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Finishing Effects on Coloured Knit Fabrics through Implementation of Effective Parameters

Md. Mostafizur Rahman[1,*], Muhammad Abu Taher[1], Mst. Zakia Sultana[1], Ashaduzzaman[1], Md. Shipan Mia[1], Mohammad Sohel Rana[2,*]

[1]School of Textile Chemistry & Chemical Engineering, Wuhan Textile University, Wuhan, China
[2]School of Textile Science & Engineering, Southeast University, Dhaka, Bangladesh

Abstract Finishing is used to improve the appearance, imparting functionality and enhancing durability as well as process ability of the textile products. Different processes are associated with the complete production of Coloured fabrics to get the finished fabric. Finishing processes are carried out to improve the natural properties or attractiveness of the fabric and to increase its serviceability. Every natural fiber is noted for some properties but it lacks some other properties which are essential during its end-use. The term finishing, in a broad sense, covers all the processes which the fabric undergoes after leaving the loom or the knitting machine to the stage at which it enters the market. Thus the term also includes bleaching, dyeing, mercerizing etc. but normally the term is restricted to the final stage in the sequence of treatment of Knit fabrics after bleaching and dyeing. Major processes control parameters in all machines are discussed briefly to optimizing the faults through this machine control process and some visible hindrance. Based on the overall performance it can be said that this paper gathers all the information's related to knit-finishing factory and analyze the fault's, causes and some ideas are suggested which can meet modern textile trends and customer demand.

Keywords Finishing, Dyeing, Quality, Textile, Softener

1. Introduction

Textile finishing, in a restricted sense, is the term used for a series of processes to which all bleached, dyed, printed and certain grey fabrics are subjected before they are put on the market. The aim of textile finishing is to render textile goods fit for their purpose or end-use [1]. This is achieved by subjecting them to various processes. Finishing can be classified according to the purposes of enhancement-organdie, lusture, crease-resistance, filling, softness, proofing (shower-proofing or water-repellency, mildew-proofing, moth-proofing, flame- proofing or flame retardancy. antistatic, soil-resistance etc.) and serviceability (dimensional stability, improved fastness to washing, improved fastness to storage, resistance to fiber slippage, improved wearing quality etc.) [2, 3].

In another sense finishing processes are carried out to improve the natural properties or attractiveness of the fabric and to increase its serviceability (in that order). Every natural fiber is noted for some properties but it lacks some other properties which are essential during its end-use. Hence, the finishing processes employed will depend on the properties required in the fabric with respect to its use and its natural properties [4, 5].

The term finishing, in a broad sense, covers all the processes which the fabric undergoes after leaving the loom or the knitting machine to the stage at which it enters the market [6, 7]. Thus the term also includes bleaching, dyeing, mercerizing etc.. But normally the term is restricted to the final stage in the sequence of treatment of Knit fabrics after bleaching and dyeing [8, 9]. However, fabrics which are neither bleached nor dyed are also finished [10]. Some finishing processes such as creping of silk and rayon, mercerization of cotton or crabbing of wool are carried out as a part of the first phase of fabric treatment or even earlier, in l he form of yam [11, 12]. Hence finishing is the term usually employed for processes other than scouring, bleaching, dyeing or printing, to which the fabrics are subjected to improve their appearance, properties and serviceability. Finishing methods include chemical modifications of the materials and imparting to it dimensional stability, crease resistance and anti-shrink properties [13, 14]. The techniques of finishing depend on: chemical composition, state, weave, Nature of the fabric, physical properties of the fabric, The end-use of the material, Susceptibility to chemical modifications, Receptivity of the fabric to various finishing operations [15, 16].

* Corresponding author:
abed420@gmail.com (Md. Mostafizur Rahman)
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2. Experimental

2.1. Materials

Finishing agents those are used for chemical finishing of Textiles are: Softener, Biopolishing, Enzyme, UV Protection, Anticrease, Silicon Finish etc. Mechanical finish is Shrinkage, Raising and Shearing finish and others.

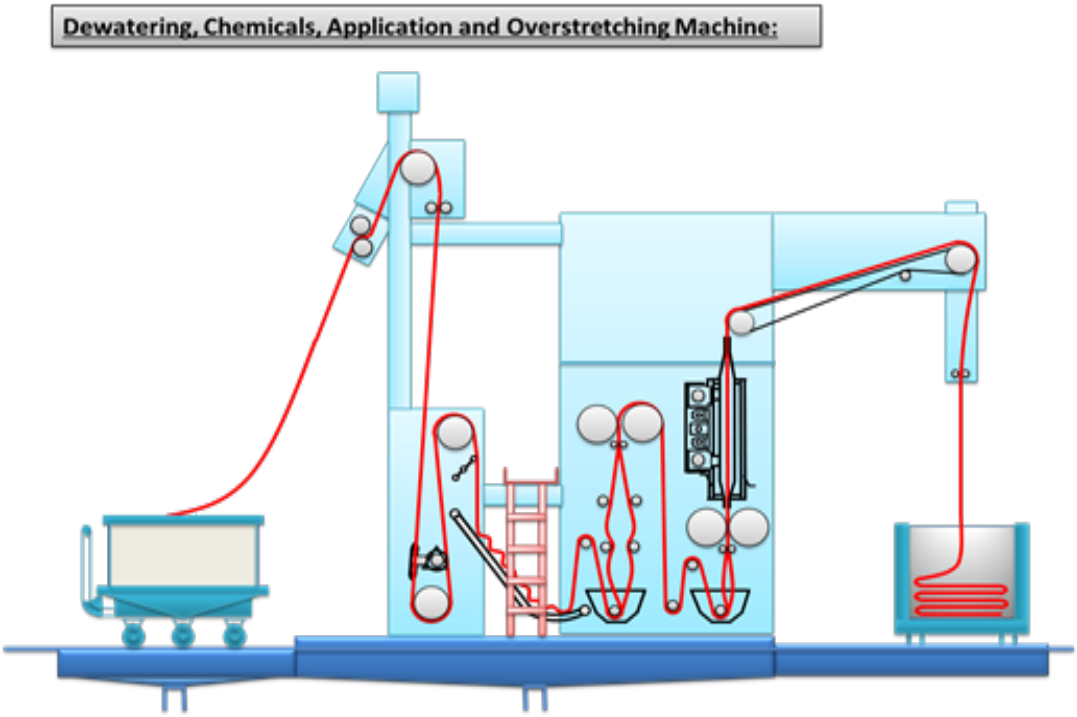

Figure 1. Fabric passage on Tube squeezer m/c

Table 1. Fabric passage & function of diff. parts of Tube squeezer

Fabric path on m/c	Function
Turn Table	Fabric trolley is placed on the turn table which can rotate in clockwise or anticlockwise direction. It is connected to the de-twister sensor via inverter. It will rotate to remove twist from the fabric. Fabric is feed to the machine from this trolley.
J-Box	Fabric is passed through J- box padder in which padder pressure can be maintained in the range of 1-5 bar. 20% water is extracted here. Fabric is then stored in flexible tray which can move up & down direction. When fabric load is high then the tray will automatically lowered & s. When fabric load is reduced the tray tops the feeding of the fabric. When fabric load is reduced will move upward & fabric feeding will be started again.
De-Twister	A sensor device is present here, which can detect twist in the fabric. If any twist goes through the de-twister, it will rotate in clockwise or anticlockwise direction to remove twist and easy passage of fabric.
Dia-extension r/r	This is used to control the dia of tubular knit fabric. This devise holds the two sides of the fabric in tube form and two sensors are present here, which detect hole in the fabric. If any hole is appeared then the sensor will off the m/c
Water Tray	Fabric is washed with water to remove unfixed dyes and impurities. Fabric is ringed continuously during the passage and constant water level (80 Lt) is maintained here. Emersion r/r is used to immerse the fabric to the water tray.
Air-pressure r/r	Air is applied to make the fabric in balloon form. This will help to prevent crease mark formation due to padder pressure.
Padder	Fabric is squeeze here with the help of two large padderes to remove 60% water
Pilling Tray	After squeezing the fabric will be stored in pilling tray which relaxes the fabric. Sensor device is present which detect fabric load. When fabric load is high then fabric feeding will be reduced automatically.
Chemical Tray	Fabric is passed through the chemical tray which is connected to the chemical tank. Chemicals can be applied to the fabric by this tray. Immersion r/r is used to ensure maximum wet medium.
Air-pressure r/r	Air is applied to make the fabric in balloon form. This will help to prevent crease mark formation due to padder pressure.
Padder	Fabric is squeeze here with the help of two large padderes to remove excess chemical. Padder pressure can be maintained as required but will be less then back padder.
Shaft	Fabric dia extension is done with the help of shaft. Sensor is present here to detect hole. Fabric dia will be kept more than the required dia because fabric remain 40% wet after squeezing.
Delivery zone	Fabric is delivered via folder which moves like pendulum to fold the fabric.

2.2. Method

Normally finishing process is of two kinds 1. Chemical finishing and 2. Mechanical finish. By obtaining those process we get these results: Easy – care, Crease recovery, Dimensional stability, Good abrasion resistance, Improved tear strength, Good sew ability, Soft or stiff handle, Shine or lusture .

After dyeing process from the dyeing machine then the fabrics arc ready for dc-watering. This is the process to remove the water from the fabric partially by squeezing But here we have to control the some important factor. Like width of the fabric, spirality of the fabric, crease mark of the fabric.

Table 2. Fabric passage & function of diff. parts of Relax Dryer

Fabric path in m/c	Function
Fabric Trolley	Fabric trolley is placed in front of the m/c & fabric is passed over guide r/r. Those rollers maintain uniform tension of fabric & ensure uniform passage of fabric.
Wheel	Wheel is used to control tubular fabric dia. Fabric dia in this wheel will be more than the required finished dia.
Over Feed r/r	Over feed the fabric in the dryer.
Net	Fabric enters in the dryer in contact with net. There are 4 sets of net which extend throughout the dryer. Each net forms endless loop. Those nets provides 3 times more dwell time to the fabric. Net position is maintained with the help of sensor.
Heating Chamber	Heating is done with super heated steam. Steam is entered to the heat exchanger through steam pipe. There are 4 heat exchangers through which heat is applied to the fabric.
Blower	Blowers are used to spread heat from heat exchanger through the whole dryer. There are 8 blowers which are run by individual motor.
Out line	Exhaust fan is used to remove exhausted air from the drying zone.
Folder	Folder delivers the fabric to the trolley. Fabric feeding to the folder is controlled by delivery r/r.

Table 3. Fabric passage & function of diff. parts of Tubular Compactor

Fabric path on m/c	Function
Trolley	Fabric trolley is placed in front of the machine. From this trolley fabric is feed to the machine.
Feeding zone	Tube fabric is passed through the wheel to control fabric dia. Sensor is present here and if any hole is going to pass through this section, the m/c automatically stops.
Steam Tray	Steam tray is present after feeding zone. Steam is applied to soften the fabric. On the top of this zone exhaustion unit is present to remove extra steam.
Fabric Spreading Zone	The spreader spread the fabric and set the required width of the fabric. Magnet is used to hold the wheel which control fabric width. Sensor is also present here to ensure proper feeding and to detect hole.
Steam Supply Zone	Steam is applied to heat and wet the fabric for proper compacting action. Steam supporter is present here to support steaming action. Extra steam will out through steam out line.
Compacting Zone	The fabric is passed through compacting zone. Compacting action is done by the action of heated cylinder in the lower side and blanket in the upper side. The blanket is wrapped over the cylinder and proper compaction is done by the help of blanket. Sensor is present to fix the blanket.
Fabric Delivery Zone	Fabric folder delivers the fabric to the delivery tray. Here fabric supporter is present to press the fabric ply and when required amount of fabric is stored in the delivery tray, it will automatically pass folded fabric to delivery zone

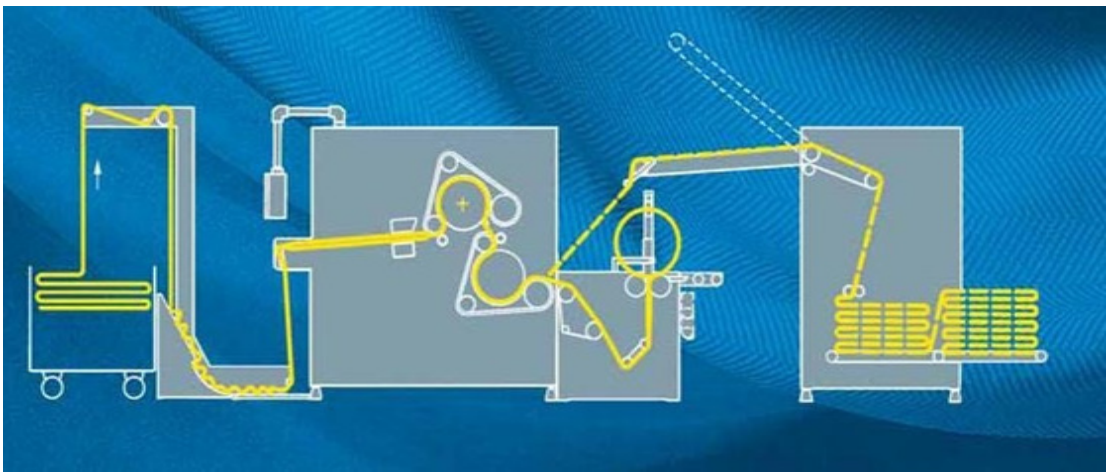

Figure 2. Fabric passage diagram in tube compactor machine

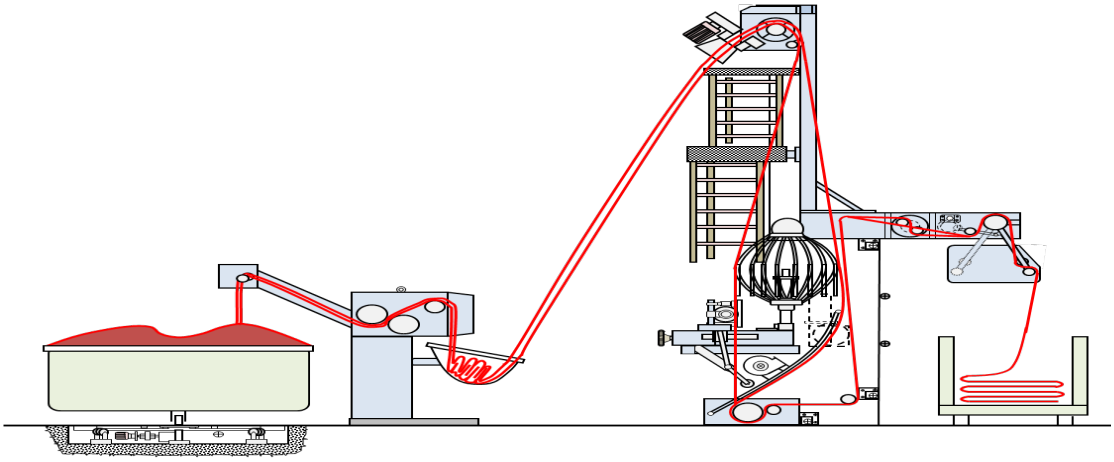

Figure 3. Fabric passage in open squeezer m/c

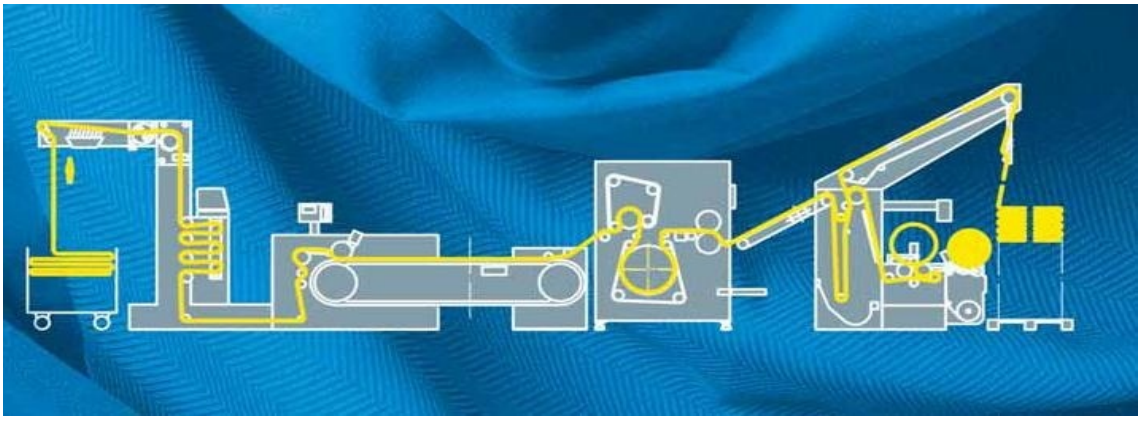

Figure 4. Fabric passage on open compactor

After squeezer fabric comes to dryer machine. Dryer machine is used to dry the fabric with the help of the steam. Besides drying it controls the shrinkage and prepares the fabric for the next process.

Tube compactor is used to finish knit fabric in tube form. The basic functions of the Tube compactor machine is To control the GSM. (Increase & decrease), control the dia, control the shrinkage. (Increase & decrease).

For open width fabric, after dyeing fabric comes in this machine for slitting and squeezing. Here fabric is cut through the dia mark and squeezing is also done.

Controlling parameters of open squeezer are Speed, Padder pressure and Air Pressure. In case of light color padder pressure should be low. Otherwise shade will be lighter. If the padder is not clean, then line mark can appear in the fabric. If low gsm S/J fabric is processing, then padder pressure and speed will be maximum. If high gsm fabric is processing, then padder pressure and speed will be minimum.

Open Compactor has the the basic functions of the Open compactor machine is to compact the fabric in open form &he basic functions of the Open compactor machine is to compact the fabric in open form & control the GSM. (Increase & decrease), control the dia, control the shrinkage. (Increase & decrease).

Stenter machine in very important for finishing knit fabric in open form. It can be used for those functions: Apply chemical and softener, To dart set the T/C fabric, Drying of fabric, To control width, Curing of fabric, Apply pigment dyeing, control GSM, control shrinkage, decrease spirality, decrease bowing effect, Surface coating for teflon finish, Apply soil release chemical finish, Heat set for cotton/lycra fabric.

Ultra soft machine is used to increase softness of fabric. This is a mechanical process of finishing.

By the brushing machine back side of the fleece fabric is brushed.

There are several machines are used for knit fabric finishing. Every machine is used for a particular effect.none of them are less important then each other. According to the requirement each machine has their pirticular use.

Mainly finishing is necessary for all kind of fabrics both knit and woven fabrics. Now a days finishing technology is receiving a versitile improvement. One machine is not not providing only one kind of finishing like if we talk about stenter then we can see that we normally use it to dry open weidth fabrics but it also used for heat setting of knit fabrics, for application of differnt kind of chemicals for controlling dia and shrinkage etc.

Table 4. Fabric passage & function of diff. parts of stenter machine

Fabric in different Parts of the m/c.	Function
Feeding through the tension r/r	The fabric is fee through tension r/r and passes in between two centering device to straight the fabric. Here expender 2 rollers are present to ensure uniform feeding of the fabric.
Fabric in padding zone	If the fabric is treated by using 2 padders then, at first the fabric is immersed to the water tray by immersion r/r then squeezed by padder. Then the fabric is passed through chemical tray where softener is used. If one padder is used then, only chemical application is done by the padder. After chemical tray the fabric is squeezed to remove excess chemicals. Here padder pressure is less than the front padder pressure & will be 0-10bar
Tension adjust r/r	Here tension is adjusted by sensor. The tension r/r will move upward direction if fabric feeding is lowered due to any reson.
Sensors	Fabric course line is continuously monitor and result is shown on the screen. Number of total sensors is 8 and placed side by side through the width wise direction off the machine. With this result bowing and slanting of fabric is controlled.
Control unit	Here monitor is present which shows fabric position graph of the course line, speed, temperature in different zone, over feed for left & right feeding r/r. In this position bowing con be automatically controlled via control unit.
Mahalo r/r	Mahalo rollers are used to control the bowing effect from fabric. This will maintain the fabric position and when sensor sense that bowing or slanting is appeared then this r/r will fix that. Number of total bowing r/r 2 and other 2 supporters are present.
Overfeed r/r	Over feed is given via this r/r. 0-60 % over feed can be given depending on the fabric type.
Width adjusting device	There are two plates at the two ends of the machine which remove curling of the fabric and also dust. If any hole is obtain then, sensor stops the m/c
Wheel	Attach the fabric to the pin of the chain.
Brush	There are 2 brushes which ensure the fabric is attached to the pin.
Pin rail	Pin rail is used to covey the fabric to the heating chamber. There are two chain rails, one in each side and forms endless loop throughout the machine from chain entry zone to heating chamber.
Steam tray	There is steam tray on the underside of feeding zone for steam application.
Heating chamber	Here heat is applied to the fabric in six heating chamber. Heating arrangement is done via thermo oil and there are 6 heating chambers. Blower is used to spread heated air throughout the chamber, one from upper side another from lower side of the fabric. There are 2 exhaust fans in each chamber to remove residual heated air. There is oil line inlet and outlet for continuous passing through heat exchanger to the oil boiler. Exhaust air line is present on the upper side of the heating chamber. Heat is increased after each chamber towards the end.
Delivery Zone	Fabric is delivered through some tension r/r and then passed via folder to the fabric trolley.

Table 5. Fabric passage & function of diff. parts of Ultra soft m/c

Fabric path on m/c	Function
Trolley	Fabric trolley is placed in front of the machine. From this trolley fabric is feed to the machine.
Feeding zone	Tube fabric is passed through some tension r/r. those rollers ensures proper feeding of the fabric to the machine.
Auto controller	Here sensor is present to detect the sewing line in the fabric. When sewing line is appeared then the sensor will slower the drum speed of the machine. If this is not done there is possibility to open up the sewing. Because high tension is occurred during the passing of the fabric to the carbon brush or drum r/r thus drum speed is lowered.
Expander r/r	This is used to spread the fabric and to feed the fabric in the machine. Here 2 expender rollers are present.
Carbon Roller unit	Fabric is then passed over the carbon r/r where 6 carbon brushes are present. Those brushes along with the drum rotate in the opposite direction of the fabric. Fabric face side will be in contact with the carbon brush. On the top of this zone, blower is present to blow dust produced due to brushing of the fabric. Number of blower is 8 and blowing will vary depending on the fabric type. In the lower side, suction unit is present to suck the dust and conveyed to the outer duct. The whole unite is covered with glass cover to ensure dust free environment
Bitter and brush r/r	Fabric is then passed through the bitter and brush roller to remove dust residual to the fabric. Exhaust sensor is present here to exhaust dust from the fabric.
Delivery unit	Fabric is delivered to the trolley in folded form to the trolley. folding device is used to fold the fabric.

Table 6. Fabric passage & function of diff. parts of Brushing m/c

Fabric path on m/c	Function
Trolley	Fabric trolley is placed in front of the machine. From this trolley fabric is feed to the machine. Fabric is feed to the machine so that the back side of the fleece fabric should be in contact with the brushing unit.
Feeding zone	Tube fabric is passed through some tension r/r. those rollers ensures proper feeding of the fabric to the machine. There are some expender rollers in the machine which ensures proper feeding of the fabric to the m/c
Fabric in brushing unit	Brushing action is done with the help of brushing roller which consists of 24 rollers with sharp pinned surface like carding r/r in carding m/c. 12 rollers are move along with the fabric which have rpm more than the fabric. Other 12 rollers are move in the opposite direction of the fabric. Combine action of all brushing r/r will brush the loops in fleece fabric.
Blower and suction unit	Blowing arrangement is present on the machine to remove dust produced during brushing. There is exhaust unit on the lower side of the brushing unit to exhaust dust.
Guide r/r	Fabric is conveyed to the front side of the machine with the help of some guide rollers. The fabric is delivered to the front side of the m/c
Delivery unit	Fabric is delivered to the trolley in folded form to the trolley. Folding device is used to fold the fabric.

Figure 5. Difference between fabrics before Stenter and after Stenter

3. Results and Discussion

Textile finishing is a term commonly applied to different process that the textile material under go after pretreatment, dyeing or printing for final embellishment to enhance their attractiveness and sale appeal as well as for comfort. Now we will observe different sample through different finishing machine and try to test and analysis the effect.

Table 7. Difference obtained before stenter and after stenter

Before stenter	After Stenter
Water is contained in fabric	Water is removed
Spirality is appeared	Spirality is not appeared
Shrink is appeared	Shrink is controlled
GSM is not adjusted	GSM ist adjusted
Fabric dia is uncontrolled	Fabric dia is controlled

Table 8. Difference obtained before stenter and after stenter

Before Compactor	After Compactor
Crease mark appeare.	Crease mark is not appeared
Lusture medium	Lusture is improved
Hand feel medium	Low GSM can be adjusted.
Crease mark is appeared	Crease mark is minimised.
Haireness is high	Haireness is minimised.

Table 9. Difference obtained before Tumble and after Tumble

Before Tumble	After Tumble
Small amount of water contained	water is removed
Crease mark appear	Crease mark is minimized
Lusture medium	Lusture is improved
Hand Feel medium	Hand Feel medium
	Low GSm Can be controlled

It is seen that in case of each and every finishing machine that they can not perform with their full efficiency .Every machine has some limitation for that finishing machine cannot fulfill their effect. Generally finishing machines require temperature, pressure, steam, speed, dust free environment. We found some problem on different machine which causes faulty finishing or less efficiency. Now a days some latest devices have been invented that, this can not only improve effects and but also increase the production and quality of fabric.

Now we suggest using some device to improve effect, quality and production. Some faults normally found in stenter machine are in GSM control, Skewing, Bowing, Spirality, Dimensional stability. If mahalo/ plevia device is settled with stenter this problem can be minimized. This device improves quality, effect and production. And use of sensor is also necessary for ensuring the even pressure and temperature. The problem with compactor machine almost same as stenter machine. Sunforising device can solve this problem. This device can easily control of low gsm fabric. About 10 gsm can be controlled. Dimensional stability can be also controlled.

In Dewatering & Squeezer Machine Softener is used. Softener is also used for shade match. Different softeners are used for different shade. When softener is used, after sometimes dust contaminated with it. Then it does not give required effect. In these case filter can be used. This is called softener recycling device. This device recycles the softener from dust. The recycled softener can be used again. It save cost and improve effects. Generally problems found in Tumble dryer are Fabric dry unevenly, Presence of crease mark, luster improvement is less.

Recently a new machine is available. This is the Brio machine. It can be used instead of Tumble dryer. This machine improves the fabric quality. It also provide with those advantages: Fabric dry evenly, No crease mark, Significant luster improve, Extra care of fabric, Finishing effect creates by vibration, Ideal for decorative and sensitive fabric.

For improving fabric attractiveness must have to do modification of fabric appearance by using calendaring machine and optical brightening agent. For hand feel must alter fabric handle by using Softening or Stiffening agent. and for controlling fabric dimension we use Sanforising, Compacting machine. For improving serviceability according to the demand of customer like as For Protection of fabric (Flame proofing, Water proofing), Improved performance (Water repellency, Raising), Easy care properties (Resin finish, Crease recovery).

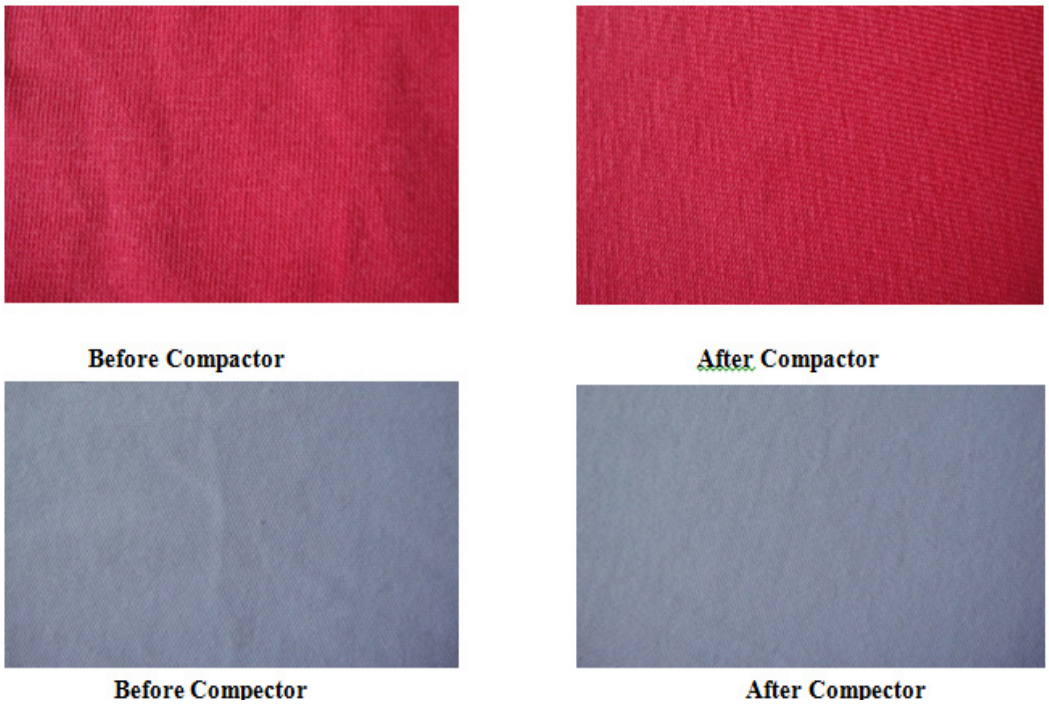

Figure 6. Difference between fabrics before Compactor and after Compactor

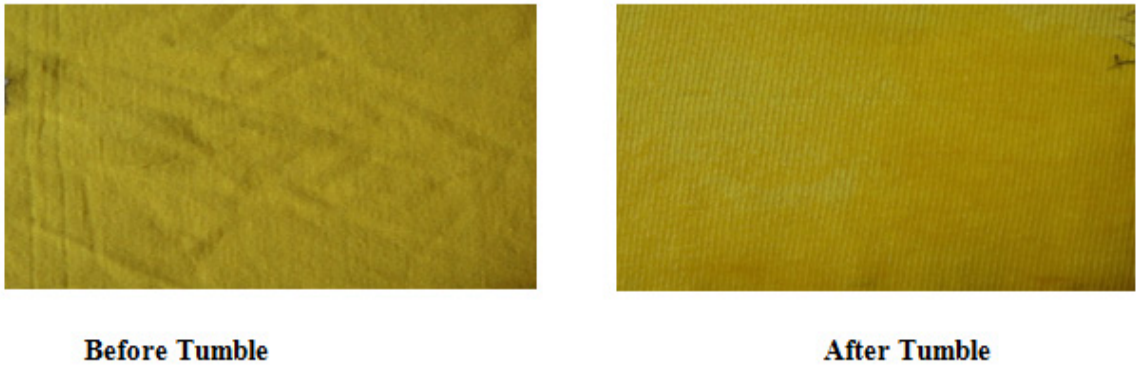

Figure 7. Difference between fabrics before Tumbel and after Tumbel

Figure 8. Difference between fabrics before Brio and after Brio

4. Conclusions

Finishing used to improve appearance, impart functionality and enhance durability as well as process ability of the textile products different processes associated with complete production of fabrics are required to get finished fabric. An effort is made to formulate all the finishing production steps. This paper also gives an idea of different processes and machineries used usually in a fast growing and mass productive knit-dyeing factory. Major processes control parameters in all machines are discussed briefly to optimizing the faults through this machine control process and some visible hindrance.

Finally based on the overall performance it is concluded that the this paper tries to gather all the information related to knit-finishing factory and analysis fault's causes and suggest some ideas which can meet modern textile trends and customer demand.

In this project, different important factors are discussed on knit fabric finishing that can impact on finishing. All the reports are done by practical knowledge from different industry and finally some important factors which are obtained from knitting to dyeing and finishing. So deviations are obtained and the reason of the problem must observe to avoid in further. Because customers are always worried about the product quality. We hope this project work will be very helpful in our practical industrial life.

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