

by Giovanni Tanchis

the pioneers

REFERENCE BOOKS OF TEXTILES TECHNOLOGIES

INDEX

| | |
|---|-----------|
| Chapter 1 – Generalities | 11 |
| 1.1 Definition of the term “nonwoven” | 11 |
| 1.2 Historical outline | 12 |
| 1.3 Application sectors | 14 |
| Chapter 2 – Production processes | 17 |
| 2.1 The raw materials | 17 |
| 2.1.1 Properties of the fibres..... | 22 |
| 2.1.2 The evolution of the fibres..... | 24 |
| 2.2 The manufacture of nonwovens | 27 |
| 2.3 The production of drylaid webs..... | 29 |
| 2.3.1 Fibre opening..... | 29 |
| 2.3.2 Fibre oiling | 38 |
| 2.3.3 Carding | 39 |
| 2.3.4 Garnett machine..... | 44 |
| 2.3.5 Carding machine..... | 45 |
| 2.4 Folding systems | 49 |
| 2.5 Drawing machines | 50 |
| 2.6 Web formation by vertical folding | 50 |
| 2.7 The airlaying process..... | 51 |
| 2.7.1 Characteristics of raw material and fibre preparation | 52 |
| 2.7.2 Technology of airlaying processes | 55 |
| 2.7.3 Evolution of airlaying processes | 63 |
| 2.7.4 Air flow and fibre dynamics in airlaying processes | 64 |
| 2.7.5 Web bonding | 65 |
| 2.7.6 Physical properties and practical applications of airlaid nonwovens | 66 |
| 2.8 Production of wetlaid webs | 67 |
| 2.8.1 Raw materials | 69 |
| 2.8.2 Preparation of raw materials..... | 73 |
| 2.8.3 Technology of web forming process | 74 |
| 2.8.4 Bonding systems..... | 77 |
| 2.8.5 Finishing treatments | 79 |
| 2.9 Web formation by direct spinning..... | 79 |
| 2.9.1 Raw materials | 80 |
| 2.9.2 Nonwoven production by direct spinning | 83 |
| 2.9.3 Extrusion spinning..... | 84 |
| 2.9.4 Spunbond production systems..... | 87 |
| 2.9.5 Process variables | 93 |
| 2.9.6 Structure and properties of spunbond nonwovens..... | 97 |
| 2.10 Production of meltblown nonwovens..... | 99 |
| 2.10.1 Process technology | 100 |
| 2.10.2 Studies on process parameters..... | 100 |
| 2.10.3 Characteristics and properties of meltblown nonwovens..... | 102 |

| | | |
|--------|--|-----|
| 2.11 | Composite fabrics and other extrusion processes..... | 103 |
| 2.11.1 | Coform®..... | 103 |
| 2.11.2 | Flashspinning..... | 103 |
| 2.11.3 | Electro-spinning | 104 |
| 2.11.4 | Centrifugal spinning system..... | 107 |
| 2.11.5 | Future trends..... | 107 |

Chapter 3 – Bonding methods 108

| | | |
|-------|---|-----|
| 3.1 | Mechanical bonding | 108 |
| 3.1.1 | Stitchbonding or needlebonding | 108 |
| 3.1.2 | Recent developments in stitchbonding..... | 116 |
| 3.2 | Needlepunching | 117 |
| 3.2.1 | Technology of the needlepunching process..... | 122 |
| 3.3 | Bonding by hydroentangling | 127 |
| 3.3.1 | Technology of the hydroentangling process | 135 |
| 3.3.2 | Multilayer (composite) hydroentangled nonwovens | 143 |
| 3.4 | Thermobonding | 144 |
| 3.4.1 | Materials | 145 |
| 3.4.2 | Calender (contact) bonding | 147 |
| 3.4.3 | “Through-air” and impingement bonding | 152 |
| 3.4.4 | Ultrasound bonding | 154 |
| 3.5 | Chemical bonding..... | 155 |
| 3.5.1 | Chemical binders | 156 |
| 3.5.2 | Mechanism of chemical bonding..... | 161 |
| 3.5.3 | Binder application methods | 163 |
| 3.5.4 | Drying..... | 168 |

Chapter 4 – Finishing of nonwovens..... 172

| | | |
|-------|--|-----|
| 4.1 | Wet finishing treatments..... | 172 |
| 4.2 | Chemical finishes | 174 |
| 4.2.1 | Methods for chemical finishes application..... | 175 |
| 4.3 | Mechanical finishing treatments..... | 178 |
| 4.4 | Emerging technologies | 182 |
| 4.5 | Cutting and winding | 183 |

Chapter 5 – Characterization of nonwovens..... 194

| | | |
|-------|---|-----|
| 5.1 | Norms for nonwoven analysis | 194 |
| 5.1.1 | Norms for medical nonwovens..... | 194 |
| 5.1.2 | Norms for air filtration | 194 |
| 5.2 | Characterization of nonwoven structure – Generalities | 194 |
| 5.3 | Characterization of bonding structure | 196 |
| 5.3.1 | Needlepunched nonwovens | 196 |
| 5.3.2 | Wetlaid nonwovens | 197 |
| 5.3.3 | Stitchbonded nonwovens..... | 197 |
| 5.3.4 | Thermobonded nonwovens | 198 |
| 5.3.5 | Chemically bonded nonwovens..... | 198 |
| 5.4 | Measurement of basic parameters | 198 |

| | |
|---|------------|
| Chapter 6 – Nonwoven applications | 205 |
| 6.1 The products | 205 |
| 6.2 The “intelligent” nonwovens – The new applications..... | 207 |
| 6.2.1 Biodegradable nonwovens..... | 207 |
| 6.2.2 Medical nonwovens | 212 |
| 6.2.3 Nonwovens against electromagnetic pollution..... | 219 |
| 6.2.4 Protection against radiations..... | 221 |
| 6.2.5 Nonwovens with thermoregulating properties | 222 |
| 6.2.6 Tridimensional textiles | 222 |
| | |
| Multilingual dictionary | 224 |