GLEADER

ANHUI GLEADER INTELLIGENT TECHNOLOGY CO. LTD.,
安徽格萊德智能科技有限公

Textile Finishing Machine

Machinery & Machinery Parts

Stenter is the most expensive and important fabric drying and finishing machine. Stenter is a machine or apparatus for stretching or stentering fabrics. It is also known as a ‘tenter’ in the woollen industry. The purpose of the stenter machine is to bringing the length and width to pre-determine dimensions and also for heat setting and it is used for applying finishing chemicals and also shade variation is adjusted. The main function of the stenter is to stretch the fabric widthwise and to recover the uniform width.

Stenter machine consists of two endless auto-lubricated driven chains, typically 40 to 60 m in length carrying pins or clips to hold the fabric edges while passing through a number of hot-air chambers (3–5, each of about 3 m). Hot air is directed onto the fabric equally from above and below. A stenter has the provision for overfeeding the fabric to allow required shrinkage during heat setting of fabric while the width is increased to the precisely specified value by the chains. The use of clip stenter has declined because of the difficulty of applying overfeed. The stenter speed ranges from 10 m/min for heavyweight furnishing fabrics to 100 m/min for lightweight dress-goods.

The speed also depends on the processes carried out in stenter namely:

- Drying,
- **Heat setting**,
- Weft straightening,
- Curing after application of finishes.

The controllers fitted in a modern stenter may monitor and control the following parameters:

1. Chamber temperatures,
2. Moisture retention,
3. Stretch/shrinkage (over feed),
4. Fabric width,
5. Fabric weight,
6. Padder pressures,
7. Exhaust humidity.

Types of Stenter Machine

A tenter or stenter is a transport device that carries fabric from one point to another continuously in open width with precise width control. The stenters are of two types, pin stenters and clip stenters, depending on the means of holding the fabric onto the chains.

In clip stenters, the clips are in two sections, upper and lower; the upper being in either in an open or closed position. At the entry point of the fabric, the upper jaw descends and grips the edge of the fabric. At the delivery point, the jaw opens and releases the fabric. The clip stenter requires a specific edge, preferably a selvedge, to grip and is usually confined to woven fabrics.

The more common pin stenters have pins about 5 mm long, mounted in two rows, about 3–4 pins/cm, along the base plate. The pins are thicker near the base to prevent direct contact of the fabric with the hot base plate. Clip stenters leave no pin marks in the selvedges, but customers will accept pinholes in the selvedges associated with pin stenters.

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Functions of Stenter Machine

However, the stenter is the only drying machine that provides adjustment and control of fabric width during drying. In addition to drying, the stenter performs several other functions, namely:

- Imparting a particular mechanical finish affecting appearance and feel, commonly known as stenter finish.
- Heat setting is done by the stenter for lycra fabric, synthetic and blended fabric.
- Width of the fabric is controlled by the stenter.
- Applying and fixation of several finishing agents by stenter machine.
- Loop of the knit fabric is controlled.
- Moisture of the fabric is controlled by the stenter.
- Spirility controlled by the stenter.
- GSM of the fabric is controlled by stenter.
- Fabric is dried by the stentering process.
- Shrinkage property of the fabric is controlled.
- Curing treatment for resin, water repellent fabric is done by the stenter.

Components of stenter machine

- Paders
- Weft straightner (Mahlo)
- Burners 10
- Heat recovery
- Attraction rollers
- Circulating fans 10,8
- Exhaust fans 2
- Winder 2
- Clips
- Pins
- I.R
- Cooling drums 2

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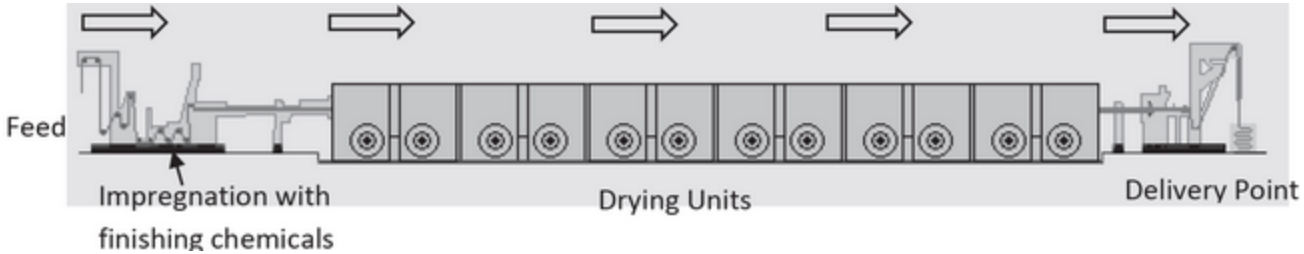
Main parts of stenter machine

1. Feed zone:
   - Centering device
2. Chemical padding zone:
   - Squeezing roller
   - Chemical tray
3. Bowing control zone:
   - Bowing roller (rubber roller, no of roller -2)
   - Sensor (no of sensor -6)
   - Uncurling roller
4. Chain entry zone:
   - Uncurling device (both side of the chain entry)
   - Sensor (both side of the chain entry)
   - Brush roller (for attaching the fabric with the pin of the chain, no of brush roller -4)
   - Selvedge gumming device with gum box under the chain entry
5. Drying zone:
   - Gas rotamatic burner (10)
6. Cooling zone
7. Delivery zone



Chemical used: Silicon softener (It is used to soft and slippery of the fabric)
Heating arrangement: By Gas burner
There are 7 heating chamber in this machine. Each chamber has two burners which is placed two sides of the machine.
Table 1: Heating Arrangement

Chamber	Burner	Burner
01	1A	1B
02	2A	2B
03	3A	3B
04	4A	4B
05	5A	5B
06	6A	6B
07	7A	7B

Temperature:

- Maximum = 250^{o}C
- Sample = 110^{o}C
- Average = 130-170^{o}C

Utility:

- Gas
- Electricity
- Compressed air.
- Steam

Parameters used for different types of fabric

Table 2: Parameters used for different types of fabrics in stenter m/c (For DILMENLER stenter)

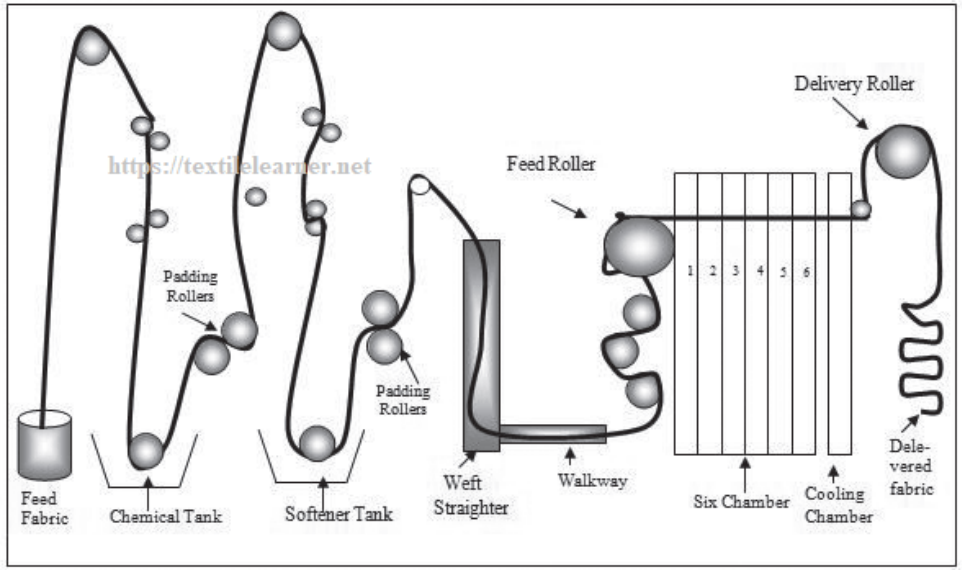
Fabric	Req. GSM	Finish GSM	R	F	B	Temperature	Speed m/min	Over feed
S/J	140	–	68"	71"	67"	140	14	60%
"	160	150/52	56"	64"	60"	150	20	10%
"	180	170/72	54"	56"	54.5"	110	12	60%
"	190	188/90	58"	61"	57"	110	15	60%
Fleece	260	260/65	74"	80"	75"	110	9	60%
1×1 rib	240	224/26	72"	75"	74"	110	10	60%

Working Principle of Stenter Machine:

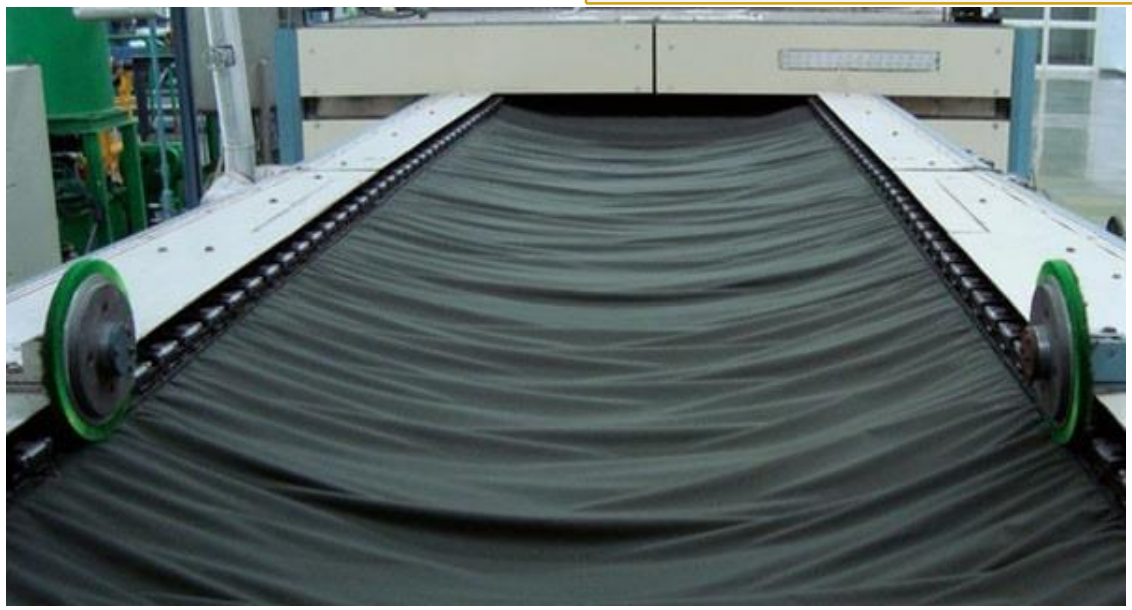
The main mechanism of the stentering machine, under feed roller to feed the fabric, over feed roller to increase and decrease GSM, spending roller to remove the crease mark, mahalo to adjust the bowing angle, fabric wheel to stretch the fabric and contact with chain.

Working process of stenter machine is described below:

The fabric enters the machine from a batcher or a trolley and is passed on to the solution tank through the guide rollers and the tensioners. The solution tank contains different finishing auxiliaries. The fabric is padded in the solution tank and then taken out, passed through the squeezing rollers that squeeze the fabric according to required percentage. Then, the fabric is passed through the weft straightener.



In the feeding unit, the fabric is collected from the batcher or trolley to the scray and then it is passed through the padders where the finishes are applied and sometimes shade variation is corrected. The fabric is entered into the weft straightener (mahlo). The function of the weft straightener is to set the bow and also weave of the fabric is gripped 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 sensors that sense the fault in weft and removes the fault. There are 8 to 10 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 are provided to stretch the warp yarn.



After stentering we can increase the width of the fabric up to 1.5-2 inch. The speed of the machine is about 7-150 m/min.3 meters fabric can run in each chamber. Temperature is adjusted that according to the fabric as for,

PC – 210^{o}C

Cotton – 110-130^{o}C

After dyeing – 160-170^{o}C and after print – 130-140^{o}C.

Controlling Parameters of Stenter Machine

Controlling parameters for the stenter are as follows.

1. Nip pressure:
It is examined by checking liquor pick-up. It should be uniform throughout the width and length. To obtain uniformity the necessary action is to check the surface of padding mangle and adjust the pressure (pneumatically or hydrolytically).

2. Bow and heading (skew) controllers:
During processing visual checking is necessary. There should be no bow or heading in the fabric. The synchronisation of photo cell, heading and bowing rollers is to be checked. The hardness and alignment of bowing rollers are to be checked.

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Controlling Parameters of Stenter Machine

7. Expanders and uncurlers:

During this process, usually the working of uncurlers is to be checked. Pneumatic uncurlers and mechanical uncurlers are generally used.

Standard: there should be no crease on the fabric.

Necessary action: the smooth working condition of the uncurlers and smooth revolution of the expanders are to be checked.

8. Blower:

Proper functioning of the blower during the finishing process is to be checked.

Standard: proper air circulation.

Necessary action: for proper air circulation, the air filters are to be cleaned. The fan direction is to be checked – air is to be taken from out to in.

9. Width of the fabric:

Width is decided by the distance between the chains and it is to be checked at the delivery end. Proper working of width adjusting shaft is to be ensured.

10. Leakages of thermic fluid:

There should be no leakages. If many small brown spots are seen on the fabric it means that there are small leakages where the fluid falls as a spray. Larger brown spots on the fabric may indicate bigger leakages.

11. Concentration of the chemicals:

The chemicals and their respective concentrations are to be listed.

Necessary action: the required optimum concentrations are to be maintained. Higher concentrations of the chemicals will lead to white patches, called chalk marks, when scratched with nail. Chalk marks may be due to higher concentration of chemicals.

12. Temperature and viscosity of the finishing bath:

Temperature and viscosity of the finishing liquor are to be kept constant throughout the process.

13. Drying efficiency:

It is checked during and after the drying process with a conductometer that is with the help of transducers.

Standard: no over-drying of the fabric, which will lead to high-energy consumption and strength loss. Drying efficiency of 95–98% is expected.

14. Temperature of thermic fluid oil:

The temperature of thermic fluid should be optimum and should be frequently checked during the process with digital thermometer.

Standard: regulate thermic fluid circulation.

15. Clips and pins:

Random inspection of clips and pins is to be done before processing.

Standard: proper working of the pins and clips should be ensured.

Comparison between Stenter 10F, Stenter 8F and Knit Stenter

Stenter 10F:

The word 10F stands for 10 flames in stenter. 10F clips are used to stretch the fabric and this is a disadvantage that holes appears on the selvedge of the fabric and also uneven dyeing is achieved.

Stenter 8F:

Stenter 8F has 8 flames and the main purpose of 8F stenter same as 10F stenter. The basic advantage of the machine is dyeing can also done on 8F machine and has I.R system. Finishing, dyeing can also done even we can dye pigment , heat setting and also we can control skew and bow problems and another advantage is using light shades no clip marks appears.

Knit Stenter:

The basic difference of the knit stenter machine is that it is used for knit fabric weft straightening, heat setting, and dyeing, light shades and also for print and knit finishing chemicals applications. Pins are also provided with the clips. Flat rollers are present and a brush to hold the pin, the L-guide is also used for knit fabric and a selvedge cutter with suction provided.

Specification of a Stenter Machine

Brand Name	Bruckner
Serial no	72276-0463
Origin	Germany
Year of manufacture	1995
Speed range	15-80 m/min
Maximum fabris width	102”
Minimum fabric witdth	30”
Steam pressure	2 bar
Air pressure	10 bar
Applied for	Open tube fabric
No. of ratamatic burner	6
Extra Attachment	Mahlo weft straightener
M/C parts	Burner, Nozzle, Exhaust air fan, Over feed roller, Suction fan, Chain arrangement

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Technical Data of Stenter Machine

Roller Width	1500 mm to 3800 mm
Fabric Width	1200 mm to 3600 mm
Mangle	Two Bowl or Three Bowl
Fabric Feeding Draw Nip	1.1 kW / 1.5 kW
Mangle Motor	5.6 / 7.6 / 11 kW
Top Roller	305 mm Diameter
Driven Roller	295 mm Diameter
Bottom Roller	305 mm Diameter
Trough	Single Trough with 2 or 3 Guide Rollers or Double Trough
Guide Roll Diameter	114 mm / 141 mm / 152 mm / 177 mm (Wider Width)
Weft Correction	Fully Automatic Electronic OR Motorised Manual
Stenter	From 3 Chamber to 10 Chamber Pin-Clip Chain, Clip Chain, Pin Chain Vertical Return Pin Chain execution
Heating Media	Thermic Oil / Direct Gas / Steam
Selvedge Tension Motor	1.5 kW / 2.2 kW AC
Over-feed Motor	1.5 kW AC
Pinning Motor	0.75 kW AC
Blower Motor	5.6 kW / 7.6 kW / 11 kW
Thermic Fluid Heater	60,000 - 1,30,000 kCal - Multipass - 2 per Chamber)
Natural Gas / LPG Burner	60,000 Kcal to 1,50,000 Kcal (2 per Chamber) Approx. 65 - 150 kW
Drive	Variable Frequency AC Drive
Exhaust	With / without moisture controller

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