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About Stabilizer of Hydrostatic Pressure of Suspension

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ABSTRACT: The article describes the development of a pressure stabilizer for the working suspension of the seed dresser and the rationale for the operating modes. The experiments were carried out in two versions, the first option without installing a hydrostatic pressure stabilizer, the second option with installing a hydrostatic pressure stabilizer after the flow tank. The results of the experiments showed that the developed hydraulic pressure stabilizer provides a more uniform supply of the working slurry to the treater, regardless of the amount of slurry in the supply tank.

KEY WORDS: Pressure, stabilizer, capacity, treater, seeds, hydroscopic, supply tank.

I.INTRODUCTION

It is known that according to the law of fluid hydraulics, when a liquid is found, for example, in a cylindrical container, the hydrostatic pressure to the walls in the horizontal direction does not change and remains constant [1]. However, the hydrostatic pressure to the bottom of the container, the pressure in the vertical direction changes, the value of this pressure depends on the amount of liquid in this container.

II. FORMULATION OF THE PROBLEM

The hydrostatic pressure depends on: the height of the liquid *h*, the magnitude of the acceleration of free fall *g*, the bottom area of the container *S* and the specific density of the liquid ρ:

$$P = \frac{F}{S} = \frac{\rho g S h}{S} = \rho g h \qquad (1)$$

According to this formula, the higher the height of the liquid, the greater the hydrostatic pressure to the bottom of this container. The flow of the working suspension of the mordant occurs through an elastic tube using a valve, usually installed closer to the bottom of the container. The required quantity of the discharge of the slurry treater is installed with this valve. If the operator adjusted the valve at full volume of the slurry in the tank over time (with a decrease in the number of suspension or by reducing the hydrostatic pressure from the working suspension to the bottom of the tank) amount of slurry supplied through the valve decreases. If the operator adjusted the valve with a smaller volume of suspension in the container, the opposite phenomenon occurs.

III. SOLUTION OF THE TASK

In order to stabilize the hydrostatic pressure to the bottom of the flow container, a scheme was developed and an experimental sample of the etcher was made at RIM Ustakhonasi (figure 1) with a hydrostatic pressure stabilizer to the bottom of the flow container according to the scheme shown in figure 2 [2, 3].

The hydrostatic pressure stabilizer 3 (figure 2) is installed below the flow tank 1, inside which a float 4 is installed on the bracket 5 with the help of a seal 8 and a screw 9 on the vertical axis 6. The vertical position of the float 4 on the axis 6 is adjusted using the seal 8 and the screw 9. At the upper end of the axis 6, an automatic valve 10 is installed, opening or closing the hole on the pipe 11 and communicating with the flow capacity 1. From the stabilizer, the working suspension of the mordant enters the dispenser 12 (conditionally) through a pipe 13 installed in the lower part of the hydrostatic pressure stabilizer.

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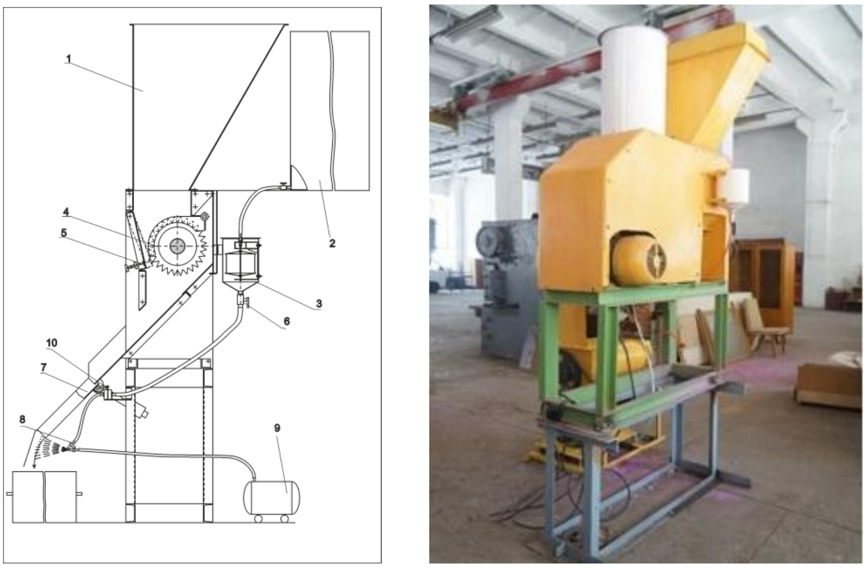

Figure 1. Scheme and General view of the experimental treatment plant with a hydrostatic pressure stabilizer of the liquid

1-seed hopper, 2-container for the working suspension of the mordant, 3-hydrostatic pressure stabilizer, 4-seed dispenser, 5-adjustable wall of the dispenser, 6-suspension valve, 7-seed tray, 8-nozzle, 9-compressor, 10-adjustment mechanism.

From the flow tank 1, the suspension of the mordant 2 through the pipe 11 enters the hydrostatic pressure stabilizer 3. As the working suspension accumulates, the float 4 rises with the vertical axis 6.

The hydrostatic pressure stabilizer works as follows. The automatic valve 10, located on the axis 6, rises and closes the hole in the pipe 11. If the etcher does not work (there is no flow of suspension through the pipe 13), the position of the float 4 does not change and the hole in the pipe 11 will be closed by an automatic valve 10. During the operation of the mordant, the suspension valve 6 will be opened (figure 1) and the working suspension will flow from the stabilizer 3.

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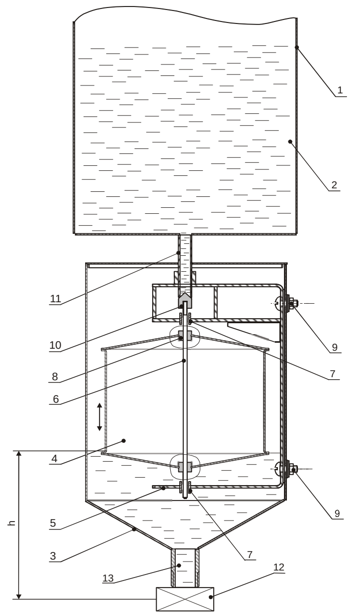

Figure 2. The scheme of the hydrostatic pressure stabilizer together with the capacity of the working suspension of the mordant.

In this case, the automatic valve 10 together with the float 4 is lowered down and opens a hole in the pipe 11 where the flow of the working suspension from the flow container 1 to the stabilizer 3 will begin. As the working suspension accumulates, the float 4 rises, for example, to a height h, while the automatic valve 10 closes the flow of the working suspension from the container 1. Thus, inside the stabilizer all the time the height of the suspension is at the same set level (height), so the influence of the hydrostatic pressure of the working suspension of the mordant on the flow rate set after the stabilizer by the valve 6 (figure 2) is prevented.

IV. EXPERIMENTAL RESULTS

To check the operation of the hydraulic pressure stabilizer, experiments were conducted using the following method. For the flow capacity of the working suspension of the mordant, a cylindrical tank with a capacity of 500 l is selected, the inner diameter of the pipe for the outlet of the suspension is 15 mm.

The experiments were carried out in two versions: the first version without the installation of a hydrostatic pressure stabilizer, the second version with the installation of a hydrostatic pressure stabilizer after the flow capacity [3].

In the first embodiment, after the service tank to the pipe outlet of the slurry valve and set the required flow rate of the slurry established in the amount of the slurry on the flow capacity equal to 100 liters In 30 seconds when you set the mode of the suspension flowing through the valve was collected in a measuring bowl and determined actual flow rate of the suspension. The repetition of each version of the experience is three-fold. Then the same experiments were repeated with the amount of suspension on the flow container 150, 200, 250, 300, 350, 400, 450, 500 l.

In the second variant, a hydrostatic pressure stabilizer was installed on a pipe with an internal diameter of 13 mm below the flow capacity. After the stabilizer is installed valve for flow of the slurry and the required flow rate of the slurry established in the amount of the slurry on the flow capacity equal to 100 liters In 30 seconds when you set the mode of the suspension flowing through the valve was collected in a measuring bowl and determined actual flow rate of the suspension. Then the same experiments, as in the first version, were repeated with the amounts of suspension in the flow container 150, 200, 250, 300, 350, 400, 450, 500 l. The results of the experiments are shown in tables 1 and 2.

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Table 1
Results for determining the slurry flow rate depending on the amount of slurry in the flow tank when working without a hydraulic pressure stabilizer

Amount of suspension in the discharge tank, l	The flow rate of the slurry, l/h Repeatability of experiments				Mean square deviation, S	Coefficient of variation, V
	1	2	3	Average		
100	0,31	0,33	0,32	0,32	0,01	3,125
150	0,35	0,33	0,34	0,34	0,01	2,941
200	0,34	0,35	0,36	0,35	0,01	2,857
250	0,37	0,36	0,35	0,36	0,01	2,777
300	0,37	0,38	0,39	0,38	0,01	2,631
350	0,40	0,45	0,35	0,40	0,05	12,5
400	0,41	0,43	0,42	0,42	0,01	2,381
450	0,47	0,43	0,45	0,45	0,02	4,444
500	0,48	0,49	0,47	0,48	0,01	2,083

Table 2
Results for determining the slurry flow rate depending on the amount of slurry in the flow tank when working with a hydraulic pressure stabilizer

Amount of suspension in the discharge tank, l	The flow rate of the slurry, l/h Repeatability of experiments				Mean square deviation, S	Coefficient of variation, V
	1	2	3	Average		
100	0,310	0,330	0,320	0,320	0,010	3,125
150	0,320	0,310	0,330	0,320	0,010	3,125
200	0,328	0,323	0,324	0,325	0,0026	0,8
250	0,340	0,320	0,330	0,330	0,010	3,030
300	0,330	0,340	0,320	0,330	0,010	3,030
350	0,335	0,330	0,325	0,330	0,005	1,515
400	0,335	0,333	0,337	0,335	0,0014	0,418
450	0,338	0,341	0,341	0,340	0,0017	0,5
500	0,340	0,339	0,341	0,340	0,001	0,294

V. CONCLUSION AND FUTURE WORK

According to the results of tables 1 and 2, it can be concluded that the developed hydraulic pressure stabilizer provides a more uniform supply of the working suspension to the etcher, regardless of the amount of suspension in the flow tank. When working without a hydraulic pressure stabilizer, the flow rate of the suspension increases with the amount of suspension in the flow tank (when the required flow rate is set at 100 l in the flow tank) changes over a wide range and leads to excessive consumption of the working suspension and poor-quality etching of cotton seeds.

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