Endless Possibilities and Growth for Nonwovens

The North American Nonwoven Filtration Market

Brad Kalil
Director of Market Research and Statistics

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Today’s Discussion

- The North America Nonwovens Market
- North American Nonwovens Filtration Market
- What’s At the Forefront
Nonwovens Definition

An Engineered Fabric

“An engineered fibrous assembly which has been given a designed level of structural integrity by physical and/or chemical means, with the exclusion of paper, woven, or knitted material.”

A successful, growing, continuously evolving, dynamic and diverse industry
Today’s Discussion

The North America Nonwovens Market

- Supply Side Growth
  - Capacity
  - Investments
  - Mergers & Acquisitions

- Demand Side Growth
Robust Global Production

Production Growth in Tonnes, Historical and Forecast Average Annual Growth Rates

Historical Growth
7.1% 2004-2014
439k per Year

Forecast Growth
5.7% 2014-2020
700k per Year

North America Investments Exceed GDP
North America Capacity by Process in Tonnes

Incumbent & New to Nonwovens, Region
North America Capacity Additions, 2015 (8 new lines)

- 1 airlaid hydroentangle line: wipes
- 2 drylaid hydroentangle line: wipes (1 New to Industry)
- 1 drylaid needlepunch line: filtration
- 1 drylaid needlepunch line: home & office furnishings
- 1 meltblown line: wipes, filtration
- 1 meltblown line: filtration
- 1 wetlaid glass line: construction

Source: INDA
Significant Uptick in Number of Lines
North America Capacity Additions, 2016 (17 new lines)

- 1 airform thermal bond line: home & office furnishings
- 1 airform thermal bond line: automotive, home & office furnishings, bldg. construction
- 1 carded hydroentangle line: filtration
- 1 carded line: wipes, hygiene, filtration, automotive
- 7 carded needlepunch lines: filtration (4), automotive and other durable products
- 1 carded thermal bond line: absorbent hygiene
- 1 spunmelt needlepunch line: high-temperature durable products
- 3 spunmelt lines: hygiene
- 1 wetlaid glass lines: battery separator, filtration

Source: INDA
Growth Continues
North America Capacity Additions, 2017 (14 new lines… so far)

- 1 airformed needlepunch line – industrial products
- 1 carded hydroentangle line – wipes, medical, hygiene
- 1 carded hydroentangle line – filtration
- 3 carded needlepunch lines – automotive, home&office furnishings
- 1 carded stitchbond line – automotive
- 2 spunlaid lines – hygiene, medical
- 1 spunlaid line – construction
- 1 wetlaid thermal bond line – filtration
- 1 wetlaid hydroentangle line – wipes
- 1 wetlaid glass line – filtration, building construction
- 1 wetlaid line – wipes

Source: INDA
Variety of Production Investments

• Companies with a North American Footprint expanding
  – Numerous

• Companies adding a North American footprint
  – Sandler, Germany
  – Mogul, Turkey
  – Norafin, Germany
  – Uniquetex, China

• Companies entering into the nonwovens industry
  – Carver Nonwoven Technologies
  – U.S. Cotton
Healthy M&A Activity

• Nonwovens companies acquiring other nonwoven companies
  – Lydall acquired Texel
  – TWE acquired Vita Nonwovens
  – Foss Manufacturing acquiring Beaulieu America

• Adjacent companies acquiring nonwoven related companies
  – Clacor acquiring FibeRio Technology
  – Parker Hannifin acquiring Clarcor
  – Drylock acquiring Presto Absorbent Products

• CPGs companies acquiring nonwoven related companies
  – S.C. Johnson acquired Babyganics
  – Unilever acquired Seventh Generation
Healthy M&A Activity

• Paper companies investing in and acquiring nonwoven companies
  – **Neenah** (conversion and acquiring Crane Technical Markets)
  – **Schweitzer-Mauduit International (SWM)** (DelStar, Conwed)
  – Glatfelter
  – Domtar

• Adjacent companies acquiring nonwoven companies
  – Berry Plastics acquired **Avintiv**
  – AstenJohnson acquired **Eagle Nonwovens**

• Nonwoven companies acquiring nonwoven related companies
  – **3M** acquired **Polypore International’s** ultrafiltration business
Today’s Discussion

The North America Nonwovens Market

- Supply Side Growth

- Demand Side Growth
  - Existing Markets Expanding
    - Economic Drivers
    - Demographic Drivers
  - Product Innovation
  - Taking Share from Other Materials
  - Entirely New Uses (Markets)
Recovery of the Durables
North America End Use Categories – Size and Growth in Tonnes

Forecast Based on GDP Forecast…

Annual Growth of Real GDP in the United States, Percent Change from Preceding Year

Today’s Discussion

North American Nonwovens Filtration Market

├ Taxonomy
├ Demand Drivers
├ Size
├ Outlook
Harmonize Industry Taxonomies

Air Filtration

Transportation (8)
• Induction/Air Intake, Cabin Air
Commercial HVAC (4)
• HEPA/ULPA, MERV 9-15, MERV 1-8
Residential HVAC/Furnace (3)
• Low End, High End, HEPA/ULPA
Personal Protection/Face Masks (4)
• Molded/Pleated, Respirator
Industrial (4)
• Dust Removal/Baghouse, Air Intake
Vacuum Cleaner Bags (3)
• Standard, Standard w/MB, HEPA w/MB

Liquid Filtration

Water (3)
• Water Treatment, Wastewater, Pool/Spa
Transportation
• Oil, Lubrication, Fuel, Transmission
Manufacturing (4)
• Hydraulics, Manufacturing, High-Tech
Food Processing (6)
• Tea Bags, Coffee Filters, Cooking Oil
Healthcare (3)
• Blood, Pharma, Bio
Demand Drivers

• Main Drivers
  – The Economy
    – Construction, Transportation
  – Consumers Awareness and Sensitivity
    – Air and Water Quality Concerns
  – Legislation and Regulatory Control
    – Clean Air Act
    – Environmental Protection and Pollution Control
Demand Drivers

• Secondary Drivers
  – Increasing Share of Filter Media
  – Filter Efficiency Improvements
  – Use of Nanofibers
  – Sustainability
Different Ways to Measure “Size”

Air Filtration Nonwoven Material Consumption, 2013

Forecast from the 2015 Report
Historical CAGR, Forecast CAGR and Size in Tonnes of Production by End-Use, 2014

North American Average
1.4%, 5.1%

Filtration
2.4% Historical
3.5% Forecast

Forecast from the 2015 Report

Historical CAGR, Forecast CAGR and Size in Tonnes of Production by End-Use, 2014

Filtration Average
2.4%, 3.5%

Air Filtration Categories
- Transportation +
- Commercial HVAC +
- Residential HVAC +
- Personal Protection
- Industrial +
- Vacuum Cleaner Bags

2013–2018 3.7%

Historical 2010–2015 AAGR

Updated Forecast to the 2015 Report

Filtration Demand Size and Growth

Filtration
2.4% Historical
3.5% Forecast

Updated Forecast to the 2015 Report
Filtration Demand Growth Update

**Historical**
2010–2015 AAGR

**Filtration**
2.4% Historical
3.5% Forecast
**3.9% Updated**

Today’s Discussion

What’s At the Forefront

- Material Development
- Product Innovation
- Machinery Development
- Market Developments
Material Development

• Functionalizing Nonwoven Fabrics
  – Main Processes… Just Faster, Better
  – Nanotechnology / Meltblown / Fine Fibers
    – Proprietary Developments
    – Nonwovens Approaching Membrane Efficiency
  – Composites
Nanofiber Composite Media Technology

Spunbond

Nanofiber

Meltblown

Analytical Instrumentation Facility NCSU
5.0 KV EM Mag 250X

100μm
Material Development

- Fibers/Resins
  - Biopolymers
  - Engineered Staple Fibers
Machinery Development

• Machinery
  – Reifenhäuser Reicofil High Loft Spunbond
  – Resurgence of Wetlaid
Product Innovation

- Transportation Air Induction Filters
- Transportation Cabin Air Filtration
- Air Treatment in Healthcare
- Personal Protective Equipment
Nonwoven Producer Developments

170 Producers in North America with nearly 700 lines, Top 10 Account for Only 46%

- Berry Plastics
- Kimberly-Clark
- Hollingsworth & Vose
- Johns Manville
- DuPont
- Ahlstrom
- 3M
- Lydall
- Freudenberg
- Neenah
Filter System Manufacturer Developments

- Mann + Hummel
- Cummins Filtration
- Pall Corporation
- Parker-Hannifin / Clarcor
- Donaldson
- 3M
- Pentair
- The Filtration Group
- Camfil
Market Developments

• Very Fragmented Industry
  – Supply Chain
  – Numerous End-Uses
  – Media, Fibers and Polymers Used

• Growing Market
  – Numerous Drivers
  – Steady Revenue
  – Continuous Innovation
Market Developments

• Attracts Attention
  – Within the Industry
  – Companies Outside the Industry
  – Financial Sector

Resulting in…
  – Strategic Alliances and Mergers
Market Developments

• Types of Mergers and Acquisitions
  – Consolidators
  – Expanders
    – Nonwoven Producers
    – Filter System Manufacturers
  – Joiners

Invites…

  – Private Equity
In Conclusion

• The Market
  – Growing Markets with Steady Revenue
  – Highly-Fragmented
  – Continuous Innovation

• Attracts Attention
  – Within the Industry
  – Companies Outside the Industry
  – Financial Sector

• Will Continue
Thank You

Questions

bkalil@inda.org