic device

From the ABC triangle

$$BC^2 = AB^2 + AC^2 - 2ABAC\cos\alpha \quad (1)$$

Also from the BDC triangle

$$BC^2 = BD^2 + DC^2 \quad (2)$$

take into account formulas (2) to (1) and doing mathematical operations

$$h^2 + (r + L_q)^2 = a^2 + (r + L_q)^2 - 2a(r + L_q)\cos a \quad (3)$$

$$L_q = \frac{a^2 - h^2 - 2ar\cos\alpha}{2a\cos\alpha} \quad (4)$$

Here, a- length of the side surface of the plate-shaped spring, h- is the height of the plate-shaped spring, r- is the width of the side surface.

Formula (4) makes it possible to determine the maximum running distance of a plate-shaped spring. On the basis of the obtained indices, we can correctly determine the geometric parameters of the seat socket of the plate-shaped spring.

As a result of the research it was revealed that for the improved deformation ability of the plate-shaped spring included in improved construction, the width of the seat B socket according to the formula (4) should be equal to

$$B = r + \frac{a^2 - h^2 - 2ar\cos\alpha}{2a\cos\alpha} \quad (5)$$

Here r -is the width of the side surface of the plate-shaped spring.

Defined by the formula

$$r = D_x - D_d \quad (6)$$

Taking into account the formula (6) on (5) and avoiding friction in full deformation on the side surface of the plate-shaped spring for B, we obtain the following formula:

$$B = (D_x - D_d) + \frac{a^2 - h^2 - 2ar\cos\alpha}{2a\cos\alpha} + \delta \quad (7)$$

Here, B- width of the seat socket of the plate-shaped spring, D_e is the external diameter of the plate-shaped spring, D_i is the internal diameter of the plated-shaped spring, δ -number to avoid friction on the side surface of the plate-shaped spring socket at full deformation. Accepting δ = 2 ÷ 3 mm is expedient[1].

Determination of the width of the socket seat according to the formula (7) providing the efficiency of the plate-shaped spring on its socket, also will lead to increase in the sealing efficiency of the gate valve knot.

Conclusions

1. Analytical formula was obtained for calculating the running distance from the deformation of a plate-shaped spring in improved directly gate valves.

2. On the basis of the obtained formula, for determining the width of the socket of a fitted plate-shaped spring devined a formula .

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