Faculty of Engineering

Department of Textile Engineering

Course Title: - Project (Thesis)

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Study on waste generation in single jersey circular knitting Machine.

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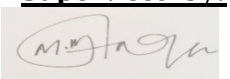
A thesis is submitted in partial fulfilment of the requirements for the degree of
Bachelor of Science in Textile Engineering

Advanced in Fabric Manufacturing, Fall 2021

Declaration:

I hereby declare that this paper has been created by me under the supervision Of **Prof. Md. Mahbubul Haque,** Professor of TE at **Daffodil International University**. I further declare that neither this report nor any part of this report has been submitted elsewhere for attribution of title.

Supervised by:



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Acknowledgement:

At first, we thank a lot to Almighty Allah for his blessing and support us to complete my project successfully**.**

I am also grateful to my supervisor Professor **Prof. Md. Mahbubul Haque** my supervisor, I extremely indebted for her tremendous support and guidance throughout my training period. Being working with her I have not only earned valuable knowledge but was also inspired by her innovativeness which helped enrich my experience to a greater extent. His ideas and his way of working were truly remarkable.

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

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

Letter of Approval:

25th December, 2021

Prof. Md. Mahbubul Haque

Academic Supervisor

Department of Textile Engineering

Daffodil International University

Subject: Submission of the thesis work on, "Study on waste generation in single jersey circular knitting Machine."

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Dear Sir,

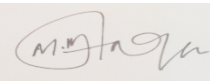
With due respect, as student of Daffodil International University, I have prepared our thesis work on A survey on process loss of yarn and Fabric during production in knitting on the basis of different criteria of raw material and machine.

I have tried our level best to follow your guidelines in every aspect of planning of this thesis work. I have also collected what we believe to be the most important information to make this thesis specific and coherent as possible. I am enjoyed the challenge of preparing the thesis as it provided us with an opportunity to enlarge knowledge. I am honestly thankful for your guidance during the preparation of this thesis report. We hope you will appreciate our effort. I have done the study in a complete form and we have tried our level best to conduct this in a professional manner. It is true that if there had been no constraints, it could have been done better. I hope you will rate my report given the limitations of the study.

Yours sincerely,

Md. Shafiul Islam (181-23-461)

Signature of supervising Teacher



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Prof. Md. Mahbubul Haque

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Abstract:

The textile factory in Bangladesh, especially the knitwear industries, where a huge amount of knitted fabric is produced daily. There are also many kinds of raw materials such as yarns, different kinds of titration are used depending on the production needs. So in this aspect, though the production procedure is same for different knit products, major different are seen during the time of production I has often been seen that the amount of fabric produced is slightly less than the amount of incoming yarn. . It was remembered as the so-called loss of process. Now the question is,what is the reason for this loss process and how much in weight of yarn wasted during production. To find the answer to these questions, we have seen that the loss of process is influenced by certain factors during production, such as yarn types, yarn composition, yarn count, yarn brand, yarn bundle, m / c r.p.m. operator skill, thread tension, thread load, relative humidity, etc. All necessary data was collected throughout the day beyond 12 hours per day (1 shift) and was collected and reorganized as a Microsoft trading word. And it has been shown that this thesis uncovers the loss of process for each of the criteria at the same time for each of the individual machines. Through this thesis it is clear that the waste of yarn is more important in the case of a foreign brand than in the case of a local brand during knitting.

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CHAPTER 01

Introduction

Introduction:

The readymade pieces of clothing industry goes about as the foundation of our economy and as an impetus for the Advancement of our country. We invest heavily in the area that has been bringing billions of dollars as product profit and making occupations for a great many individuals in the country. The “Made in Bangladesh” label has also brought prestige to Bangladesh, making it a brand appreciated around the world.

It's actually a question of incredible interest to many: how is the economy of Bangladesh doing develop at a consistent speed, once in a while in any event, when paddling against the tide. Presently we imagine Bangladesh accomplishing the center pay country status by 2021. We solidly accept that our dream will work out as expected inside the specified time and the RMG business will absolutely play a pivotal job in appearing the fantasy.

Knitting is one of the significant modern areas of Bangladesh. The lion share our product arranged RMG is begun from sew textures Export implies care about quality with the amount.

Different knitting machines have different output capacities, or the efficiency of production varies from machine to machine and design to design. We also know that high count yarn, GSM, stitch length, machine dia, and gauge all affect knitted fabric creation.

Different industries in Bangladesh utilize different brands of machines. Some off-brand machines are highly prolific, while branded machines are slow to produce.

The explanations that follow should be useful in determining the production efficiency of various machines with varying knit criteria.

1.1. Objectives of this thesis:

1. Determine the yarn process loss.

2. Determining the cause of process failure.

3. Calculate the change in process loss as a result of varied production factors. as an example

• Type of yarn

• RPM of the machine

• Count of yarn

• Type of Fabric

4. To learn about recent work on those segments and to determine their limitations.

5. Determine a method for reducing process loss.

1.2. This thesis outline:

Chapter Number	Chapter Name	Description
01	Introduction	A general summary of research effort is included in the introduction.
02	Literature Review	The review of recent research work linked to this effort, as well as the finding of gaps in existing studies and the goal of this research study, has been discussed.
03	Theoretical Context	This chapter offers a brief overview of knitting, knitting machines, and the functions of various knitting machine parts, as well as information on process.
04	Material and Method	It describes a material's property, a process's procedure, and maybe another machine parameter. Production quantity and efficiency for various machines.
05	Result and Discussion	The result and discussion describe the yarn loss variation in knitting production processes.
06	Conclusion	The conclusion has been reached. Recommendations for future research are provided.
07	Reference	In this chapter the journal, books, websites helped in this research work are referred
08	Appendices	

CHAPTER 02

Literature Review

2. Literature Review:

Knitting is taken from the word "knot," which is borrowed from a Dutch word. Knitting is a method of making cloth out of yarn or wool (Wikipedia). The very first artifact was an Egyptian sock from the 11th century. (Wikipedia)

Knit fabric demand is expanding day by day because to its soft and comfortable feel, good air porosity, nicely drapes, low cost, and good technological support. The demand for knit fabric is expanding in Paris in 1912, following the success of silk fabric. They now utilize around 15 billion worth of knit products each year. The circular knitting machine is used more than the v-bed flat knitting machine. (V. M. Matkovi, 2011)

Knit fabric manufacture is much more competitive than it was previously. In order to create the product with process. There are numerous reasons for decreased efficiency in the textile business.

There are three main causes of machine failure in the knitting business.

1. Characteristics of yarn (Breaking strength, elongation, count, filament or natural yarn)

2. Machine quality criterion (Machine maintenance and clearance)

3. The state of the knitting industry (Yarn count, machine setting, yarn storage, Air conditioning)

Machine stoppage, worker inactivity, loose yarn, and machine failures are the most common causes of machine stoppage, all of which reduce efficiency. The machine's speed is important.

Fabric flaws play an important role. As a result, for optimal production, an optimal speed should be maintained. The machine's speed was increased by 1 and 2 rpm per day, and the negative influence of several factors such as fabric defects, yarn breakages, and needle defects was discovered.

The production efficiency of some fabrics, even when sophisticated methods and designs are applied, is surprisingly poor. Fleece, terry, 2*2 rib, double Lacoste, and other fabrics need the use of low count yarn. As a result, the rpm of the machine must be reduced to reduce yarn breakage. As a result, overall manufacturing efficiency decreases. Though nowadays there are companies that manufacture high-rpm machines with low yarn breakage modules and deliver good fabric quality. (November 2002, Peled)

Yarn input tension can be used as a process variable in circular knitting machines. Control, so that problems can be avoided or discovered quickly. Because it represents the overall behavior of the knitting machine (Mário de ARAJO1), this was determined to be a useful approach for completing this work.

CHAPTER 03

Theoretical Context

3.1 About Knitting:

Knitting is a technique by which yarn is controlled to make a material or texture. It is utilized in many sorts of articles of clothing. Sewing might be finished manually or by machine. Knitting makes lines: circles of yarn in succession, either level or in the round (cylindrical). There are generally numerous dynamic lines on the sewing needle at one time. Sewn texture comprises of various back to back columns of associated circles that intermesh with the following and past lines. As each row is modeled, each newly created circle is obtained through at least one circle from the previous column and set on the acquiring needle so the circles from the earlier line can be pulled off the other needle without disentangling. Contrasts in yarn (changing in fiber type, weight, consistency and turn), needle size, and fasten type consider an assortment of knitting with various properties, including shading, surface, thickness, heat maintenance, water obstruction, and honesty. A little example of knit work is known as a sample.

The popularity of the knit fabric is primarily owing to its many advantages. Some of the key benefits of the knit fabric are:

- Flexible,
- Absorbs Moisture,
- Fitting,
- Convenient Care,
- Comfortable,
- Wrinkles,

3.2 There are types of Knitting :

1. Warp Knitting.
2. Weft Knitting.

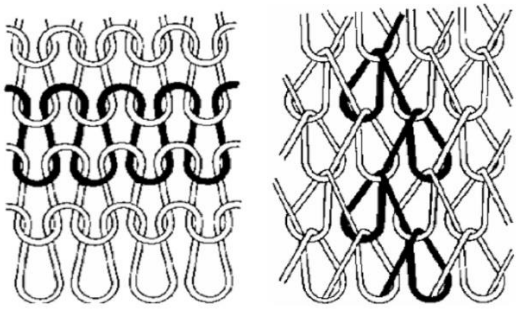


Fig 3.1: Weft & Warp Knitting.

3.3 Types of Knit Fabric:

Types of Knit Fabric:

- Single Jersey,
- Single Slub,
- Single Lacoste,
- Double Lacoste,
- Single Pique,
- Double Pique,
- Terry,
- Plain Interlock,
- 1×1 Rib,
- 2 ×1 Rib,
- 2 ×2 Rib,
- 5 ×2 Rib,
- Fleece Normal,
- Diagonal Fleece,

3.4 Knitting Machines:

There are two types of Knitting machine,

1. Weft knitting machine.
2. Warp knitting machine.

3.5 Basic Weft Knitted Structure:

Basic knitted structure are,

1. Plain/Single knit structure.
2. Rib knit structure,
3. Fleece knit structure.
4. Interlock knit structure.

3.6 Single Jersey Circular Knitting Machine:

Knitting machine is generally utilized all through the knitting industry to the produce texture. This machine can be inherent practically any sensible width and the little measurement of up to five, which are utilized for wear. Machine for outerwear and under wear might fluctuate from 12 inch to 60 inch in measurement as indicated by fabricates prerequisite.

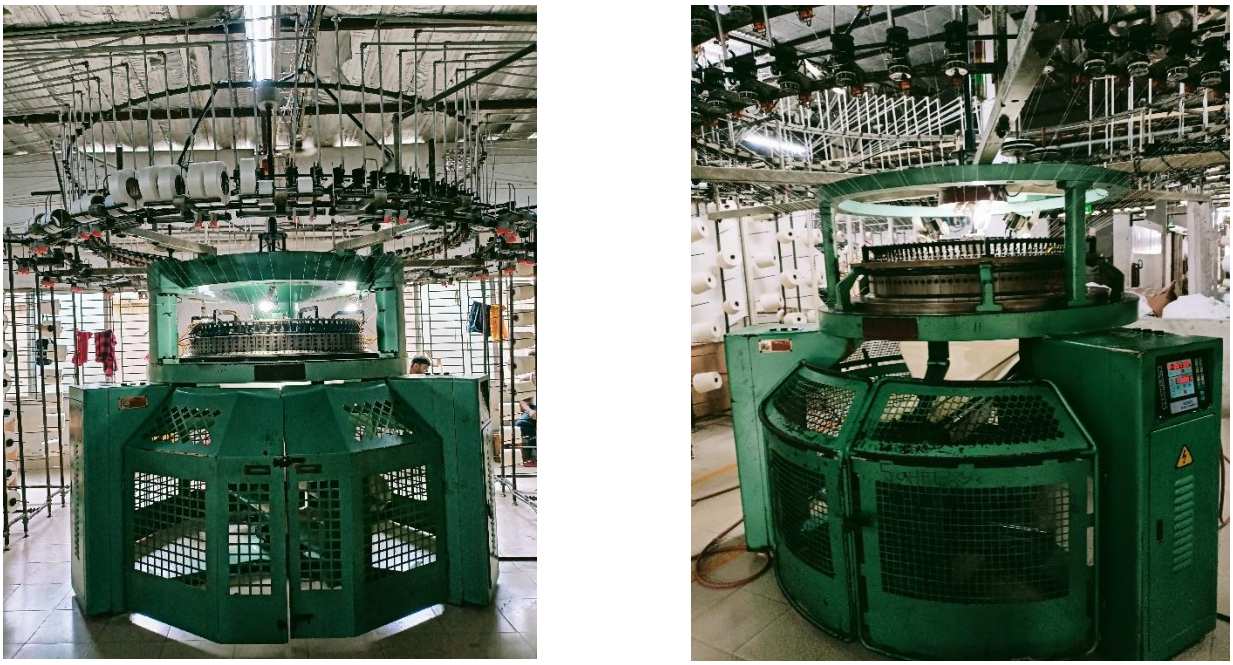


Fig 3.2: Circular weft Knitting machine.

3.7 Machine Parts & Function:

Creel: Creel is an upward aluminum stick where creel is set for holding the yarn cone. It otherwise called side creel.

Yarn Guide: The main function of this is to guide the yarn in proper direction.

Knot Catcher: To hold the dust and other extra impurities also knot. Only allow yarn pass. Through this.

Magnetic Tensioner: It is use to pass the yarn with proper direction also hold the yarn loosely.

Positive Wheel: To feed the specific amount of yarn keeping proper tension and ensure even yarn feed.

Sensor: To stop the yarn after breaking a single yarn as result machine will stop.

Indicator light: The function of this device is to identify the feeder or wheel place where yarn break.

Ceramic Eye Guide: To guide the yarn properly to the feeder.

Yarn Feeder: To feed the yarn to the needle for loop formation.

Sinker: The main function is to hold the old loop and help to formation of new loop.

Needle: To stretch the thread and making new loop also pass the new lop through the old loop.

Sinker Ring: To support sinker cam also sinker.

Sinker: To make sinker path also give to and fro motion

Feeder Ring: To hold the feeder.

Cylinder: To hold and place the needle in right position.

Base Plate: To hold and place the cylinder properly.

Sinker Ring Supporter: To hold the sinker ring, feeder ring tightly.

Needle Cam: To make a path for needle for accelerating through in the cylinder according the fabric.

3.8. Description of Important parts:

- **Cam:** Cam is gadget s which changes over the rotating machine drive in to a reasonable responding activity for the needles and different components.
- **Sinker:** It is most significant component of the machine. Its assistance to circle shaping, thumping over and holding down the circle.
- **Gauge:** knitting measure is the necessary number of lines per inch evenly, and the quantity of lines per inch upward.
- **Needle:** It assists the yarn with making a circle. Furthermore by this way texture are produce. Preceding yarn taking care of the needle is raised to clean the old circle off of the snare, and got the new circle above it on needle stem. The new circle is then encased in the needle snare as the needle begins to plummet.
- **Cylinder:** Circular knitting machines have either a solitary needle bed as a chamber (single pullover machines) or they have a chamber with a dial bed mounted above when they are fit for sewing twofold shirt textures.
- **VDQ Pulley:** It is a vital piece of the machine. It controls the nature of the item. Adjusting the place of the strain pulley changes the G.S.M. of the texture. If pulley moves towards the positive order then the G.S.M. is decline. Also in the switch heading G.S.M will increment.

3.9. Types of Needle:

There are three type of Needle:

- Latch Needle
- Bearded Needle
- Compound Needle

3.10. Different parts of Latch Needle:

Hook: The hook is used to catch a twist and form loops.

Butt: Butt of latch needle enable the needle to be reciprocate.

Tail: The tail is an extensional underneath the butt giving help to the needle and keeping the needle in its stunt.

Latch: This latch locates the latch in the needle.

Stem: The stem of latch needle carries the loop in the clearing on rest place.

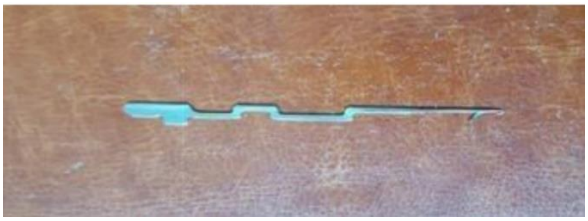


Fig 3.3: Needle

3.11. Knitting Sinker & Function:

Sinker is second primary element in Weft Knitting section.

Function:

- Loop Formation.
- Holding Down.
- Knocking Over.

Fig 3.3: Sinker

3.12/3.13. Knitting Cam & Function:

Knitting Cam are three types:

1) Knit Cam,
2) Tuck Cam,
3) Miss Cam.

Function:

- Produce movement of needles.
- Drive the needle.
- Development of circle.

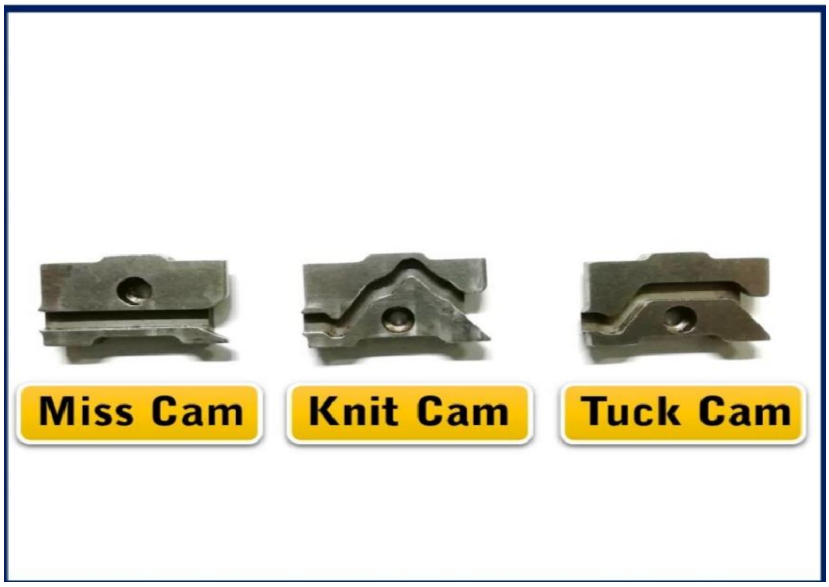


Fig 3.4: Knitting Cam

3.15. Produce of GSM Cutter:

- Cut the fabric with the GSM cutter.
- Weight the fabric with the electric equilibrium.
- The cut example is 100sq.cm. The heaviness of the cut example is increased by 100.
- The outcome is the GSM of that specific fabric.

For example

The weight of the fabric is 2.58 gm. That means the G.S.M of the fabric is 258 gm.

3.16. Knitting Production Calculation:

Knitting Production:
Knitting is a method by which thread or yarn is used to create a cloth. It is the interlocking of one or more yarns through a series of loops. In the case of knitting production, the knitter or knitting master has to apply some formula. In this article, I will give some essential formula which will be effective for newcomers in knitting.

Essential Formula for Knitting Production:

- **WPI:** Wales per inch is called WPI.
- **CPI:** Course per inch is called CPI.
- **GSM:** Grams per square meter of the fabric are called GSM.

Knitting Production
Needle Calculation Formula:

1. Single jersey circular knitting machine needle = ∏DG
2. Rib/Inter lock /Double jersey circular knitting machine needle = ∏DG×2 (two needle bed is here)
3. Single bed flat knitting machine needle = width× gauge
4. GSM = {WPI× CPI × (39.37)2×stitch length (mm) ×Tex /1000× 1000} g/m^2
5. Stitch density = (WPI × CPI) $inch^{-2}$ = (WPC ×CPC) cm^{-2}
6. The number of sinkers equals the number of needles.
7. No-Wales =No of needle
8. No, of course = No of feeders =No of yarn (per revolution of cylinder)
9. Course per minute = cylinder rpm x number of feeders
10. Course length = yarn required for each course. = No of needle × stitch length

*** V bed flat knitting machine needle = 2× width× gauge

Here,
D = Cylinder Diameter,
G = Machine Gauge ,
Needle pitch = 1/G.

*** **Fabric width** = wale spacing ×Total no of Wales
= (1/WPI ×No of Needles) inch
= (No of Needles/WPI× 39.37) meter

*** **For single jersey fabric** = (∏DG/WPI×39.37) meter (open width.)
= (∏DG/WPI×39.37) meter^2 (Folded/Tubular width)

*** **For double jersey fabric** = (2 ×∏DG/WPI×39.37) meter (open width.)
= (2×∏DG/WPI×39.37) meter^2 (Folded/Tubular width).

*** **Fabric Length** = Course spacing ×Total course per hour
= {(Feeder× cylinder rpm× 60)/CPI} inch/hour
= {(Feeder× cylinder rpm× 60)/CPI ×39.37} m/hour

3.17. Causes of Production interruption:

- Waste sample,
- Cone exchange,
- Faulty knit waste,
- Cleaning fly yarn,
- Yarn breaks,
- Needle Breaks,
- Load shedding,
- Sinker marks,
- Stains-stripes,
- Thick & thin place ,
- Wrong knitting program,
- Maintenance,

3.18. Efficiency and Process Lose:

Types of knitting machines were selected for the study. Single jersey machine specification is mentioned below:

Machine Name	Hengyi
Origin	Taiwan
Machine dia & gauge	30 × 24
Count	28
Stitch length	2.8mm
Efficiency	85%
No. of feeders	102
Machine RPM	30
Finished GSM	150

Table 01: Machine specification single jersey fabric.

The calculated production per single jersey machine per day. For calculated the following formula is used.

Production/hour = (No of Needle × No of Feeder × Stitch length × Efficiency × RPM × 60)/ (10 × 2.54 × 36 × 840 × Count × 2.2046)

= (∏ × D × G × No of Feeder × Stitch length × Efficiency × RPM × 60)/ (10 × 2.54 × 36 × 840 × Count × 2.2046)

= (3.1416 × 30 × 24 × 102 × 2.8 × 0.85 × 30 × 60)/ (10 × 2.54 × 36 × 840 × 28 × 2.2046)

= 20.84 kg/hour

= 500.16 kg/day

The calculated production per day single jersey machine is 500.16kg/day. But in factory actual production was 340kg/day during running the machine.

So efficiency of Circular knitting machine = (Actual production × 100)/Calculated production

= (340 × 100)/ 500.16

= 67.97 %

So efficiency loss of single jersey machine is = (100 - 67.97) = 32.03 %

Obviously there could be some important factors/reason behind the process loss% or Process gain%. They are –

1) Lose Cone yarn.

2) Cut yarn.

3) Knot yarn.

4) Fly fiber.

Here some picture of these reason to clear it-

Fig 3.5. Lose Cone yarn

Fig 3.6. Cut yarn.

Fig 3.7. Knot yarn.

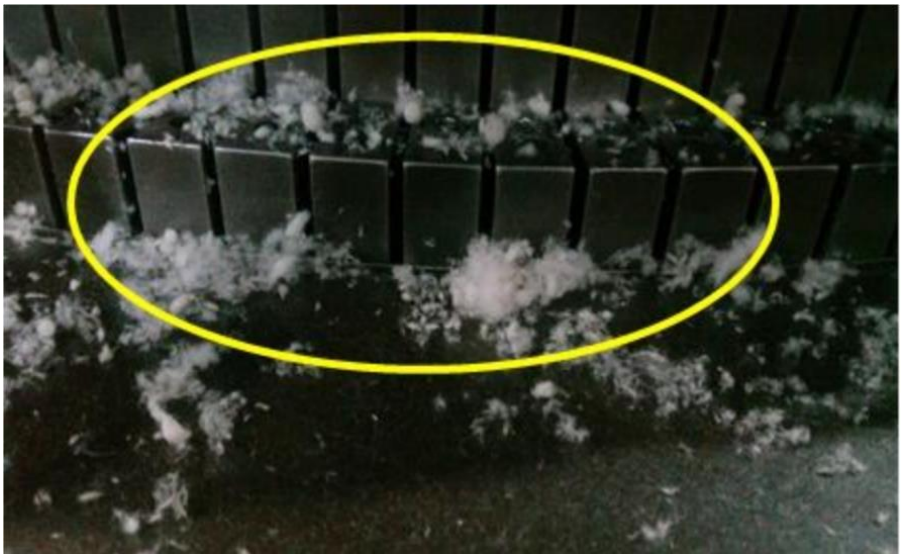


Fig 3.8. Fly fiber.

CHAPTER 04

Material and Method

Materials:

- **Yarn package:** Yarn packages are used in this case based on count, brand, and kind.

Kind of Yarn	Yarn Count	Brand
Grey Melange	30/1	Multazim
Combed	34/1	Bhardhaman
Grey Melange	40/1	Multazim
Combed	24/1	Omat
Pima Cotton	32/1	Patspin
Combed	40/1	Metro

Table 02: Kind of Yarn, Count and Brand.

Grey Melange: a yarn made by combining at least two and maybe more than two fibers.

Melange yarns can be divided into two categories based on their basic characteristics:

- Blended grey mélange yarn.
- Non-blended grey mélange yarn.

Combed Yarn: Combed yarn is made up of fibers that are straight and parallel.

Pima Cotton Yarn: Pima cotton is a type of cotton that contains just ten percent short fibers and ninety percent staple fibers.

- **Electric Balance:** To accurately record the weight of each package and each fabric role, an electric balance must be used.

- **Calculator:** To appropriately calculate process loss.

Method of Process Loss:

The following is a flow chart of the process:-

Collect the intake yarn packages from the yarn store.

By using an electric balance, determine the weight of intake cones without the use of a carton.

Keep track of the weight of the intake cones.

The weight of wastage yarn had to be recorded in order to determine the end of the cone.

The process and calculate the overall weight of wastage yarn in order to knot the broken yarn.

Keep meticulous records of the weight of the yarn.

Keep track of the weight of each cloth roll made from different yarn bundles.

After the entire production is completed, note the weight of all lost yarn that was not utilized to make fabric.

Then, by plugging recorded data into the equation, determine process loss.

Machine Specification:

The thesis work is completed on the basis of various types, dia, gauge, feeder, and RPM:

M/C No	M/C types	Dia	Gauze	Feeder	R.P.M
02	S/J	38	24	110	22
03	S/J	40	24	112	23
05	S/J	38	24	120	23
07	S/J	36	24	114	18
11	S/J	34	28	102	22

Table 03: Machine specification.

Required data for find out process loss and calculation:

M/C No = 22,

Dia = 38

Gauge = 24,

Feeder = 124

Yarn description:

Brand =Metro.

Lot No = 149h140886

Count = 40/1, combed yarn.

SL No	No. of Cone	Weight of Grey Yarn (Kg)	No. of Fabric Roll	Weight of grey fabric in kg/roll (Kg)
01	42	117.92	01	26.35
02	40	115.82	02	25.1
03	42	117.80	03	25.70
			04	25.20
			05	25.40
			06	25.60
			07	25.66
			08	24.78
			09	25.72
			10	25.59
			11	26.16
			12	25.65
			13	25.72
Total	**124**	**351.54 Kg**		**332.63 Kg**

Table 04: Data table and Process loss calculation.

The total weight of the loose yarn with cone paper is **15.87 kg**, which is yarn that will not be used.

The yarn's actual weight is used = 351.54 - 15.87 Kg = 335.67 Kg

Yarn wastage while using 335.67 kg of yarn = 335.67 – 332.63 Kg = 3.04 Kg

Process Loss% = (3.04 × 100)/335.67 = 0.90 %

CHAPTER 05

Result and Discussion

05. Result and Discussion:

The following is a summary of the information / data gathered:-

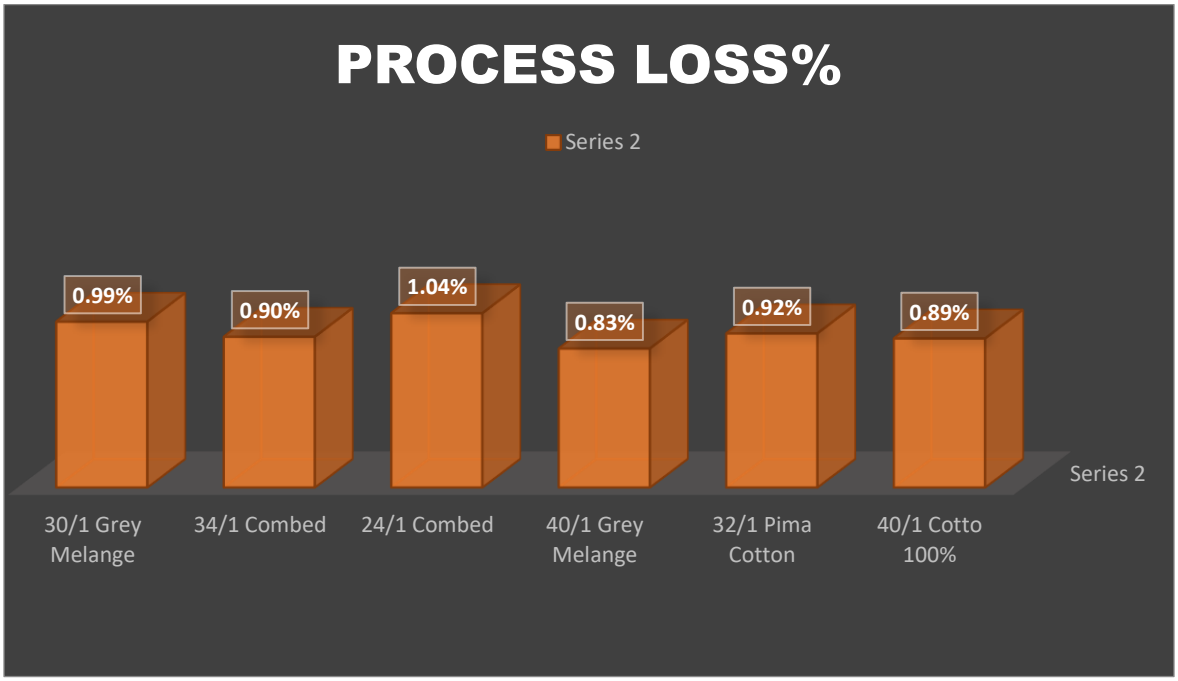
Yarn type	Brand	Count	Wt. of grey yarn (Kg)	Wt. of used yarn (kg)	Total wt. of fabric (Kg)	The rest yarn(Kg)	Wastage (Kg)	Process Loss %
Grey Melange	Multazim	30/1	241.6	202.8	200.8	38.3	2	0.99
Combed	Bhardhaman	34/1	328.5	313.1	310.3	15.4	2.8	0.90
Combed	Omat	24/1	235	223	220.7	12	2.3	1.04
Grey Melange	Multazim	40/1	237	206	204.3	31	1.7	0.83
Pima Cotton	Patspin	32/1	267.4	250.1	247.8	17.3	2.3	0.92
100% cotton	Metro	40/1	380	361.8	358.6	18.2	3.2	0.89

Table 05: Summary of the information / data gathered.

The table shows the difference in percent process loss between yarns of the same count but different counts.

It clearly shows that the process loss percent of 40/1 Ne, grey mélange yarn is lower than the process loss percent of 30/1 Ne, grey mélange yarn.

Also, the process loss percent of 34/1 Ne Combed yarn is lower than that of 24/1 Combed yarn, demonstrating that the process loss percent increases as the yarn count decreases.



Graph: Various types of yarn have different percentages of process loss.

The accompanying graph depicts a few differences in process loss percent between several types of yarn during knitting. The difference in process loss percent between yarns is determined by a number of factors. One of the most significant considerations is the yarn count. The process loss percent increases as the yarn count decreases, as indicated in the graph. This is due to the fact that the TPI decreases as the yarn count decreases. TPI is higher in higher count yarn than in lower count yarn. Because lower count yarn has a lower TPI, it is easier to remove fiber from the yarn. An extra graph, which is split down from the preceding image, is provided below to provide more clarity on these factors –

CHAPTER 06

Conclusion

06. Conclusion:

In this thesis, the efficiency and process loss of textile businesses are explored, as well as the computed efficiency of a knitting machine. The reason for process loss while knitting was also explained, as well as how to minimize process loss.

However, the thesis work is mostly focused on categorizing the efficiency differences between machines for various knitting parameters, as well as some of their basic production criteria, such as machine RPM, yarn count, fabric type, and so on. In this thesis, it is also attempted on a high level to focus on how to reduce process loss.

Due to a machine malfunction, we were unable to discuss fleece, pearl, Lacoste, and other design fabrics. As a result, others can try their hand at this segment. Fabric production, according to the operator, is higher during the night shift than during the day shift. As a result, one can experiment with night shift production.

For more theoretical background information, read David Spencer's book "knitting technology," which has been published in three versions. I only read one edition. There is a wealth of knowledge about knitting available in PDF format at Daffodil International University as a project file that may be downloaded for this purpose.

After all, one thing that must be mentioned is that efficiency and process loss are dependent not only on the machine type or other knitting parameters, but also on the good environment of the production floor, where honesty and respect for one another help to increase knitting efficiency and reduce process loss overall.

CHAPTER 07

References

07. References:

Construction Labor Productivity: Factors Affecting It (2012). Paper that is white in color. Effectiveness (2017). Wikipedia.

M. Akaydin, M (march 2009). Fabric made using a basic knitted structure using a combination of ring and combed yarn and compact yarn. 22-30 in Indian journal of fiber and textile research.

Fibre2fashion.com/industry-article/6277/various-wastage-areas-of-a-knitting-floor-and-minimizing-procedure

Mário de ARAÚJO1, A. C. (n.d.). Process Control for Total Quality in Circular Knitting.

Pawar Hemraj, P. R. (n.d.). A study on improving the Knitting Machine Efficiency.

Sapub.org/10.5923.j.textile.20190803.02.html?fbclid=IwAR2Zy2u4Tsp1eY2oiwA15LxalreacSW9BBtd8e3MMQ98A2PYHEOV1MvL8wM

Spencer, D. j. (1998).knitting technology. Cambridge, England: woodhead publication.

.Wolfers, J. (2015, January 13,). Peterson institute for international economics.

CHAPTER 08

Appendices

08. Appendices:

Total data for this thesis is mostly gathered from a single jersey knitting machine. And, by adjusting the cam arrangement, needle arrangement, and sinker arrangement, several designs such as terry, lacoste, and single jersey Lycra may be made in the same machine. In some cases, the statistics may resemble those of a single jersey knitting machine. For the creation of pattern knitting fabric, there are special machines. Although a single jersey knitting machine may make such types of products, the quality and efficiency of both types of knitting machines are not the same.

The entire production is calculated using the same knitting calculation. As a result, the production calculation was found to be more reliable and trustworthy.

The thesis basically stands for something predictable, thus over all of this debate, it can be readily stated that efficiency can easily be raised by careful management of the factory floor, as well as a reduction in process loss percent.