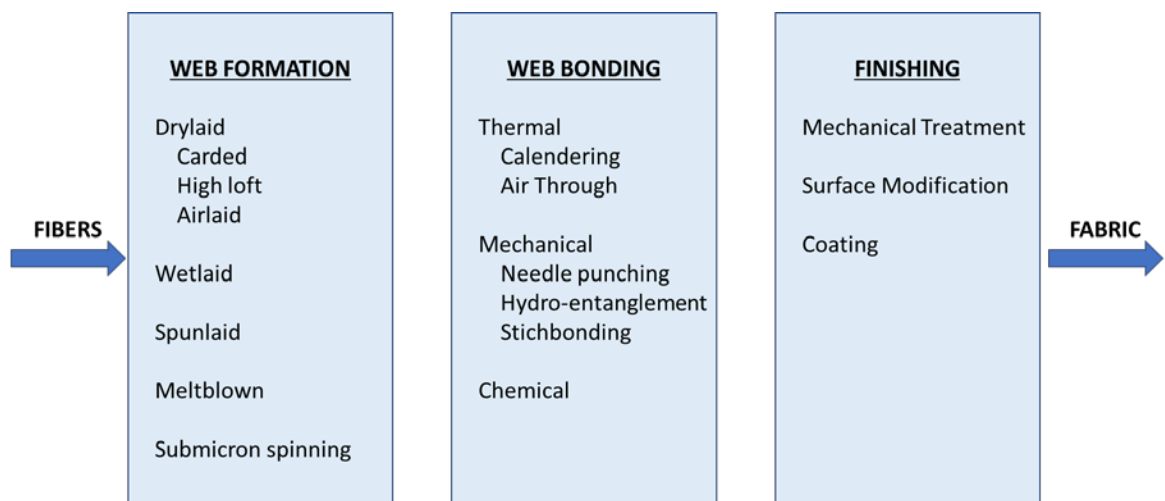


COVID – 19

PPE materials

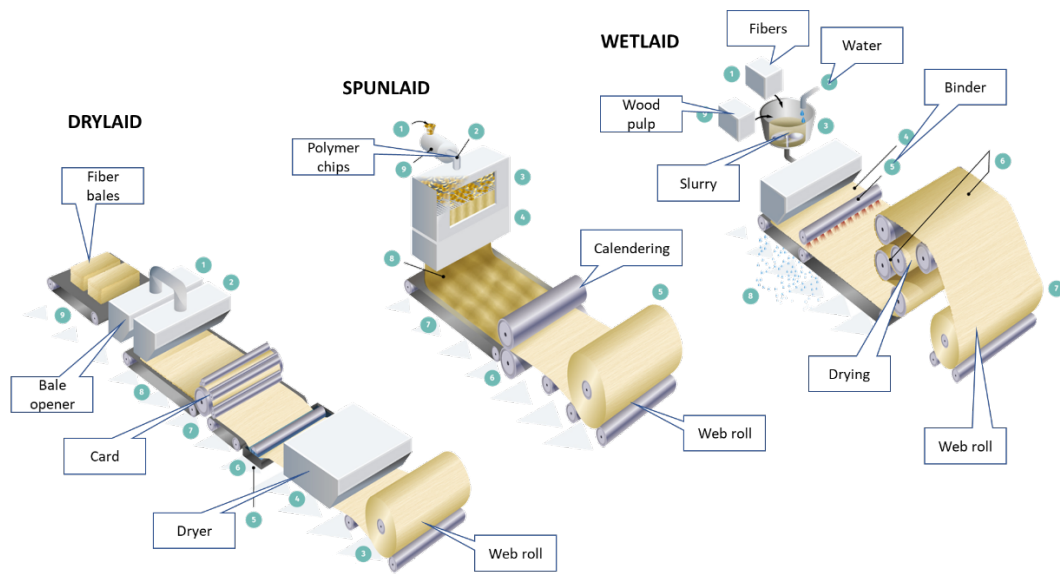
Nonwoven Manufacturing

1. Instead of yarns, nonwoven fabrics are made by directly entangling textile fibers together, to form a web. Web formation is the base for nonwovens and by Web Bonding the fibers are attached together to increase friction and strength of the fabric. The surface of the fabric can be modified by mechanical or treatment, like coating.

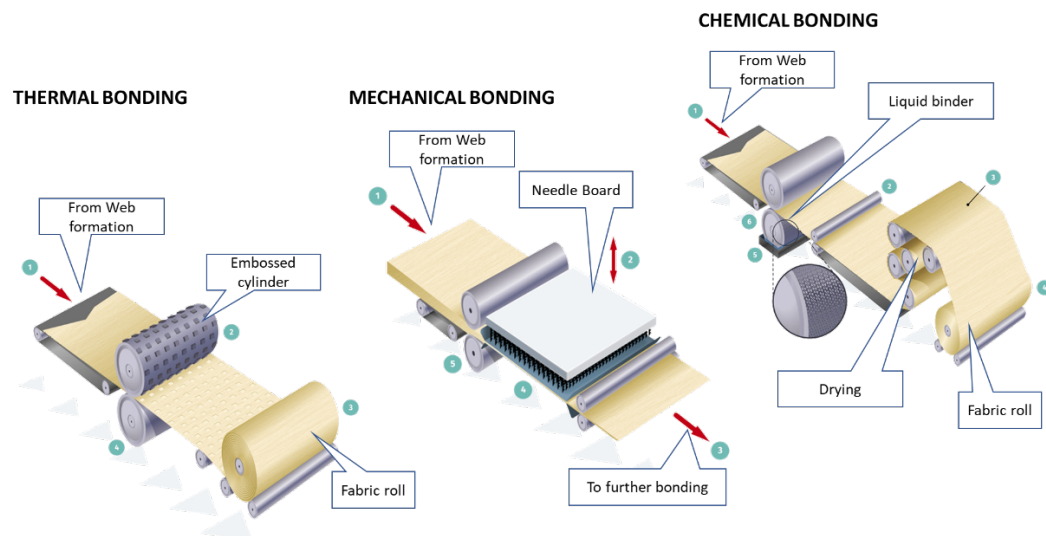


2. In Drylaid method the web is formed by carding or air laying the fibers. Wetlaid technology is similar to papermaking, and the web is produced from slurry of fibers and water. In Spunlaid, Meltblown and Submicron Spinning technologies the web is formed directly after melt spinning. All kinds of fibers can be used in Drylaid and Wetlaid web formation, while in melt spinning only synthetic fibers can be used.
3. Web Bonding is the second phase, where fibers are consolidated in order to increase strength. In Thermal Bonding the thermoplastic properties of fibers are used to form bonding between fibers. The web is passed between heated calendar rollers or hot air is blown through the web. Fibres must be thermoplastic like polypropylene. This is the most common method for producing nonwovens for medical textiles.
4. Mechanical Bonding strengthens the web by increasing the inter-fiber friction, which is achieved by Needle Punching or Hydro Entanglement. Needles or a jet of water punches through the web and increases the physical entanglement of the fibers. In Chemical Bonding the web is bonded by liquid-based bonding agents like latex. The bonding agent may be applied by saturation bonding, spray bonding, print bonding or foam bonding.

WEB FORMATION



WEB BONDING



Source: EDANA

NONWOVENS FOR MEDICAL TEXTILES

5. Scrubs, gowns and masks for health care personnel need to fulfil high requirements to protect the wearer. Requirements regarding consumer masks can be more relaxed, but still the mask needs to provide adequate protection. Scrubs are sanitary clothing worn by hospital personnel in patient care for personal protection. Surgical gowns and surgical masks worn in surgery need to be sterilized.



Scrubs, surgical gowns, surgical mask and respiratory mask.

6. Scrubs can be reusable and made of normal cotton or cotton/polyester blended fabrics. Single-use scrubs are made of polypropylene nonwovens and treated against bacterial contamination.
7. Surgical gowns are often made of SMS (Spunbond Meltblown Spunbond), a tri laminate nonwoven fabric. The top layer is spunbond polypropylene, the middle layer meltblown polypropylene and the bottom layer again spunbond polypropylene. It can be made with different finishing, for example Soft SMS is soft and noiseless material, has maximum breathability and is highly fluid repellent. Spunlace, also known as hydroentangled, jet entangled or Spunlaced, is another material made of pulp/polyester fibers used for surgical gowns.
8. Surgical masks are made of nonwovens with high bacterial filtration efficiency for maximum protection and when used professionally they need to comply with standard EN14683, where, according to bacterial filtration efficiency, masks are classified to Type I and Type II. Type II is further divided into whether the mask is splash resistant or not. Type IIR signifies splash resistance.

9. Respiratory masks, defined in USA as N95 mask and in Europe FFP mask, prevent the user from inhaling small airborne particles in aerosol-generating procedures. They are made of different type of materials and technology for making them is more challenging than Type I and Type II masks.

Standards and Requirements

10. European standards EN 14683 specifies the requirements for medical face masks and testing methods. EN 149 defines the requirements for respiratory protective devices. EN 13795 defines requirements for surgical clothing and drapes. ASTM International standards F2100 covers requirements for materials used in medical face masks. US standard FDA Class I and Class II for medical devices. Liquid barrier performance classifications are defined by AAMI PB70.

Requirements for surgical gowns (EN13795)

Characteristic	Test method (for normative references see Clause 2)	Unit	Requirement			
			Standard performance		High performance	
			Critical product area	Less critical product area	Critical product area	Less critical product area
Microbial penetration — Dry	EN ISO 22612	CFU	Not required	≤ 300 ^a	Not required	≤ 300 ^a
Microbial penetration — Wet	EN ISO 22610	I_B	≥ 2,8 ^b	Not required	6,0 ^{b c}	Not required
Cleanliness microbial / Bioburden	EN ISO 11737-1	CFU/100 cm ²	≤ 300	≤ 300	≤ 300	≤ 300
Particle release	EN ISO 9073-10	log ₁₀ (lint count)	≤ 4,0	≤ 4,0	≤ 4,0	≤ 4,0
Liquid penetration	EN ISO 811	cm H ₂ O	≥ 30	≥ 10	≥ 100	≥ 10
Bursting strength — Dry	EN ISO 13938-1	kPa	≥ 40	≥ 40	≥ 40	≥ 40
Bursting strength — Wet	EN ISO 13938-1	kPa	≥ 40	Not required	≥ 40	Not required
Tensile strength — Dry	EN 29073-3	N	≥ 15	≥ 15	≥ 20	≥ 20
Tensile strength — Wet	EN 29073-3	N	≥ 15	Not required	≥ 20	Not required

Requirements for medical face masks (EN 14683)

Test	Type I	Type II	Type IIR
Bacteria filtration efficiency (%)	≥ 95	≥ 98	≥ 98
Differential pressure (Pa/cm ²)	< 40	< 40	< 60
Splash resistance pressure (kPa)			≥ 16
Microbial cleanliness (cfu/g)	≤ 30	≤ 30	≤ 30

11. Typical specification for nonwoven fabric for gowns and masks would be:

- Polypropylene nonwoven fabric made by thermal or chemical web bonding
- Commercial terms SMS (Spunbond Meltblow Sponbond), Spunbond, Spunlace, etc.
- Weight 40 g/m²
- Type I or Type II (IIR) requirements

Nonwoven Industry Associations

African Textiles

<https://africantextiles.africa/directory/>

ANNA, All Nippon Nonwoven Association

<https://www.anna.gr.jp/eng/>

ANFA, Asia Nonwoven Fabric Association:

https://www.asianonwovens.org/members_list06.html

CNITA, China Nonwovens and Industrial Textiles Association

<http://www.cnita.org.cn/en/>

EDANA, is the global association for nonwovens, located in Brussels. Members:

<https://www.edana.org/about-us/members>

INDA, Association of Nonwoven Fabrics Industry, located in North Carolina. Members:

<https://www.inda.org/indamembers/select.php>

Nonwovens Industry:

<https://www.nonwovens-industry.com/buyersguide/associations>

Nonwoven Association of South Africa

<https://africantextiles.africa/directory/>

Taiwan Nonwovens Fabric Industry Association

<http://www.nonwoven.org.tw/index.php>

Turkish Exporter

<https://www.turkishexporter.net/en/company-tags/nonwoven>