PP Non woven - a revolutionary fabric

Deven Mehta
AGM - Sales
Agenda

- PP Non woven Application / Markets
- Properties of the fabric
- Advantages
- Market scenario
- What is nonwoven?
- Manufacturing Process
- A typical machine set up
- Rajoo – at a glance
Applications

- Automotive
- Medical
- Personal care and hygiene
- Home furnishings
- Household
- Stationery
- Agriculture
- Geotextiles
Applications

- Floor covers
- Side liners
- Front and back liners
- Wheelhouse covers
- Seat applications

- Air filters
- Door trim panel carpets
- Door trim panel padding
- Cover slip sheets

- Hood silencer pads
- Dash insulators
- Carpet tufting fabric and under padding
- Foam reinforcements
Applications

medical

- Surgical:
  - disposable caps, gowns,
  - masks and shoe covers
- Drapes, wraps and packs
- Sponges, dressings and wipes
- Bed linen
- Contamination control gowns
- Examination gowns
- Shrouds
- Under pads
- Procedure packs
- Heat packs
- Ostomy bag liners
- Fixation tapes
- Incubator mattress
- Protective Cloth
Applications

Personal care & hygiene products

- Diapers
- Sanitary napkins
- Training pants
- Incontinence products
- Dry and wet wipes
- Cosmetic applicators, removers
- Lens tissues
- Hand warmers
- Vacuum cleaner bags
- Tea and coffee bags
- Shoe covers
- Buff pads
Applications

home furnishings

- Furniture construction sheeting
- Insulators, arms and back
- Pillows & pillow cases
- Dust covers
- Mattress pad components
- Acoustical wall coverings

- Bedding construction sheeting
- Carpet backings, carpets & pads
- Dust covers
- Blankets
- Spring wraps
- Table decoration
## Applications

**house hold**

- Aprons
- Scouring pads
- Fabric softener sheets
- Dust cloths, mops
- Tea and coffee bags

- Placemats, napkins
- Wash cloth
- Table cloth
- Coat Cover
- Carry bags
Applications

stationery

• Book covers
• Mailing envelopes, labels
• Maps, signs, pennants
• CD disk liners

• Promotional items
• Posters and banners
Applications

leisure & travel

- Sleeping bags
- Tarpaulins, tents
- Artificial leather, luggage
- Airline headrests, pillow cases
Applications

agriculture

- Crop Covers
- Turf Protection products
- Nursery overwintering
- Weed Control fabrics
- Root bags
- Containers
- Capillary matting
- Green house shading
- Seed blanket
Applications

geotextiles

• Asphalt overlay
• Road and railroad beds
• Soil stabilization
• Drainage
• Golf and tennis courts
• Artificial turf
• Sedimentation and erosion control
• Dam and stream embankments
Desirable Properties

- Abrasion resistant
- Absorbent
- Antistatic
- Breathable
- Conductive
- Colour fast
- Crease resistant
- Dense
- Drapeable
- Dry cleanable
- Durable
- Dust free
- Elastic
- Flame resistant
- Foldable
- Heat sealable
- Impermeable
- Kind to skin
- Light
- Long-lasting

- Lint free
- Mouldable
- Non-conductive
- Non-fading
- Permeable
- Porous
- Printable
- Protective
- Sewable
- Smooth
- Soft
- Stable
- Sterilisable
- Stiff
- Strong
- Tear resistant
- Washable
- Water repellent
- Weatherproof
- Weldable

Combination of many features possible with PP nonwovens
Advantages of Nonwoven

• Fabricated much faster with greater flexibility

• Can be slit in both directions without fraying

• Heat sealed/seamed/folded/shaped in a variety of ways

• Ultrasonic welding possible
PP Nonwoven Industry – Global Market Scenario

World market - 7.5% per annum growth rate

- The nonwovens consumption is directly related to economic development and per-capita income of the population.
- 60% nonwovens usage is in disposable products.
- China today is producing over 1 million tons of nonwovens.
- Current nonwoven production level in India is only about 70,000 tons per annum which was the same level in China, 15 years ago.
PP Nonwoven Industry – Market Scenario

Is India the next booming market for nonwovens?
Will India be reaching the new horizons in nonwovens and technical textiles?

Strength:

• India is one of the largest producers of natural and manmade fibers
• Population growth and increase in middle class disposable income
• Low cost skilled labor
• Ability to cater to the value chain
• Growing domestic retail market
PP Nonwoven Industry – Market Scenario

Is India the next booming market for nonwovens? Will India be reaching the new horizons in nonwovens and technical textiles?

Weakness:

• Textile industry being fragmented less of organized and more unorganized sector
• Low productivity and cost competitiveness
• Obsolete technology
• Lack of product knowledge and expertise
What is PP Nonwovens?

- Non-woven fabric is an engineering fabric, manufactured by putting small fibers together in the form of a sheet and then binding them either through thermal bonding, mechanically (as in the case of felt), with an adhesive, or by interlocking them with serrated needles such that the inter-fiber friction results in a strong fabric.

- Nonwovens can be single use (disposable) products or durable fabrics depending upon the need of end use.
PP Nonwoven Fabric

• Flat flexible porous sheet structure

• Produced by interlocking layers or networks of fibers, filaments.

• Classified as disposable or durable nonwovens based on usage.

• Disposable applications include Baby Diapers, Adult incontinence products, Feminine Hygiene products, Wet Wipes.

• Durable applications include Filtration Media, Protective Apparel, Geo textiles, Home Furnishings, Automotive and Agricultural fabrics.
PP grades for Nonwoven

Mainly Homo-polymer PP

• Staple fiber process       -  12 to 25 MFI
• Spun-bonded process       -  20 to 35 MFI
• Melt blown process        -  450 to 1200 MFI
PP Nonwoven Fabric - Costing

Base polymer cost  Rs. 80 /- Kg
Basic cost of Filler (upto 50%)  Rs. 40 /- Kg
Effective cost per Kg of Raw material  Rs. 60 /- Kg

Conversion into Non-woven
• Direct cost  =  Rs. 9/- Kg
• Indirect cost  =  Rs. 5/- Kg
• Packing cost  =  Rs. 1/- Kg

Sales Realization  =  Rs. 115/- Kg  [ up to Rs 120/- ]
Nett Value addition  =  Rs. 35 to Rs. 45 Per Kg

Gross Profit at 80% capacity utilization =  Rs. 1200 M.Ton x Rs. 35,000
=  Rs. 420 Lacs / year
Manufacturing process

Nonwoven is commonly manufactured by three processes:

• Spun bonded process direct extrusion followed by online thermal web bonding
• Melt blown process followed by online web bonding
• Staple fiber process followed by carding

PP Nonwoven production in India is mainly through Spun bonding
Manufacturing process - Spun bonding

- Extrusion
  - Cooling & Filtering
  - Spinning
    - Drawing
      - Laydown on Forming Web
        - Autogenous Bonding
          - Roll Up

Polymer Melt
- Filament
- Web
- Fabric
Manufacturing process – spun bonding
# A Typical machinery set up

<table>
<thead>
<tr>
<th>Main machinery</th>
<th>Auxiliary equipments</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Extruder</td>
<td>• Refrigeration for chilled air</td>
</tr>
<tr>
<td>• Recycle Extruder</td>
<td>• Oil heating System</td>
</tr>
<tr>
<td>• Spinning &amp; stretching</td>
<td>• Blower</td>
</tr>
<tr>
<td>• Web forming</td>
<td>• Spinnerets ultrasonic cleaner</td>
</tr>
<tr>
<td>• Thermal bonding</td>
<td>• Cooling tower</td>
</tr>
<tr>
<td>• Winding</td>
<td></td>
</tr>
<tr>
<td>• Slitting / Rewinding</td>
<td></td>
</tr>
</tbody>
</table>
PP Non woven : Rajoo offering ..

FabREx - PP Non woven Spun Bonded Fabric Extrusion Line

- RENW-1513/1600 – Finished width 1600mm
- RENW-1515/2400 – Finished width 2400mm
- RENW-1515/3200 – Finished width 3200mm
PP Non woven : Rajoo offering - RENW-1513/1600

**SALIENT FEATURES OF THE LINE**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Unit</th>
<th>Values</th>
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<tbody>
<tr>
<td>Screw diameters</td>
<td>mm</td>
<td>150 &amp; 105</td>
</tr>
<tr>
<td>Screw length</td>
<td>D</td>
<td>30 &amp; 15</td>
</tr>
<tr>
<td>Spinneret width</td>
<td>mm</td>
<td>1910</td>
</tr>
<tr>
<td>Maximum fabric width (trimmed)</td>
<td>mm</td>
<td>1600</td>
</tr>
<tr>
<td>Fabric weight range</td>
<td>gsm</td>
<td>12 to 150</td>
</tr>
<tr>
<td>Average output</td>
<td>kg/hr</td>
<td>225</td>
</tr>
<tr>
<td>Line speed range</td>
<td>mts/min</td>
<td>15.0 - 150.0</td>
</tr>
<tr>
<td>Filament denier</td>
<td>denier</td>
<td>1.8 to 3</td>
</tr>
<tr>
<td>Total installed load</td>
<td>kW</td>
<td>434.13</td>
</tr>
<tr>
<td>Space requirement (LxWxH)</td>
<td>mm</td>
<td>17000 x 11000 x 12000</td>
</tr>
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**PP Non woven : Rajoo offering - RENW-1515/2400**

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<tr>
<td>Spinneret width</td>
<td>mm</td>
<td>2710</td>
</tr>
<tr>
<td>Maximum fabric width (trimmed)</td>
<td>mm</td>
<td>2400</td>
</tr>
<tr>
<td>Fabric weight range</td>
<td>gsm</td>
<td>12 to 150</td>
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<tr>
<td>Average output</td>
<td>kg/hr</td>
<td>325</td>
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<tr>
<td>Line speed range</td>
<td>mts/min</td>
<td>15.0 - 150.0</td>
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<tr>
<td>Filament denier</td>
<td>denier</td>
<td>1.8 to 3</td>
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<tr>
<td>Total installed load</td>
<td>kW</td>
<td>528.37</td>
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<tr>
<td>Space requirement (LxWxH)</td>
<td>mm</td>
<td>18000 x 12000 x 12000</td>
</tr>
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PP Non woven : Rajoo offering - RENW-1515/3200

**SALIENT FEATURES OF THE LINE**

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<tr>
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<td>3200</td>
</tr>
<tr>
<td>Fabric weight range</td>
<td>gsm</td>
<td>12 to 150</td>
</tr>
<tr>
<td>Average output</td>
<td>kg/hr</td>
<td>450</td>
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<tr>
<td>Line speed range</td>
<td>mts/min</td>
<td>15.0 - 150.0</td>
</tr>
<tr>
<td>Filament denier</td>
<td>denier</td>
<td>1.8 to 3</td>
</tr>
<tr>
<td>Total installed load</td>
<td>kW</td>
<td>562.79</td>
</tr>
<tr>
<td>Space requirement (LxWxH)</td>
<td>mm</td>
<td>19000 x 14000 x 13000</td>
</tr>
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</table>
Raw material feeding

Here PP is mixed with stabilizers, additives, color master-batch, resin modifiers, or other additives and fed to the extruder throat.
European Designed Extrusion System

- Heavy duty main extruder with 130mm or 150mm screw size.
- Specially designed recycling extruder with 105mm screw size with direct feeding of fabric side trim.
Melt Filtering & Screening

- Diverter type continuous screen changer.
- Melt pressure transducers are provided before screen changer and on both ports of melt pump.
Melt metering pump

- The molten polymer is conveyed to a filter and foreign particles such as metals, solid polymer particles and others are separated from the molten polymer.
- The filtering is very important, because the unfiltered polymer may cause problems such as blocking the spinneret holes or creating filament breaks.
- Then it is conveyed to a metering pump which plays an important role in a precise volumetric flow rate of the molten polymer.
- The important thing is that once the polymer is melted and liquefied uniform temperature must be maintained to a die block assembly.
- The metering pumps is insulated on all sides and the speed is generally between 10rpm and 40 rpm
Spin Beam with two Spinnretes

The spinneret is a single block of metal having thousands of drilled orifices or holes on it, and the designing and fabrication of this part affect web uniformity.
Filament spinning

- The molten polymer is emitted through the spinneret holes. When the emitted filaments pass through quench chambers, cool air is directed across the filament bundle to cool the molten filaments sufficiently to cause solidification.

- The quenching can be done by blowing air with a two-sided inflow quench air supply box.
Filament Drawing, Air quenching and deposition

In the attenuation the filaments are led into a tapered conduit by high velocity air, causing acceleration and accompanying attenuation or stretching of the individual filaments. The attenuation leads to a polymer molecular orientation making up the continuous filament and a modification of fiber diameter.

Polypropylene (PP) usually spins at about 2,000 m/min. When quenching using air, other parameters like temperature and humidity must be controlled.
Fiber deposition on conveyer

Row of spin pack
Web formation

The filaments are deposited on a moving belt. High pressure air through a blower is used to move the filaments and a vacuum under the belt helps in forming the filament web on the forming belt. The filaments are separated by aerodynamic force before reaching the belt to achieve maximum uniformity and cover.
Thermal bonding – Hot S Role calendar

Both temperature and pressure to effect fiber fusion

Calendar roll meant for embossing
Winding & Slitting /Rewinding
Melt Blown Process

Single row of filaments blown into fine fibers (1 to 10 micron) by heated air jet
SMS Technology – Combination of Spun – Melt - Spun

Spun bond – melt blown – spun bond composite nonwoven structure
A Glimpse of

Rajoo

excellence in extrusion
Overview

- Vision
- Core team
- Product portfolio
- Infrastructure
- Culture
- Expanding footprint
- Credentials
Vision

To become one of the most trusted and passionate solution providers for the plastic extrusion machinery world-wide in the best interests of all the stake holders pursuing ethical business practices.
Core team
Product portfolio

- FabRex – PP Non Woven Fabric Extrusion Lines
- Foilex – Upward extrusion monolayer blown film Lines
- Multifoil – Upward extrusion multilayer blown film Lines
- Aquaflex – Downward extrusion mono & multilayer blown film lines
- Lamina – Mono and multilayer sheet lines
- Fomex – Physical and chemically foamed PE sheet lines
- Fomex – EPS – Foamed polystyrene sheet lines
- Dispocon – Thermoformers-solid &foamed disposables line
Rajoo infrastructure - Operations

- Design centre
- Extruder manufacture
- Die manufacture
- Surface treatment
- Aluminium casting and fabrication
- Steel fabrication
- Assembly, trial and wet testing

(blown film plants of 22 m height)
Design centre

EXCELLENCE IN EXTRUSION
Surface treatment (including gas nitriding)
Shree Yantralaya (dust free & air conditioned)
Shree Yantralaya (dust free & air conditioned)

- 3-axis CNC thread milling machine–WMW, Germany-ABC 3300 mm and SOB 110 mm.
- 3-axis CNC smart turn lathe – Pinacho, Spain – ABC 4000 mm and SOB 700 mm.
- 3-axis high speed milling center – Huron, France - X-1000 mm, Y-800 mm, Z-500mm
- 4-axis CNC double column vertical machining center Huron, France X-3200 mm, Y-2200mm, Z-800 mm
- 3-axis vertical turning lathe – You Ji, Taiwan - SOB 2000 mm, turning height 1200 mm
Shree Yantralaya (dust free & air conditioned)

- 2-axis CNC Water Jet cutting machine – KMT Jet Line, Germany - 4000 mm x 2000 mm
- 3-axis CNC turning center – Jyoti, India – ABC 1000 mm and SOB 200 mm
- 3-axis CNC turning center – Jyoti, India – ABC 1000 mm and SOB 300 mm
- 3-axis CNC vertical machining center – Feeler, Taiwan X-1600mm, Y-1600 mm, Z-800mm
- Universal cylindrical grinding machine – Smithson, India ABC 4000 mm and SOB 600 mm
Assembly, trial and testing (wet trials for all machines)
Assembly, trial and testing (wet trials for all machines)
Assembly, trial and testing (wet trials for all machines)
CULTURE
Culture - Environment, health and safety

“going green
going paperless”
Culture – we care!

Blood donation camp

REL club – milk distribution activity

Flag hosting by rural kids

Rural educational program

Training program for educational Institutes
Expanding footprint

Installations in 52 countries.....
Expanding footprint - 52 countries....

<table>
<thead>
<tr>
<th>Region</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America</td>
<td>Colombia, Mexico, Ecuador, Argentina</td>
</tr>
<tr>
<td>Europe</td>
<td>UK, Germany, Spain</td>
</tr>
<tr>
<td>North America</td>
<td>USA</td>
</tr>
<tr>
<td>Gulf</td>
<td>Iran, Kuwait, UAE, Oman, Saudi Arabia, Egypt, Syria</td>
</tr>
<tr>
<td>East Africa</td>
<td>Kenya, Tanzania, Malawi, Uganda</td>
</tr>
<tr>
<td>West Africa</td>
<td>Nigeria, Ghana</td>
</tr>
<tr>
<td>Southern Africa</td>
<td>RSA, Zambia, Leshoto, Botswana</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>Malaysia, Vietnam, Thailand, Sri Lanka, Nepal, Pakistan, Bangladesh</td>
</tr>
<tr>
<td>Australasia</td>
<td>Papua New Guinea</td>
</tr>
</tbody>
</table>
Credentials

Commenced business as Rajoo Engineers Pvt. Ltd. at Manavadar, a small village in Junagadh district to manufacture mechanical cutting – sealing machines.

1986

Ventured into the manufacture of blown film lines and delivered first PPTQ blown film line.

1988

Launched the first ever blown film line to manufacture chemically foamed PE films.

1990
Credentials

1991
Introduced the first Indian co-
extrusion feed block for multilayer
sheet line and today command the
largest market share of sheet
extrusion lines in India.

1994
Introduced the first ever
indigenously designed and
developed Oscillating Haul – off
system for blown film lines and
displayed at Plastindia 1994 – over
100 installations now.

1995
Introduced the first indigenously
designed wide width blown film line
for a lay flat width of 3000 mm.
Credentials

Grooved feed extruder with barrier screw – first time is Asia – over 600 extruders operating worldwide

1995

Internal bubble cooling system during Plastindia

1996

Exported country’s first “CE” marked machine to the most demanding European market and since regularly exporting to Europe – over 500 machines now operating overseas and in India

1997
Credentials

2000

Launched the first ever sheet line for PET at Plastindia 2000.

2000

5 layer stack die (UCD) with horizontal – first time in India – and 4\textsuperscript{th} in the world – during Plastindia 2000 – over 40 such dies in operation.

2000

Introduced \textit{world’s highest output} PPTQ downward extrusion blown film line at Plastivision 2002. christened Aquaflex.
Credentials

Introduced India’s first Electro-hydro-pneumatic plug-assist thermometer with in-mould cutting for Polypropylene & PS containers.

Asia’s highest output 3 layer blown film line with stack die (UCD) – during Plastindia

Asia’s first 2 layer PPTQ film plant – 150 kg/hour.
Credentials

a) Developed a CE complaint high output sheet line for processing PET regrind at the rate of 700 kg/hr and exported the same to Germany.
b) Developed and supplied first sheet line for physically foamed PE sheets using carbon dioxide as blowing agent.

Developed Asia’s first resin sack three layer blown film line and exported to Iran.

2005

a) Developed Asia’s first seven layer blown film line incorporating conical spiral stack (INCOSS) die.
b) Developed Asia’s first three layer wide width blown film line incorporating die dia 1200 mm and 4000 mm LFW. The maximum output is 1200 kg/hr.
Credentials

2007
Entered into technical collaborations with Commodore Inc. USA for manufacture of XPS sheet line and thermoformer.

2009
Launched India’s first PS foam extrusion line and vacuum forming machine and exported to Ghana.

2009
Vacuum forming machine with mould : model RECR – 7086 XPS received and award “Machinery for packaging operations” from IPMMI – IMDIR 2009.
Credentials

2010

Wonderpack merger: A unified approach for the benefit of the thermoforming industry

Rajoo Engineers JV with Bausano of Italy: Plastic pipe manufacturing industry in India to get a fillip

Rajoo Engineers forges ahead; Technical collaboration with Hosokawa Alpine AG, Germany
Credentials

2011

Supplied Asia’s first CE compliance 7 layer fully automatic blown film line to Turkey
Thank you

www.rajoo.com