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# Study on drying machine in Dyeing Industry

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**Daffodil**  
*International*  
**University**

Faculty of Engineering  
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**Study on Drying Machine in Knit Dyeing Industry**  
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Advance in Textile Wet Processing

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# **Study on Drying Machine in Knit Dyeing Industry**

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## Declaration

We hereby declare that the work which is being presented in this thesis entitled, **“Study on Drying Machine in Dyeing Industry”** is original work of our own, have not been presented for a degree of any other university and all the resource of materials uses for this project have been duly acknowledged.

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This is to certify that the above declaration made by the candidates is correct to the best of our knowledge.

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Tanvir Ahmed Chowdhury

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Date

Supervisor

## **ABSTRACT**

This aim of the study is to know about drying machine in dyeing industry in details. A lot of processes were observed to conduct this study. Specially the change of diameter and GSM were observed very cautiously. Seven fabrics including single jersey, pique, rib& fleece were selected for this study. The process of changing diameter and GSM were studied very carefully. Finally, the relation between GSM and Temperature, GSM and Machine Speed were critically examined.

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# **CHAPTER 1**

# **INTRODUCTION**

## 1.1 Introduction

Drying is a mass transfer process consisting of the removal of water or another solvent<sup>[1]</sup> by evaporation from a solid, semi-solid or liquid. This process is often used as a final production step before selling or packaging products. To be considered "dried", the final product must be solid, in the form of a continuous sheet (e.g., paper), long pieces (e.g., wood), particles (e.g., cereal grains or corn flakes) or powder (e.g., sand, salt, washing powder, milk powder). A source of heat and an agent to remove the vapor produced by the process are often involved. In byproducts like food, grains, and pharmaceuticals like vaccines, the solvent to be removed is almost invariably water.

## 1.2 Features of drying

- To dry the fabric
- To control Shrinkage percentage
- Basically it is use for wet tube fabric
- To control over feed
- To control variation which increase G.S.M.
- To adjust the tone of fabric
- To match the fabric color shade

### **1.3 Significance of the Study:**

- ❖ The importance of the study is given below:
- ❖ After wet processing the weight is about 300% more than the original weight.
- ❖ Most of this weight is due to the amount of water absorbed by the textiles.
- ❖ To remove this water by direct evaporation /drying a large amount of heat energy is required.
- ❖ It is calculated that about 18% of the total cost of wet processing goes for heat generation.
- ❖ So this excess water is removed before evaporation/drying to reduce the cost.
- ❖ To achieve the above mentioned knowledge, I have observed a lot of processes of finishing.

**CHAPTER 2**  
**LITERATURE REVIEW**

## 2.5 Drying

Drying is done after de-watering of fabric. In textile finishing unit; dryer uses for dry the knit, woven fabrics and dyed yarn. But the drying process and drying mechanism of yarn and fabrics is different from one to another. The main functions of a textile dryer is to dry the textile fabrics. Drying is defined as a process where the liquid portion of the solution is evaporated from the fabric.

### 2.5.1 Considering points for selecting a dryer

Following points should consider during buy a dryer.

1. Heating methods: The textile fabrics may be heated by gas burner or steam.
2. Chamber: Number of chamber.
3. Burner: Number of burner.

### 2.5.2 Features of dryer m/c:

- To dry the fabric
- To control Shrinkage percentage
- Basically it is use for wet tube fabric
- To control over feed
- To control variation which increase G.S.M.
- To adjust the tone of fabric
- To march the fabric color shade

### 2.5.3 Dryer m/c specification:

- Brand name: Chengfu
- Country : China
- Capacity: 06-07 Tons per day
- Gas driven m/c
- Max 170°c to 180°c GSM 150-170
- Min 120°c to 130°c GSM130-150

### 2.5.4 Main parts of the machine:

1. Chamber -3
2. Burner -3pcs.
3. Belt- 3pcs
4. Blower fan 6
5. Blower(motor-) 3pcs
6. Nozzle- 99



Fig: Chambers of Dryer

### 2.5.5 Parameters used for different types of fabric in dryer

<b>Types of fabric</b>	<b>GSM</b>	<b>Speed m/min</b>	<b>Temperature (<sup>0</sup>C)</b>
Single jersey	130-150	8-10	120-130
Single jersey	180-200	5-6	140-150
1×1 Rib	210-250	3-4	160-170
2×2 Rib	210-250	3-4	170-180
Puqea	210-250	3-4	170-180
CVC fabric	160-200	5-6	140-150
Fleece	200-250	3-4	170-180

### 2.5.6 Work instruction of gas dryer

<b>Color</b>	<b>Speed m/min</b>	<b>Temperature (<sup>0</sup>C)</b>
Light	8-10	120-130
Medium	8-10	120-130
Tarques	5-6	160-170
Deep	3-4	170-180

Image of gas dryer



### **2.5.7 Working Principle of Dryer:**

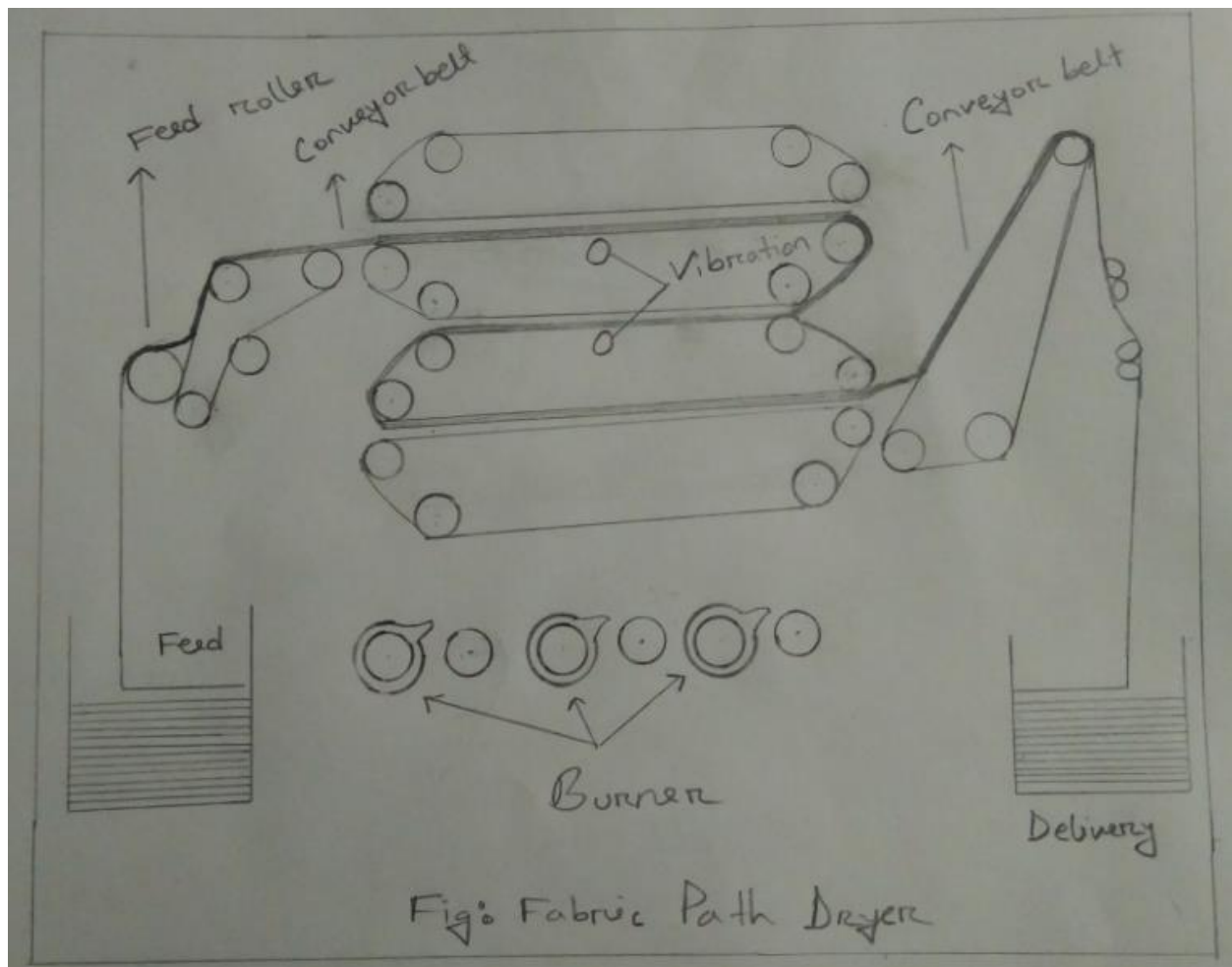
After de-watering then the fabric through the dryer, the main function of the dryer is given below,

1. To dry the fabric.
2. To control the overfeed system.
3. To control the vibration which increase the G.S.M.

This machine contains three chambers. Three mesh endless conveyors are placed lengthwise to the chamber named conveyor net and filter net, each chamber contain a burner, which supply hot air .This hot air is guided through the ducting line by suction fan .There are nozzles placed in between filter net and conveyor net. When the fabric pass on the conveyor net, hot air is supplied to the wet fabric to dry it. There are exhaust fan which such the wet air and deliver to the atmosphere through the ducting line.



## 2.5.8 Passage Diagram of The fabric in Dryer Machine



**Fig:** Passage Diagram of The fabric in Dryer Machine.

## 2.5.9 Faults of the machine :

- Create Shade variation due to over high temperature & less Speed of the machine
- Sometimes Fabrics are burnt for high temperature of low GSM fabrics

**CHAPTER 3**  
**MATERIALS & METHODS**

### 3.1 Materials:

We have taken the following samples for our study

Fabric Type	GSM	Temperature	Machine Speed
Single jersey Fabric	160	120 °C	10
Single jersey Fabric	170	130 °C	11
Single jersey Fabric	160	120 °C	10
Single jersey Fabric	150	140 °C	11
Single jersey Lycra Fabric	175	130 °C	9
2×1 Lycra Rib Fabric	250	180 °C	7
2×1 Lycra Rib Fabric	240	130 °C	7
1×1 Rib Fabric	160	160 °C	12
Single jersey (CVC) Cotton 60%+40% Polyester Fabric	155	130 °C	14

### 3.2 Methods:

At first wet dyed fabric is feed on the drying machine. Then the fabric is treated by drying machine. After drying the output fabric comes out with change in diameter. We have also observed the temperature and machine speed for the above mentioned fabrics.

Fabric variation = Temperature Variation = machine speed variation.

There are many types of fabric and many types of color use of dyer machine .than all fabric is not same and GSM is different than temperature is different use machine speed is different. Fabric type variation than variation of temperature and machine speed,

# **CHAPTER 4**

## **DISCUSSION OF RESULTS**

## 4.1. Analysis for Diameter Change:

**Table-4.1.1: Relation between hot and cooling Dia after drying**

<b>Fabric type</b>	<b>GSM</b>	<b>Fabric Dia After Drying (Hot) Inch</b>	<b>Fabric Dia After Drying (Cooling) Inch</b>
Single jersey Fabric	160	34	32
Single jersey Fabric	170	34	32
Single jersey Fabric	160	34	32
Single jersey Fabric	150	34	32
Single jersey Lycra Fabric	175	36	32
2×1 Lycra Rib Fabric	250	35	34
2×1 Lycra Rib Fabric	240	36	35
1×1 Rib Fabric	160	35	34
Single jersey (CVC) Cotton 60%+40% Polyester Fabric	155	34	32

Table-: Relation between hot and cooling Dia after drying

Single jersey Fabric GSM in hot & cool condition difference is two types. Variation is the Fabric variation is GSM than fabric dia after drying hot is the 34 and cooling is the 34 than difference between 2. Single jersey Fabric is variation of Single jersey Lycra Fabric is difference hot and cooling variation. Fabric variation is the different by the fabric gsm variation than hot and cooling system It is the mostly variation of fabric type.

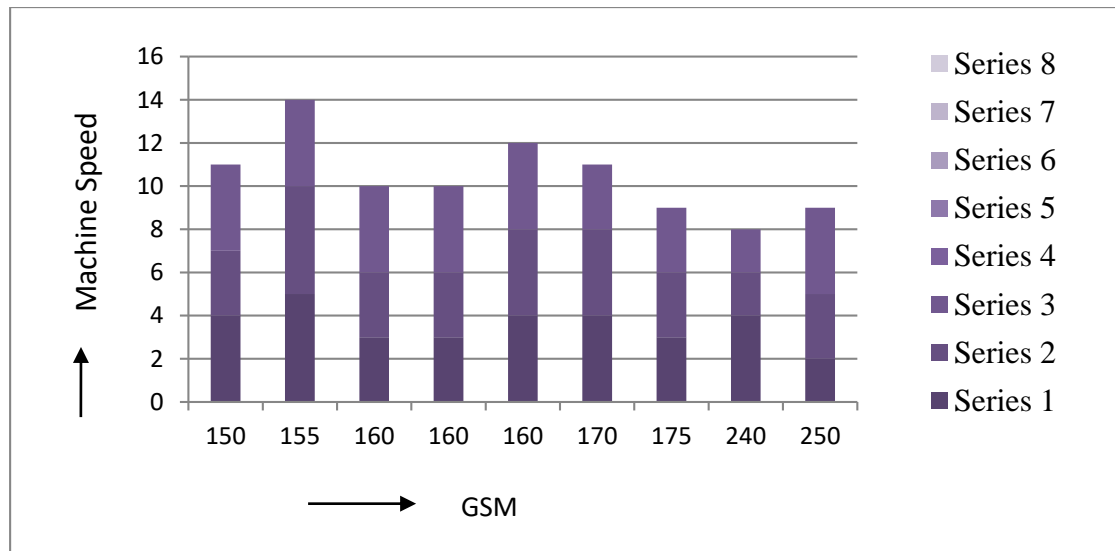
## 4.2. Relation between GSM and Machine Speed:

**Table-4.2.1: Relation between GSM and Machine Speed**

Fabric type	GSM	Machine speed
Single jersey Fabric	160	10
Single jersey Fabric	170	11
Single jersey Fabric	160	10
Single jersey Fabric	150	11
Single jersey Lycra Fabric	175	9
2×1 Lycra Rib Fabric	250	7
2×1 Lycra Rib Fabric	240	8
1×1 Rib Fabric	160	12
Single jersey (CVC) Cotton 60%+40% Polyester Fabric	155	14

Table-: Relation between GSM and Machine Speed

**Graph-4.2.2: Relation between GSM X and Machine Speed Y**



Graph: Relation between GSM X and Machine Speed Y

Single Jersey fabric is a type of knit textile made from cotton or a cotton and synthetic blend. Some common uses for jersey fabric include t-shirts and winter bedding. The fabric is warm, flexible, stretchy, and very insulating, making it a popular choice for the layer worn closest to the body. Jersey also tends to be soft, making it very comfortable. Other is the single jersey Lycra fabric is used by Lycra. Single jersey fabric has a GSM of 160 and a Machine Speed of 10, but Single jersey Lycra fabric has a GSM of 175 and a Machine Speed of 9. Single jersey and single jersey Lycra fabric have different GSMs, so their Machine Speeds are different. 2×1 Lycra Rib fabric has a GSM of 240 and a Machine Speed of 7, otherwise 1×1 Rib fabric has a GSM of 160 and a Machine Speed of 12. Single jersey (CVC) Cotton 60%+40% Polyester Fabric has a GSM of 155 and a Machine Speed of 14. Fabric Variation with Machine speed variation.

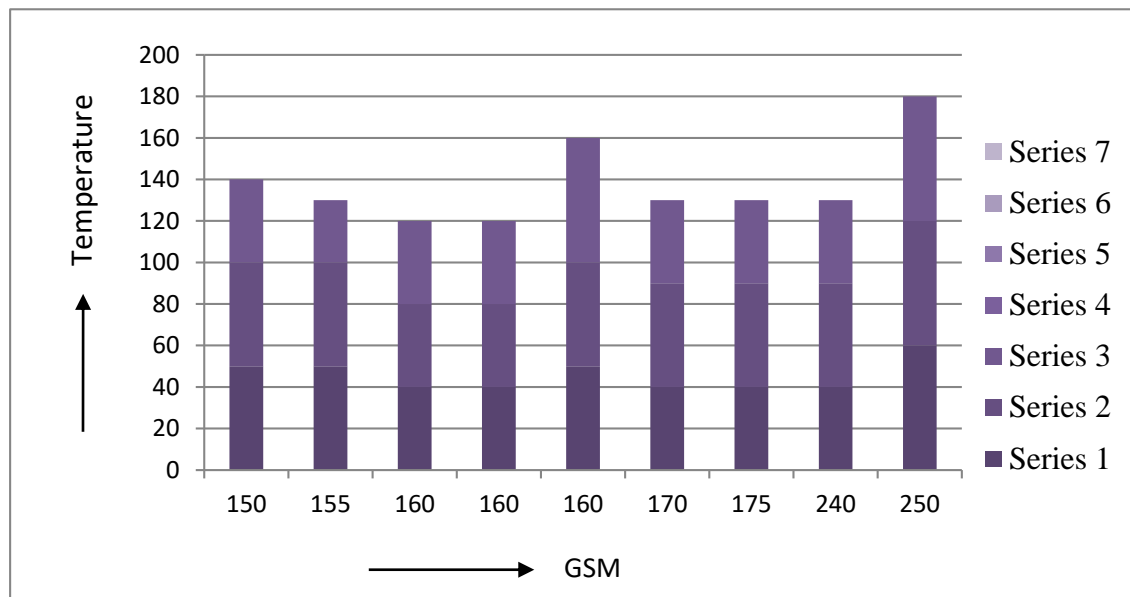
### 4.2.3. Relation between GSM and Temperature:

**Table-4.2.3: Relation between GSM and Temperature**

Fabric type	GSM	Temperature
Single jersey Fabric	160	120 °C
Single jersey Fabric	170	130 °C
Single jersey Fabric	160	120 °C
Single jersey Fabric	150	140 °C
Single jersey Lycra Fabric	175	130 °C
2×1 Lycra Rib Fabric	250	180 °C
2×1 Lycra Rib Fabric	240	130 °C
1×1 Rib Fabric	160	160 °C
Single jersey (CVC) Cotton 60%+40% Polyester Fabric	155	130 °C

Table: Relation between GSM and Temperature

**Graph-4.2: Relations between GSM X and Temperature (°C) Y**



Graph: Relations between GSM X and Temperature (°C) Y

Relation between GSM and Temperature is the variation by the Fabric type .single jersey fabric gsm by 150 but Temperature is use by 140 °C otherwise Single jersey laycra fabric gsm 170 but temperature use is 130 °C. Variation by the gsm and fabric type than Temperature is up and down need.gsm,

Fabric type is very important of temperature section.2×1 Lycra Rib Fabric is gsm is 240 and Temperature is 180 °C that time is other gsm fabric is 1×1 Rib Fabric gsm is 160 but Temperature is 160 °C and Single jersey (CVC) Cotton 60%+40% Polyester Fabric variation of fabric and gsm is 155 and Temperature is 130 °C

So variation is fabric than variation is temperature.

# **CHAPTER 5**

# **CONCLUSION**



## **Conclusion:**

This project work basically helps us to meet the knowledge about drying machine. It is an important study in the field of wet processing technology. The study confirmed that drying machine for fabrics and always so obvious for finished fabric. Drying machine is used for bio-polish process which gives fabrics a clear, luster & even surface appearance. It is important to identify which Drying machine is more effective for GSM & Fabric diameter. Comparing the two different materials of drying machine, it can be said that both do not lead to the same result.

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