Faculty of Engineering

Department of Textile Engineering

Thesis Report

On

EFFECTS OF STENTERING ON WOVEN FABRIC CHARACTRISTICS

Course code: TE-4214   Course title: Project (Thesis)

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A thesis submitted in partial fulfillment of the requirements for the degree of

Bachelor of Science in Textile Engineering

Advance in Wet Processing Technology

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DECLARATION

I hereby declare that, this project report has been done by me under the supervision of **Tanvir Ahmed Chowdhury, Assistant professor,** Department of Textile Engineering, Faculty of Engineering, Daffodil International University. I also declare that, neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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LETTER OF APPROVAL

This project report prepared by **Md. Abdullah Al-Mamun (ID: 172-23-5054),** is approved in Partial Fulfillment of the Requirement for the Degree of **BACHELOR OF SCIENCE IN TEXTILE ENGINEERING**. The said student has completed his project work under my supervision. During the research period I found him sincere, hardworking and enthusiastic.

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ACKNOWLEDGEMENT

Firstly, I have expressed my gratefulness to almighty Allah for his divine blessing makes me possible to complete this project successfully.

I am grateful to my supervisor **Tanvir Ahmed Chowdhury,** Assistant Professor, Department of Textile Engineering, Faculty of Engineering, Daffodil international University. Deep knowledge and keen interests of my supervisor in the field of textile dyeing and finishing influenced me to carry out the project work. His endless patience, scholarly guidance, continual encouragement, energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting these at all stages have made it possible to complete this project.

I would like to express my thanks to **Mr. Md. Mominur Rahman**, **Assistant Professor & Head (In-Charge)**, Department of Textile Engineering, Faculty of Engineering, Daffodil international University for his kind help to finish my project report. I would like to express my thanks to **Prof. Dr. Md. Zulhash Uddin**, Dean, BUTex and **Prof. Dr. S.M. Mahbub Ul Haque Majumder** for providing me necessary information to complete the report on time.

I would like to deliver thanks to my entire course mates in Daffodil International University, who took part in the discussion while completing the course work.

Finally, I would like to express a sense of gratitude to my beloved parents and friends for their mental support, strength and assistance throughout writing the project report.

DEDICATION

I dedicate this project report to my beloved teacher and my parents.

ABSTRACT

Stenter is a machine which is used for finishing process. The main purpose of stenter is to control the parameter of the fabrics. Stenter machine is used to apply finishing chemicals into the fabrics, used for shade variation adjustment and used for heat setting and bringing the length & width according to buyer requirements. Stenter machine is widely used to recover pre-determined length and width of fabrics. In this project report I will give a brief explanation on polyester woven fabric types and their characteristics why should stenter finishing is used. The main objectives of this thesis report is to find out the relation between the overfeed (%) to GSM, EPI, PPI, Crimp (%) in Warp way and Crimp% in Weft way. For this research I took Ten different types of fabrics like Polyester Oxford (Plain 1/1), Rib Slipe (Plain), Polyester Twill (Twill 2/2), Polyester Twill (Twill2/2), TC Herringbone (2/1 herringbone, Micro Twill (Twill 2/1), TC Plain (Plain 1/1), TC Herringbone (2/1) herringbone, Virga (Plain 1/1), Taffeta (Plain 1/1). For the accurate measurement I have created two table to understand the relationship for change in GSM percentage after stentering under different overfeed percentage and similarly change in fabric width after stentering through different overfeed% and change in Ends per inch and Pics per inch after stentering under different overfeed percentage and finally of Crimp percentage in Warp way and Crimp% in Weft way after stentering through different overfeed percentage of stenter machine. Finally, I got the result and it shows me that, if I want to control the GSM, I have to control the over feed percentage. If I want to reduce fabrics GSM then we have to reduce overfeed percentage due to lower overfeed percentage machine feeding speed is lower and therefore the tension on delivery roller is higher as a result for higher tension GSM will be decreases. On the contrary higher overfeed percentage machine feeding speed is higher and therefore the tension on delivery roller is lower as a result for lower tension GSM will be increases. Similarly, if I want to increase EPI, PPI, Crimp% then I have to increase overfeed (%) and I want to decreases EPI, PPI and Crimp (%) then I have to decreases overfeed (%).

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Introduction

1.1 Introduction:

Stenter machine is an electric machine which is widely used in textile finishing section. Each and every fabric can be process in this machine after/before dyeing it would be knit fabric or woven fabric or others fabric. Stenter finish is used to control shrinkage, GSM, fabrics diameter by using under feed and over feed system. the main function of this machine is to stretch the fabric widthwise and lengthwise to get uniform width and length. In stentering machine some fabrics can be processed like Polyester, Cotton, CVC, Polyester + Cotton blended, Polyester + Viscose blended, lycra etc. fabrics. In HAIDA stenter machine have eight chambers and each chamber has been developed with heater, gas burner, and blower fan. When fabric is pass through the ducts heat is pass through holes and the fan disperse the temperature everywhere equally by air flow.

1.2 Objectives:

The main objective of this thesis is to study the effect of stentering process of woven fabric characteristics.

The tangible objectives are-

- To know about how to control Width and Length of the fabric with specific temperature and machine speed.
- To know how to control GSM and identification of GSM change %
- To know about EPI, PPI change after stentering and identification EPI, PPI change %
- To know how to control Crimp percentage and identification of Crimp%
- To know about different parts name and function of stenter machine.

Chapter-2
Literature Review

Literature Review

2.1 Stenter machine:

Stenter machine is a finishing machine which is widely used to finish woven and knit fabric stentering. Stenter machine is used for various purpose of woven fabric which is dry the wet fabric, control GSM, Shrinkage, widely used for fabric width and fabric length control and some chemical finishing according to buyer requirement.

2.2 Specification of Stenter machine:

Table 2.2.1

Brand Name	HAIDA
Company Name	JAINGSU HAIDA DYEING AND PRINTING MACHINARY CO.LTD
Origin	China
Manufacturing year	2015
Heating type	Gas
Maximum temperature	220℃
Maximum Speed	100m/minute
Used Utilities	Electricity, Gas, Air pressure and steam
Maximum Fabric width	70 inches
Minimum fabric width	40 inches
Number of chambers	8

Number of burners	8
Application form	Open fabric
Number of Padder	2
Machine Parts	Feed roller, Spreading Roller, Padder, Over feed roller, Under feed roller, chain arrangement, burner, nozzle, air fan, suction fan and Delivery roller.
Production Per day (24 hours)	12000yds

2.3 Operation/Function of Stenter Machine:

- Heat setting is done by this machine on different fabric like cotton, synthetic and blended fabric and Lycra fabrics.
- Width and length of the fabric is controlled by this machine.
- Finishing chemical is apply on the fabric by this machine.
- Loop of knit fabric can be controlled.
- Moisture of the fabric is can be controlled.
- GSM of the fabric is controlled by this machine according to buyer requirement.
- Fabric is dried by the stentering machine.
- Shrinkage property of the fabric is controlled.
- Curing treatment for resin, water repellent fabric is done by this machine.

2.4 Different Parts of a Stenter Machine:

- Feed roller Guide roller
- Softener tank.
- Immersed roller
- Spreading roller
- Padder
- Mahlo
- Monitor
- Mixing tank
- Under feed roller
- Over feed roller

- Gas Burner
- Blower
- Ducts
- Exhaust System
- Delivery Roller

2.5 Working procedure of stenter machine:

The fabric is collected from the dyeing section and then it is passed through the guide roller and immersed roller (immersed roller are placed into the softener tank) then passed through the padders where the finishes are applied and some times shade variation is corrected.The fabric is entered into the mahlo (weft straigtner) the function of the mahlo is to set the bow and also weave of the fabric then the fabric is passed through the under feed roller to overfeed roller and passed through the chain arrangement and the fabric is griped by the clips and pins are also provided but the pins has a disadvantage that they pins make holes at the selvedge but the stretchning of the pins are greater than the clips.these clips and pins are joined to endless chain.there are 8 chambers provided on the machine each chamber contains a burner and filters are provided to separate dust from air. the circulating fans blow air from the base to the upper side and exhaust fans sucks all the hot air within the chambers. Attraction rollers ar provided to stretch the warp yarn. After stentering I can increase the width of the fabric up to 1.5-2 inch.The speed of the machine is about 20-100 m/min and the temperature is 130180°C. Finally, I can get the finished fabric from delivery roller.

2.6 Stentering?

Stentering is a finishing process which is used to control fabric width, fabric length, shrinkage, weight of the fabric and fabric shade colour. In this process some chemical finishing is done according to buyer requirement.

2.7 Objectives of Stentering:

The objectives are-

- To learn about GSM of different fabric's before stentering and after stentering and calculate their change%
- To learn about Width and Length of the fabric's before stentering and after stentering and calculate their change%
- To learn about EPI, PPI change before stentering and after stentering and identification EPI, PPI change %
- To know how to control Crimp percentage and identification of Crimp%

2.8 Process in stentering:

Normally there are two process-

- Stentering for undyed fabric.
- Stentering for dyed fabric.

2.8.1 Processing step of stenter machine:

Dyed fabric collected from dyeing section

↓

Fabric feeding by feed roller

↓

Guide roller

↓

Spreading roller

↓

Fabric through the padding mangle

↓

Immersed solution by padder (pressure 2.5-4 kg)

↓

Mahlo

↓

Under feed roller

↓

Overfeed roller

↓

Selvedge spreader

↓

Chain arrangement

↓

Eight chambers

↓

Delivery roller

2.9 Some Stenter Finishing:

Softener Finish: A softener is a chemical that alters hand feel of the fabric. A softened fabric has smooth sensation, less stiffness, more tearing strength etc.

Used chemical for softening:

- Ultratek TTK--- 75g/l
- Ultra-phil PA –- 80g/l ▪ Catanika softener---10g/l
- Silicon softeners.

Water Repellent Finish: Water repellent finish is a surface modification finish which reduce water penetration into the fabric.

Used Chemical for Water repellent finish:

- Rockstar EEE ---75g/l
- Silicon water repellent

Hard finish: Hard finish make the fabric stiffer and give them more body by filling certain chemicals.

Used Chemical for hard finish:

- Apriton—10g/l
- C.P.C ---- 15g/l

2.10 Calculation for finishing chemical:

Let,

Fabric weight =300kg

Chemical = 15 g/l

Pick up = 65% (for wet fabric)

Required Chemical =?

Required Chemical = (Fabric weight × Pick up % × Chemical g/l) ÷ 1000

= {(300× .65× 15) ÷ 1000kg}

= 2.925 kg

Required Water = Fabric weight × Pick up %

= 300 × .65

= 195 liters

Chapter-3
Experimental Details

Experimental Details

3.1 Used Equipment:

For this research purpose I have taken ten different types woven fabric with their different GSM, for EPI and PPI counting used a counting glass and needle. For crimp percentage used a calculator and measuring scale and used a HAIDA stenter machine origin china that machine has been developed with eight chamber and each chamber length ten feet.

Table 3.1.1 Specification of "HAIDA" stenter machine used for my research purpose

Brand Name	HAIDA

Company Name	JAINGSU HAIDA DYEING AND PRINTING MACHINARY CO.LTD
Origin	China
Manufacturing year	2015
Heating type	Gas
Maximum temperature	220℃
Maximum Speed	100m/minute
Used Utilities	Electricity, Gas, Air pressure and steam
Maximum Fabric width	70 inches
Minimum fabric width	40 inches
Number of chambers	8
Number of burners	8
Application form	Open fabric
Number of Padder	2
Machine Parts	Feed roller, Spreading Roller, Padder, Over feed roller, Under feed roller, chain arrangement, burner, nozzle, air fan, suction fan and Delivery roller.
Production Per shift (24 hours)	12000yds

3.2 Different parts name of HAIDA stenter machine that used for my research

Feed Zone: This zone is use to feed different types of fabric uniformly by feed roller. And the feed roller which help to feed the fabric through the machine from the pre-treated area.

Fig. 3.2.1 Feeding zone

Spreading Roller: This roller is use to help spread the fabric and reduce curling tendency of fabric.

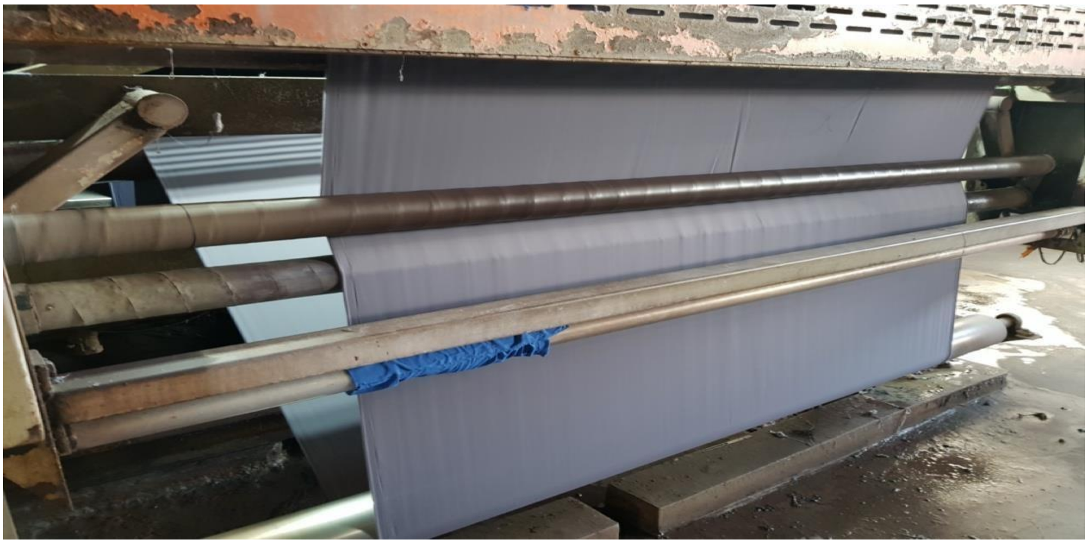

Fig. 3.2.2 Spreading roller

Padder: It is one of the most important parts of stenter. It helps to squeeze the fabric and remove extra solution. When the fabric passes through the immerse roller into the softener tank the fabric takes finishing chemical solution which is squeezed by padder and remove extra solution. Two padder is used in this machine.

Fig. 3.2.3 Padder

Softener Tank: Water and other finishing chemical is taken as per recipe into this tank to apply onto the fabric surface.

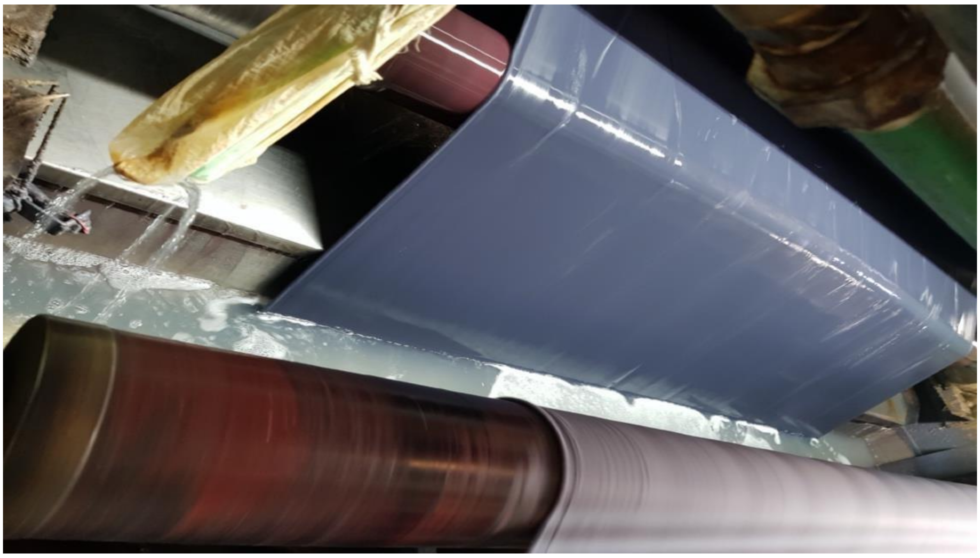

Fig. 3.2.4 Softener tank

Mixing Tank: This tank is use to mixture all finishing chemical and prepare for padding mangle to apply onto the fabric surface.

Fig. 3.2.5 Mixing tank

Mahlo: Bowing is a major defect in finishing. Bowing is identified by this device and remove bowing defect by roller from the fabric.

Fig. 3.2.6 Mahlo

Over feed Roller: Over feed roller is an important roller in this machine which is used to control GSM of fabric. To increase GSM of fabric, need to reduce tension on the fabric.

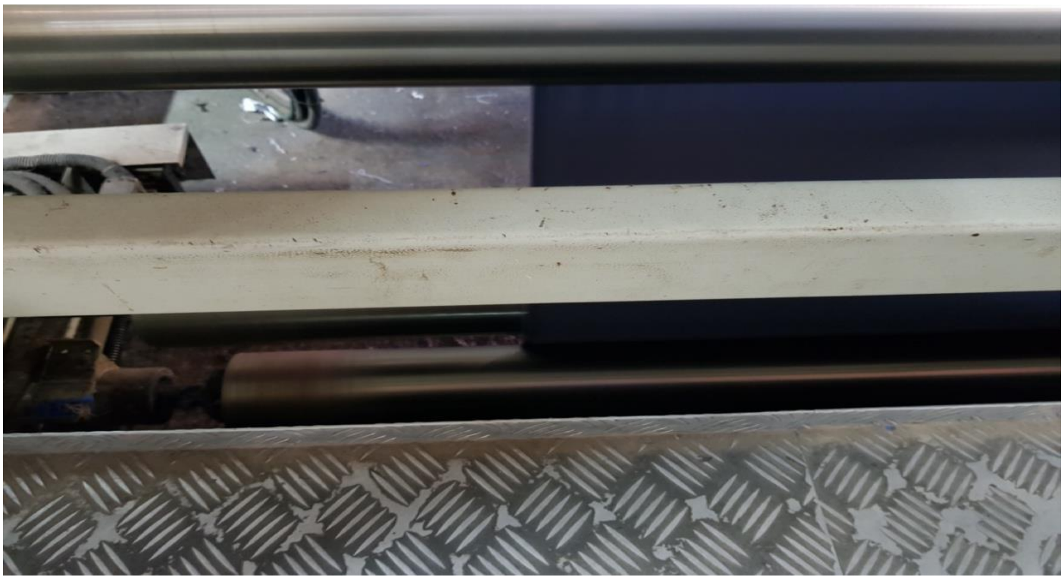

Fig. 3.2.7 Over feed roller

Chain Arrangement: It is a mechanical device which work with sensor. This device is used to control fabric and pass through one end to other end of gas chamber. It controls shrinkage and width of the fabrics. It works according to the required width setup.

Fig. 3.2.8 Chain arrangement

Gas Chamber: This machine has been developed with eight chambers where each chamber contains one gas burner and one blowing fan**.** Heat is produced into this chamber where each burner produce heat(130-190C°).

Fig. 3.2.9 Gas chamber

Delivery Roller: Fabric is delivered by different roller that control crease of fabric and finally we can get our desired finished fabric.

Fig. 3.2.10 Delivery roller

3.3 Different sample Specification

I have researched ten different woven polyester fabrics in various properties before the feed of stenter machine**.**

1. Polyester Oxford (Plain 1/1)
    - GSM:225
    - EPI:120
    - PPI:75
    - EPI Crimp%: 8.16
    - PPI Crimp%: 4.17

2. Rib Slipe (Plain)
    - GSM:124.2
    - EPI:147
    - PPI:95
    - EPI Crimp%: 5.26
    - PPI Crimp%: 5.26

3. Polyester Twill (Twill 2/2)
    - GSM:212.6
    - EPI:73
    - PPI:71
    - EPI Crimp%: 8.57
    - PPI Crimp%: 8.57

4. Polyester Twill (Twill 2/2)
    - GSM:222
    - EPI:72
    - PPI:70
    - EPI Crimp%: 6.45
    - PPI Crimp%:8.82

5. TC Herringbone (2/1 herringbone)
    - GSM:77
    - EPI:122
    - PPI:68

- EPI Crimp%: 6.67
- PPI Crimp%:7.7

6. Micro Twill (Twill 2/1)

- GSM:126.8
- EPI:148
- PPI:96
- EPI Crimp%: 6.25
- PPI Crimp%: 12.5

7. TC Plain (Plain 1/1)

- GSM:91.8
- EPI:99 ➢ PPI:69
- EPI Crimp%: 4.17
- PPI Crimp%: 2.86

8. TC Herringbone (2/1 herringbone)

- GSM:86.5
- EPI:137
- PPI:83
- EPI Crimp%: 2.4
- PPI Crimp%: 9.1

9. Virga (Plain 1/1)

- GSM:90.4
- EPI:150
- PPI:92

- EPI Crimp%: 6.06
- PPI Crimp%: 9.1

10. Taffeta (Plain 1/1)

- GSM:72.1
- EPI:116
- PPI:89
- EPI Crimp%: 2.5
- PPI Crimp%: 2.22

3.3 Sample running condition:

Table 3.1.2

Sample No	Sample Type	Sample Color	Machine Temperature °C	Machine Speed	Overfeed	Width before stenter finishing	Width after stenter finishing
01	Polyester Oxford (Plain 1/1)	olive	180°	25m/min	3%	67.8″	68.5″
02	Rib Slipe (Plain)	Red	170°	30.2 m/min	2%	145 cm	147 cm
03	Polyester Twill (Twill 2/2)	Navy Blue	180°	30 m/min	2%	58″	59″
04	Polyester Twill (Twill 2/2)	Black	180°	30.2 m/min	3%	57.5″	58″
05	TC Herringbone (2/1 herringbone)	Off White	170°	40.5 m/min	3%	41″	42.5″
06	Micro Twill (Twill 2/1)	White	170°	20 m/min	2%	59″	59.5″

07	TC Plain (Plain 1/1)	Black	170°	30 m/min	2%	61″	61″
08	TC Herringbone (2/1 herringbone)	Black	180°	35.5 m/min	2%	41″	42″
09	Virga (Plain 1/1)	6A Grey	170°	30 m/min	2%	145 cm	147 cm
10	Taffeta (Plain 1/1)	7A Black	160°	35 m/min	2%	58″	59″

Method used for testing:

At first, I have taken ten different sample before stentering and after stentering. Measured GSM of before stentering and after stentering with the help of GSM cutter and electric balance. I am able to count EPI and PPI by the counting glass and needle. Then a measured sample is taken to measure crimp percentage.

* Takes a sample by GSM cutter then measured average weight.
* GSM = Average Sample Weight × 100
* I have calculated EPI and PPI by the counting glass and needle. EPI means Ends per inch and PPI means Picks per inch.
* I have measured crimp percentage, Crimp% ={(L-P) ×100) ÷ P

Here, L = Straightened Thread Length

P = The length of thread in fabric/ crimped length.

3.4 Sample Attachment

Sample before stentering	Sample after stentering
Sample before stentering	Sample after stentering
Sample before stentering	Sample after stentering
Sample before stentering	Sample after stentering

Sample before stentering	Sample after stentering

Sample before stentering	Sample after stentering
Sample before stentering	Sample after stentering
Sample before stentering	Sample after stentering
Sample before stentering	Sample after stentering

Sample before stentering	Sample after stentering

Chapter-4

Discussion of Results

Discussion of Results

Table 4.1 Change in Gram per Square meter (GSM) of different types of fabrics after stentering:

Sample No.	Sample Type	Machine Temp. (°C)	Machine Speed	Overfeed	GSM (Before Stentering)	GSM (After Stentering)	Change%
01	Polyester Oxford (Plain 1/1)	180°	25 m/min	3%	225	272	20.88
02	Rib Slipe (Plain)	170°	30.2 m/min	2%	124.2	119.7	-3.62
03	Polyester Twill (Twill 2/2)	180°	30 m/min	2%	212.6	198.4	-6.68
04	Polyester Twill (Twill 2/2)	180°	30.2 m/min	3%	222	203.5	-8.33
05	TC Herringbone (2/1 herringbone)	170°	40.5 m/min	3%	77	80	3.89
06	Micro Twill (Twill 2/1)	170°	20 m/min	2%	126.8	116.4	-8.20
07	TC Plain (Plain 1/1)	170°	30 m/min	2%	91.8	93.9	2.29
08	TC Herringbone (2/1 herringbone)	180°	35.5 m/min	2%	86.5	84.5	-2.31

09	Virga (Plain 1/1)	170°	30 m/min	2%	90.4	89.8	-1.105
10	Taffeta (Plain 1/1)	160°	35 m/min	2%	72.1	73.5	1.94

In this table I can see the change of GSM (gram per square meter) of before stentering and after stentering of different woven polyester fabrics. From this table I can explain that GSM of polyester oxfort (1/1) plain fabric increases 20.88% when the treated temperature is 180°C and the overfeed 3% and the machine speed was 25m/min. Rib slipe plain fabric decreases the 3.62% when the temperature is 170°C and the overfeed 2% with machine speed 30.2 m/min. Polyester twill (2/2) fabric decreases the 6.68% when the temperature is 180°C and the overfeed 2% with machine speed 30 m/min. Polyester twill (2/2) fabric decreases the 8.33% when the temperature is 180°C and the overfeed 3% with machine speed 30.2 m/min. TC herringbone(2/1) fabric increases the 3.89% when the temperature is 170°C and the overfeed 3% with machine speed 40.5 m/min. Micro twill (2/1) fabric decreases the 8.20% when the temperature is 170°C and the overfeed 2% with machine speed 20 m/min. TC plain (1/1) fabric increases the 2.29% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. TC herringbone (2/1) fabric decreases the 2.31% when the temperature is 180°C and the overfeed 2% with machine speed 35.5 m/min. Virga plain (1/1) fabric decreases the 1.105% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. Taffeta plain (1/1) fabric increases the 1.94% when the temperature is 160°C and the overfeed 2% with machine speed 35 m/min.

Table 4.2 Change in Ends per inch (EPI) of different types of fabrics after stentering:

Sample No.	Sample Type	M/C Temp. (°C)	M/C Speed	Overfeed	EPI (Before Stentering)	EPI (After Stentering)	Change EPI	Change%
01	Polyester Oxford (Plain 1/1)	180°	25m/min	3%	120	109	-11	-9.17
02	Rib Slipe (Plain)	170°	30.2 m/min	2%	147	144	-3	-2.04
03	Polyester Twill (Twill 2/2)	180°	30 m/min	2%	73	78	5	6.8
04	Polyester Twill (Twill 2/2)	180°	30.2 m/min	3%	72	68	-4	-5.55
05	TC Herringbone (2/1 herringbone)	170°	40.5 m/min	3%	122	128	6	4.91
06	Micro Twill (Twill 2/1)	170°	20 m/min	2%	148	138	-10	-6.76
07	TC Plain (Plain 1/1)	170°	30 m/min	2%	99	99	0	0
08	TC Herringbone (2/1 herringbone)	180°	35.5 m/min	2%	137	134	-3	-2.18

09	Virga (Plain 1/1)	170°	30 m/min	2%	150	148	-2	-1.33
10	Taffeta (Plain 1/1)	160°	35 m/min	2%	116	116	0	0

EPI Ends inch) of before stentering and after stentering of different woven polyester fabrics. From this table I can explain that EPI of polyester oxfort (1/1) plain fabric decreases 9.17% when the treated temperature is 180°C and the overfeed 3% and the machine speed was 25m/min. Rib slipe plain fabric decreases 2.04% when the temperature is 170°C and the overfeed 2% with machine speed 30.2 m/min. Polyester twill (2/2) fabric increases 6.8% when the temperature is 180°C and the overfeed 2% with machine speed 30 m/min. Polyester twill (2/2) fabric decreases 5.55% when the temperature is 180°C and the overfeed 3% with machine speed 30.2 m/min. TC herringbone(2/1) fabric increases 4.91% when the temperature is 170°C and the overfeed 3% with machine speed 40.5 m/min. Micro twill (2/1) fabric decreases 6.76% when the temperature is 170°C and the overfeed 2% with machine speed 20 m/min. TC plain (1/1) fabric increases 0% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. TC herringbone (2/1) fabric decreases 2.18% when the temperature is 180°C and the overfeed 2% with machine speed 35.5 m/min. Virga plain (1/1) fabric decreases the 1.33% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. Taffeta plain (1/1) fabric increases 0% when the temperature is 160°C and the overfeed 2% with machine speed 35 m/min.

Table 4.3 Change in Picks per inch (PPI) of different types of fabrics after stentering:

In this table I can see the change of (per

Sample No.	Sample Type	M/C Temp. (°C)	M/C Speed	Overfeed	PPI (Before Stentering)	PPI After Stentering)	Change PPI	Change%
01	Polyester Oxford (Plain 1/1)	180°	25m/min	3%	75	79	4	5.3
02	Rib Slipe (Plain)	170°	30.2 m/min	2%	95	92	-3	-3.15
03	Polyester Twill (Twill 2/2)	180°	30 m/min	2%	71	67	-4	-5.6
04	Polyester Twill (Twill 2/2)	180°	30.2 m/min	3%	70	66	-4	-5.71
05	TC Herringbone (2/1 herringbone)	170°	40.5 m/min	3%	68	68	0	0
06	Micro Twill (Twill 2/1)	170°	20 m/min	2%	96	91	-5	-5.21
07	TC Plain (Plain 1/1)	170°	30 m/min	2%	69	69	0	0
08	TC Herringbone (2/1 herringbone)	180°	35.5 m/min	2%	83	80	-3	-3.61
09	Virga (Plain 1/1)	170°	30 m/min	2%	92	91	-1	-1.09
10	Taffeta (Plain 1/1)	160°	35 m/min	2%	89	91	2	2.24

PPI Picks inch) of before stentering and after stentering of different woven polyester fabrics. From this table I can explain that PPI of polyester oxford (1/1) plain fabric increases 5.3% when the treated temperature is 180°C and the overfeed 3% and the machine speed was 25m/min. Rib slipe plain fabric decreases 3.15% when the temperature is 170°C and the overfeed 2% with machine speed 30.2 m/min. Polyester twill (2/2) fabric increases 5.6% when the temperature is 180°C and the overfeed 2% with machine speed 30 m/min. Polyester twill (2/2) fabric decreases 5.71% when the temperature is 180°C and the overfeed 3% with machine speed 30.2 m/min. TC herringbone (2/1) fabric increases 0% when the temperature is 170°C and the overfeed 3% with machine speed 40.5 m/min. Micro twill (2/1) fabric decreases 5.21% when the temperature is 170°C and the overfeed 2% with machine speed 20 m/min. TC plain (1/1) fabric increases 0% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. TC herringbone (2/1) fabric decreases 3.61% when the temperature is 180°C and the overfeed 2% with machine speed 35.5 m/min. Virga plain (1/1) fabric decreases 1.09% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. Taffeta plain (1/1) fabric increases 2.24% when the temperature is 160°C and the overfeed 2% with machine speed 35 m/min.

Table 4.4 Change in Crimp% in Warp way of different fabrics:

In this table I can see the change of (per

Sample No.	Sample Type	Machine Temp.(°C)	Machine Speed	Overfeed	Crimp% in Warp Way Before Stentering)			Crimp% in Warp Way After Stentering)			Change% between before and after stentering
					L (cm)	P (cm)	Crimp % (C)	L (cm)	P (cm)	Crimp % (C)	
01	Polyester Oxford (Plain)	180°	25 m/min	3%	5.3	4.9	8.16	5	4.9	2.04	-75
02	Rib Slipe (Plain)	170°	30.2 m/min	2%	4	3.8	5.26	4	3.8	5.26	0
03	Polyester Twill (Twill)	180°	30 m/min	2%	3.8	3.5	8.57	3.6	3.5	2.85	-66.74
04	Polyester Twill (Twill)	180°	30.2 m/min	3%	3.3	3.1	6.45	3.2	3.1	6.45	0
05	TC Herringbone	170°	40.5 m/min	3%	3.2	3	6.67	3.1	3	3.33	-48.37
06	Micro Twill (Twill)	170°	20 m/min	2%	3.4	3.2	6.25	3.4	3.2	6.25	0
07	TC Plain (Plain)	170°	30 m/min	2%	2.5	2.4	4.17	2.5	2.4	4.17	0
08	TC Herringbone	180°	35.5 m/min	2%	4.3	4.2	2.4	4.3	4.2	2.4	0
09	Virga (Plain)	170°	30 m/min	2%	3.5	3.3	6.06	3.4	3.3	3.03	-50
10	Taffeta (Plain)	160°	35 m/min	2%	4.1	4	2.5	4.1	4	2.5	0

EPI Ends inch) crimp% of before stentering and after stentering of different woven polyester fabrics. From this table I can explain that EPI of polyester oxford (1/1) plain fabric decreases 75% when the treated temperature is 180°C and the overfeed 3% and the machine speed was 25m/min. Rib slipe plain fabric decreases the 0% when the temperature is 170°C and the overfeed 2% with machine speed 30.2 m/min. Polyester twill (2/2) fabric decreases 66.74% when the temperature is 180°C and the overfeed 2% with machine speed 30 m/min. Polyester twill (2/2) fabric decreases the 0% when the temperature is 180°C and the overfeed 3% with machine speed 30.2 m/min. TC herringbone(2/1) fabric decreases 48.37% when the temperature is 170°C and the overfeed 3% with machine speed 40.5 m/min. Micro twill (2/1) fabric decreases the 0% when the temperature is 170°C and the overfeed 2% with machine speed 20 m/min. TC plain (1/1) fabric decreases the 0% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. TC herringbone (2/1) fabric decreases 0% when the temperature is 180°C and the overfeed 2% with machine speed 35.5 m/min. Virga plain (1/1) fabric decreases 50% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. Taffeta plain (1/1) fabric increases the 0% when the temperature is 160°C and the overfeed 2% with machine speed 35 m/min.

Table 4.5 Change in Crimp% in Weft way of different fabrics:

Sample No.	Sample Type	Machine Temp.(°C)	Machine Speed	Overfeed	Crimp % in Weft Way Before Stentering)			Crimp% in Weft Way After Stentering)			Change% between before and after stentering
					L (cm)	P (cm)	Crimp % (C)	L (cm)	P (cm)	Crimp % (C)	
01	Polyester Oxford (1/1 Plain)	180°	25 m/min	3%	5	4.8	4.17	4.9	4.8	2.08	-50.12
02	Rib Slipe (Plain)	170°	30.2 m/min	2%	4.2	3.8	5.26	3.9	3.8	2.63	-50
03	Polyester Twill (2/2 Twill)	180°	30 m/min	2%	3.6	3.2	8.57	3.3	3.2	3.13	-63.5

In this table I can see the change of (per

04	Polyester Twill (2/2 Twill	180°	30.2 m/min	3%	3.7	3.4	8.82	3.5	3.4	2.94	-66.7
05	TC Herringbone (2/1 herringbone)	170°	40.5 m/min	3%	4.2	3.9	7.7	4.1	3.9	5.13	-33.4
06	Micro Twill (2/1 Twill)	170°	20 m/min	2%	3.6	3.2	12.5	3.3	3.2	3.13	-75
07	TC Plain (1/1 Plain)	170°	30 m/min	2%	3.6	3.5	2.86	3.6	3.5	2.86	0
08	TC Herringbone (2/1 herringbone)	180°	35.5 m/min	2%	4.6	4.4	9.1	4.5	4.4	2.27	-75
09	Virga (1/1 Plain)	170°	30 m/min	2%	3.9	3.6	8.3	3.7	3.6	2.78	-66.5
10	Taffeta (1/1 Plain)	160°	35 m/min	2%	4.6	4.5	2.22	4.6	4.5	2.22	0

In this table I can see the change of PPI (Picks per inch) crimp% of before stentering and after stentering of different woven polyester fabrics. From this table I can explain that PPI of polyester oxford (1/1) plain fabric decreases 50.12% when the treated temperature is 180°C and the overfeed 3% and the machine speed was 25m/min. Rib slipe plain fabric decreases the 50% when the temperature is 170°C and the overfeed 2% with machine speed 30.2 m/min. Polyester twill (2/2) fabric decreases 63.5% when the temperature is 180°C and the overfeed 2% with machine speed 30 m/min. Polyester twill (2/2) fabric decreases the 66.7% when the temperature is 180°C and the overfeed 3% with machine speed 30.2 m/min. TC herringbone(2/1) fabric decreases 33.4% when the temperature is 170°C and the overfeed 3% with machine speed 40.5 m/min. Micro twill (2/1) fabric decreases the 75% when the temperature is 170°C and the overfeed 2% with machine speed 20 m/min. TC plain (1/1) fabric decreases the 0% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. TC herringbone (2/1) fabric decreases 75% when the temperature is 180°C and the overfeed 2% with machine speed 35.5 m/min. Virga plain (1/1) fabric decreases 66.5% when the temperature is 170°C and the overfeed 2% with machine speed 30 m/min. Taffeta plain (1/1) fabric increases the 0% when the temperature is 160°C and the overfeed 2% with machine speed 35 m/min.

Chapter-5
Conclusion

Conclusion

By this project (thesis) report, I am able to learn about the effect of stentering process on various kind polyester woven fabrics and blended woven fabrics also. Before making this project, I didn't know about the impact of stentering finishing process on polyester woven and blended woven fabric. Now I can say that after stenter finishing process some properties of polyester woven fabric has been changed. They are- Ends per inch (EPI), Picks per inch (PPI), Gram per square meter (GSM) and Crimp percentage of each fabrics.

- After the stentering process of different polyester woven fabrics, I have seen that the GSM (20.88%) changes when the over feed (%) is high and the GSM changes (-1.105) few when the over feed (%) is low.
- After the stentering process of different polyester woven fabrics, I have seen the percentage of variation of EPI decreases (-9.17%) with the increases of over feed (%) and tension and somewhere EPI increases (4.91%) with the increases of over feed percentage.
- After the stentering process of different polyester woven fabrics, I have seen that the percentage of PPI decreases (-5.71%) with the increases of over feed (%) and somewhere PPI increases (5.3%) with the increases of over feed percentage.

- After the stentering process of different polyester woven fabrics, I have seen that the Crimp percentage in Warp Way decreases (-75%) with higher overfeed (%) on the other hand Crimp% in Warp way decreases (-48.37%) with the increases over feed percentage.
- The Crimp% variation in Weft Way decreases (-50.12%) with the increases of over feed (%) and some variation of Crimp% in Weft Way decreases (-33.4) with the increases of over feed (%).

In this thesis report I have taken Ten different polyester woven fabrics but it will be more accurate for more fabrics construction and composition are same and I will be able to get actual data. Then I will be able to change over feed percentage, temperature, machine speed when it produces actual result.

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