Journal of Textile Science and Technology, 2023, 9, 101-114
https://www.scirp.org/journal/jtst
ISSN Online: 2379-1551
ISSN Print: 2379-1543

The Influence of Fabric Structural Parameters on Dust Retention Using a Simple, Newly Constructed Device

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How to cite this paper: Hassan, S.B. and Saad, M.A. (2023) The Influence of Fabric Structural Parameters on Dust Retention Using a Simple, Newly Constructed Device. *Journal of Textile Science and Technology*, **9**, 101-114.
https://doi.org/10.4236/jtst.2023.91007

Received: May 7, 2022
Accepted: February 24, 2023
Published: February 27, 2023

Abstract

This article has been directed to Environment Protection Technology with the purpose of providing a new instrument designed and developed to measure filtration efficiency through the relationship between clean cloth fabric structural parameters, dust parameters, and test measuring variables. Fabric samples used throughout the present study were woven cotton 100%, polyester 100% and cotton/polyester 50/50%. The warp count: 30/2 for all fabric samples, the weft count is 9/1; 12/1; and 20/1. The weave of satin, basket, and twill is 3/1 with four different picks/cm to produce the fabrics with the same cover factor. For dust separation fabrics range in weight from "300 - 450 g/m^2" with an air permeability of "100 - 300 l/d m^2·min" at "196.2 Pa" (20 mm WG) as specified in DIN 53887. Air permeability through fabrics depends entirely on the sieving percent of the surface of the fabric, which is partly the pores and partly the permeability through the yarns, which are the basic elements of a fabric. The results showed that dust capturing depends entirely on air permeability, which is related to fabric weave structure and fabric material at specified testing and measuring variables.

Keywords

Dust Retention, Permeability, Fabric Structure, Yarn

1. Introduction

Dust permeability characterizes the capacity of fabrics to let the dust pass through it, while dust capacity is the fabric ability of retaining it. These properties are undesirable as they cause contamination of the fabrics and the under layers of clothes. Moreover, the dust capacity impairs the air and vapor permeability of fabrics, which may be a threat to fabric comfort and garment wearer. Dust resistant protective fabric has been the interest of many researchers. Protective fabrics were developed by the Saxon Textile Research Institute [1] methods, for producing dense but breathable fabrics which retain their microprobes structures without the need for membranes or coatings. The fabrics were produced on warp knitting machines using specific conditions and then subjected to a high temperature treatment. Possible end-users are dust-resistant protective garments, in the paint spraying sector and in insulation work and grinding operations. A method for handling semiconductor wafers in clean room by wearing dust proof clothing was developed by Tominaga Y, Oki-Electric-Industry's. LTD [2].

Dust proof clothing is made of a given fabric structure defined by multiple fiber groups which are each composed of linear fibers and extend in a first direction, and multiple second fiber groups which are each composed of curved fibers and extend in a second direction intersecting the first direction. The first and second fiber groups are mutually interwoven in such way that an inside surface has more the second fiber groups exposed than the first fiber groups, and such that an outside surface which is opposite inside surface has more of the first fiber groups exposed than second fiber groups. The dust proof clothing is worn that the inside surface is in contact with a wearer of the dust proof clothing. The ability of fabrics to retain dust is also desirable in case of being used for industrial dust filtration. Studies [3] [4] [5] dealt with the fabrics for dust collectors and filtration in cement industries. The properties of the original fibers used in needle fabrics for dust filters, chemical stability, mechanical properties, hand and abrasion resistance and electrostatic properties are discussed. Also, the influence of fabric weight, reinforcing material and polyester fiber of nonwoven polyester filter fabrics has been studied.

2. Results and Discussion

2.1. Measuring Dust Permeability

Koblyakov [6] used a household vacuum cleaner to test the dust permeability of fabrics in terms of dust permeability coefficient and dust capacity. Filtration efficiency was measured by Chatterjee and co-works [7]. Saad [8] [9] [10] introduced a new apparatus with a theory similar to the dust collector using jet pulsing for cleaning function at controlled pressure differences. **Figure 1(a)** & **Figure 1(b)** show the fabric filtration efficiency testing apparatus, **Table 1** depicts the components of the newly designed system.

This apparatus has been employed in the present study with the following variables:

- Number of pulses/min: 3, 6, and 9.
- Cleaning air pressure: 6 bar.
- Pressure difference: 18 mm WG.

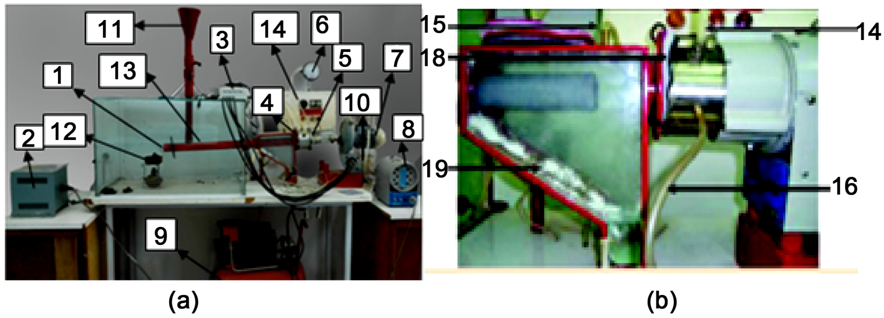


Figure 1. (a): Filtration efficiency apparatus, (b): Close up photo of the testing zone.

Table 1. The components of the newly designed system.

1—Gas inlet.	2—Converter.
3—Gas dusting sensors.	4—Filter sample holder.
5—Master filter.	6—Differential pressure gauge 1.
7—Vacuum pump (low speed).	8—Vacuum pressure (high speed).
9—Air compressor.	10—Gas outlet.
11—Dust feed inlet.	12—Gases source.
13—flexible joint.	14—Differential pressure gauge 2.

- Test time: 30 seconds.
- Dust type: 100% lime dust.
- Dust load: 53 g/m^2.

After testing each fabric sample the residual amount of dust was determined which is equal to the difference between sample weight before and after dust cleaning by jet pulsing. Also, the air permeability change % due to dusting was obtained.

2.2. Dust-Fabric Relationship

Textile materials proved to be the most efficient filter media of dust control in industrial pollution fields. A correct filter medium can only be selected if a mutual cooperation exists between three experts; design engineer of the dust collector, the process engineer of the plant, and the filter media expert. However, to achieve proper performance, three factors must be harmonized; the dust, the filter, and the filter medium.

2.3. Textile Structures as Dust Filters

Fabrics for use in filtration can be woven or needle felt (scrim or non-scrim supported). In filtration, the quality criteria of fabrics take into account the following characteristics when selecting a filter medium:

- Area weight
- Density of fiber and fabric
- Air permeability

- Bursting strength
- Breaking load & extension
- Abrasion structure
- Chemical resistance to oxides, acids and alkalis
- Resistance to flexing and splitting
- Dimensional stability in high temperatures

As far as filtration is concerned, air permeability is considered the most important property of a filter medium, since it largely determines the differential pressure, face velocity rating, clean ability and separation efficiency.

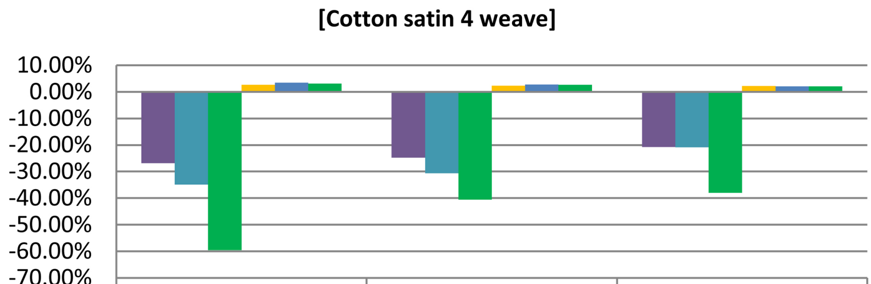
The main parameters influencing the fabric dust permeability are deduced from different variables, which are fiber type and yarn variables.

2.4. Cotton Weave Fabrics

For 100% cotton fabrics, where the data concerning cotton satin 4 weave showed that the Rate of Air-permeability decrease with increasing pulses from 3 - 9 pulses/m. The best fabric dust holding capacity was achieved at Weft count/ Pulsing rate (P/min) = 24/3 as shown in Table 2, Figure 2. In cotton basket

Table 2. Cotton satin and basket weave.

Cotton satin 4 weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change in sample weight after pulsing	+10.2	+9.1	+8.7	+13.0	+10.6	+7.9	+14.0	+10.8	+9.4
% Change in Rate of Air-permeability after pulsing	−26.8	−24.8	−20.7	−34.9	−30.6	20.8	−59.5	−40.5	−38
% Change in sample thickness after pulsing	+ 0.84	0.74	0.65	+0.84	+0.40	+0.1	+1.0	+1.6	+3.0
Fabric dust holding capacity (%)	+2.6	+2.3	+2.2	+3.4	+2.7	+2.0	+3.1	+2.6	+2.1
Cotton basket weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change in sample weight after pulsing	+5.8	+5.4	+5.1	+8.9	+8.4	+6.0	+8.7	+8.2	+5.7
% Change in Rate of Air-permeability after pulsing	−31.2	−27.7	−26.4	−34.3	−33.1	−32.7	−46.3	−39.1	−34.7
% Change in sample thickness after pulsing	+0.9	+0.88	+0.88	+2.7	+2.6	+0.9	+1.0	+2.12	+2.1
Fabric dust holding capacity (%)	+1.5	+1.4	+1.2	+2.2	+2.1	+1.5	+2.0	+1.9	+1.3



	3 puls/m	6 puls/m	9 puls/m
18/2s	-26.80%	-24.80%	-20.70%
24/2s	-34.90%	-30.60%	-20.80%
40/2s	-59.50%	-40.50%	-38%
18/2s	2.60%	2.30%	2.20%
24/2s	3%	2.70%	2.00%
40/2s	3%	2.60%	2.10%

Figure 2. Cotton/satin. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability and after pulsing and fabric dust holding capacity.

weave the best rate of air permeability obtained Weft count/Pulsing rate (P/min) = 18/6, while the best fabric dust holding capacity still the same as cotton satin at 24/3, as shown in Figure 3. The percent residual powder increases with yarn count at the same number of cleaning pulses. This can be explained as using finer counts and higher number of picks per inch give smoother fabric surface thus higher number of yarn intersection causing dust trap.

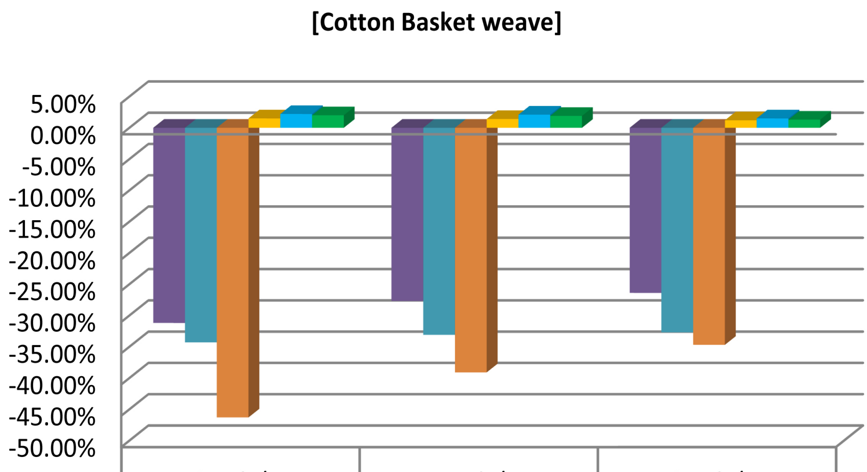
The in deep investigation of the cotton twill fabrics (1/3), Table 3, the best result of air-permeability were achieved at Weft count/Pulsing rate (P/min) = 40/9. The best fabric dust holding capacity were achieved at Weft count/Pulsing rate (P/min) = 24/3 as shown in Figure 4.

The for cotton twill 2/2 the best air permeability was determined at Weft count/Pulsing rate (P/min) = 40/9, while best holding dust capacity appeared at Weft count/Pulsing rate (P/min) = 18/3, Figure 5 which means that using finer counts and higher number of picks per inch give smoother fabric surface thus higher number of yarn intersection causing dust trap.

2.5. Polyester Weave Fabrics

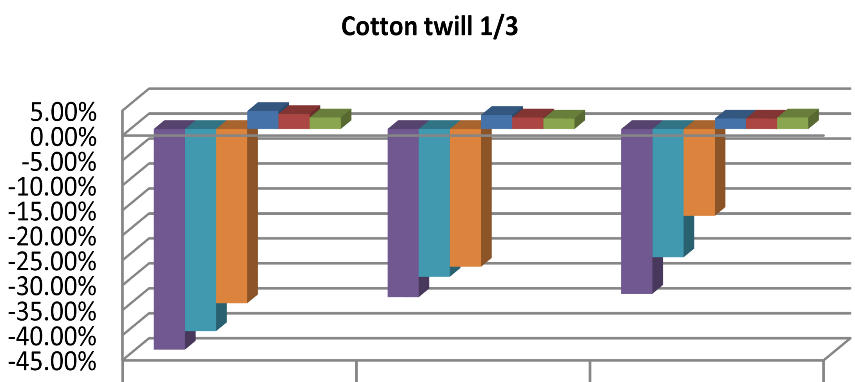
The polyester fabric weaves underwent investigations for their efficacy as filters, where the relation between weft count at different pulse per minute and the percent change in rate of air permeability and fabric dust hold capacity were recorded for the polyester satin fabrics, Table 4, showed that best air permeability was at weft count (40/2S) after 9 pulses/m, while the best holding capacity (+2.6) appeared to be at weft count 24/S, Figure 6.

The data in Table 4 for polyester basket weave represents that best fabric dust holding capacity were recorded at weft count, 40/S at 9 pulses/m. The best air permeability showed the same weft count (18/S) at 3 pulse/m, compared to the



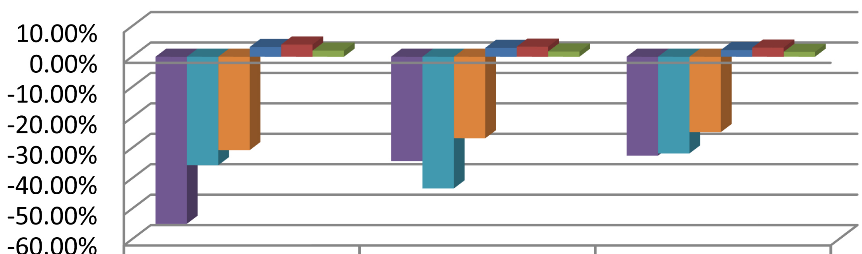
	3 puls/m	6 puls/m	9 puls/m
18/2s	-31.20%	-27.70%	-26.40%
24/2s	-34.30%	-33.10%	-32.70%
40/2s	-46.30%	-39.10%	-35%
18/2s	1.50%	1.40%	1.20%
24/2s	2.20%	2.10%	1.50%
40/2s	2.00%	1.90%	1%

Figure 3. Cotton/Basket. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability and after pulsing and fabric dust holding capacity.



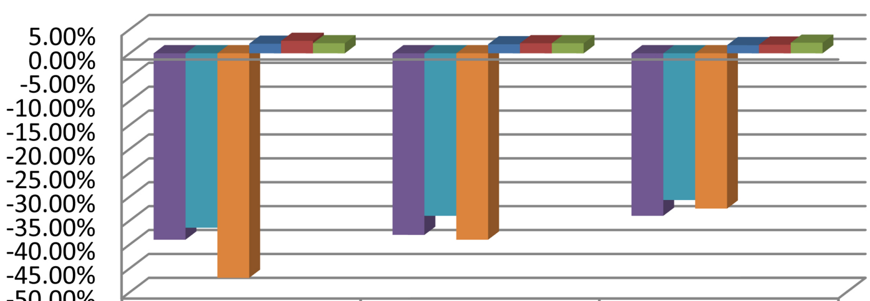
	3 puls/m	6 puls/m	9 puls/m
18/2s	-44.20%	-33.70%	-33.00%
24/2s	-40.50%	-29.60%	-25.70%
40/2s	-34.90%	-27.60%	-17%
18/2s	3.60%	2.80%	2.10%
24/2s	3.00%	2.30%	2.10%
40/2s	2.30%	2.10%	2%

Figure 4. Cotton/twill 1/3. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability and after pulsing and fabric dust holding capacity.



	3 puls/m	6 puls/m	9 puls/m
18/2s	-54.90%	-34.30%	-32.50%
24/2s	-35.66%	-43.30%	-31.80%
40/2s	-30.70%	-26.80%	-25%
18/2s	3.20%	2.90%	2.20%
24/2s	4.00%	3.30%	3.00%
40/2s	2.00%	1.70%	2%

Figure 5. Cotton/twill 2/2. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability after pulsing and fabric dust holding capacity.



	3 puls/m	6 puls/m	9 puls/m
18/2s	-39.00%	-38.00%	-34.00%
24/2s	-36.50%	-34.00%	-30.70%
40/2s	-47.00%	-39.00%	-33%
18/2s	2.00%	1.90%	1.70%
24/2s	2.60%	2.10%	1.80%
40/2s	2.10%	2.10%	2%

Figure 6. Polyester satin. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability and after pulsing and fabric dust holding capacity.

results obtained from cotton weaves Figure 7.

Continuing our study for polyester fabrics of the both types twill 1/3 and twill 2/2, Table 5, we found that the percent change in rate of air permeability after 9

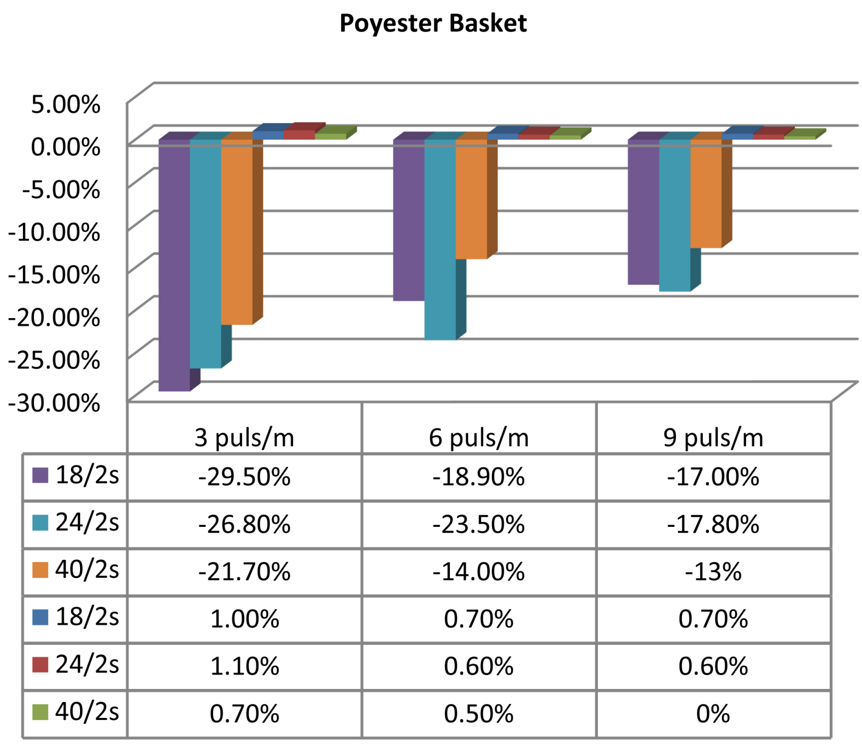


Figure 7. Polyester Basket. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability after pulsing and fabric dust holding capacity.

Table 3. Cotton twill 1/3 & twill 2/2 weave.

Cotton twill 1/3 weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change in sample weight after pulsing	+13.9	+10.8	+8.13	+102	+9.1	+8.2	+10.2	+9.54	+9.09
% Change in Rate of Air-permeability after pulsing	−44.2	−33.7	−33.0	−40.5	−29.65	−25.7	−34.9	−27.6	−17.4
% Change in sample thickness after pulsing	+0.8	+0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fabric dust holding capacity (%)	+3.6	+2.8	+2.1	+3.0	+2.3	+2.1	+2.3	+2.1	+2.0
Cotton twill 2/2 weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change Sample weight after pulsing (gm)	+12.3	+11.1	+8.3	+15.5	+12.7	11.5	+8.7	+7.5	+7.1
% Change in Rate of Air-permeability after pulsing	−54.9	−50.2	−32.5	−35.6	−34.3	−31.8	−30.7	−26.8	−24.8
Sample thickness (mm)	+1.7	+1.6	+1.6	+1.6	0.0	0.0	0.0	0.0	0.0
Fabric dust holding capacity (%)	+3.2	+2.9	+2.2	+4.0	+3.3	+3.0	+2.0	+1.7	+1.6

Table 4. Polyester satin and basket weave.

Polyester satin 4 weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change Sample weight after pulsing (gm)	+7.0	+6.7	+5.8	+9.6	+8.0	+6.7	+9.7	+9.3	+9.3
% Change in Rate of Air-permeability after pulsing	−39	−38	−34	−36.5	−34.0	−30.7	−47	−39	−32.5
Sample thickness (mm)	+3.6	+1.8	+0.0	+1.8	+0.93	+0.0	+0.0	0.0	+1.0
Fabric dust holding capacity (%)	+2.0	+1.9	+1.7	+2.6	+2.1	+1.8	+2.1	+2.1	+2.2
Polyester basket weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change Sample weight after pulsing (gm)	+8.5	+6.8	+4.9	+5.6	+5.0	+4.7	+11.6	+10.0	+9.3
% Change in Rate of Air-permeability after pulsing	−37.7	−30.2	−29.3	−39.7	−36.9	−35.6	−49	−47	−43.4
Sample thickness (mm)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fabric dust holding capacity (%)	+2.4	+1.9	+1.4	+1.9	+1.6	+1.5	+2.6	+2.3	2.1

pulses/m was the optimum results for the weft count (24/S) for twill 1/3, while dust holding capacity was best at 3 pulses for weft count (18/S), Figure 8. In polyester twill 2/2, both best permeability and dust holding capacity appears at weft count (24/S), Figure 9.

2.6. Polyester Cotton Fabrics (50/50)

Cotton/polyester blend (50/50) underwent investigation, Table 6, in a trail to combine best fabric weft from both cotton and polyester weave. 50/50 blend of satin 4 weave parameters were investigated. The best percent change in air permeability was recorded for satin blend at weft count (18/S)/9 pulses m, near the value obtained from weft count (40/S) at 9 pulses as well, Figure 10. This nice result enabling to conclude that better filter have to made from the blend not cotton weave nor polyester separately. Comparing the results from the 50/50 cotton/polyester blend of basket weave Figure 11, a very nice same result obtained

Table 5. Polyester twill 1/3 & 2/2 weave.

Polyester twill 1/3 weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change Sample weight after pulsing	+14.5	+11.8	+9.5	+9.05	+8.2	+5.6	+17.3	+14.6	+10.0
% Change in Rate of Air-permeability after pulsing	−54.3	−52.7	−49.0	−38.5	−37.0	−29.5	−79.6	−73.0	−64.0
Sample thickness (mm)	+1.6	0.0	0.0	+1.8	+1.8	+0.0	+2.1	+0.0	0.0
Fabric dust holding capacity (%)	+4.5	+3.6	+2.9	+2.4	+2.2	+1.5	+3.9	+3.3	+3.3
Polyester twill 2/2 weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change Sample weight after pulsing (gm)	+8.8	+6.6	+6.2	+7.2	+5.9	+4.0	+11.6	+10.0	+9.3
% Change in Rate of Air-permeability after pulsing	−57	−42	−41	−43.3	−38.5	−31.8	−49	−47	−43.3
Sample thickness (mm)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fabric dust holding capacity (%)	+2.5	+2.0	+1.8	+2.0	+1.6	+1.1	+2.6	+2.3	+2.1

at weft count (40/S).

3. Conclusions

The following conclusions were deduced within the range of yarn count and number of jet pulses used throughout the research:

1) The residual dust value using 100% cotton twill fabric 3/1 is greater than satin and basket fabric.

2) For 100% polyester fabrics, the residual dust value using twill 3/1 is greater than basket and satin fabric.

3) For cotton/polyester blended fabrics, the residual dust value for basket fabric greater than satin and twills 3/1 fabric.

4) The residual dust value for fabrics structures twill 3/1 made of 100% polyester is higher than that made of cotton and cotton/polyester blended fabrics.

Table 6. Polyester/cotton satin 4 & basket weave (50/50).

50/50% Cotton/polyester satin 4 weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (40/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change Sample weight after pulsing (gm)	+3.3	+2.6	+1.6	+2.3	+2.0	+1.6	+4.7	+3.9	+2.7
% Change in Rate of Air-permeability after pulsing	−22.9	−21.6	−16.5	−22.0	−13.8	−10.3	−25.8	−20.5	−17.4
Sample thickness (mm)	0.0	0.0	0.0	0.0	0.0	+1.8	0.0	0.0	0.0
Fabric dust holding capacity (%)	+1.0	+0.8	+0.5	+0.6	+0.5	+0.4	+1.2	+1.0	+0.7
50/50% Cotton/polyester basket weave	Weft count (18/2S)			Weft count (24/2S)			Weft count (30/2S)		
	Pulsing rate (P/min)			Pulsing rate (P/min)			Pulsing rate (P/min)		
	3	6	9	3	6	9	3	6	9
% Change Sample weight after pulsing (gm)	+3.3	+2.3	+2.3	+4.4	+2.3	+2.3	+2.7	+1.96	+1.6
% Change in Rate of Air-permeability after pulsing	−29.5	−18.9	−17.0	−26.8	−23.5	−17.8	−21.7	−14	−12.7
Sample thickness (mm)	+1.4	+2.1	+2.8	0.0	0.0	0.0	0.0	0.0	0.0
Fabric dust holding capacity (%)	+1.0	+0.7	+0.7	+1.1	+0.6	+0.6	+0.7	+0.5	+0.4

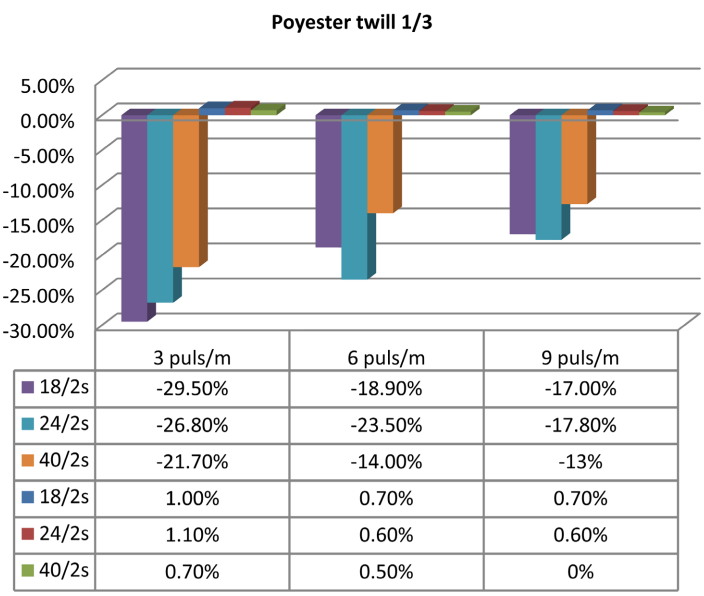
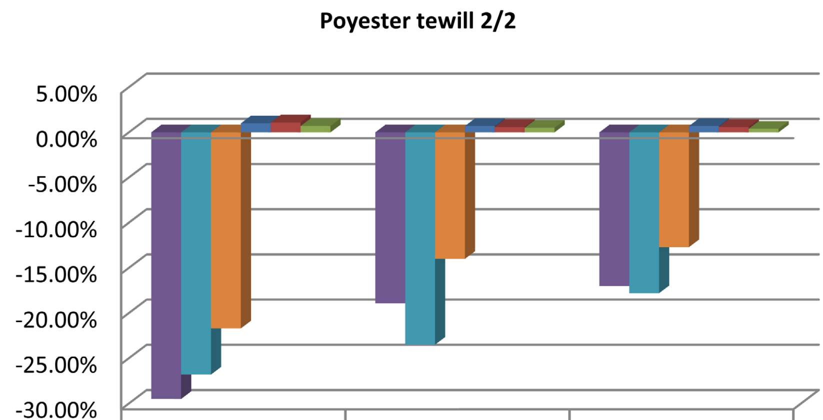
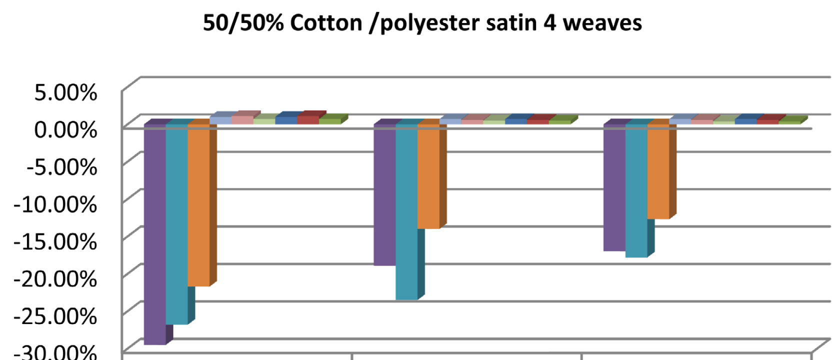


Figure 8. Polyester twill 1/3. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability after pulsing and fabric dust holding capacity.



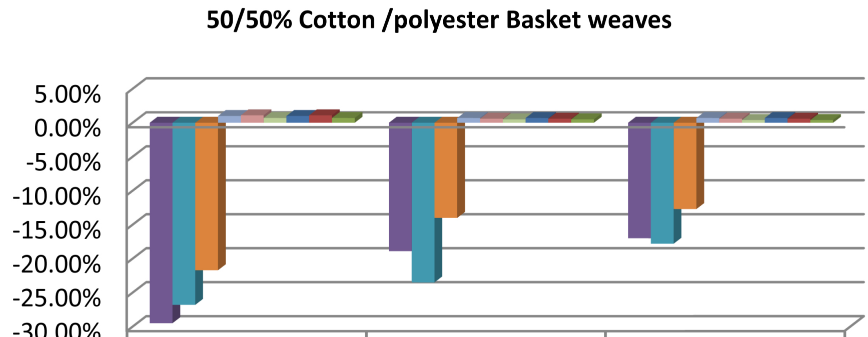
	3 puls/m	6 puls/m	9 puls/m
18/2s	-29.50%	-18.90%	-17.00%
24/2s	-26.80%	-23.50%	-17.80%
40/2s	-21.70%	-14.00%	-13%
18/2s	1.00%	0.70%	0.70%
24/2s	1.10%	0.60%	0.60%
40/2s	0.70%	0.50%	0%

Figure 9. Polyester twill 2/2. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability after pulsing and fabric dust holding capacity.



	3 puls/m	6 puls/m	9 puls/m
18/2s	-29.50%	-18.90%	-17.00%
24/2s	-26.80%	-23.50%	-17.80%
40/2s	-21.70%	-14.00%	-13%
18/2s	1.00%	0.70%	0.70%
24/2s	1.10%	0.60%	0.60%
40/2s	0.70%	0.50%	0%
18/2s	1.00%	0.70%	0.70%
24/2s	1.10%	0.60%	0.60%
40/2s	0.70%	0.50%	0%

Figure 10. Cotton/Polyester blend 50/50-satin weave. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability after pulsing and fabric dust holding capacity.



	3 puls/m	6 puls/m	9 puls/m
18/2s	-29.50%	-18.90%	-17.00%
24/2s	-26.80%	-23.50%	-17.80%
40/2s	-21.70%	-14.00%	-13%
18/2s	1.00%	0.70%	0.70%
24/2s	1.10%	0.60%	0.60%
40/2s	0.70%	0.50%	0%
18/2s	1.00%	0.70%	0.70%
24/2s	1.10%	0.60%	0.60%
40/2s	0.70%	0.50%	0%

Figure 11. Cotton/polyester blend 50/50-Basket weave. Effect of both yarn count and jet pulses/min on residual powder % change in rate of air-permeability after pulsing and fabric dust holding capacity.

5) The % change in the rate of air permeability for twill structure 3/1 cotton/polyester blended fabric is higher than polyester 100% and cotton 100% fabric.

6) The % change in the rate of air-permeability for basket structure made of cotton/polyester blended fabric is higher than 100% polyester and 100% cotton fabric.

7) The % change in the rate of air-permeability for satin structure made of blended fabric is higher than 100% cotton and polyester 100% fabric.

8) Twill structure fabrics made of polyester showed higher tendency for dust capturing than other fabric weave structures.

9) Dust capture is more pronounced for basket weave made of cotton/polyester fabrics.

The results, in general, showed that dust capturing depends entirely on air-permeability which is related to fabric weave structure and fabric material at specified testing and measuring variables.

Samples Preparation

Fabric samples used throughout the present study were woven with the following variables:

- Material: cotton 100%, polyester 100% and cotton/polyester 50/50%.
- Warp count: 30/2 for all fabric samples.
- Weft count: 9/1, 12/1, 20/1.
- Weave: satin. Basket, twill 3/1.
- 4 different picks/cm were used to produce the fabrics with the same cover factor.

For dust separation fabrics range in weight from 300 - 450 g/m^2 with an air permeability of 100 - 300 l/d m^2·min at 196.2 Pa (20 mm WG) as specified in DIN 53887.

Air-permeability through fabrics depends entirely on the % sieving surface of the fabric, which are partly the pores and partly the permeability through the yarns, which are the basic element of a fabric.

Conflicts of Interest

The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

References

[1] Ketten Wirk Praxis (1997) Non-Coated Warp-Knitted Dust-Resistant Protective Garments. 31/2, 66+E30.

[2] Tominaga, Y. and Oki (n.d.) Method for Handling Semiconductor Waters in Clean Room by Wearing Dust Proof Clothing. Electric Industry Co. Ltd.

[3] Erkebaev, T., Attokurov, K., Sattarov, A., Shaimkulova, M., Orozaliev, N., Erkebaev, T., Topchubaeva, E., Kaparova, N. and Abdullaeva, Z. (2021) Dust Retention Ability of Plants as a Factor Improving Environment Air. *American Journal of Plant Sciences*, **12**, 187-198. https://doi.org/10.4236/ajps.2021.122011

[4] Strzembosz, W. and Wlokienniczy, P. (1997) Properties of Filter Fabrics for Industrial Dust with Respect to the Parameters of the Raw Materials. Vol. 51, 21-23.

[5] Chatterjee, K.N., Mukhopadhgay, A., Jhalani, Sc. and Mani, B.P. (1996) Performance Characteristics of Filter Fabrics in Cement Dust Control. II. Influence of Fibre Cross-Sectional Shape and Scrim on the Performance of Nonwoven Filter Fabrics. *Indian Journal of Fibre and Textile Research*, **21**, 251-260.

[6] Koblyakov, A. (1986) Laboratory Practice in the Study of Textile Materials. Mir Publishers, Moscow.

[7] Chatterjee, K.N., Jhalani, S.C., Tyagi, G.K., Mani, B.P. and Babu, S. (1990) Air Pollution: It's Control by Textile Material III. *The Indian Textile Journal*.

[8] Saad, M.A. (1997) Measurements of Filtration Efficiency of Dust Filter Fabrics by Means of a New Apparatus. *The Indian Textile Journal*.

[9] Saad, M.A. (2015) Engineering of Filtration Systems in Egyptian Cement Plants: Industrial Case Study. *Journal of Industrial Engineering Research*, **1**, 11-21.

[10] Saad, M.A. (2016) Comparison between Polyester and Fiber Glass as Filter Media to Collect Silica Fumes: Case Study. *International Journal of ChemTech Research*, **9**, 185-192.