Visit to Ahlstrom Munksjo

Location : Mundra Sez Textile & Apparel Park (MITAP) Plot No. 7,Survey No. 141 Mundra, Kutch-370421,Gujarat,India

Duration : 15-5-2018 to 19-5-2018

Visitors : Siddharth Sakariya
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We the students of Textile Technology department of SCET college visited the non-woven medical-textiles product manufacturing company named 'Ahlstrom Munkjo' during the duration of 15-5-2018 to 19-5-2018 situated in the Mundra region of Kutch city of the state Gujarat.

On the first day of our visit, first we were given safety instructions and was informed to follow their safety rules because one of the main objective in this company is to prevent any accidents so that no one gets hurt. Over past 10 years there has not any accident happen in Ahlstrom munksjo.

Then we were introduced with the basics of the machines those were used.

There are two different lines:

Line 1 : Line 1 is of the company Reicofil and it's of fourth generation so know as a trademark name of Reicofil-4. In this line mainly, fabric is manufactured and it's given anti-static finish. Line 1 is also known as MUPM01. The flow of machines in Line 1 is as followed:

Reicofil-4
↓
Calender
↓
Monforts dryer
↓
Kissroll Dryer
↓
Cooling roll
↓
Cognex Slitter winder
↓
Packing machine

Line 2 : The fabric produced in Line 1 is taken to Line 2 for further processing in order to giver alchohol repelent finish and vapour cool finish to the fabric. Line 2 is also known as MUCO01. The flow of machines in Line 2 is as followed:

Martine unwinder
↓
Accumulator
↓
Padder
↓
Niproll
↓
Size press
↓
Dryer
↓
Cooling roller
↓
Cognex Selvedge guider
↓
Slitter winder

Different Categories of fabrics produced by the company are :

- Untreated Fabric
- Antistatic fabric
- Alchohol repelent & antistatic fabric
- Absorbamt fabric
    - Baby-diaper [Fabric GSM : 8-13]
    - Sanitary napkin [Fabric GSM : 8-13]
    - Adult diaper [Fabric GSM : 8-13]
- Hydrophilic fabric
- Vapour cool fabric

Raw-material :

- Poly-Propylene : Poly-Propylene has good strength,durability and processibility so it is used.

Products :

- SS [S_1S_2] : In such products, two spun-bond beams are used for fabric manufacturing.
- SMS [$S_1M_1M_2M_3S_2$] : In such products, five beams are used say A,B,C,D,E . All these beams are arranged in sequence. Here, two beams A&E are of spun bond filaments and beams B,C&D are of melt blown filaments.

Here Spun bond filaments help in giving strength and Melt blown filaments are barrier against the fluid and alcohol which is required in the end product.

Depending upon the Melt Flow Index of the melt generated inside the hopper, the spun bond and melt blown filaments are classified. Spun bond filaments has the Melt Flow Index [MFI] of 30-35 Dynes and Melt blown filaments has the MFI of 1200-1300 Dynes

Application :

- Medical Gown : This fabric has high antibecterial properties and is widely used during the operation of patient. Such fabric are used once only so they are not used again and can be said as a use and throw fabric. The GSM of the fabric required for the medical gown ranges between 35-50.

Material flow in Line 1:

Silo
↓
Daybin
↓
Dozing unit
↓
Extruder
↓
Screen changer
↓
Melt pump
↓
Monomer extractor
↓
Die
↓
Conveyor belt
↓
Calendering
↓
Kiss roll
↓
Cooling zone
↓
Cognex
↓
Slittler winder
↓
Packing

- The polymeric chips arrive in the plant in truck in big bags. Each bags has the weight of 500 kg. Number of such bags are laid in the plant.

- The polymeric chips from bag are tranfered to the hopper. This is a big hopper and it has a capacity of 5 tolo tones.

- **Silo** : Polymeric granuels of Poly-Propylene are fed in large silos through pipes form hopper. There are 5 silos for 5 beams A,B,C,D,E. The capacity of each silo is about 60-70 metric tone. The pipes of each silo are connected with several butterfly valve in order to deflect the flow of chips as per the requirement.

- **Daybin** : From silos, the polymeric chips are transfered to the daybins. There are three daybins, on daybin is for the spun bond filaments' polymeric chips i.e. A & E. The second daybin is for the melt blown filaments' polymeric chips i.e. B,C & D. The third daybin is in spare which is used if any fault takes place in the main two daybins. The capacity of each daybin is 2 tones.

- **Dozing unit** : From daybins, the chips are fed to the dozing unit. There is a seprate dozing unit for each beam. The dozing unit is a special equipment in which the polymeric chips are collected. Each dozing unit is provided with 4 auxillaries. These auxillaries are used in case when other chemicals like colour,softening chemical,antistatic chemical are to be mixed with the polymeric chips. The capacities of different auxillaries are mentioned in the table below
  .

Auxillaries of Melt-blown dozing unit	Auxillaries of Spun-bond dozing unit
A1 - 3 kg (Colour – Master batch)	A1 - 7 kg (Colour – Master batch)
A2 - 7 kg (Softner – Vistamat & Claripase)	A2 - 12 kg (Softner – Vistamat & Claripase)
A3 - 7 kg	A3 - 12 kg
A4 - 12 kg	A4 - 25 kg

- **Extruder** : The polymeric chips are fed to the extrusion unit where the melting and mixing takes place by hot air and at the high temperature. The temperature inside the extrusion unit for spun bond filaments is between 250-260^{o}C and the temperature inside the extrusion unit for melt blown filaments is between 260-270^{o}C. The extruder has a unique design, as the melt moves forward inside the extruder, the pressure on the melt liquid gradually increases. The waster fabric is also fed to the extruder but in case of melt blown only as the amount of melt blown filaments are high in the fabric.

- **Screen changer** : The melt from extruder then passes to a screen changer. Screen changer has 5 perforated metal wire screens stuck together. The molten polymer is forced to pass through this screen in order to filter it so that micro dust,dirt and impurities don't takes place in the fabric. Normally the screen has to be changed once in a shift because impurities are gethered around the screen so if the screen isn't changed then there is no path for molten polymer to pass and it causes the blockages. The screen change in case of spun bond is done when the pressure on the screen rises to 106 bars. The screen change in case of melt blown is done when the pressure on the screen rises to 35 bars. When the screen is being changed at that time to continue the process, the melt is passed through the other screen placed above it so the machine does't stop. The venting point becomes an important factor when the changed screen has to be used again. Venting point for spun bond is 150 & 180 bars and venting point for melt blown is 202 & 222 bars. When the venting point reaches the given value, the machine is restarted.

- **Melt pump** : Melt pump is very important euipment because the rpm if melt pump decides the GSM of the fabric. One rpm of melt pump releases 15.5 kg melt in case of spun bond filaments and 7.5 kg melt in case of melt blown filaments on the converyor belt placed below the spinneret. The maximum rpm of melt pump is 60 rpm. Total throughput of the material can be found as below:

Beam	Process	Melt pump rpm	Melt extruded(kg/rpm)	Total melt exturded in a minute
A	SB	43	15.5	666.5
B	MB	10	7.5	75
C	MB	10	7.5	75
D	MB	10	7.5	75
E	SB	10	15.5	155
				Total throughput - **1046.5 kg/min**

- **Monomer extractor** : When the melt passes forward to the connector zone, before that monomer extractor unit is provided because the monomers are generated from the polymeric melt which are need to be removed otherwise they create deffects on the fabric surface. Monomer extractor unit big pipe and with that big pipe,11 small pipes are connected. The melt is passed through big pipe and the monomers are extracted through small pipes and collected in the chamber.

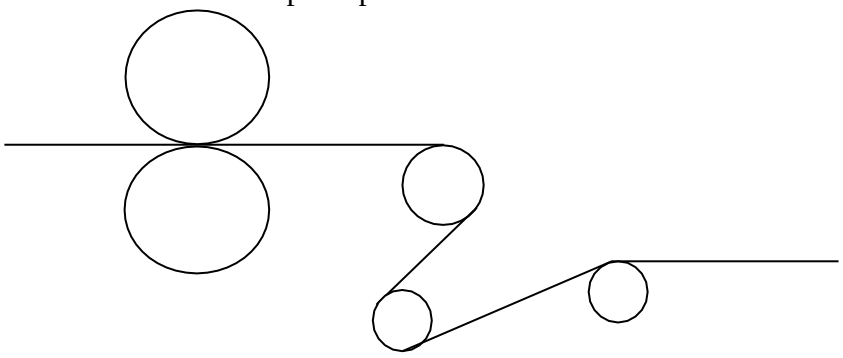
- **Spinneret (Die) [Spun bond]** : The molten polymer from the connecting zone is passed through the spinneret. Spinneret is a unit which contains number of small holes through which the molten polymer is passed to convert it to the continuous filament form. The diameter of one hole is about 0.6 mm. There are 23465 holes in the spinneret of spun bond process. Spinneret is a part of a die. Spinneret is placed at the bottom of the die. The total width of die is 3.4 meters but utilised width is about 3.2 meters. The die is seperated by breaker plate at the centre. The breaker plate is provided to break the flow of the molten polymer and facilitate the uniform distribution of the molten polymer over the surface of the spinneret. The portion below the spinneret has the temperature of about 38^oC in order to solidify the molten filaments coming from the spinneret. The walls of the portion below spinnert contain small honeycomb type design in order to for uniform airflow on the filaments. This portion follows the Semi Automatic System (SAS). In this system, the temperature set should be as per the requirement. If it is higher than required, the filaments will cluster in the middle so the GSM of the fabric increases at the middle and decreases at the edges. If it is lower than required, the filaments will cluster at the edges so the GSM of the fabric increase at the edges and decrease in the middle. Below this portion, the temperature is a about 23^oC. Because of low temperature, the solidification or quenching of the filaments takes places. As the filaments move down, the passage of material gets narrow which facilitates the stretchiing and orientation of the filaments.

- **Melt blown die** : The melt blow die consists of :
    - The die body for distributing the polymer melt produced by the extruder across the effective width.
    - The die cassette as exchange system for holding the spinneret.
    - The spinneret for forming the polymer melt to a single-row curtain of melt filaments.
    - A hot air distribution for quenching the melt filaments with heated process air.
    - An insulation for reducing the heat loss and to project against burns.

- The die body consist of two die parts. Each of these incorporates one half of the melt flow channel. The heating of die body is done by heating cartridges which are held by corresponding bores and combined to heating zones. Each heating zone is regulated using a thermocouple. Bores in the die parts allow the feeding of process air through the die body.
- Die cassette is mounted at the outlet of the die body and function as an exchange system. This unit offers the advantage of a preassembly and fine adjustment of the air knife to the spinneret.A complicated adjustment of the air discharge gap can thus be adjusted during the die exchange.
- The spinneret consist of the perforated plate and the die tip. Both parts are screwed together and are incorporated together into the die support. The perforated plate supports the filter screen and thus prevents a pass flow around because of bending. The spinneret boreholes are incorporated in the die tip for forming the polymer melt into a single row filament curtain. The weight of the spinneret is about 120 kg. The effective width of spinneret is 3.2 meters and there are approx. 150 holes/cm. The diameter of each hole is about 0.4 mm.
- Heated process air is fed to the front face of the melt blown die. Units for the process air distribution are mounted on the right and left on the die body. The unit consist of an outer pipe,a pipe support and depending on the effective width-one to two throttle pipes. By means of the throttle pipe, the process air that is fed in from the front end is distributed on the respective effective width.
- Bores in the outer pipe and the pipe support feed the process air into the die body. Pockets on the sides in the die parts serve to hold air conduction sheets. Process air passing by these sheets are guided by angled bores through the air filter screens, the process air spinneret refer also to adjust setback(0.3-1.7 mm) and airgap(0-3 mm).
- To reduce the loss of heat and to protect against burns, the melt-blown die is equipped with an insulation.Depending on the effective width, the insulation consists of several top,side and frontend parts as well as several angle sheets. Angle sheets mounted on the die cassette close the gap between the insulation side parts and the die cassette.
- As the MFI value for melt blown filaments is higher and the liquid is less viscous, the distance between the spinneret and the conveyor belt is less about 160- 180 mm.

- **Conveyor belt** : The filaments coming from the spinneret are laid on the conveyor belt. The filaments of beam A then B,C,D and at the last E are laid parallel to each other. Conveyor belt plays an important role in deciding the GSM of the fabric. Higher the rpm of conveyor belt,lower will be the GSM of the fabric and vice-versa.

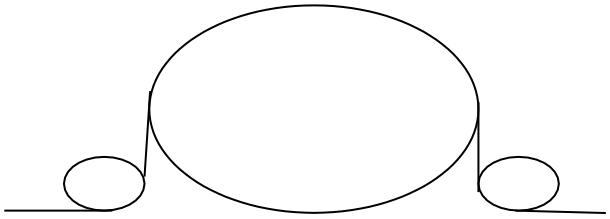
- **Calendering** : Here thermal mechanical calendering is carried out for bonding of the filaments. The temperature of the calender roller is about 160-170^{o}C. There are two calender roller between which, the fabric is passed. The top calender is embossed with small oval shaped points which helps in proper binding of filaments with one another. The bottom calender has plain polished surface.



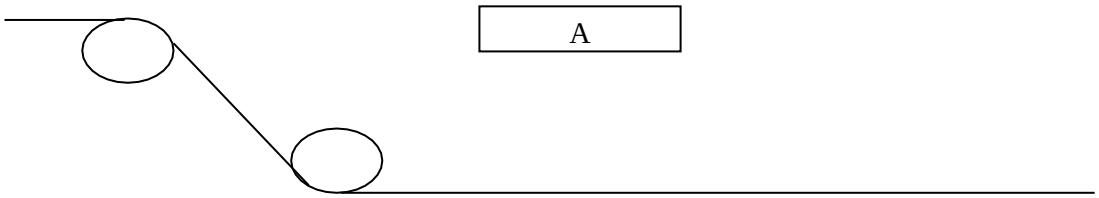
- **Kiss roll** : Kiss roll is a stainless steel roller used for the coating of liquid on one or both sides of the fabric surface. The surface of the roller is friction less and very well polished. There are mainly two kiss rolls provided, the second one is used when the other side has also to be treated. Specifications of kiss roll are:

    - Speed range : 2-50 rpm
    - Circumference : 27”
    - Trough capacity : 80 lts
    - Tank capacity : 100 lts
    - Preparation tank capacity : 1000 lts

- **Dryer** : After applying the liquid on the fabric surface, its drying is carried out to fix the liquid on the fabric surface. The fabric is passed over a very big hot cylinder.

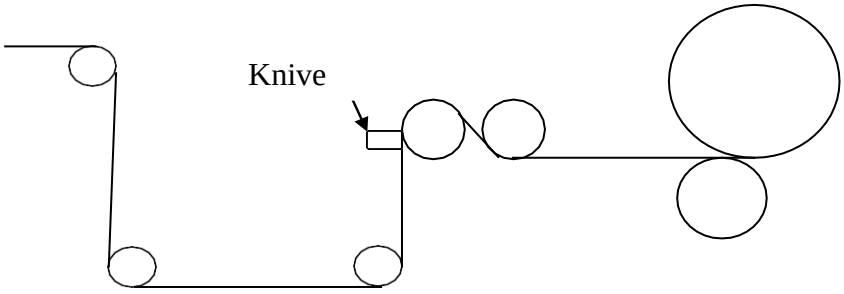


- **Cooling zone** : The fabric coming from dryer is cooled down at the temperature of about 23^{o}C. The certain area is decided for cooling inside which air-conditioner is placed wich hhelp in cooling.



- **Cognex** : Cognex is a system which is used for the quality control of the fabric. Cognex consisits of cameras. These cameras are very much powerful which can detect any defect from the fabric passed below them. Just before the cagnex, there is a honeywell 2080 which reflects the light on the fabric so that defects and faults can be easily detected.

- **Slittler winder** : Slitter winder is an online winder connected with the programing system in which the cutting of the fabric roll is done by knife in required width as per the requirement of the user. There are total 32 knives so at a same time, maximum 32 rolls can be made of required width from the given big roll.



- **Packing** : The packing of the rolls are done and according lot number is given.

Material flow in line 2 :

Martine unwinder

↓

Accumulator

↓

Niproll

↓

Size press

↓

Dryer

↓

Cooling rollers

↓

Cognex

↓

Slittler winder

↓

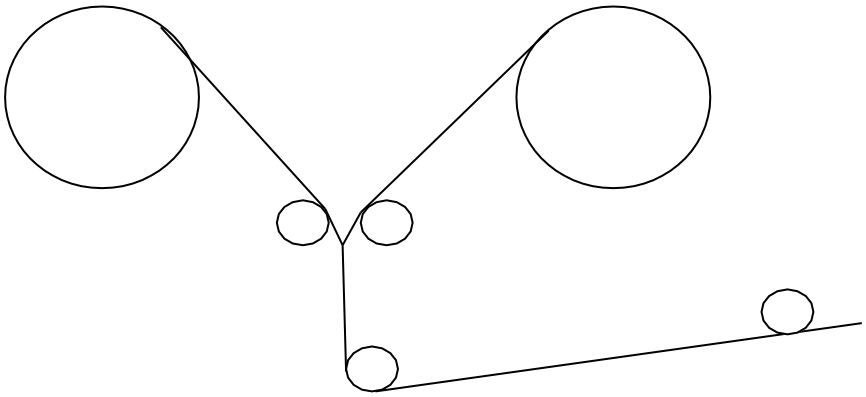
Packing

- Line 2 is maily for giving the alchohol repellent treatment to the fabric. First of all, preparation of alchohol repellent chemical is necessary and for that 3 tanks are provided. 1st tank is called mixing tank and its capacity is 3500 lts. 2nd tank is called loading or transfer tank and the 3rd tank is chemical holding tank which is connected with the trough in which nip rolls are dipped. The capacity of third tank is also 3500 lts.

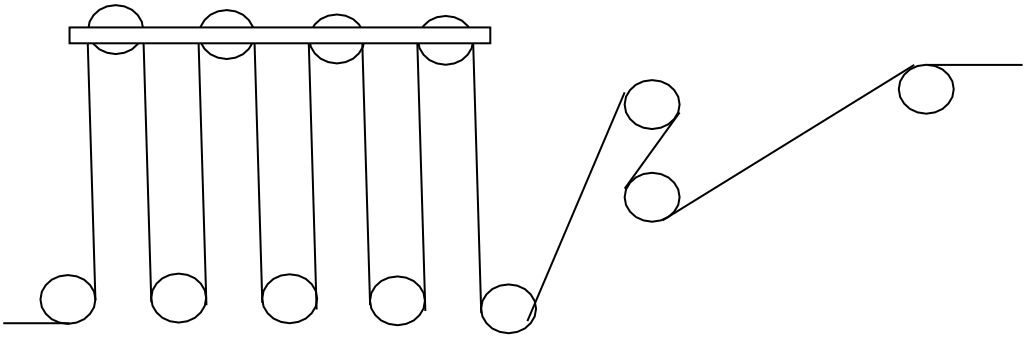
— There are maily 4 chemicals : Octanol,Polyfix,AGE600 and TG5502
— For AR 9 products, the preparation of mixture is as : 60% water + Octanol + Polyfix + AGE600
— For AR 6 & AR 7 products, the preparation of mixture is as : 60% water + Octanol + Polyfix + TG5502

There is a provision of some extra tanks in order to add some additives as per the requirement of the user.

- **Martine unwinder** : The fabric roll produced on line 1 is brought on to the martin unwinder where unwinding of the roll takes place for further processing.

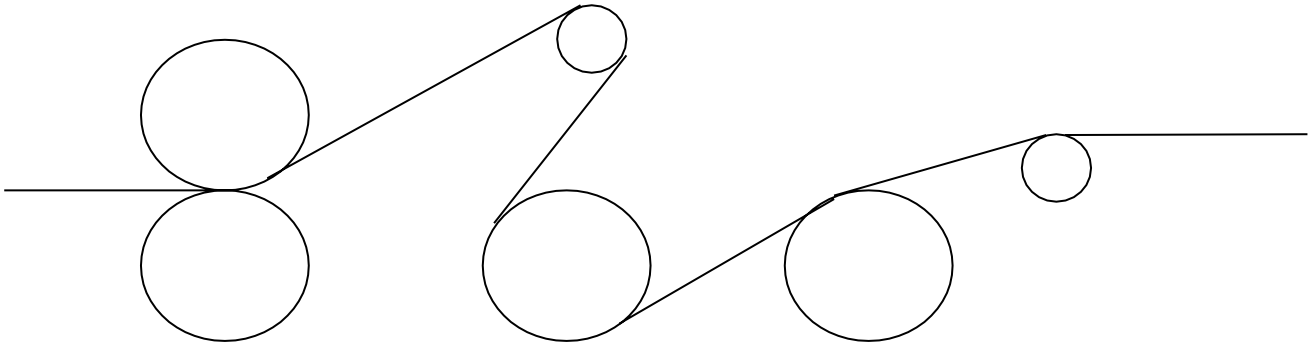


- **Accumulator** : Accumulator consists of number of rollers in series and the fabric is passed over those rollers in order to main constant tension on the fabric and maintain uniform feeding. Top rollers are adjustable and the heights of which is adjusted as per the amount of tension required on the fabric.

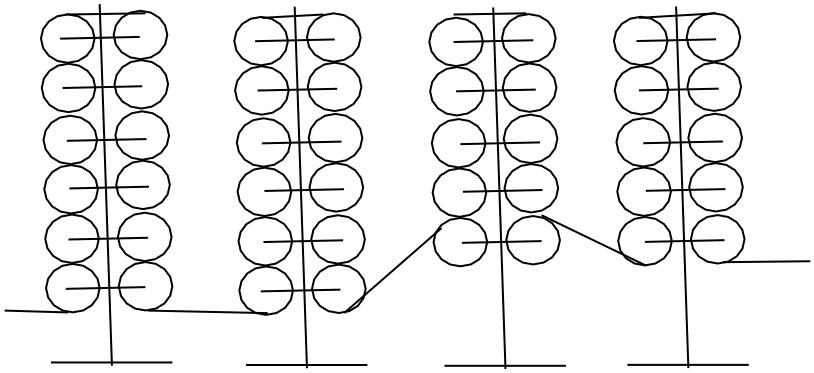


- **Niproll** : The fabric is further passed over and under the series of rollers. Half of these rollers are dipped in the trough filled with the alchohol repellent chemical. The trough is connected with the chemical holding tank which maintains the level of chemical in trough.

- **Size press** : The fabric after nipping is pressed between the pair of rollers to penetrate the liquid inside the fabric and remove the excess from the fabric surface.



- **Dryer** : The drying of the fabric is carried out on series of cams arranged as shown in fig below:



- **Cooling roller** : The fabric coming from dryer is very hot so it need to be cooled for packaging so its cooling is carried out by passing it over cooling rollers.
-
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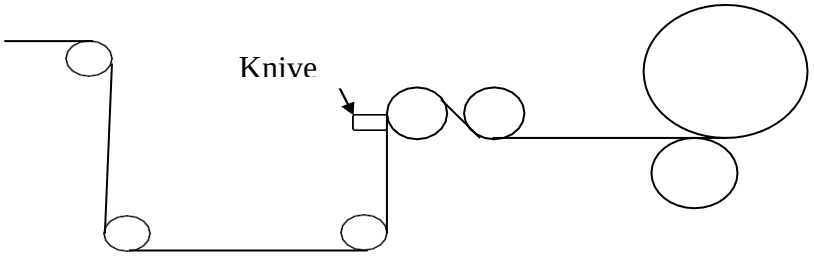

- **Packing** : The packing of the rolls are done and according lot number is given.

Testing instuments :

- Mulab hydrohead tester [To check the timing in which the water drop emergies on fabric surface when placed under required condition]
- Static decay meter [To check the timing in which a fabric can get rid of static charge]
- Martindale abrasion tester [To check the abrasion resistance of the fabric]
- Mullen bursting tester [To check the bursting strength of the fabric]
- Elemendorf tearing tester [To check the tearing strength of the fabric]
- Mulab Thickness tester [To measure the thickness of the fabric]
- Liquid strike through tester [To meausure the time required by fabric to absorb water with NaCl and specially for baby diapers]
- Coverstock wet back tester [To check if water is coming out of the fabric after absorption or not and specially for baby diapers]
- Extrusin plastomer [To check melt flow index]
- Cusick drape tester [To check the crease resistance of the fabric]
- Taber abrasion tester [To check the abrasion resistance of the fabric]
- Stoll abrasion tester [To check the abrasion resistance of the fabric]
- Colourflex tester [To check the opacity of the fabric]
- Microscope tester [To check fiber diameter and length]
- Handle o meter [To check aesthetic properties]
- Zwick-roell UTM [To check tensile properties]

Faults in the fabric :

- Big drop : Due to clustring of filaments on one place, a big drop is made.
- Blow back : Curved portion on fabric which creates bowl like shape.
- Burn hole : Due to burning of certain portion.
- Crease : Mostly seen in melt blown, formed when filaments aren't laid properly.
- Drip : Very small creases , only visible when the fabric is properly wathced.
- External contamination : When external dust,dirt and other contamination get stuck to the fabric during processing.
- Eyebrow : When eyebrow type of shape is generated on the fabric surface.
- Filaments : When the laying of the 1 or 2 filaments are not proper and which creates certain unwanted portion on the fabric surface.
- Fly : Mostly seen in melt blown and made when small fly in the factory get stuck to the fabric during processing.
- Fold : Folded portion appears on the fabric surface.
- Insect : Any insect get stuck with the fabric surface during the process.
- Microdrip : Very very small creases
- Missing pin : During the calendering process, if any of the pin of the calender roller is missing appears as a missing pin on the fabric surface.
- Overbonding pin : If the size of pin on the calender is greater than the required than the overbonding takes place.
- Paper dust : When the small paper gets stuck to the fabric surface during processing.
- PP granule : When the polymeric chip is not melted properly and appears as a granule on the fabric surface.
- Shots : Mostly seen in melt blown and made when any external aprticle get stuck to the calender roller and which is further embossed on the fabric surface.
- Streaks : Mostly seen in spun bond. It is a long stipe seen on the fabric surface.
- Sugar grain : Mostly seen in spun bond and made when any sugar like particle get stuck with the fabric surface during processing.
- Thick place : Thick portion on the fabric surface.

Pictures


6S LEAN WORKPLACE
SAFETY
SUSTAIN
AHLSTROM MUNKSJÖ
LEAN COMMUNICATION BOARD MUNDRA
KAMISHIBAI BOARD
DAY
TEAM
MANAGER
PLANT MANAGER
MON
TUE
WED
THU
FRI
Team Activity


WE ARE ONE
AHLSTROM MUNKSJÖ