Study the effect of air pressure reduction on some properties of fabric made from metallic yarns on air – jet looms

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Research problem:

1 - Textile designers and engineers limited the role of air – jet looms to the production of fabrics with wefts made of natural materials and some industrial raw materials because of their light weight and the availability of a sense of these materials, which facilitates the passage of air – jet looms (compressed air) carry wefts and pass through to complete the weaving process.

2 - Restricting the fabric used in metallic yarns as wefts on other looms, such as elastic bayonets, on the pretext of the inability of air – jet looms to carry metallic yarns for heavy weight and the lack of property of metallic yarns, limiting the enormous potential of air – jet looms.

3 - Increased energy consumption, which results in higher operating cost of production, when producing woven fabrics using metallic yarns as weft fabric on air – jet looms to increase the air pressure used with relay nozzles so that it can carry these wefts and pass through them to complete the weaving process.

Research goals:

The research aims to:

The possibility of obtaining woven fabrics suitable for use as curtains fabrics manufactured on air-jet looms using metallic yarns as wefts to create the desired decoration utilizing all the possibilities of air-jet looms, taking into account the need to reduce the consumption of air and the subsequent reduction of operating cost without Impact on the quality of the finished product manufactured.

Research hypotheses:

1 - Reducing the air pressure of air – jet looms when producing curtain fabrics when using metallic yarns as wefts, which saves energy consumption and consequently saves operating cost.

2 - Reducing the air pressure of the air – jet looms leads to the non-consumption of the relay nozzles quickly, which entails saving the hard currency associated with the import of spare parts consumed by the air – jet looms.

DOI:10.12816/mjaf.2019.15971.1282

Research importance:

1 - Determination of the perfect controls for air – jet looms and the optimum air pressure when using metallic yarns as wefts.

2 - Adapting all types of metallic yarns for use as wefts on air – jet looms, which leads to a wider use of air – jet looms in the production of curtain fabrics.

3 - Reducing the air pressure used by the relay nozzles of air – jet looms when producing woven fabrics suitable for use as curtain fabrics using metallic yarns as wefts to create the required decoration, which will eventually reduce the energy consumption used in these machines, which will reduce the operating cost.

Research limit:

The possibility of making use of air-jet looms using metallic yarns as wefts to produce curtain fabrics, taking advantage of all the possibilities of air-jet looms taking into account the reduction of air consumption and the subsequent reduction of operating cost without affecting the quality of the finished product manufactured.

Research Methodology:

Experimental analytical approach.

Previous studies:

The previous studies section is divided into two parts: -

1 - Part One:

We briefly talk about air – jet looms in terms of explaining the following points:

A - How to pass the weft thread through the pressure of the air – jet looms.

B - Extrusion theory of weft thread with jet air – jet looms.

C - The factors that depend on the speed of the weft thread with air – jet looms.

D - How to Adjust Air Pressure with air – jet looms.

E - The relationship between the properties of the thread surface and the air energy consumed.

F - Reducing the air consumption used in air – jet looms.

2- The second part:

In this section we talk about the decorative threads in general and down to the metallic yarns, through which we review the following points:

A - Definition of metallic yarns.

B - Types of metallic yarns.

C - Physical and mechanical properties of metallic yarns.

Practical Experiments:

The practical program consists of two main parts:

1- The first part is a histological experiment where the research samples were produced.

2- The second part is to conduct some laboratory tests on the research samples.

Part I - Histological Experiments:

It is a histological experiment where the research samples were produced and the number of 9 different samples by:

Change the pressure of relay nozzles using the following pressures: 2,5 / 3 / 3,5 bar.

Change the order of the posts between the metallic and polyester yarns and was arranged as follows:

2 filament cane filament: 1 filament polyster filament.

1 filament cane filament: 2 filament polyster filament.

2 filament cane filament: 2 filament polyster filament.

Part II Fabric Testing:

A - Test weight per square meter.

B - Fabric thickness test.

C - Tensile strength and elongation test.

D - Friction test.

E - Hardness coefficient test.

F - Air permeability test.

Results and discussion:

The following table shows the results of the tests for the samples under study:

Air permeability test	Testing the hardness coefficient in weft direction	Friction test	Elongation test in weft direction	Tensile strength in weft direction	thickness in mm	Weight per square meter in grams	the test / the sample
983	292.3	38.6	15	49.3	0.38	46.7	1 Sample No
972	255.4	42.2	17.9	54.2	0.40	47.2	2 Sample No
943	180.6	42.3	18.4	54.9	0.42	47.5	Sample No 3
963	257.5	39	17.6	53.4	0.39	47.1	Sample No 4
889	241.6	43	18.2	55.8	0.41	47.7	Sample No 5
921	149.2	43.4	19.6	57.8	0.43	47.9	Sample No 6
889	242.2	39.8	18.2	55.8	0.40	47.7	Sample No 7
864	185.6	43.3	19.4	57.3	0.42	48	Sample No 8
892	131.8	43.5	20.6	60.1	0.44	48.1	Sample No 9

Based on the results of this table, the following relationships were drawn:

A - The relationship between the weight of the square meter in grams of the produced fabrics and the difference of the relay nozzles pressure.

B - The relationship between the thickness of the fabrics in millimeters of the produced fabrics and the differential pressure of the relay nozzles.

C - The relationship between the tensile strength in the direction of the weft of the produced fabrics and the differential pressure of the relay nozzles.

D - The relationship between the stiffness coefficient of the produced fabrics and the difference of the relay nozzles pressure.

E - The relationship between the relative elongation of the cuts in the direction of the weft of the produced fabrics and the difference of the relay nozzles pressure.

F - The relationship between the corrosion resistance of the fabrics by the friction in grams of the produced fabrics and the differential pressure of the relay nozzles.
G - The relationship between air permeability L / m 2 / s for the produced fabrics and the difference of the relay nozzles pressure.

The following table the amount of air consumed to produce the research samples:

number of Sample	Order of wefts	The amount of pressure	Number of the relay nozzles	The amount of air consumed in kg Watt / 8 working hours
1	2 Weft filament cane: 1 weft filament poly aster	3.5 bar	50	1401.6 KW
2	2 Weft filament cane: 2 weft filament poly	3 bar	50	1401.6 KW
3	1 Weft filament cane: 2 weft filament poly	2.5 bar	50	1401.6 KW
4	2 Weft filament cane: 1 weft filament poly	3.5 bar	50	1200 KW
5	2 Weft filament cane: 2 weft filament poly	3 bar	50	1200 KW
6	1 Weft filament cane: 2 weft filament poly	2.5 bar	50	1200 KW
7	2 Weft filament cane: 1 weft filament poly	3.5 bar	50	999.84 KW
8	2 Weft filament cane: 2 weft filament poly	3 bar	50	999.84 KW
9	1 Weft filament cane: 2 weft filament poly	2.5 bar	50	999.84 KW

Summary of results

1 - Fabrics produced at pressure of 2.5 bar recorded the highest readings of the tensile strength in the direction of the weft - the weight of the square meter - thickness - the relative elongation in the direction of the weft - the resistance of the fabrics to abrasion - of fabrics produced at a pressure of 3 bar and finally 3.5 bar which have The same operational specifications.
2 - Fabrics produced at pressure of 3.5 bar recorded the highest readings for each of the hardness coefficient in the direction of the weft - air permeability - of fabrics produced at pressure of 3 bar and finally 2.5 bar which have the same operational specifications.
3 - Fabrics produced by wefts arrangement 2 polyester: 1 cane had the highest readings of the tensile strength in the direction of the weft - weight per square meter - thickness - relative elongation in the direction of the weft - the resistance of the fabrics to corrosion abrasion - of

fabrics produced in the order of wefts 2 polyester 2 canes and finally arranged wefts 1: 2 polyster canes which have the same executive specifications.
4 - Fabrics produced in the order of wefts: 1 polyster: 2 canes have the highest readings for each of the hardness coefficients in the direction of the weft - air permeability - from the fabrics produced in the order of the wefts 2 Polyster: 2 canes and finally in the order of 2 polyster wefts: 1 cane which have The same operational specifications.
5 - There is an inverse relationship between the amount of air pressure the relay nozzles and the tensile strength readings in the direction of the weft - the weight of the square meter - thickness - the relative elongation in the direction of the weft - the resistance of fabrics to abrasion by friction that have the same operational specifications.
6 - There is a direct relationship between the amount of air pressure and the relay nozzles and readings of the permeability of fabrics to air and the hardness coefficient of fabrics produced, which have the same operational specifications.
7 - There is an inverse relationship between the thickness of the fabric and the permeability of air fabrics, which have the same operational specifications.
8 - There is a direct relationship between the tensile strength of fabrics and the relative elongation of the cloth, which have the same operational specific

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