

Improved Application of Ecg Excavator Compressor Filter in Quarries

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Abstract: In this article, the theoretical and practical results of the long-term, efficient and high-quality operation of the compressor equipment of quarry excavators by improving the compressor filter shell and installing metal guides on the shell diffuser are considered.

Keywords: Quarry, excavator, compressor, filter, shell, diffuser, metal guide, brake system, cylinder.

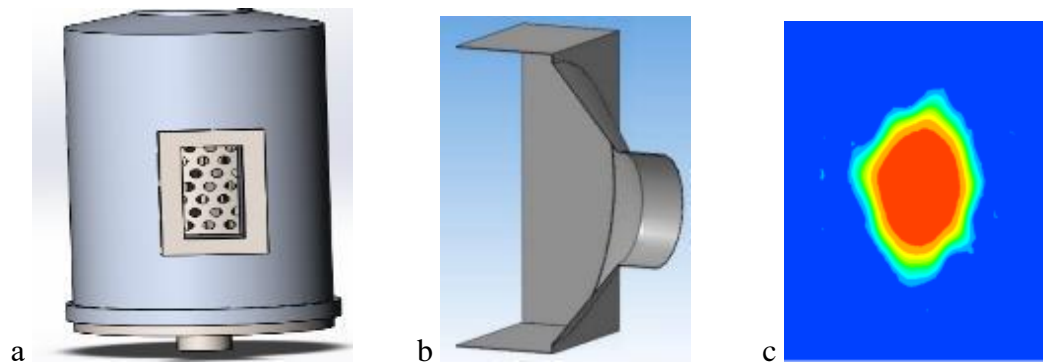
1. Introduction

Currently, about a hundred mineral deposits are being developed in the territory of the Republic of Uzbekistan. These include the Muruntau, Kokpatas, Daugiztau, Auminzo-Amantay deposits of the Navoi Mining and Metallurgical Combine, the Kalmakir deposit of the Almalyk Mining and Metallurgical Combine, and the Angren coal deposit, the largest coal deposit of the Uzbekkomir JSC, as well as many oil and gas companies[1,2,4,11,15].

The service of the compressor equipment, which supplies compressed air to the brake cylinders, is incomparable in stopping the movements of the working mechanisms of excavators at the right time. For this, the compressor and its equipment must be of high quality, reliable and efficient operation. Therefore, it is necessary to pay attention to the function of the filter device. The service of the compressor equipment, which supplies compressed air to the brake cylinders, is incomparable in stopping the movements of the working mechanisms of excavators at the right time. For this, the compressor and its equipment must be of high quality, reliable and efficient operation [5,6,8,10,12,14]. Therefore, it is necessary to pay attention to the function of the filter device.

2. Material and Methods

Figure 1a shows the shell of the filter device, which is made of metal in a cylindrical shape. A single-layer filter device is placed inside it. Figure 1b shows the diffuser of the shell, which is the air inlet. Figure 1c shows the direct effect of air and airborne dust on the filter unit, showing the filter erosion caused by the incoming air.



a – shell; b - shell diffuser; c– direct impact of air and air dust on the filter device
 Figure 1. Filter device

Figure 2 shows the amount of dust retained in the diffuser part of the single-layer filter device of the filters of the compressor device of steel wire rope excavators for 10 days. As a result of the experiments, the amount of dust particles trapped in the filter around the diffuser part is presented, and based on this graph, the amount of dust in the filter device for 10 days is presented. It was 0.03 kg.

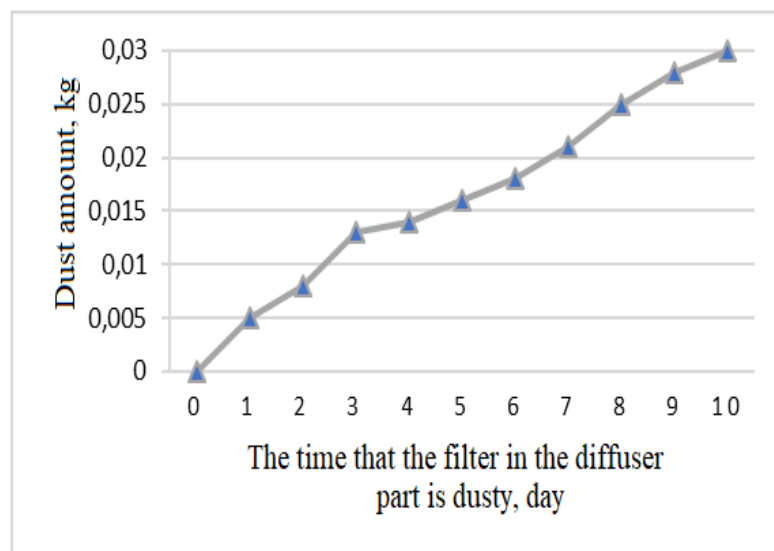


Figure 2. Indicators of the amount of dust trapped in the diffuser part of a single-layer filter device

Figure 3a shows the shell of a two-layer filter device, which has the appearance of a cylinder. As a result of installing the air distribution diffuser on the shell in Fig. 3b, the distribution of the air filter to all points can also be confirmed by Fig. 3b. It can be seen that the effect of the filter on the life of the filter has increased with the correct penetration of the filters in the air inlet.

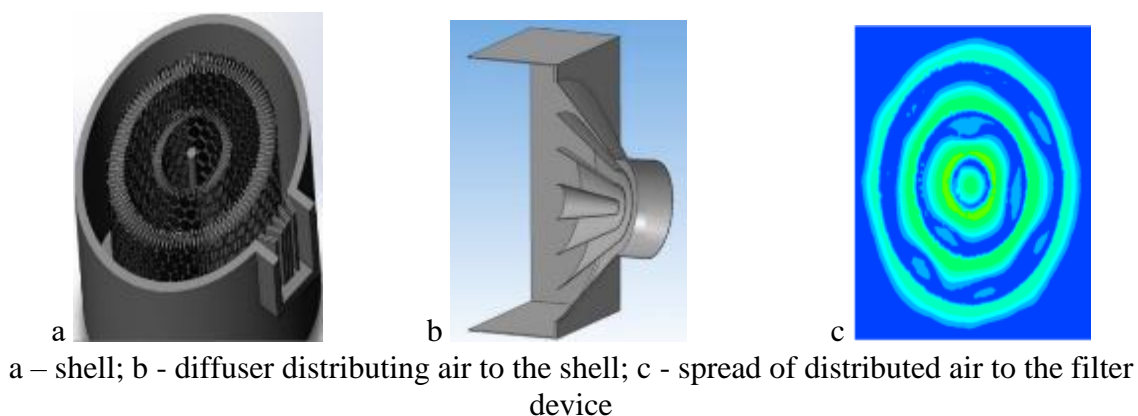


Figure 3. Double layer filter device

Therefore, as a solution to this problem, a metal guide (Fig. 3b) was installed on the air inlet diffuser of the double-layer filter device (Fig. 3a). As a result, the air passing through the inlet of the filter device is distributed along the filter shell and the production period increases without damaging the filter (Fig. 3c).

In Figure 4, experiments were carried out for 10 days by installing two-layer filters and filter air inlet diffuser guides on the compressor equipment of excavators EKG-8I N°34, EKG-8I N°36, EKG-5A N°35, and the dust particles in the filter trapped around the diffuser part a graph of quantities is presented.

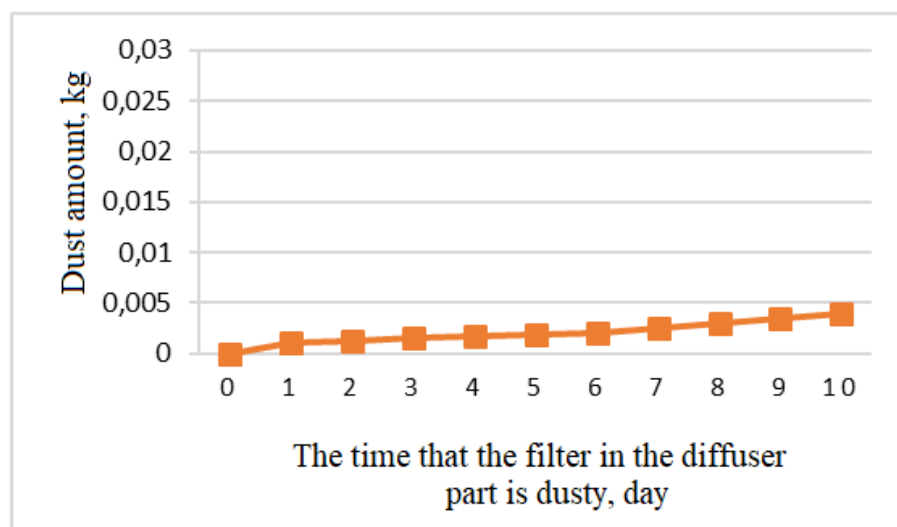
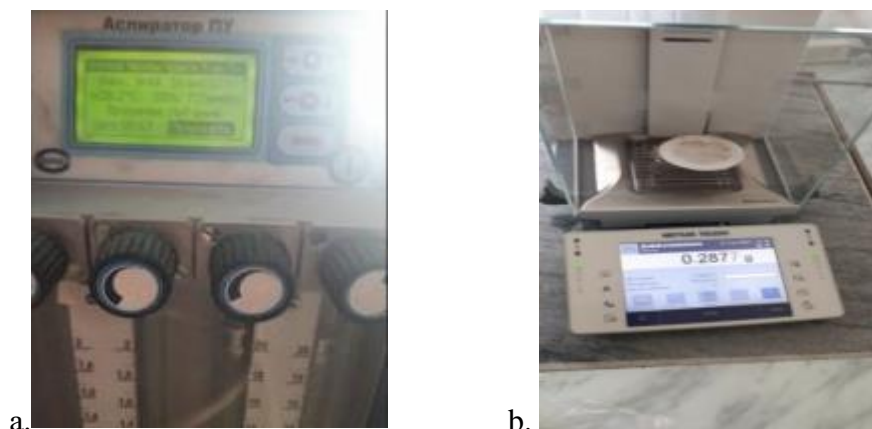


Figure 4. Indicators of the amount of dust trapped in the diffuser part of the double-layer filter device

Instead of a single-layer filtering device, a double-layer filtering device was proposed and used in excavators EKG-8I N°34, EKG-8I N°36, EKG-5A N°35 in the Daugiztau quarry. In order to determine the amount of dust, air productivity, and pressure of the two-layer filter device, an aspirator PU-4E device was installed at the air outlet from the air flow through the compressor equipment (Fig. 5a), and with the help of the device, air temperature, humidity, atmospheric pressure, productivity and AFA-VP were determined. -20 along filter readings received. The weight of dust settled on the used AFA-VP-20 filter was measured using a

Mettler Toledo instrument balance (Figure 5b). The results of the measurements are shown in Table 1.



a – aspirator PU-4E device; b – Mettler Toledo device scale

Figure 5. The process of measuring the amount of dust particles in the air

Table 1 Results from Aspirator PU-4E and Mettler Toledo devices

№	Filter devices	Air temperature, °C	Moisture %	Atmospheric pressure, mm. mercury column	Productivity, l/min	AFA-VP-20 Along filter weight, gr	Weight of used AFA-VP-20 powdered Allong, gr	Amount of dust in AFA-VP-20 filter, gr
1	Single layer filter device	27.8	22	746	20	0.284	0.297	0.013
2		26.3	22	747	20	0.273	0.287	0.014
3		28.8	38	729	20	0.274	0.290	0.016
4	Double layer filter device	27.0	23	746	20	0.270	0.273	0.003
5		29.3	26	741	20	0.271	0.274	0.003
6		30.3	34	732	20	0.276	0.280	0.004

Figure 6 shows the amount of dust in a single-layer filter device and a double-layer filter device through the AFA-VP-20 along filter.

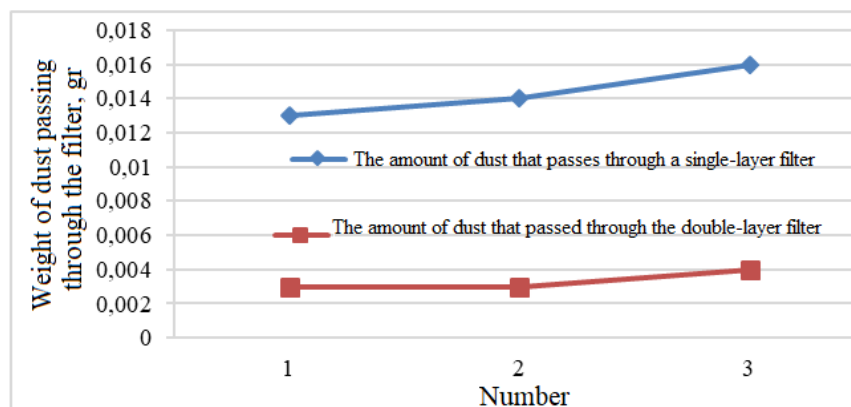
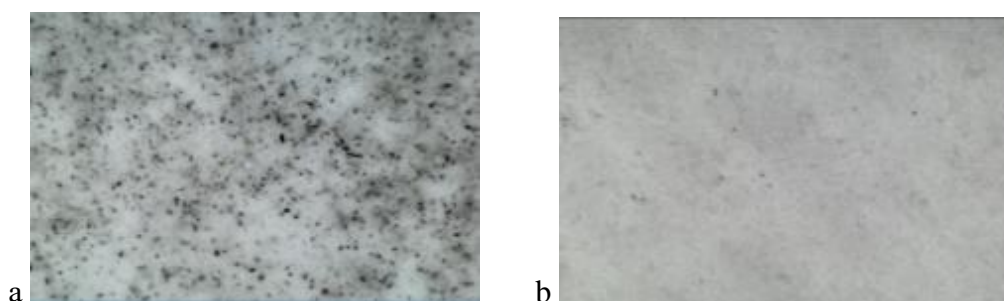


Figure 6. Single-layer and double-layer filter comparison graph as a result of research

The size of a new one-layer filter is 260 g, after 10 days of use in an excavator compressor, it was found to be 436 g and 176 g of dust was collected.

The new one of the large filter in the double-layer filter is 920 g and it was used for 10 days in the compressor and it was 1154 g and 234 g of dust was collected, and the new one of the small filter in the second layer was 360 g and when it was used for 10 days it was 408 g and 48 g of dust was collected. It was found that a double-layer filter can catch 60% more dust than a single-layer filter.

Therefore, instead of a single-layer filter device, a double-layer filter device was proposed, and the velocity vector generated by the air flow was fully compared and analyzed between single-layer and double-layer filter devices.



a – dust passed through a single-layer filter; b – dust passed through a two-layer filter

Figure 7. Photographs taken using a DMX-4 microscope

As a result of the analysis, the amount of dust passed through a single-layer filter device and a double-layer filter device was studied using a DMX-4 brand microscope based on the samples of the AFA-VP-20 allong filter. was 3.5 μm , and Fig. 7 shows the microscope images.

3. Results

As a result of experimental studies, it was found that the amount of dust passing through the filter was reduced by 75%, as a result of the installation of guides on the diffuser of the filter shell, the production period was extended by 6 times without damaging the filter, and the compressor service life was increased by 1.15 times.

4. References

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