North American Nonwovens Industry Outlook, 2016-2021

A Review and Forecast of the North American Nonwovens Supply and Demand for 2011, 2016 and 2021
Foreword

This is INDA’s tenth report analyzing the nonwovens industry of North America. This report presents detailed supply and demand data for the North American nonwovens industry for 2011 and 2016, and a forecast for 2021. Specifically the goals of the report were to:

- Provide baseline economic and demographic trends, as they are significant drivers of demand within the North American nonwovens industry;
- Develop industry consumption figures by sales, units, square meters, and tonnage for nonwoven materials in 11 end use markets and their numerous subcategories (255) for 2011 and 2016, and provide a forecast for 2021;
- Explain industry trends within the end-use markets;
- Provide an overall picture of the North American supply side by analyzing the key metrics of capacity (1990–2016), production including operating rates (2006–2016), and trade flow data (2006–2016); and
- Define and clarify end use market segmentation and production processes to provide greater precision in categorizing the industry.

INDA has undertaken this study to fulfill the element of its mission to provide credible statistics to its members and the overall industry. This information is intended to assist those in the nonwovens industry in making better business decisions. While no study is perfect, INDA has devoted considerable time, knowledge, reach, and resources to make this the most accurate and most comprehensive analysis of the total North American nonwovens industry.

It is INDA’s intention to continue to improve the quality of data and industry information with each report. Your comments are welcome on information you would like included in future reports of the nonwoven industry in North America. Please feel free to contact either of us regarding any aspect of this report.

Dave Rousse, President
INDA, Association of the Nonwoven Fabrics Industry
drousse@inda.org
919.459.3730

Brad Kalil, Director of Market Research and Statistics
INDA, Association of the Nonwoven Fabrics Industry
bkalil@inda.org
919.459.3734
# TABLE OF CONTENTS

### I. Executive Summary

1

### II. Economic and Population Drivers

5

A. North American Economic Growth

7

1. United States

7

2. Canada

10

3. Mexico

11

4. Country Comparison

12

B. North American Population

14

1. Age Cohorts

15

   Babies and Toddlers (Age 0 – 4 Years)

   16

   Females Age 13 – 51

   18

   The Elderly (65+)

   19

2. Population Pyramids

21

### III. North American Nonwoven Demand

23

A. Disposable Applications Demand

30

1. Absorbent Hygiene

38

   Consumer

41

   Baby Diapers and Training Pants

43

   Incontinence Products

50

   Feminine Hygiene

58

   Institutional

62

2. Wipes

67

   Consumer Wipes

74

   Baby

79

   Home Care

82

   Personal Care

89
Industrial and Institutional Wipes ........................................... 96
Industrial/Commercial: General ........................................... 100
Industrial: Specialty ......................................................... 103
Institutional: Food Service and Hospitality ............................ 107
Institutional: Healthcare/Medical ......................................... 110

3. Filtration ........................................................................... 114
   Air Filtration ................................................................... 122
      Industrial Air ................................................................ 126
      Transportation ............................................................ 130
      Commercial Air Systems ............................................ 134
      Residential Locations ................................................ 138
      Personal Protection .................................................... 141
      Vacuum Cleaner Bags ................................................ 144
   Liquid Filtration ................................................................ 146
      Transportation ............................................................ 152
      Industrial / Manufacturing ........................................... 152
      Water ........................................................................ 153

4. Medical/Surgical ................................................................ 154
   Surgical Packs and Gowns ............................................. 165
   Other Apparel ................................................................. 168
   Sterile Packaging/Sterilization Wrap ................................. 170
   Wound Care .................................................................... 172

5. Other Disposable Applications ........................................... 175
   Personal Protective Equipment ....................................... 176
   Sorbents ........................................................................ 179
   Cleaning/Scrub and Abrasive/Polishing Discs/Pads .......... 179
   Packaging ....................................................................... 180

B. Durable Applications Demand ........................................... 184
   1. Building Construction .................................................. 192
      Building Construction Markets — Residential and Nonresidential
      .................................................................................. 193
New Residential Starts

New and Existing-Home Sales... Repair & Remodel

Nonresidential-Building Construction

Nonwovens in Building Construction

Roofing

Underlayment

Other Building Construction Materials

2. Home and Office Furnishings

Floor Coverings

Woven and Tufted Carpet Backing

Underpads/Underlay and Floor Protectors

Floor Entrance/Walk-Off Mats

Upholstered Furnishing

Bedding

Other Furnishings

3. Vehicle Construction

Light Vehicles

Nonwovens in Vehicle Construction

Other Transportation Modes

4. Geosynthetics

Civil Engineering

Geotextiles for Road Applications

Geotextiles for Other Applications

Cured-in-Place Pipe

Agriculture

Agricultural Crop Covers/Shading

Landscape Fabrics

Root Bags

5. Apparel

6. Other Durable Applications
IV. North American Nonwoven Supply ................................................................. 288

A. Capacity ........................................................................................................ 288
   1. Historical Perspective ............................................................................. 289
   2. Previous Years’ Comparisons ................................................................. 291

B. Production .................................................................................................... 297
   1. Historical Perspective ............................................................................. 298
   2. Previous Years’ Comparisons ................................................................. 301

C. Trade Flows ................................................................................................. 304
   1. United States Trade .............................................................................. 304
   2. North American Intra-Region Trade ................................................... 306
      Mexico ................................................................................................... 306
      Canada .................................................................................................. 308
   3. North America Inter-Region Trade ....................................................... 311
      Exports ................................................................................................. 311
      Imports ................................................................................................. 315

D. Overall North American Trade Flows ....................................................... 320

V. Final Thoughts ............................................................................................ 321

VI. Appendix .................................................................................................... 322

A. Methodology ............................................................................................... 322
   1. Demand Model ..................................................................................... 322
   2. Supply Model ....................................................................................... 325

B. Nonwoven Material Definitions ................................................................. 326

C. Nonwoven End Use Classifications and Definitions ................................. 329
LIST OF FIGURES

II. Economic and Population Drivers

II-1 Relative Sizes of North American Economies, 2016 .............................................. 7
II-2 Annual Growth of Real GDP in the United States, 2011–2021 .................................. 8
II-3 Annual Growth of Real GDP in Canada, 2011–2021 ................................................. 10
II-4 Annual Growth of Real GDP in Mexico, 2011–2021 .................................................. 12
II-6 Relative Sizes of North American Populations, 2016 .............................................. 14
II-7 North American Population by Country, Historical and Forecast ......................... 15
II-8 Total Number of Babies and Toddlers (0–4 Years) by Country, Historical and Forecast ................................................................. 17
II-9 Total Number Females (13–51 Years) by Country, Historical and Forecast .......... 18
II-10 Total Population and Elderly (65+ Years) by Country, Historical and Forecast .... 20
II-11 U.S./Canada Population Pyramid, 2011 ................................................................. 21
II-12 Mexico Population Pyramid, 2011 ......................................................................... 21
II-13 U.S./Canada Population Pyramid, 2016 ................................................................. 22
II-14 Mexico Population Pyramid, 2016 ......................................................................... 22
II-16 Mexico Population Pyramid, 2021f ........................................................................ 22

III. North American Nonwoven Demand

III-1 North American Nonwovens Market, Dollar Sales, 2016 ........................................ 24
III-2 North American Nonwovens Market, Square Meters, 2016 ................................... 25
III-3 North American Nonwovens Market, Tonnage, 2016 ............................................ 25
III-4 North American Nonwoven Material Consumption, 2016 ...................................... 26
III-5 North American Nonwoven Material Consumption, Historical and Forecast ....... 27
III-6 North American Nonwovens Square Meters Usage Market Sizes and Growth .... 28
III-7 North American Nonwovens Tonnage Usage Market Sizes and Growth ............. 29
III A. Disposable Applications Demand

III A-1 North American Disposable Nonwovens Market, End-Use Dollar Sales, Historical and Forecast.......................................................... 30

III A-2 North American Disposable Nonwovens Market, End-Use Unit Sales, Historical and Forecast.......................................................... 32

III A-3 Disposable Nonwoven Material Consumption by End-Use, 2016 ................. 33

III A-4 Disposable Nonwoven Material Consumption, Historical and Forecast ........ 35

III A-5 North American Disposable Nonwovens Square Meter Usage Market Sizes and Growth by End-Use.................................................... 36

III A-6 North American Disposable Nonwovens Tonnage Usage Market Sizes and Growth by End-Use.................................................... 37

III A-7 North American Absorbent Hygiene Market, Category Dollar Sales, Historical and Forecast.......................................................... 40

III A-8 North American Absorbent Hygiene Market, Category Unit Sales, Historical and Forecast.......................................................... 42

III A-9 Consumer Absorbent Hygiene Nonwoven Material Consumption by Category, 2016 ................................................................. 43

III A-10 Total Number of U.S. Births, 1950–2021 .................................................. 44

III A-11 Total Potential Children in Diapers, United States and Canada, Historical and Forecast................................................................. 45

III A-12 Total Potential Children in Diapers, Mexico, Historical and Forecast ........ 45

III A-13 Disposable Baby Diapers and Training Pants Demand, Units, Historical and Forecast................................................................. 47

III A-14 Baby Diapers and Training Pants Nonwoven Material Consumption, Historical and Forecast.......................................................... 50

III A-15 Adult Population (18–64 years and Non-Institutionalized 65+ years) Total Population and Population Impacted by Incontinence Issues........... 52

III A-16 Adult Population (18–64 years and Non-Institutionalized 65+ years) Impacted by Incontinence Issues and Product Usage ........................ 54

III A-17 North American Consumer Incontinence Market, Category Unit Sales, Historical and Forecast.......................................................... 55

III A-18 Consumer Incontinence Product Material Consumption, Historical and Forecast................................................................. 57
IIA-19 Female Population (13-51 years) Total Population and Disposable Feminine Hygiene Product Usage

IIA-20 Disposable Feminine Hygiene Product Demand, Units, Historical and Forecast

IIA-21 Consumer Feminine Hygiene Product Material Consumption, Historical and Forecast

IIA-22 Institutionalized Adult Population (65+ years) Total Population and Population Impacted by Incontinence Issues

IIA-23 North American Institutionalized Incontinence Market, Category Unit Sales, Historical and Forecast

IIA-24 Institutional Absorbent Hygiene Product Material Consumption, Historical and Forecast


IIA-26 North American Wipes Market Unit Sales to End Users, 2016

IIA-27 North American Wipes Market, Segment Dollar Sales, Historical and Forecast

IIA-28 North American Wipes Market, Segment Unit Sales, Historical and Forecast

IIA-29 Wipes Nonwoven Material Consumption, Historical and Forecast

IIA-30 North American Consumer Wipes Market, Category Dollar Sales, Historical and Forecast

IIA-31 North American Consumer Wipes Market, Category Unit Sales, Historical and Forecast

IIA-32 Consumer Wipes Nonwoven Material Consumption by Category, 2016

IIA-33 North American Baby Wipes Market, Category Unit Sales, Historical and Forecast

IIA-34 Baby Wipes Nonwoven Material Consumption, Historical and Forecast

IIA-35 North American Home Care Wipes Market, Category Unit Sales, Historical and Forecast

IIA-36 Home Care Wipes Nonwoven Material Consumption, Historical and Forecast

IIA-37 North American Personal Care Wipes Market, Category Unit Sales, Historical and Forecast

IIA-38 Personal Care Wipes Nonwoven Material Consumption, Historical and Forecast
IIIA-39 North American Industrial/Institutional Wipes Market,
Category Unit Sales, 2016 ............................................................... 96

IIIA-40 North American Industrial/Institutional Wipes Market, Category Dollar Sales
Historical and Forecast................................................................. 98

IIIA-41 North American Industrial/Institutional Wipes Market, Category Unit Sales,
Historical and Forecast................................................................. 98

IIIA-42 Industrial/Institutional Wipes Nonwoven Material Consumption
by Category, 2016 ......................................................................... 100

IIIA-43 North American General Industrial/Commercial Wipes Market, Unit Sales,
Historical and Forecast................................................................. 101

IIIA-44 General Industrial/Commercial Wipes Nonwoven Material Consumption,
Historical and Forecast................................................................. 102

IIIA-45 North American Specialty Industrial Wipes Market, Category Unit Sales,
Historical and Forecast................................................................. 105

IIIA-46 Specialty Industrial Wipes Nonwoven Material Consumption,
Historical and Forecast................................................................. 106

IIIA-47 North American Food Service and Hospitality Wipes Market
Unit Sales, Historical and Forecast.................................................. 107

IIIA-48 Food Service and Hospitality Wipes
Nonwoven Material Consumption, Historical and Forecast.................. 109

IIIA-49 North American Institutional: Healthcare/Medical Wipes Market,
Category Unit Sales, Historical and Forecast........................................ 111

IIIA-50 Institutional Healthcare/Medical Wipes Nonwoven Material Consumption
Historical and Forecast................................................................... 113

IIIA-51 North American Filtration Market, Segment Dollar Sales,
Historical and Forecast................................................................... 118

IIIA-52 Filtration Nonwoven Material Consumption, Historical and Forecast........... 121

IIIA-53 North American Air Filtration Market, Category Unit Sales,
Historical and Forecast................................................................... 123

IIIA-54 Air Filtration Nonwoven Material Consumption by Category, 2016........... 125

IIIA-55 Air Filtration Nonwoven Material Consumption, Historical and Forecast ....... 126

IIIA-56 Industrial/Manufacturing Air Filtration Nonwoven Material Consumption,
Historical and Forecast................................................................... 130
IIIA-57 Transportation Air Filtration Nonwoven Material Consumption, Historical and Forecast ................................................................. 134

IIIA-58 Commercial Air Systems Air Filtration Nonwoven Material Consumption Historical and Forecast ......................................................... 137

IIIA-59 Residential Locations Air Filtration Nonwoven Material Consumption Historical and Forecast ......................................................... 141

IIIA-60 Personal Protection Air Filtration Nonwoven Material Consumption, Historical and Forecast ......................................................... 144

IIIA-61 Vacuum Cleaner Bag Air Filtration Nonwoven Material Consumption, Historical and Forecast ......................................................... 146

IIIA-62 Liquid Filtration Nonwoven Material Consumption by Category, 2016 ............... 150

IIIA-63 Liquid Filtration Nonwoven Material Consumption, Historical and Forecast ..... 151

IIIA-64 North American Disposable Medical/Surgical Market, Category Dollar Sales, 2016 ........................................................................ 156

IIIA-65 National and State Healthcare-Associated Infections Progress Report, 2016 ..... 161

IIIA-66 Medical/Surgical Nonwoven Material Consumption by Category, 2016 ........... 162

IIIA-67 North American Medical/Surgical Market, Category Dollar Sales, Historical and Forecast ................................................................. 163

IIIA-68 Medical/Surgical Nonwoven Material Consumption, Historical and Forecast .... 165

IIIA-69 Surgical Packs and Gowns Nonwoven Material Consumption, Historical and Forecast ........................................................................ 167

IIIA-70 Medical and Surgical Other Apparel Nonwoven Material Consumption, Historical and Forecast ................................................................. 169

IIIA-71 Medical and Surgical Sterile Packaging and Sterilization Wrap Nonwoven Material Consumption, Historical and Forecast ......................... 171

IIIA-72 Medical and Surgical Wound Care Nonwoven Material Consumption, Historical and Forecast ................................................................. 174

IIIA-73 North American Other Disposable Applications Market, Category Dollar Sales, Historical and Forecast ................................................................. 177

IIIA-74 Other Disposable Applications Nonwoven Material Consumption, Historical and Forecast ........................................................................ 183
IIIB. **Durable Applications Demand**

IIIB-1 North American Durable Nonwovens Market, End-Use Tonnage Consumption, Historical and Forecast ........................................ 186

IIIB-2 North American Durable Nonwovens Market, End-Use Square Meter Consumption, Historical and Forecast ........................................ 187

IIIB-3 Durable Nonwoven Material Consumption by End-Use, 2016 ................................ 188

IIIB-4 Durable Nonwoven Material Consumption, Historical and Forecast ................ 189

IIIB-5 North American Durable Nonwovens Tonnage Usage Market Sizes and Growth by End-Use, ................................................................. 190

IIIB-6 North American Durable Nonwovens Square Meter Usage Market Sizes and Growth by End-Use ............................................................... 191

IIIB-7 United States Value of Building Construction Put in Place, 2002–2016 .......... 194


IIIB-9 U.S. and Canada New Residential Starts, Historical and Forecast ................. 197

IIIB-10 U.S. Housing Sales, 2000–2016 .................................................................. 200

IIIB-11 U.S. Housing Sales, Historical and Forecast .................................................. 201

IIIB-12 U.S. Home Improvement and Repair Spending, Historical and Forecast ........ 203

IIIB-13 U.S. Home Improvement Spending, 2010–2015 ........................................... 204

IIIB-14 United States Value of Nonresidential Building Construction Put in Place, Historical and Forecast ........................................................................ 205

IIIB-15 Building Construction Nonwoven Material Consumption by Category, 2016 .......................................................... 206

IIIB-16 Building Construction Nonwoven Material Consumption, Historical and Forecast ......................................................................................... 208

IIIB-17 Building Construction – Roofing Nonwoven Material Consumption, Historical and Forecast ........................................................................ 211

IIIB-18 Building Construction – Underlayment Nonwoven Material Consumption, Historical and Forecast .................................................................... 214

IIIB-19 Building Construction – Other Materials Nonwoven Material Consumption, Historical and Forecast .................................................................. 216

IIIB-20 U.S. Real Gross Domestic Product Components, Historical and Forecast ........ 219
IIIB-21 Home and Office Furnishings Nonwoven Material Consumption by Category, 2016 ................................................................. 221
IIIB-22 Home and Office Furnishings Nonwoven Material Consumption, Historical and Forecast .............................................................. 222
IIIB-23 Home and Office Furnishings - Floor Coverings Nonwoven Material Consumption by Category, 2016 ............................................. 224
IIIB-24 Home and Office Furnishings - Floor Coverings Nonwoven Material Consumption, Historical and Forecast .............................. 227
IIIB-25 Home and Office Furnishings - Upholstered Furniture Nonwoven Material Consumption, Historical and Forecast .......................... 230
IIIB-26 Home and Office Furnishings – Bedding Nonwoven Material Consumption by Category, 2016 ............................................................... 232
IIIB-27 Home and Office Furnishings – Bedding Nonwoven Material Consumption, Historical and Forecast ........................................... 233
IIIB-28 Home and Office Furnishings - Other Furnishings Nonwoven Material Consumption by Category, 2016 ................................................. 235
IIIB-29 Home and Office Furnishings - Other Furnishings Nonwoven Material Consumption, Historical and Forecast ............................. 237
IIIB-30 Vehicle Construction Nonwoven Material Consumption by Category, 2016 ................................................................. 240
IIIB-31 Vehicle Construction Nonwoven Material Consumption, Historical and Forecast ................................................................. 241
IIIB-32 North American Vehicle Sales, Historical and Forecast ................................................................. 243
IIIB-33 North American Light Vehicle Production, Historical and Forecast ................................................................. 245
IIIB-34 Vehicle Construction Automobiles and Light Truck Nonwoven Material Consumption, Historical and Forecast ................................. 254
IIIB-35 Vehicle Construction - Other Transportation Modes Nonwoven Material Consumption, Historical and Forecast ................................. 257
IIIB-36 Geosynthetics Nonwoven Material Consumption by Category, 2016 ................................................................. 259
IIIB-37 Geosynthetics Nonwoven Material Consumption, Historical and Forecast ................................................................. 260
IIIB-38 United States Value of Nonresidential Construction Put in Place, Historical and Forecast ................................................................. 262
IIIB-39 Geosynthetics – Civil Engineering Nonwoven Material Consumption by Category, 2016 ................................................................. 263
IIIB-40  Geosynthetics – Civil Engineering Nonwoven Material Consumption, Historical and Forecast................................................................. 272

IIIB-41  Geosynthetics – Agriculture Nonwoven Material Consumption by Category, 2016 ................................................................. 273

IIIB-42  Geosynthetics – Agriculture Nonwoven Material Consumption, Historical and Forecast................................................................. 276

IIIB-43  Apparel Nonwoven Material Consumption, Historical and Forecast .......... 282

IIIB-44  Other Disposable Applications Material Consumption, Historical and Forecast................................................................. 287

IV. North American Nonwoven Supply

IV-1  Capacity by Process, Tonnes, 2016 ................................................................. 288

IV-2  Capacity by Region, Tonnes, 2016 ................................................................. 288

IV-3  North American Capacity by Process, Tonnes, 1990–2016, 5-Year Periods ...... 290

IV-4  North American Capacity by Process, Tonnes, 2010–2016, Yearly ............ 292

IV-5  Capacity by Detailed Process, Tonnes, 2016 ................................................................. 293


IV-7  North American Capacity, Production and Operating Rate, Tonnes 2005, 2010, 2016........................................................................................................................................ 299


IV-9  North American Capacity, Production and Operating Rate, Tonnes, 2013–2016 ........................................................................................................................................ 301

IV-10  North American Capacity, Production and Operating Rate by Process, Tonnes, 2016–2016........................................................................................................................................ 303


IV-14  U.S. Nonwoven Roll Goods Imports from Mexico by Weight, Tonnes, 2006–2016 ........................................................................................................................................ 308

IV-17  U.S. Nonwoven Roll Goods Imports from Canada by Weight, Tonnes, 2006–2016 ................................................................. 310
IV-25  2016 North American Nonwoven Rolled Goods Trade Flow by Region Map ...... 320
LIST OF TABLES

II. Economic and Population Drivers
II-1 Annual Growth of Real GDP in North America by Country, Historical and Forecast ....................................................... 13

III. North American Nonwoven Demand
III-1 North American Nonwoven Market Nonwoven Material Consumption by Disposable and Durable, Historical and Forecast .................................................. 25

IIIA. Disposable Applications Demand
IIIA-1 North American Disposable Nonwoven Markets Sales and Units by End-Use, Historical and Forecast ...................................................... 31
IIIA-2 North American Disposable Nonwoven Markets Nonwoven Material Consumption by End-Use, Historical and Forecast ................. 34
IIIA-3 North American Absorbent Hygiene Market Sales and Units by Category, Historical and Forecast ..................................................... 39
IIIA-4 North American Absorbent Hygiene Market Nonwoven Material Consumption by Category, Historical and Forecast ................. 41
IIIA-5 Diaper Changes per Day by Age by Region, Historical and Forecast ................. 46
IIIA-6 North American Disposable Diaper and Training Pants Market Profile Annual Growth Rates, Historical and Forecast ............................................. 47
IIIA-7 Absorbent Hygiene Diaper and Training Pant Market Sales and Units by Category, Historical and Forecast ......................... 48
IIIA-8 North American Diaper and Training Pant Market Nonwoven Material Consumption by Category, Historical and Forecast ................. 49
IIIA-9 Absorbent Hygiene Consumer Incontinence Market Sales and Units by Category, Historical and Forecast ......................... 56
IIIA-10 North American Consumer Incontinence Market Nonwoven Material Consumption by Category, Historical and Forecast ................. 57
IIIA-11 Absorbent Hygiene Consumer Feminine Hygiene Market Sales and Units by Category, Historical and Forecast ......................... 60
IIIA-12 North American Consumer Feminine Hygiene Market Nonwoven Material Consumption by Category, Historical and Forecast ................. 61
IIIA-13 Institutional Absorbent Hygiene Market
Sales and Units by Category, Historical and Forecast................................. 64

IIIA-14 North American Institutional Hygiene Market
Nonwoven Material Consumption by Category, Historical and Forecast.......... 66

IIIA-15 North American Wipes Market
Sales and Units by Segment, Historical and Forecast................................. 69

IIIA-16 North American Wipes Market
Nonwoven Material Consumption by Segment, Historical and Forecast......... 73

IIIA-17 North American Consumer Wipes Market
Sales and Units by Category, Historical and Forecast................................. 75

IIIA-18 North American Consumer Wipes Market
Nonwoven Material Consumption by Category, Historical and Forecast......... 77

IIIA-19 North American Baby Wipes Market
Sales and Units by Category, Historical and Forecast................................. 80

IIIA-20 North American Baby Wipes Market
Nonwoven Material Consumption by Category, Historical and Forecast......... 81

IIIA-21 North American Home Care Wipes Market
Sales and Units by Category, Historical and Forecast................................. 82

IIIA-22 North American Home Care Wipes Market
Nonwoven Material Consumption by Category, Historical and Forecast......... 84

IIIA-23 North American Personal Care Wipes Market
Sales and Units by Category, Historical and Forecast................................. 89

IIIA-24 North American Personal Care Wipes Market
Nonwoven Material Consumption by Category, Historical and Forecast......... 91

IIIA-25 North American Industrial/Institutional Wipes Market
Sales and Units by Segment, Historical and Forecast................................. 97

IIIA-26 North American Industrial/Institutional Wipes Market
Nonwoven Material Consumption by Segment, Historical and Forecast......... 99

IIIA-27 North American Specialty Industrial Wipes Market
Sales and Units by Category, Historical and Forecast................................. 104

IIIA-28 North American Specialty Industrial Wipes Market
Nonwoven Material Consumption by Category, Historical and Forecast......... 106

IIIA-29 North American Institutional Healthcare/Medical Wipes Market
Sales and Units by Category, Historical and Forecast................................. 110
IIIA-30 North American Institutional Healthcare/Medical Wipes Market
Nonwoven Material Consumption by Category, Historical and Forecast.......... 113

IIIA-31 North American Filtration Market
Sales by Segment, Historical and Forecast........................................... 117

IIIA-32 North American Filtration Market
Nonwoven Material Consumption by Segment, Historical and Forecast.......... 120

IIIA-33 North American Air Filtration Market
Sales and Units by Category, Historical and Forecast............................... 122

IIIA-34 North American Air Filtration Market
Nonwoven Material Consumption by Category, Historical and Forecast.......... 124

IIIA-35 North American Industrial Air Filtration Market
Sales and Units, Historical and Forecast.............................................. 127

IIIA-36 North American Industrial Air Filtration Market
Nonwoven Material Consumption, Historical and Forecast.......................... 129

IIIA-37 Number of North American Vehicles by Region, Historical and Forecast......... 131

IIIA-38 North American Transportation Air Filtration Market
Sales and Units by Category, Historical and Forecast............................... 132

IIIA-39 North American Transportation Air Filtration Market
Nonwoven Material Consumption by Category, Historical and Forecast.......... 133

IIIA-40 North American Commercial Air Systems Filtration Market
Sales and Units by Category, Historical and Forecast............................... 136

IIIA-41 North American Commercial Air Systems Filtration Market
Nonwoven Material Consumption by Category, Historical and Forecast.......... 137

IIIA-42 Number of North American Housing Units, Historical and Forecast.................. 138

IIIA-43 North American Residential Locations Air Filtration Market
Sales and Units by Category, Historical and Forecast............................... 139

IIIA-44 North American Residential Locations Air Filtration Market
Nonwoven Material Consumption by Category, Historical and Forecast.......... 140

IIIA-45 North American Personal Protection Air Filtration Market
Sales and Units by Category, Historical and Forecast............................... 142

IIIA-46 North American Personal Protection Air Filtration Market
Nonwoven Material Consumption by Category, Historical and Forecast.......... 143

IIIA-47 North American Vacuum Cleaner Bag Air Filtration Market
Sales and Units, Historical and Forecast............................................ 145
IIIA-48 North American Vacuum Cleaner Bag Air Filtration Market
Nonwoven Material Consumption, Historical and Forecast......................... 145

IIIA-49 North American Liquid Filtration Market Sales ................................ 148

IIIA-50 North American Liquid Filtration Market
Nonwoven Material Consumption by Category, Historical and Forecast........... 149

IIIA-51 North American Healthcare Facility Usage by Process,
Historical and Forecast............................................................................. 159

IIIA-52 North American Disposable Medical/Surgical Market
Sales and Units by Category, Historical and Forecast................................. 163

IIIA-53 North American Disposable Medical/Surgical Market
Nonwoven Material Consumption by Category, Historical and Forecast......... 164

IIIA-54 North American Surgical Packs and Gowns Market
Sales and Units, Historical and Forecast.................................................... 166

IIIA-55 North American Surgical Packs and Gowns Market
Nonwoven Material Consumption, Historical and Forecast........................ 168

IIIA-56 North American Medical and Surgical Other Apparel Market
Sales and Units, Historical and Forecast..................................................... 168

IIIA-57 North American Medical and Surgical Other Apparel Market
Nonwoven Material Consumption, Historical and Forecast......................... 169

IIIA-58 North American Medical/Surgical Sterile Packaging and Sterilization Wrap
Market Sales and Units, Historical and Forecast.......................................... 170

IIIA-59 North American Medical/Surgical Sterile Packaging and Sterilization Wrap
Market Nonwoven Material Consumption, Historical and Forecast ............... 171

IIIA-60 North American Medical and Surgical Wound Care Market
Sales and Units, Historical and Forecast.................................................... 173

IIIA-61 North American Medical and Surgical Wound Care Market
Nonwoven Material Consumption, Historical and Forecast......................... 174

IIIA-62 North American Other Disposable Applications Market
Sales and Units by Category, Historical and Forecast................................. 176

IIIA-63 North American Other Disposable Applications Market
Nonwoven Material Consumption by Category, Historical and Forecast........... 182
IIIB. Durable Applications Demand

IIIB-1 North American Durable Nonwoven Markets
Nonwoven Material Consumption by End-Use, Historical and Forecast ............. 185

IIIB-2 North American Building Construction Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 207

IIIB-3 North American Building Construction – Roofing Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 209

IIIB-4 North American Building Construction – Underlayment Market
Nonwoven Material Consumption, Historical and Forecast .............................. 213

IIIB-5 North American Building Construction – Other Materials Market
Nonwoven Material Consumption, Historical and Forecast .............................. 216

IIIB-6 North American Home and Office Furnishings Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 220

IIIB-7 North American Home and Office Furnishings – Floor Coverings Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 226

IIIB-8 North American Home and Office Furnishings – Upholstered Furniture Market
Nonwoven Material Consumption, Historical and Forecast .............................. 228

IIIB-9 North American Mattress and Foundation Consumption, Units,
Historical and Forecast .................................................................................. 231

IIIB-10 North American Home and Office Furnishings – Bedding Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 234

IIIB-11 North American Home and Office Furnishings – Other Furnishings Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 236

IIIB-12 North American Transportation Market
Nonwoven Material Consumption by Segment, Historical and Forecast ............. 241

IIIB-13 North American Light Vehicle Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 253

IIIB-14 North American Other Transportation Market
Nonwoven Material Consumption, Historical and Forecast .............................. 256

IIIB-15 North American Geosynthetic Market
Nonwoven Material Consumption by Segment, Historical and Forecast ............. 260

IIIB-16 North American Geosynthetic – Civil Engineering Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 271
IIIB-17 North American Geosynthetic – Agriculture Market
Nonwoven Material Consumption by Category, Historical and Forecast ............. 274

IIIB-18 North American Apparel Market
Nonwoven Material Consumption, Historical and Forecast ................................. 281

IIIB-19 North American Other Durables Market
Nonwoven Material Consumption, Historical and Forecast ................................. 283

IV. North American Nonwoven Supply

IV-1 North American Capacity Annual Growth Rates by Process, 1990–2016,
5-Year Periods ........................................................................................................ 291


IV-5 North American Annual Net Capacity Additions by Line Type, 2011–2016 ...... 297

IV-6 North American Capacity, Production, and U.S. GDP Growth Rates,
Five-Year Periods, 2005–2016 .................................................................................. 298

IV-7 North American Production Annual Growth Rates by Process,
Five-Year Periods, 2005–2016 .................................................................................. 299

IV-8 North American Capacity, Production, and U.S. GDP Growth Rates,
2013–2016 .................................................................................................................. 301

IV-9 North American Capacity and Production Growth Rates by Process, 2016 ...... 302

IV-10 Top 10 Countries for North American Exports Yearly Comparison,
2006, 2015, 2016 ........................................................................................................ 313

IV-11 Top 10 Countries Importing to North America Yearly Comparison,
2006, 2015, 2016 ........................................................................................................ 317
2. Wipes

End Use Comprises:

► Consumer Wipes
  ► Baby
    – Standard
    – Premium
  ► Home Care
    – Disinfecting
    – General-Purpose Cleaning
    – Wet Floor Cleaning
    – Electrostatic Dry Floor Cleaning
    – Automotive Aftercare
    – Glass/Screen Cleaning
    – Furniture Polishing
    – Metal/Stainless Cleaning
    – Dry Cleaning Towel and Other Home Care Dry Wipes

► Personal Care
  – Moist Toilet Tissue
  – Toddler Training
  – General Body
  – Cosmetic/Facial Cleaners
  – Antibacterial
  – Intimate/Feminine Care
  – Adult Incontinence/Bath
  – Other Impregnated (e.g., sunscreen, medicinal, bug repellent)

► Industrial and Institutional Wipes
  ► Industrial/Commercial: General-Purpose
  ► Industrial: Specialty
    – Cleanroom Electronic
    – Cleanroom Pharmaceutical/Food
    – Printing/Photography Industry
    – Surface Prep for Auto/Aerospace Industry

► Institutional: Healthcare and Medical
  – Incontinence
  – Disinfecting
  – Patient Bathing/Wash Cloth
  – Hand Wipes
  – Alcohol Prep Pads/Antiseptic/Iodine

► Institutional: Food Service and Hospitality
Main Drivers:
- The Economy (+2.2% annually 2011-2016)
- Birth Rates (US/CDN –1.3% and MX +0.6% annually 2011-2016)
- New Products

Secondary Drivers:
- Convenience (including Flushability)
- New Markets
- Cleaning for Health
- Product Differentiation
- Sustainability (including Packaging)

The wipes market continues its strong growth, not only through increased usage and penetration, but through constant product innovation and new applications. Anything that is a liquid or a cream has the potential to be incorporated into a wipe, which still provides for plenty of new market opportunities. The sales to end users of wipes in the North American region totaled $9.6 billion in 2016. INDA classifies the wipes market into two main segments: consumer (wipes typically purchased in a retail environment and used by a consumer, typically in a household setting) and industrial/institutional (wipes typically purchased by a business or institution and used in an industrial or institutional setting). In 2016 the consumer segment accounted for 77.6 percent of the dollar sales to end users and 82.2 percent on the individual wipes sold (Figures IIIA-25 and IIIA-26).
In the next five years the main drivers of growth for nonwoven wipes will be:

- The strengthening economy, impacting both
  - Consumer wipes with increasing discretionary income and the
  - Industrial/institutional wipes markets with increased output and capital investments,
- Changing demographics with
  - An increase in baby births, impacting baby wipes,
  - An ageing population appreciating the convenience of wipes
  - An elderly population in facilities, impacting disinfecting and incontinence wipes, and
- The continued introduction of new products.

New products are introduced from established consumer packaged goods companies (CPGs) already in the wipes market, but also by companies with adjacent products or formulations that can be applied to wipes, by entrepreneurs looking for the next bestseller, and through brand extensions. Nonwoven wipe sales to end users are forecast to grow to $12.1 billion by the end of 2021, an average annual growth rate of 4.7 percent (2016–2021). The number of individual wipes is forecast to increase from 125.2 billion wipes in 2016 to 147.3 billion in 2021, an average annual growth rate of 3.3 percent (Table IIIA-15 and Figures IIIA-27, IIIA-28).

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2016</th>
<th>2021f</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sales ($MM)</td>
<td>Units (MM)</td>
<td>Sales ($MM)</td>
</tr>
<tr>
<td>Consumer</td>
<td>5,877</td>
<td>87,419</td>
<td>7,482</td>
</tr>
<tr>
<td>Industrial/Institutional</td>
<td>1,722</td>
<td>19,257</td>
<td>2,159</td>
</tr>
<tr>
<td>Total</td>
<td><strong>7,599</strong></td>
<td><strong>106,676</strong></td>
<td><strong>9,641</strong></td>
</tr>
</tbody>
</table>

Source: INDA Estimates, 2017

Wipes are being introduced in completely new markets and product categories that are expected to drive growth. The classic example is Procter & Gamble’s (P&G) Swiffer® products, which were introduced more than a decade ago. Swiffer rapidly grew to a billion-dollar brand, starting with dry wipe sweepers and expanding into wet-wipe sweepers, cleaner vacuums, and dusters, and most recently the Swiffer BISSELL® SteamBoost™.
Be it due to limited free time, ease of use, disposability, or portability, convenience continues to drive demand for nonwoven wipes. The convenience of simplifying tasks and eliminating the need for separate product purchases is one of the drivers behind the growing use of application-specific wipes.

Another driver of growth is the significant advancements in the last year — in both machinery and fibers — to meet the growing demand for flushable wipe products while adhering to the guidelines developed by INDA and EDANA (the European Association for the Nonwovens Industry). While drylaid hydroentangling has been used in the past to provide the strength and dispersability needed, in the last year both Andritz and Voith/Trützschler developed a wetlaid hydroentangling technology to provide the ability to hydroentangle smaller fibers.

Health concerns are an emerging driver of innovation in disposable wipes giving rise to wipes that are better for the consumer’s personal well-being, including wipes with
milder preservatives for sensitive skin and wipes that help to protect individuals from the many emerging pathogens, such as H1N1, SARS, H7N9, and MRSA.

Another emerging trend is in product differentiation through the material of the wipe or the formulation contained within the wipe. The material can provide product differentiation through either its raw material, such as a sustainable source, or its construction, such as wipes with two different sides providing different attributes, surfaces or microfilaments. The formulation and ingredients can also provide advantages due to the regulatory complexity within some of the wipes categories. There are numerous formulation options, some of which development times can take years, costing up to $500,000. New or non-traditional active ingredients, such as thymol, citric acid, PHMB, and silver, also can provide product differentiation.

A continuing trend in both consumer and industrial/institutional wipes is the concept of sustainability. Sustainability is a concept that has many different meanings depending on the contact and audience. In the case of wipes it can range from biodegradable and/or post-consumer content materials to carbon footprint reduction and zero-waste facilities. Disposability has been a primary advantage in the growth of wipes, but it also has the potential to curtail sales as those purchasing wipes become attuned to environmental concerns or the need to meet corporate sustainability guidelines.
These various drivers, coupled with the improving economy, are predicted to result in continued solid unit growth within the consumer wipes segment — 3.3 percent annually through the five-year forecast period — and in the industrial/institutional wipes segment, which is expected to grow 3.4 percent annually (Table IIIA-15 and Figure IIIA-28). The higher annual growth rates seen in the past are less likely; as for one reason, the bases of many of the wipes categories are becoming quite large, and the market penetration rate for some areas of wipes is slowing and may be nearing its cap, such as in some of the individual product focused wipes in home care.

Every type of nonwoven substrate is used in the wipes categories. Nonwoven substrates used in consumer wipes are typically produced using the airlaid pulp and drylaid (carded) processes bound by hydroentangling. Across both consumer and industrial/institutional wipes, spunmelt (spunbond and meltblown), wetlaid double recroped (DRC), and drylaid needlepunched technologies are also used to produce nonwoven wipes.
On a volume basis, the North American wipes industry consumed an estimated 6.6 billion square meters of various nonwoven substrates in 2016, with consumer wipes accounting for just over two-thirds (64.4%). In tonnage, 450 thousand tonnes of wipes were sold in North America, with consumer wipes accounting for nearly two thirds (61.4%) of the volume in 2016 (Table IIIA-16 and Figure IIIA-29).

### Table IIIA-16
North American Wipes Market
Nonwoven Material Consumption by End Use

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th></th>
<th>2016</th>
<th></th>
<th>2021f</th>
<th></th>
<th>2011-2016</th>
<th></th>
<th>2016-2021f</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SQM</td>
<td>Tonnes</td>
<td>SQM</td>
<td>Tonnes</td>
<td>SQM</td>
<td>Tonnes</td>
<td>SQM% (CAGR)</td>
<td>t% (CAGR)</td>
<td>SQM% (CAGR)</td>
</tr>
<tr>
<td>Consumer</td>
<td>3,633</td>
<td>237</td>
<td>4,245</td>
<td>277</td>
<td>4,958</td>
<td>323</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Industrial/Institutional</td>
<td>2,016</td>
<td>149</td>
<td>2,345</td>
<td>174</td>
<td>2,762</td>
<td>204</td>
<td>3.1</td>
<td>3.1</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>5,649</td>
<td>386</td>
<td>6,591</td>
<td>450</td>
<td>7,720</td>
<td>528</td>
<td>3.1</td>
<td>3.1</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Source: INDA Estimates, 2017

Based on the forecast, the nonwoven wipes industry will require an estimated 7.7 billion square meters of wipes substrate in 2021 with a weight equivalent to 528 thousand tonnes — both increases of 3.2 annually from 2016 (Table IIIA-16 and Figure IIIA-29). In 2016, the United States accounted for 85 percent of the nonwovens wipes demand.
Consumer Wipes

The main drivers of demand for consumer wipes are the number of babies being born and the economy. The improving economy (especially an increase in personal consumption expenditures) is a result of an improving employment market and rising wage growth which results in a greater demand for higher value, more task-specific wipes.

Other key drivers for consumer wipes include the previously discussed new product applications, convenience, new markets, and the consumer’s desire for sustainable products. To meet the desire for sustainable products, roll goods manufacturers are continuously moving toward greener ingredients by incorporating natural (e.g., wood