PRICE HANNA
CONSULTANTS

# TECHNOLOGY INNOVATIONS IN NONWOVENS

## Asia-Pacific Hygiene Products Symposium
## Shanghai China 2019

Presentation by David Price
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# About Price Hanna Consultants

Price Hanna Consultants is a management consulting firm specializing in the global nonwoven and hygiene businesses.

- The principals of Price Hanna have more than 35 years of combined consulting experience and a deep background in all key functional business areas derived from senior and executive management roles and consulting with leading nonwoven and woven fabric, fibers and related raw materials businesses worldwide.

- Our practice spans all levels of the value chain for disposable and durable nonwovens and materials in proprietary, non-conflicting projects.

# Relevant Subscription Reports

- Spunbonded and Spunmelt Nonwoven Polypropylene World Capacities, Supply/Demand and Manufacturing Economics 2013, 2018 – 2023
  - Published in April 2019
- Global Outlook for Hygiene Absorbent Products and Key Raw Materials in 2017, 2018 and 2023
  - Published in February 2019

# Innovations in Nonwovens

Innovations in Nonwovens are expanding at a rapid pace across a number of fronts.

- Most innovations are driven by advancements in technology in order to:
  - increase output and lower cost of manufacture,
  - improve nonwoven quality and consistency,
  - utilize more sustainable raw materials and
  - develop products which offer increased performance and utility.

# Technology Innovations – Spunlaid/Melt Blown Nonwovens – Reifenhauser

Reifenhauser R5 platform for manufacture of spunlaid PP nonwovens

- Up to 35% higher output (Throughput – 270/kg/hr (SB), 70/kg/hr (MB)
- Line speeds – Up to 1,200 m/m on six beam composite SB/MB lines
- Streamlined maintenance to increase uptime
- Up to 15% less composite energy consumption
- Up to 90% reduction in “hard pieces”

# Technology Innovations – Spunlaid/Melt Blown Nonwovens – Reifenhauser R5

- Capable of producing filaments in a diameter of less than one denier
- Automation – Operator Control & Monitoring, Data Storage, Trends/Reports, Remote Maintenance via VPN
- Digital Business Platform offers “Intelligent Production”
- Multiple bonding options – calendering, spunlaced, needlepunched

# Technology Innovations – Spunlaid/Melt Blown Nonwovens – Riefenhauser R5

High Loft technology –

- Semi Loft – monofilament sheath/core PP/PE extrusion
- High Loft – side/side bicomponent extrusion of low & high MF PP
- Full High Loft – same as high loft but bonded with an “Air or Hot Knife” & heated oven

# Technology Innovations – Spunlaid/Melt Blown Nonwovens – Valmet Air Through Bonded Dryer

Development and early installations of air through bonding units for spunlaid extruded nonwovens. The use of air through bonded technology for drying spunlaid nonwovens is expected to increase loft and softness.

- Dalian HuaYang Bicoweb Technology Co., Ltd and others have acquired this technology.

# Technology Innovations – Spunlaid/Melt Blown Nonwovens – Extrusion Group/TechnoWeb High Pulp melt blown

Extrusion Group and TechnoWeb have developed and installed technology which contains a high pulp content bonded with melt blown fibers for use in wiping and possibly selected hygiene components.

- A third technology company is expected to soon commercialize a similar technology.

# Technology Innovations – Spunlaid/Melt Blown Nonwovens – High Loft/Softness

Proprietary calender patterns have been developed by selected spunlaid producers that provide for areas of un-bonded surface.

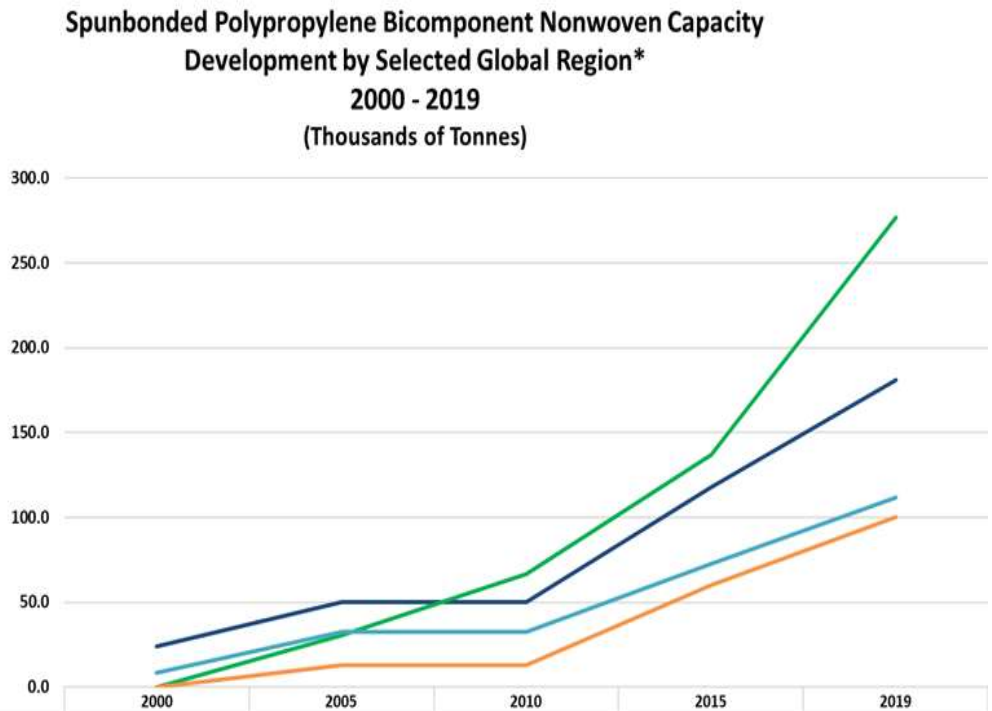
- These un-bonded areas result in a higher loft than in those surface areas which are flat bonded.

# Technology Innovations – Spunlaid/Melt Blown Nonwovens – High Loft/Softness

Much of the global spunlaid capacity installed in the world since 2010 has been equipped with either side/side or core/sheath bicomponent fiber extrusion technology. Such technology is a precursor for producing soft and/or high loft spunlaid nonwovens.

- Since 2010, bicomponent nameplate capacity has more than tripled across the world.
- In 2019, Greater Europe & Turkey accounts for 41% of all bicomponent capacity followed by North America with 27%, Asia Pacific 16% and China 11%.

# Global Bicomponent Spunbonded Nonwoven Capacity Development




| | 2000 | 2005 | 2010 | 2015 | 2019 |
|---|---|---|---|---|---|
| North America | 24.0 | 50.0 | 50.0 | 118.0 | 181.0 |
| Greater Europe & Turkey | 0 | 30.5 | 66.5 | 137.0 | 277.0 |
| Asia-Pacific | 8.5 | 32.5 | 32.5 | 72.5 | 111.5 |
| China | 0 | 13.0 | 13.0 | 60.0 | 100.0 |

*In South America there was no SBPPNW bicomponent capacity installed until 2016 (Fitesa 24kt) and none since. The first installation of SBPPNW capacity in Africa will occur in 2019 (PF Nonwovens 10kt). There is no SBPPNW bicomponent capacity in the Middle East or Southern Asia at present.

Source: Price Hanna Consultants LLC estimates

From 2010 – 2019, the global extrusion capacity for polypropylene bicomponent spunbonded nonwovens, including South America and Africa, has grown from 162 thousand tonnes in 2010 to 703.5 thousand tonnes in 2019.

This growth over the last nine years is equivalent to an average annual rate of 17.7% or 4.3x over 2010.

Bicomponent spunbonded capacity far exceeds demand. Producers are installing capacity in the anticipation of demand. The Installation cost of bicomponent technology is far less when installed with a new line than later when machine uptime can be significantly impacted.

# Technology Innovations – Wet Laid "Wet Lace" Spunlaced Nonwovens – Dispersible

Driven by government regulations and bolstered by rising social sentiment for the use of biodegradable flushable wipes, new wet laid hydroentangled technology has been installed in the U.S., Greater Europe, the Middle East and China.

# Technology Innovations – Wet Laid "Wet Lace" Spunlaced Nonwovens – Dispersible

This new technology is capable of using a wide variety of fibers from low cost pulp to high strength chemical and biodegradable natural/man-made fibers.

- Since 2015, a total of seven of these new "Wet Lace" lines have been installed globally. These lines are estimated to have a total capacity of nearly 100,000 tonnes. Estimated demand at present is on the order of 70 – 75 TPY.

# Technology Innovations – Wet Laid "Wet Lace" Spunlaced Nonwovens – Dispersible

The primary providers of this new technology are Trützschler/Voith and Andritz.

- Initial end use market is flushable wipes, but the technology continues to be developed to be used in multiple wiping end uses now served by carded spunlaced technology.

# Technology Innovations – Wet Laid "Wet Lace" Spunlaced Nonwovens – Dispersible

- Line capacities at present are small ~15K TPY with line speeds of ~ 400 m/m and narrow widths. Line capacity could be much higher with market share gains into wipe markets now served with carded technology.

- Wider width lines and line speeds up to 800 m/m could deliver annual nameplate capacity of up to 22k TPY.

# Technology Innovations – High Pulp Containing Spunlaced Nonwovens

- Technology is designed to manufacture spunbonded/pulp (SP), carded/pulp (CP) or spunbonded/carded/pulp (SPC) layered spunlaced nonwovens with flexibility to utilize a wide variety of biologic and/or synthetic fibers.

- The cost benefits of this technology is the ability to utilize a high amount of relatively low-cost pulp in the raw material blend and higher output when installing wide width, high speed lines.

# Technology Innovations – Lenzing "Web Technology" – Wipes/Hygiene

In December 2018, Lenzing announced the filing of 25 patents regarding their new "Web Technology" and the start-up of a one-meter wide pilot line.

- This technology utilizes wood pulp which is then spun into a continuous Lyocell filament spunlaid nonwoven web to form a 100% cellulose nonwoven.

- The web may be bonded using with either spunlaced or needlepunched technology or be self-bonded where filaments are bonded into a fabric during the laydown process.

# Technology Innovations – Lenzing "Web Technology" – Wipes/Hygiene

Technology provides a high strength nonwoven substrate which is 100% biodegradable.

- The use of a continuous filament spinning process may also increase output line output as compared to the use of staple fiber carding technology.

- The process is able to produce a wide variety of surface textures, drapeabilty and dimensional stability as compared to other technologies using 100% cellulosic fibers.

# Technology Innovations – Carded Spunlaced, Air Through & Thermal Bonded Nonwovens

Like in other nonwoven technologies, many innovations have been made in carded spunlaced, air through and thermal bonded nonwoven technologies in recent years.

- Among other things, the latest generation lines are equipped with carding and bonding technology which is far more cost efficient than early generation equipment.

# Technology Innovations – Carded Spunlaced, Air Through & Thermal Bonded Nonwovens

Cards are capable of much higher output due to faster operating speeds.

Fiber distribution is far more refined allowing for much lower basis weights (10 gsm on CTB; 25 gsm or lower on SL when using parallel carding technology) and much lower weight and thickness variation across the width of the web.

Raw material savings may range from 5-7% when using the most modern carding technology.

# Technology Innovations – Carded Spunlaced, Air Through & Thermal Bonded Nonwovens

Up to 35% lower energy consumption attributable to more efficient drying and recycling as compared to earlier generation spunlaced technology.

Spunlaced line speeds up to 400 m/m and machine widths of 6 meters or wider increases output which reduces cost of manufacture at full capacity utilization.

Electronic process monitoring and control improves consistency, product quality, machine uptime and raw material yield.

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