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EXPERIMENTAL DETERMINATION LENGTH OF LIQUID FILM IN DUSTY GAS CLEANER

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Abstract
The article presents the main working factors influencing the cleaning process in the contact element rotating device. Experiments were carried out to determine the length of the liquid film formed in the working pipe at different values of the gas velocities, the angle of inclination of the contact element blades (swirler) and the nozzle hole, depending on the change in fluid and gas flow to the apparatus. The length of the liquid film was studied in the apparatus and the working surface was determined experimentally.

Keywords: sliding motion, contact element, gas flow, liquid film, reference angle, contact element sliding motion apparatus.

Introduction

In the experimental model of the newly developed wet method dust collector and gas cleaning apparatus, the main working factors influencing the cleaning process were identified (Figure 1) [1]. The gas velocity in the apparatus, the length of the liquid film, and the working surface were determined experimentally by gas and liquid flow. A sharp contact element with a different slope was selected to allow the device to move. Based on the theoretical and experimental research, the initial requirements and specifications for the apparatus were developed.

Experimental part

The following necessary equipment and devices were selected for the experimental model in determining the length of the liquid film by means of gas velocity, liquid and

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gas consumption, flow regime and hydraulic resistance coefficients in the wet method dust collection and gas cleaning apparatus.

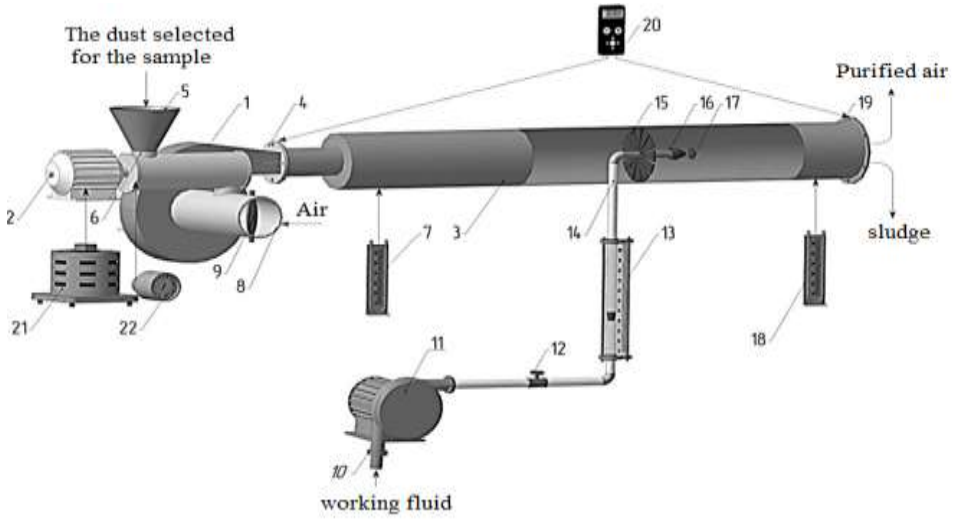

Figure 1. General view of wet dust collection and gas cleaning equipment.

S32412 nozzle (hole diameter 2; 2.5 and 3 mm nozzle according to GOST-384610), centrifugal pump (PEDRJLLA - Qmax) for spraying liquid into the working chamber of the device= 40 l/min; Ndv = 0.37 kW; Nmax = 38 m; V = 220 V; nay = 3000 rpm (according to GOST-2757030-91), rotometer (PC-5; scale readings in the range 0 ÷ 100; according to GOST-1304581) was selected. The change in fluid and gas consumption was determined by determining the length of the liquid film depending on the nozzle hole diameters and gas velocities. The experiments were performed in the following order.

In order to supply dusty gas to the working chamber of the apparatus Fan-VTs-14-07 centrifugal type fan; working productivity Qmax = 400 m^3/hour; electromotive force Ndv = 1.5 kW; number of revolutions n = 1200 rpm; Pito Prandl tube 100 mm in size; According to Gosreestr №50123-12; The gas velocity detector consists of a metal tube with D = 100 mm, L = 1200 mm. Prandl tubes with an internal diameter of 7 mm, which detect static and dynamic forces in the pipe, were selected as the experimental model, respectively.

Gas velocities and, depending on the change in fluid and gas consumption supplied to the apparatus contact elements(zavixritel) depending on the change in slope angles and

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the length of the liquid film was determined by the coefficients of resistance. The experiments were performed in the following order [2-7].

Gas velocities, depending on the change in fluid and gas consumption in the apparatus, the angle of inclination of the contact element blades(zavixritel) a= 30o and nozzle hole diameter d_{sh} = 2; Experiments were performed to determine the length of the liquid film formed in the working chamber at 2.5 and 3 mm. Fluid consumption according to the results of experimentsand when the rotometer scale is 0 ÷ 100 the length of the liquid film formed in the working chamber of the apparatus at a gas velocity yg = 7.07 ÷ 28.37 m/s 30÷It was found to be 275 mm. (Figure 1).

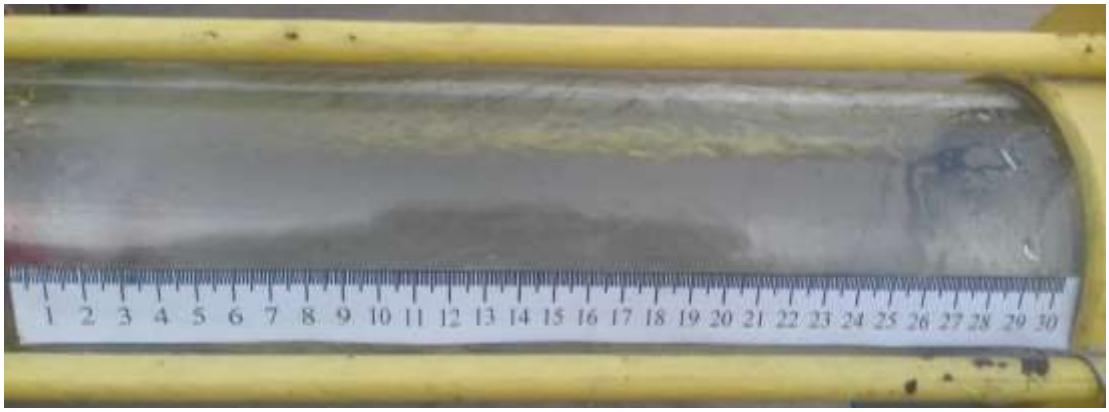

Figure 1. View of the length of the liquid film formed in the working chamber of the apparatus.

Table 1. Contact element a the values of the film length determined at = 30º and d_{sh} = 2 mm, 2.5 mm, 3 mm.

R_{sh}	d_{sh}= 2 mm					d_{sh}= 2.5 mm					d_{sh}= 3 mm				
	0º	30º	45º	60º	90º	0º	30º	45º	60º	90º	0º	30º	45º	60º	90º
10	30	40	130	160	170	30	40	80	130	150	30	40	90	150	170
20	55	70	140	170	180	45	55	95	145	165	45	55	105	165	185
30	80	95	150	180	190	60	70	110	160	180	60	70	120	180	200
40	100	120	160	190	200	75	85	125	175	195	75	85	135	195	215
50	120	145	170	200	210	90	100	140	190	210	90	100	150	210	230
60	140	165	180	210	220	105	115	155	205	225	105	115	165	225	245
70	-	-	-	-	-	120	130	170	220	240	120	130	180	240	260
80	-	-	-	-	-	-	-	-	-	-	135	145	195	255	275
90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The angle of inclination of the contact element blades(zavixritel) a= 45º and nozzle hole diameter d_{sh} = 2; Experiments were performed to determine the length of the liquid film formed in the working chamber at 2.5 and 3 mm. Fluid consumption

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according to the results of experimentsand when the rotometer scale is 0 ÷ 100the length of the liquid film formed in the working chamber of the apparatus at a gas velocity $\upsilon_г$ = 7.07 ÷ 28.37 m /s 80÷335 mm was found (Table 2.).

Table 2. Contact element a the values of the film length determined at = 45º and d_{sh} = 2 mm, 2.5mm, 3mm.

R_{sh}	d_{sh}= 2 mm					d_{sh}= 2.5 mm					d_{sh}= 3 mm				
	0º	30º	45º	60º	90º	0º	30º	45º	60º	90º	0º	30º	45º	60º	90º
10	80	130	140	180	230	95	135	155	200	270	100	145	165	225	265
20	90	140	150	190	240	100	140	165	210	280	105	150	175	235	275
30	100	150	160	200	250	105	145	175	220	290	110	155	185	245	285
40	110	160	170	210	260	110	150	185	230	300	115	160	195	255	295
50	120	170	180	220	270	115	155	195	240	310	120	165	205	265	305
60	130	180	190	230	280	120	160	205	250	320	125	170	215	275	315
70	-	-	-	-	-	125	165	215	260	330	130	175	225	285	325
80	-	-	-	-	-	-	-	-	-	-	135	180	235	295	335
90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Kthe angle of inclination of the ontact element elements (zavixritel) a= 60o and nozzle hole diameter dsh = 2; Experiments were performed to determine the length of the liquid film formed in the working chamber at 2.5 and 3 mm. Fluid consumption according to the results of experimentsand when the rotometer scale is 0 ÷ 100. The length of the liquid film formed in the working chamber of the apparatus at a gas velocity $\upsilon_г$ = 7.07 ÷ 28.37 m/s. (Table 3.)

Table 3. Contact element a the values of the film length determined at = 60º and d_{sh} = 2 mm, 2.5 mm, 3 mm

Rsh	d_{sh}= 2 mm					d_{sh}= 2.5 mm					d_{sh}= 3 mm				
	0º	30º	45º	60º	90º	0º	30º	45º	60º	90º	0º	30º	45º	60º	90º
10	100	130	135	145	150	105	140	150	165	170	110	170	175	185	195
20	110	140	145	155	160	115	150	160	175	180	120	180	185	195	205
30	120	150	155	165	170	125	160	170	185	190	130	190	195	205	215
40	130	160	165	175	180	135	170	180	195	200	140	200	205	215	225
50	140	170	175	185	190	145	120	190	205	210	150	210	215	225	235
60	150	180	190	195	200	155	190	200	215	220	160	220	225	235	245
70	-	-	-	-	-	165	200	210	225	230	170	230	235	245	255
80	-	-	-	-	-	-	-	-	-	-	180	240	245	255	265
90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Results

In experimental studies, the average growth of the liquid film is 10÷Showed an increase in the range of 15 mm.

Experiments on the determination of fluid and gas consumption, gas velocity and hydraulic resistance in the apparatus and the study of its effect on the cleaning efficiency show that the increase in the contact angle of the contact element acting on the gas flow in the apparatus ensured thickening of the liquid film layer. But it led to a decrease in the working surface. Conversely, a decrease in the reference angle led to an increase in the length of the liquid film and an increase in the working surface. Thus, high cleaning efficiency of dusty gas was achieved by increasing the length of the liquid film in the working chamber of the apparatus and increasing the working surface.

References

1. Алиматов, Б. А., & Эргашев, Н. А. Гидравлическое сопротивление пылеуловителя с прямоточно-вихревыми контактными элементами. " Энерго-ресурсосберегающие технологии и оборудование в дорожной и строительной отраслях": материалы междуна.
2. Ergashev N.A., Alimatov B.A., Axunbaev A.A. (2017). Energeticheskaya effektyvnost absorbtsionnoy gazoochistki. Scientific and technical journal of Fergana Polytechnic Institute. Fergana. №4. pp.140-143.
3. Алиматов, Б. А., Эргашев, Н. А., & Тишабаева, У. А. (2016). Автоклавная обработка малокварцевых строительных материалов. In Актуальные проблемы менеджмента качества и сертификации (pp. 6-8).
4. Эргашев, Н. А., Алиматов, Б. А., & Дикевич, А. В. (2018). Затраты энергии в мокром пылеуловителе при производстве дорожно-строительных материалов. In Энерго-, ресурсосберегающие машины, оборудование и экологически чистые технологии в дорожной и строительной отраслях (pp. 232-238).
5. Эргашев, Н. А. (2020). Исследование гидравлического сопротивления пылеулавливающего устройства мокрым способом. Universum: технические науки, (4-2 (73)), 59-62.
6. Ergashev, N. A. (2020). Determination hydraulic resistance of device that has the vortex flow creating contact element. Austrian Journal of Technical and Natural Sciences, (3-4).
7. Эргашев, Н. А., Маткаримов, Ш. А., Зияев, А. Т., Тожибоев, Б. Т., & Кучкаров, Б. У. (2019). Опытное определение расхода газа, подаваемое на пылеочищающую установку с контактным элементом, работающим в режиме спутникового вихря. Universum: технические науки, (12-1 (69)).