



Endless Possibilities and Growth for Nonwovens

The North American Nonwoven Filtration Market



Association of the
Nonwoven Fabrics Industry
ADVANCING NONWOVENS WORLDWIDE®

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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

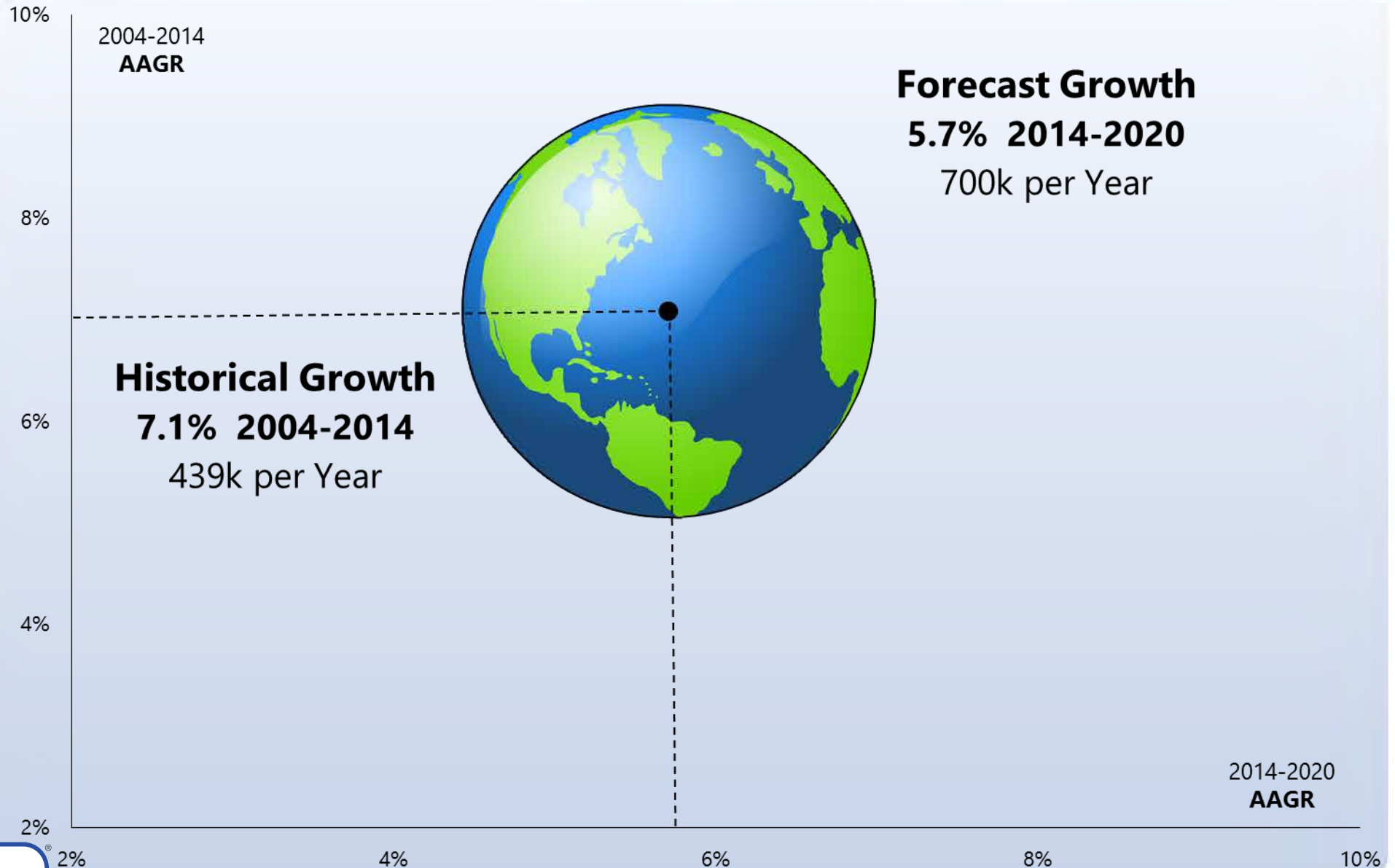


The North America Nonwovens Market

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

Robust Global Production

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

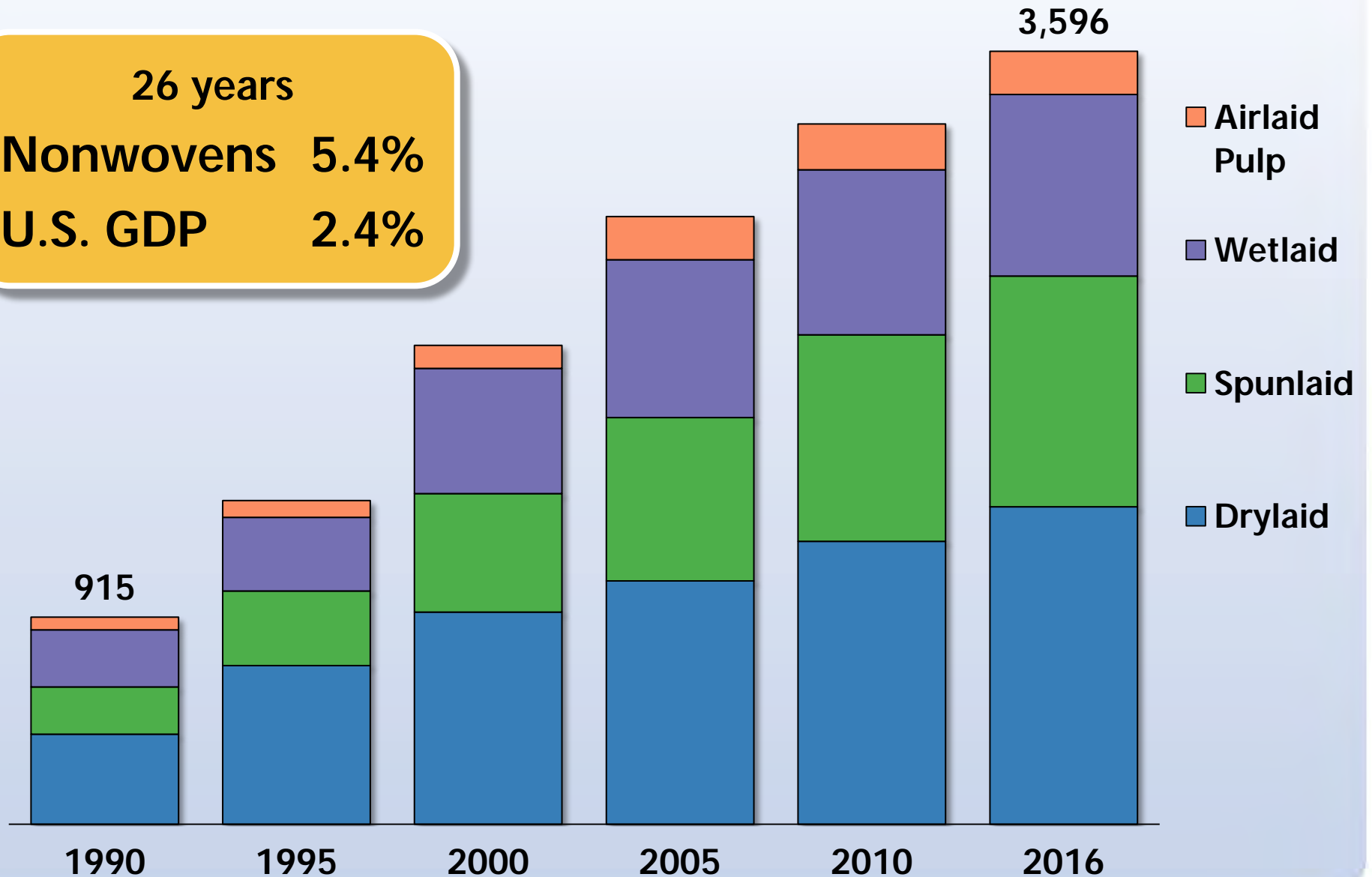


Source: Worldwide Nonwovens Industry Outlook, INDA/EDANA, 2015

North America Investments Exceed GDP

North America Capacity by Process in Tonnes

26 years
Nonwovens 5.4%
U.S. GDP 2.4%



Source: INDA North American Nonwovens Supply Report, 2017



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



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



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



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

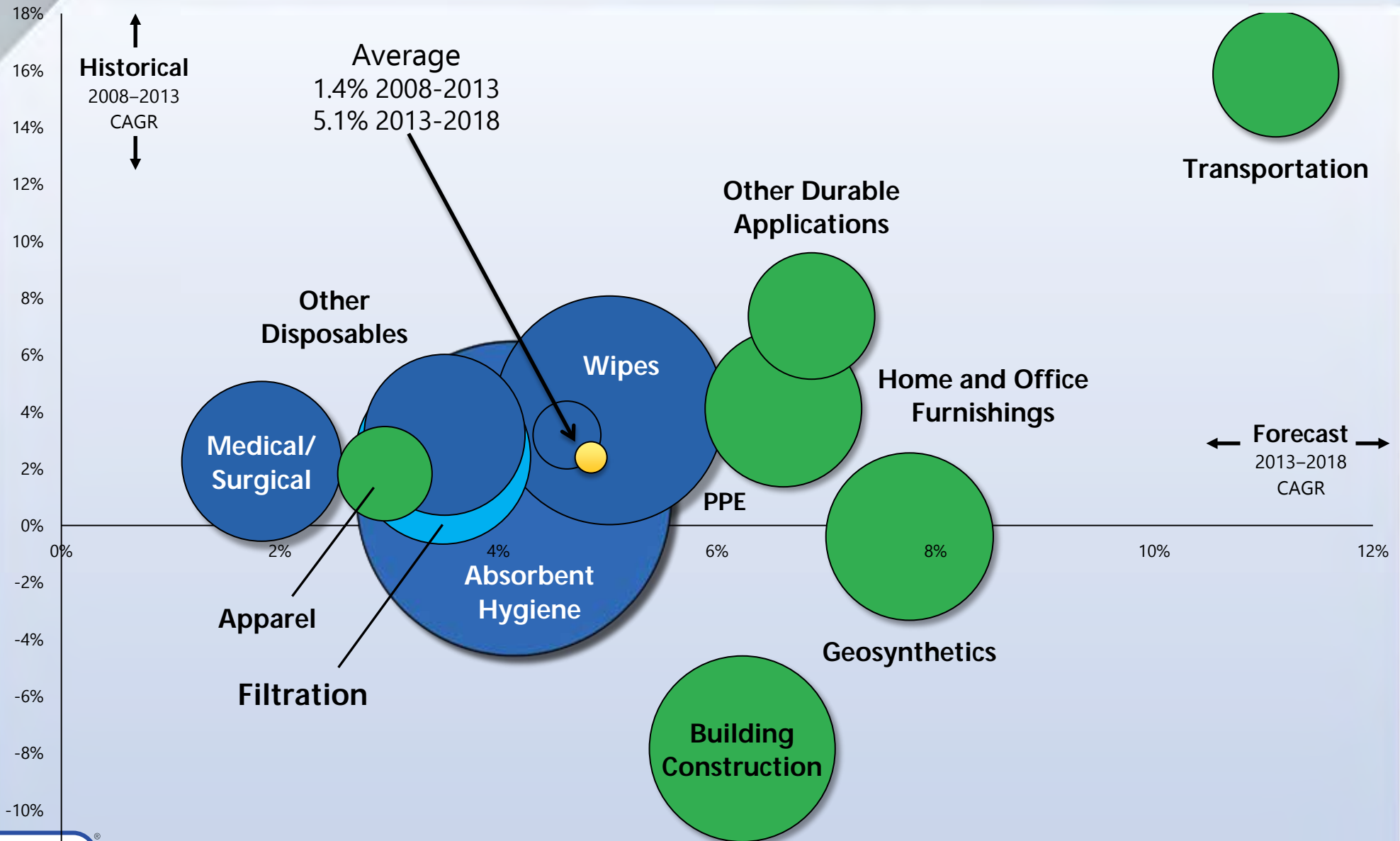


The North America Nonwovens Market

- Supply Side Growth
- Demand Side Growth
 - Existing Markets Expanding
 - Economic Drivers
 - Demographic Drivers
 - Product Innovation
 - Taking Share from Other Materials
 - Entirely New Uses (Markets)

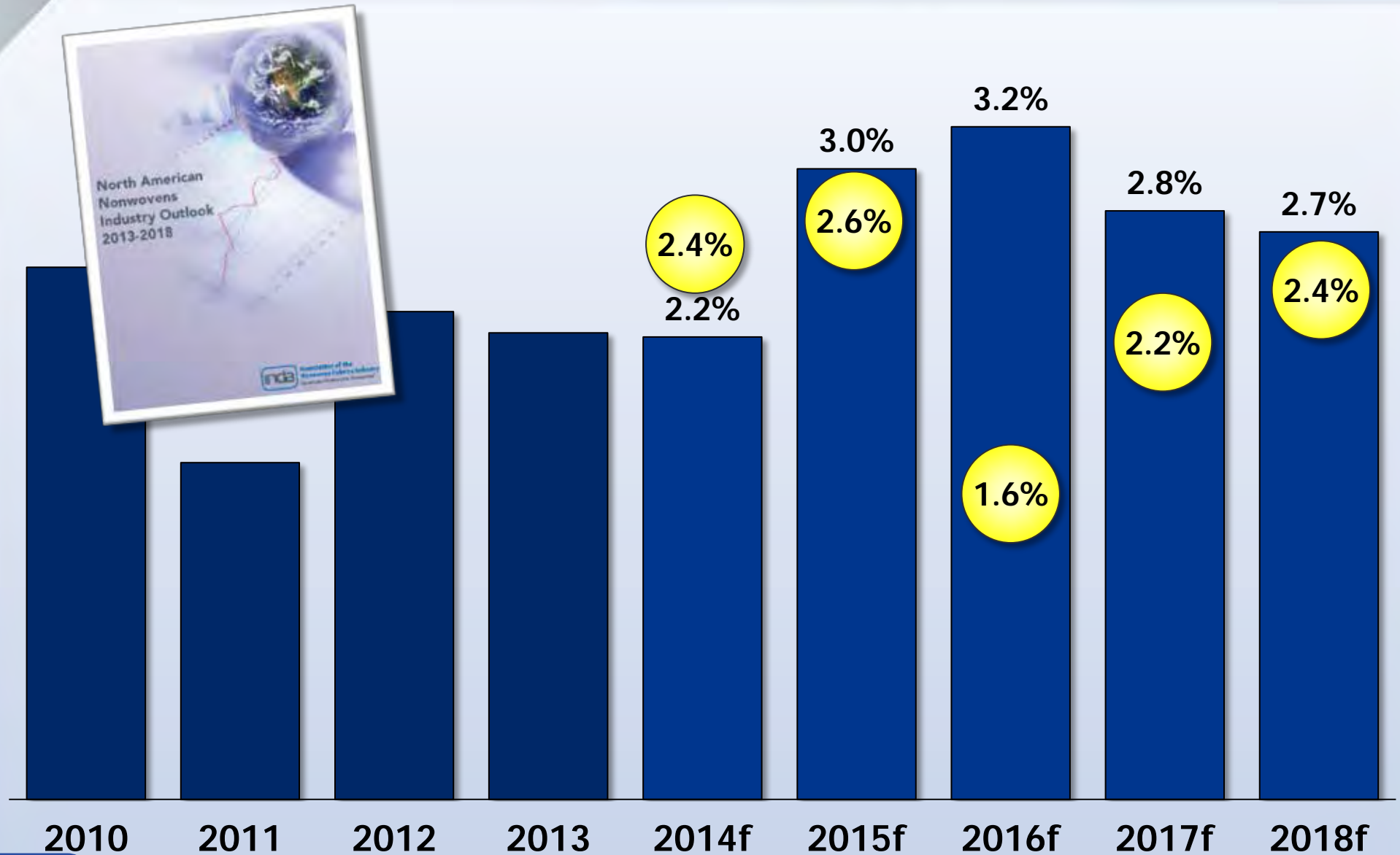
Recovery of the Durables

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



Source: INDA North American Industry Outlook Report, 2015

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

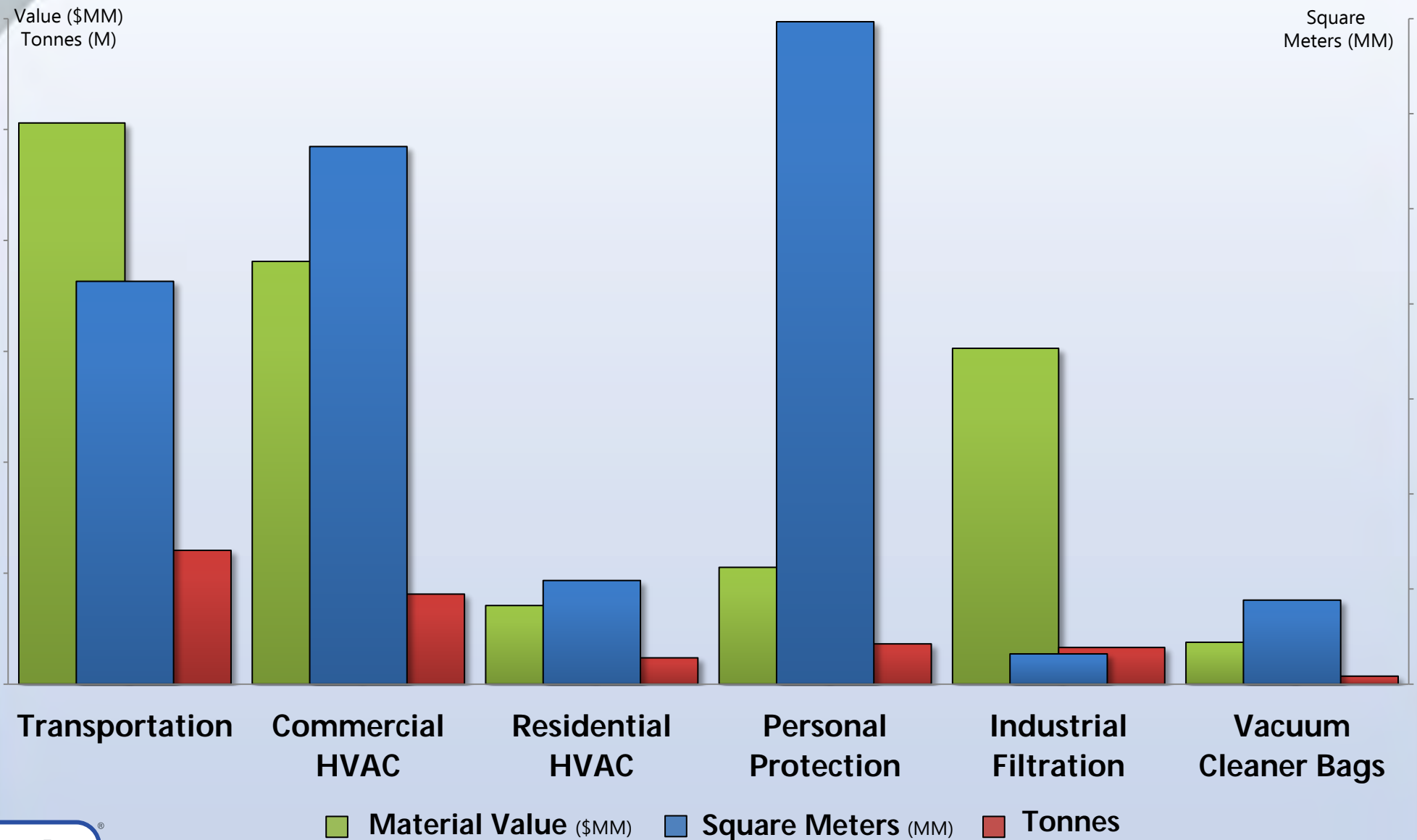
- Secondary Drivers
 - Increasing Share of Filter Media
 - Filter Efficiency Improvements
 - Use of Nanofibers
 - Sustainability





Different Ways to Measure “Size”

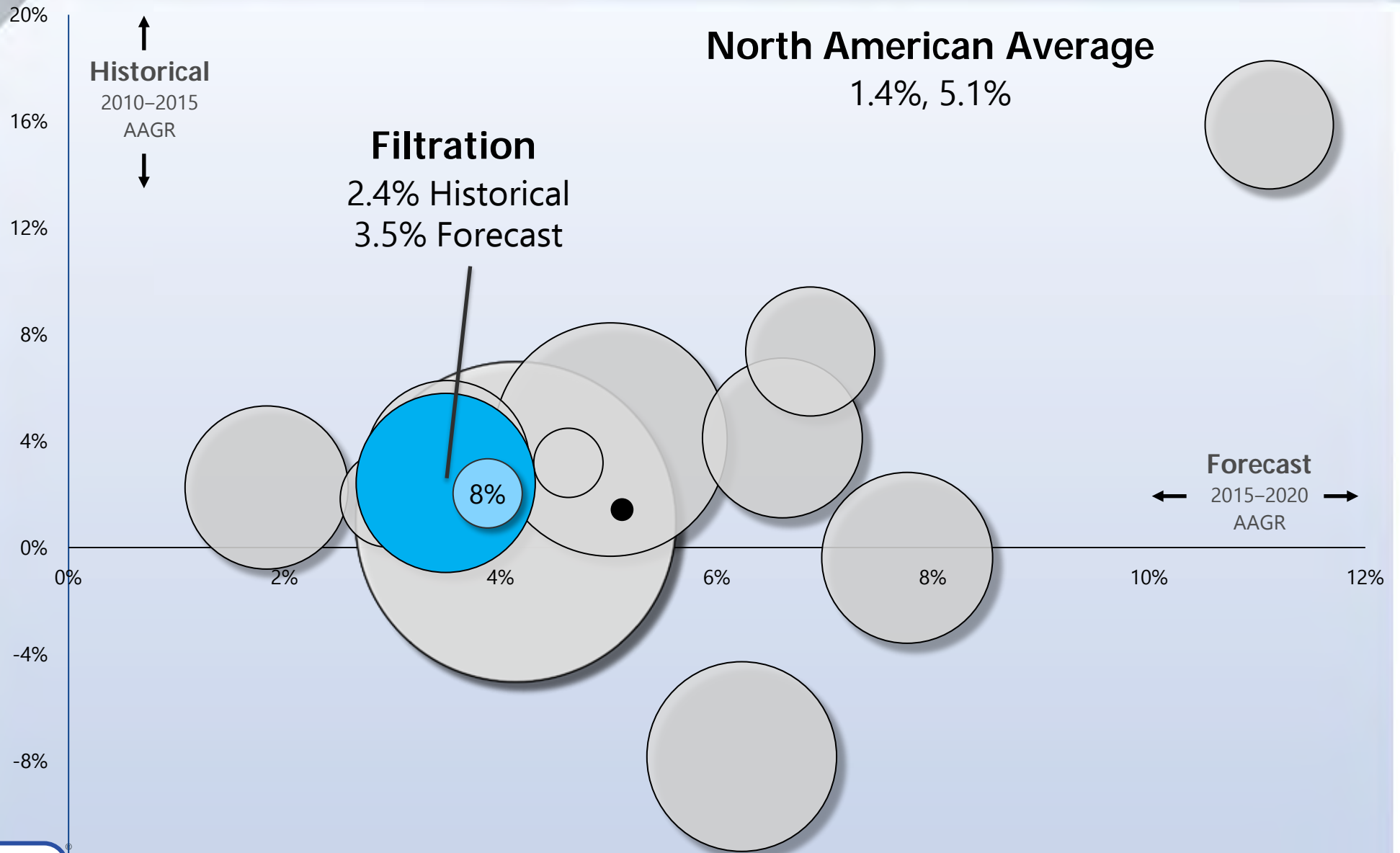
Air Filtration Nonwoven Material Consumption, 2013



Source: INDA North American Industry Outlook Report, 2015

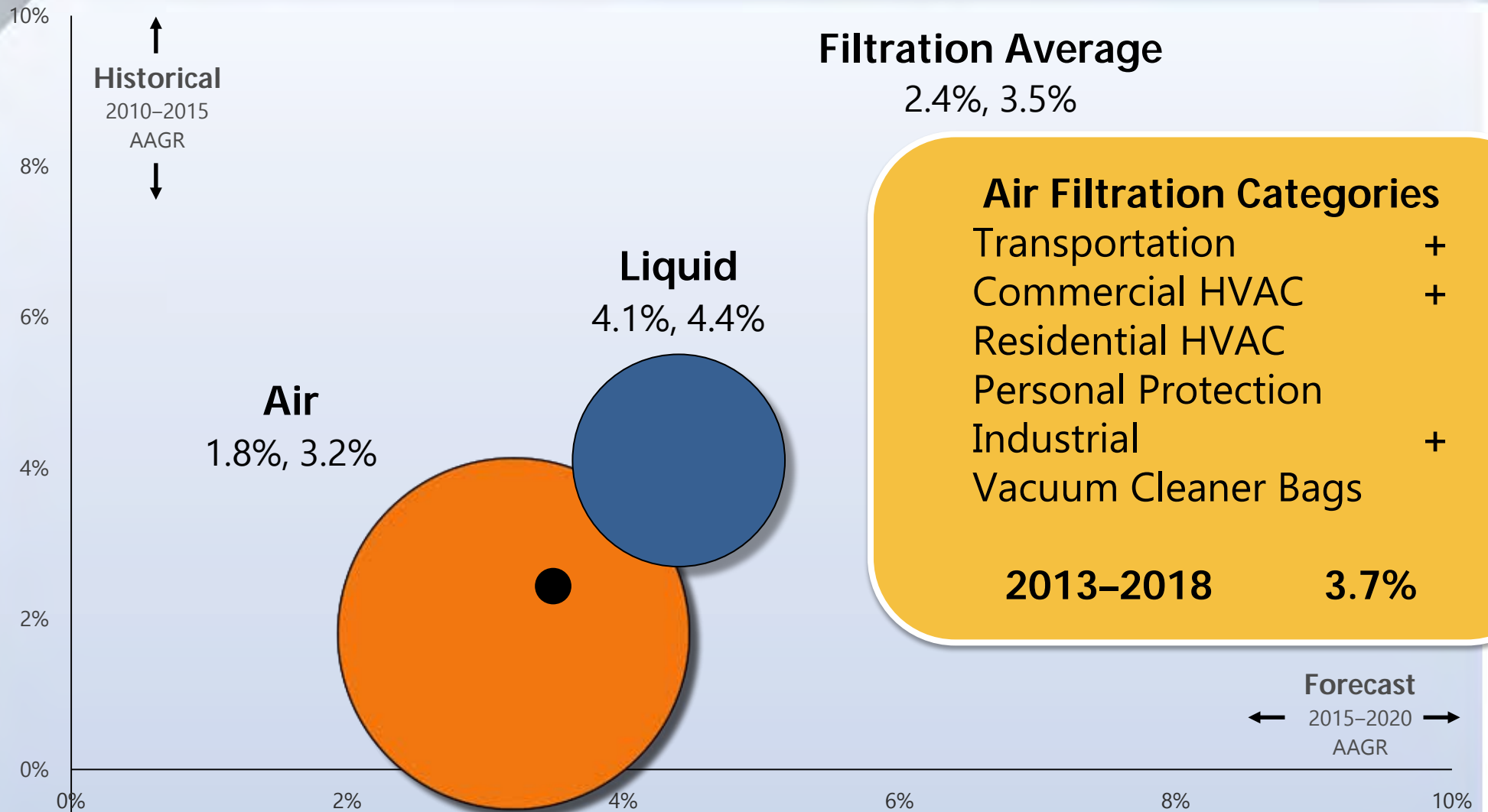
Forecast from the 2015 Report

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



Forecast from the 2015 Report

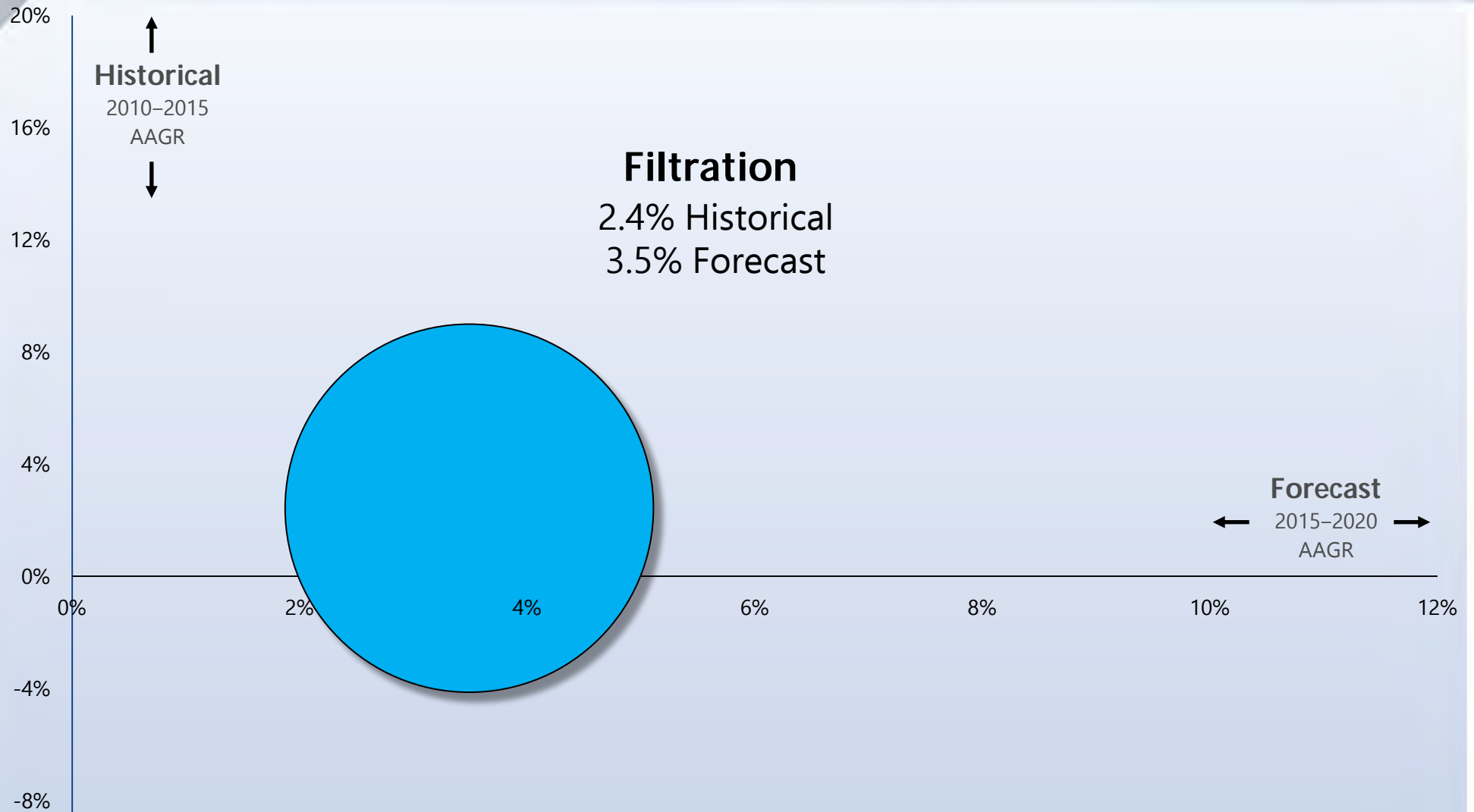
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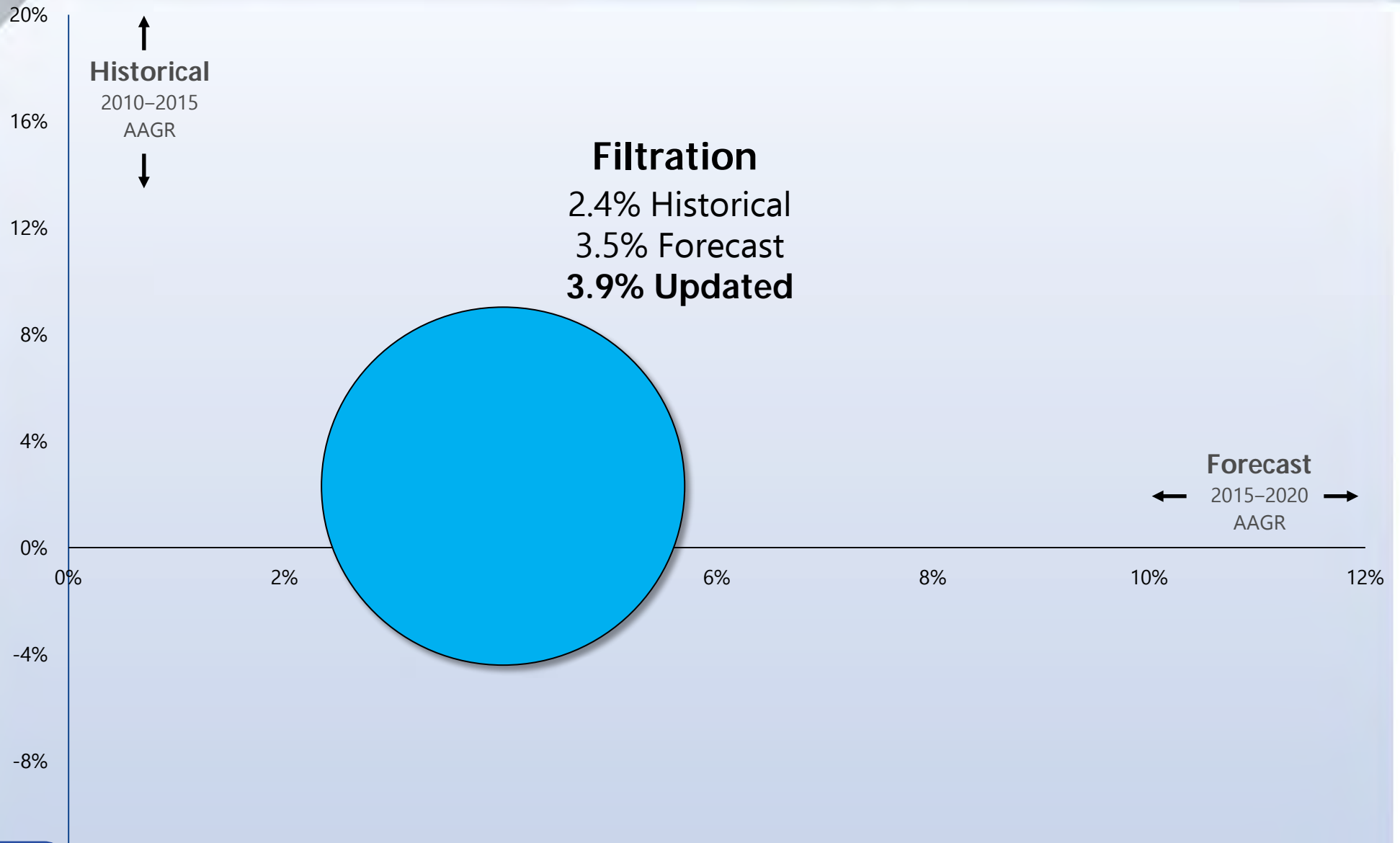
Updated Forecast to the 2015 Report

Filtration Demand Size and Growth



Updated Forecast to the 2015 Report

Filtration Demand Growth Update



Today's Discussion

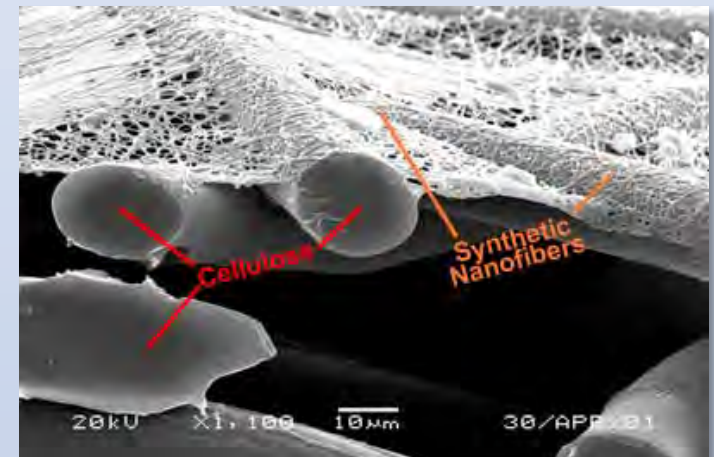


What's At the Forefront

- 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

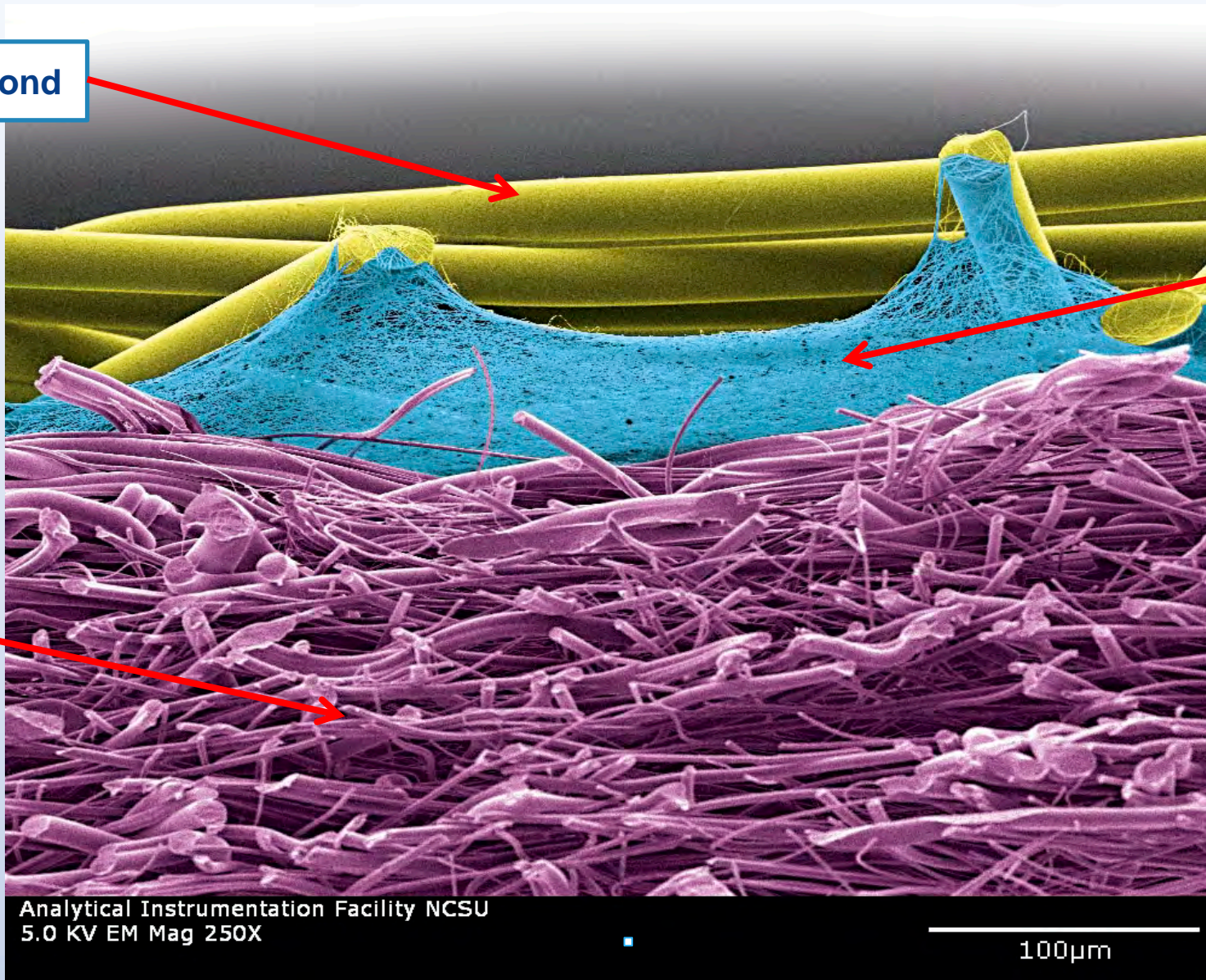


Nanofiber Composite Media Technology

Spunbond

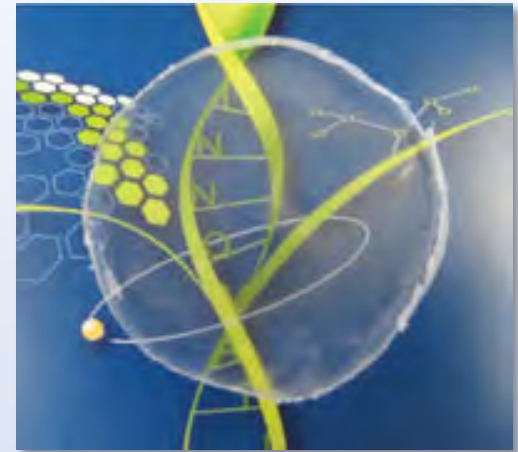
Nanofiber

Meltblown



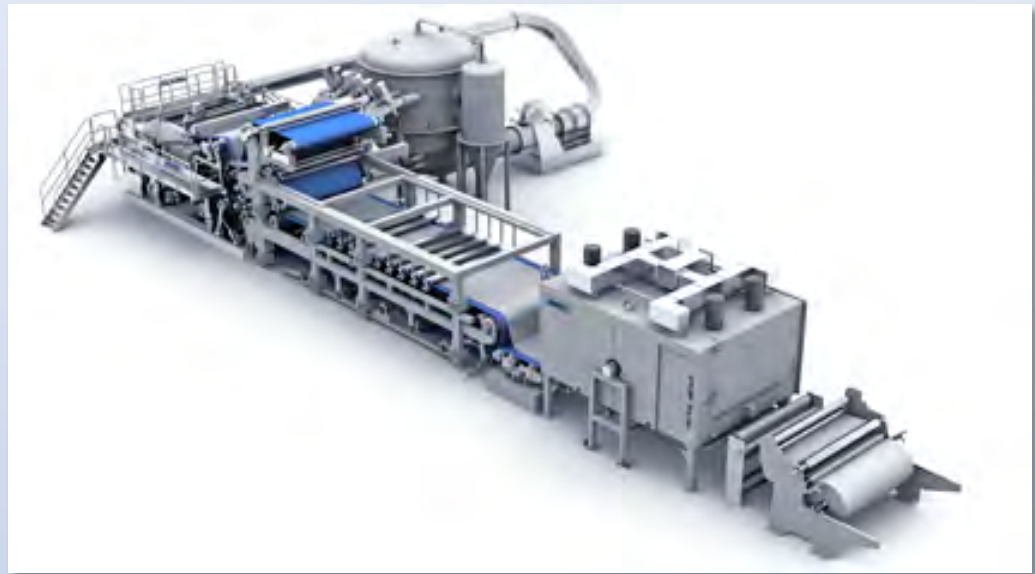
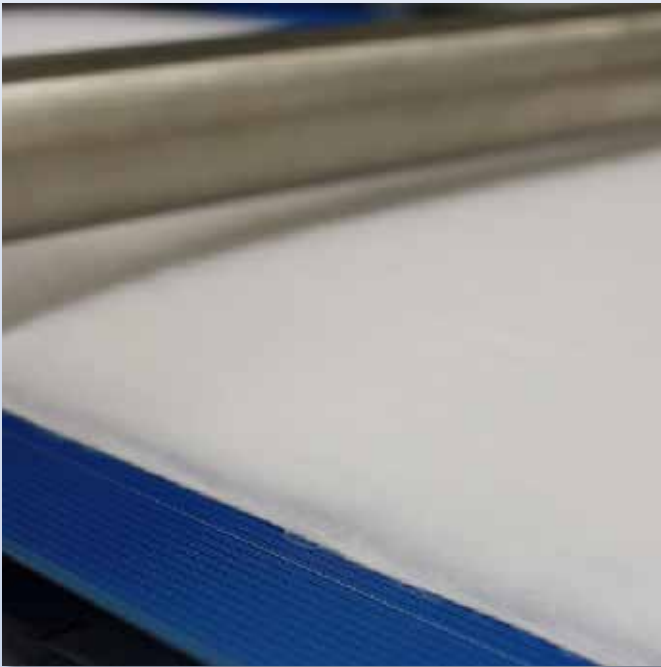
Material Development

- 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

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