

## Design of superfine denier Nylon Fabric

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**Abstract.** This fabric is given priority to with plain weave, which can play a good down-proof, mainly for down jacket fabrics and development. Using superfine yarn of polyamide as raw material, making the fabric soft and exquisite, meanwhile, the weight of the fabric has been reduced so as to make such fabric light to wear on body with a good heat preservation performance. The weave construction, technological process as well parameters have been discussed in this paper.

### Introduction

Fine fabric can meet the demand of textile market, characterized with high rank and fashion<sup>[1]</sup>. The nylon fabric is famous for its elastic property with superior strength<sup>[2]</sup> as well as economy, which can be used as a casual wear for spring and autumn period, jacket, mountaineering wear fabric, this fabric is dyed with disperse dye or acid dyes in finishing process.

The raw material inspection is a key link, the sizing regain are key technique parameters which should be carefully controlled.

### Fabric design

**The weave structure in term of the interlaced regular patter for warp and weft**

The weave structure is shown in figure 1.

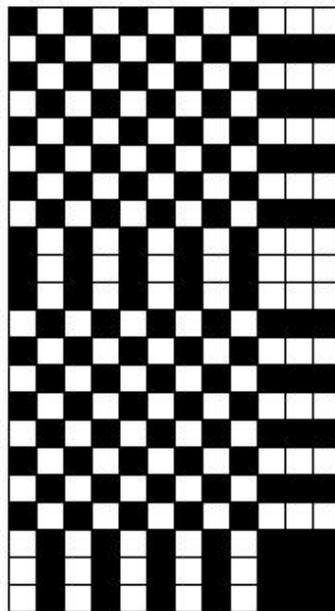


Figure.1 weave structure

The weave construction is combined weave based plain and warp rib as well as weft rib, such design will give the fabric is exquisite appearance as well as flexible handle feeling.

#### Technique specification of fabric

**Warp:** 100% Nylon6; 10D/6F, FDY, BR

Here, FDY is the abbreviation of “full draft yarn”. BR is the abbreviation of the bright of warp yarn.

**Weft :** 100%Nylon6; 15D/12F, FDY , FD

Here, FD is the abbreviation of the full dull of weft yarn.

**Warp Density:** 276ends/inch

**Weft Density:** 247ends/inch

**Finished Width:** 56.5inch

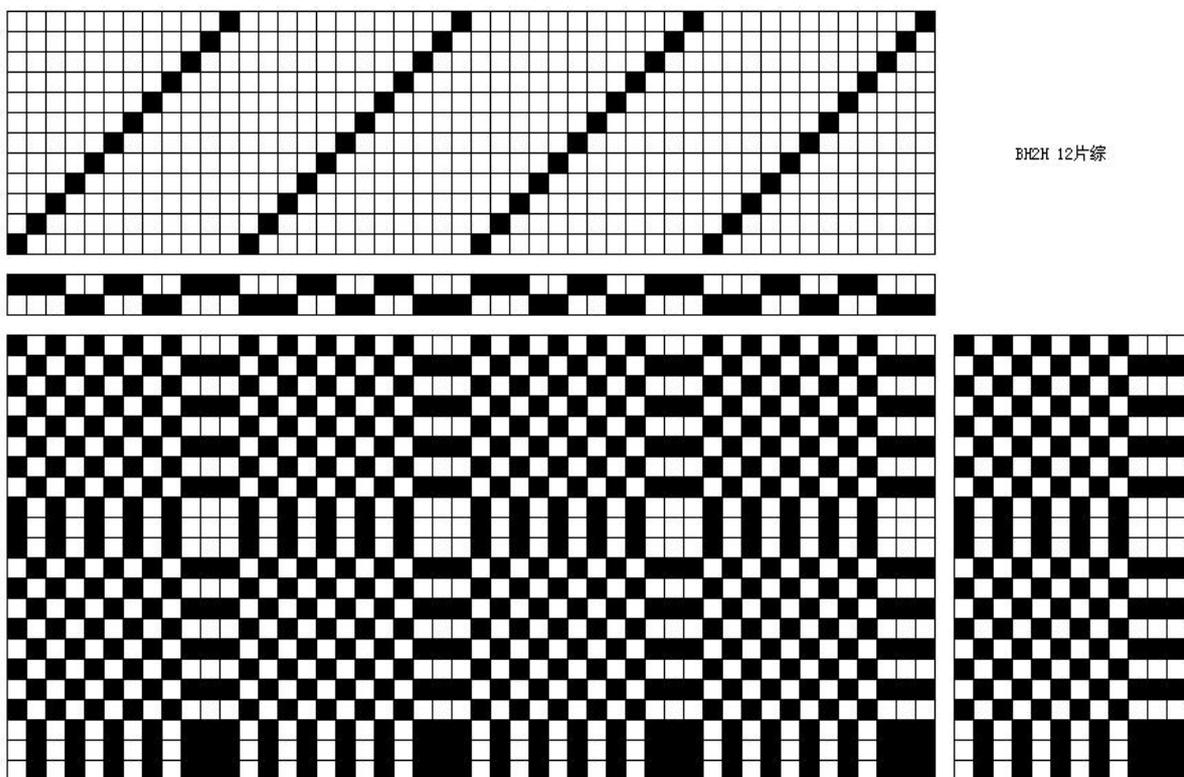
The filament used as warp and weft yarn can be described as Tab.1

**Tab.1 The property of filament yarn for fabric**

TYPE	Material	Shape	Liner Density/dtex	Fibre bundle/F	Lustre
Warp	Nylon6	FDY	11.1	6	BR
Weft	Nylon6	FDY	16.7	12	FD

**Loom Draft**

The loom draft include weave diagram to be seated on bottom fig.2, the draw in plan to be on top of fig.2, the card diagram to seated on the right of Loom Draft.



**Fig.2 Loom Draft**

**The technical condition for design**

Warp crimp in percentage in finishing: 4.7%

Fabric shrinkage in percentage in finishing: 12%

Warp crimp in percentage in weaving process: 5.1%

Weft crimp in percentage in weaving process: 6.0%

The relevant technical parameters in brief (see Tab.2)

**Tab.2 Technical parameters of general process.**

S/N	DESCRIPTION	CORRESPONDANT VALUE
1	Number of selvage ends	64x2
2	Number of total ends	15600
3	Number of ends for each warp beam	1200
4	Number of warp beam	13
5	Warp yarn consumption /gm/100mt	1830
6	Weft yarn consumption /gm/100mt	2641
7	Total Yarn Consumption (gm/mt)	4471
8	Fabric weight (gm/m <sup>2</sup> )	31.26
9	Ends/dent for ground	4
10	Ends /dent for selvage	4
11	Reed count (Dents/cm)	37.4
12	Reed width for draw in (cm)	168.9
13	Treatment in Finishing	Dyeing

## Fabric process

### Warping

The technical parameters in warping process in shown in Tab.3

**Tab.3 Technical parameters in warping**

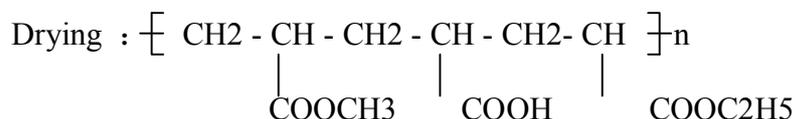
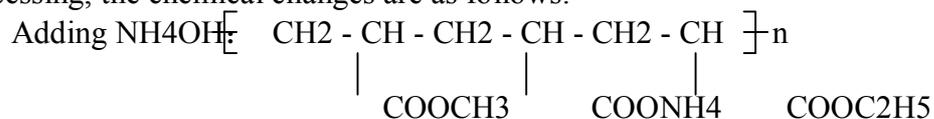
S/N	DESCRIPTION	CORRESPONDANT VALUE
1	Type of warping machine	CGC 141
2	Max. number of bobbin on creel	1700
3	Running speed of warping machine/ m/min	350
4	Tension of warp for single yarn/gram	2.2
5	Horizontal stroke for extension comb/mm	0-20
6	Pressure of compression roller/ Kpa	0.15-0.3
7	Stiffness of beam/HRC	80
8	storage time/h	24

The running speed will directly affect the end breakage during the warping process, the extra high linear running speed will result in more end breakage due to the high tension.

Nylon fiber strand under external force to a certain elongation, which is composed of elastic deformation, delayed elastic deformation and plastic deformation, in which delayed elastic deformation take the priority, plastic deformation can be negligible, elastic deformation in tension release after to reply, while the delayed elastic deformation need 24 hours or longer to eliminate.

### Sizing process

**Sizing recipe :** Main ingredients are polyacrylic ester mixture in sizing recipe, in different processing, the chemical changes are as follows:



### Sizing technical parameters(see Tab.3)

**Tab.4 Technical parameters in sizing**

S/N	DESCRIPTION	CORRESPONDANT VALUE
1	Type of sizing machine	FILA-EXPERT-N
2	Mode of sizing	Beam to beam
3	Running speed of warping machine/m/min	200
4	Horizontal stroke for extension comb/mm	0-20
5	Number of drying box	2
6	Number of drying cylinder	2
7	Solid of sizing glue/%	11.3
8	Temperature of sizing glue/°C.	93

The performance of sizing glue is greatly affected by temperature<sup>[3]</sup>, since the viscosity of sizing glue is depend on temperature under the condition of constant solid content, the high temperature is, the low the viscosity will be, the viscosity of sizing glue determine the extent of penetration and coating for sized warp, low viscosity will result in deep penetrating of size glue inside the warp to obtain the high tensile strength to minimize the end breakage in loom weaving<sup>[4]</sup>, but the coating is less insufficient to form the intact sizing film to resist the abrasion against the comb and harness wire on loom to enhance the loom efficiency.

That is why the temperature should be controlled according to the fiber type of material and sizing recipe as well as technique design.

### Weaving process

Technical parameters in weaving process will affect the loom efficiency and fabric quality, the optimized process parameters will greatly reduce the fabric defects such as starting mark, warp jump[3] in weaving process.

**Tab.5 Technical parameters in sizing**

S/N	DESCRIPTION	CORRESPONDANT VALUE
1	Type of loom	Water jet loom (YAMADA)
2	Running speed of loom/rpm	420
3	Tension of warp on loom/kg	30
4	Time of shedding/degree	350

### Conclusion

3.1. The weave construction of super fine fabric woven by Nylon filament should be combined weave based on plain.

3.2.The technical parameters of process in term of warping, sizing and weaving must be optimized as carefully controlled so as to minimize the end breakage and fabric defects.

### References

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