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SPECIAL FOCUS: SUSTAINABILITY

RESPONDING TO COVID-19 AND THE ROAD AHEAD

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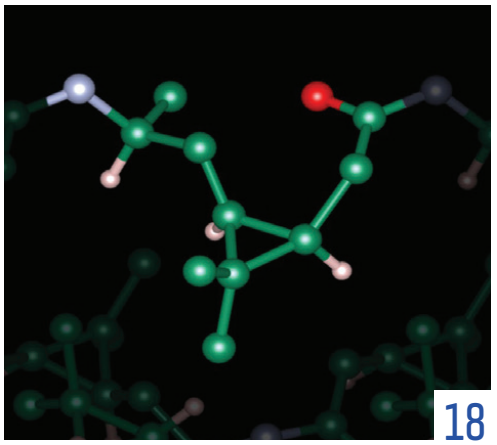

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RESPONDING to COVID-19

COLUMNS & DEPARTMENTS

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VIEWPOINT

Considering COVID-19

When last I wrote this column, I spoke of sitting at my kitchen table as "stay at home" orders had just been implemented where I live in North Carolina. At that time, there were 16,328 COVID-19-related fatalities worldwide. Much has changed since then, with the global death toll having eclipsed 350,000 at the time of this writing. And the pandemic continues to challenge the public at large, as well as business and government leaders worldwide, who are all struggling for answers when none are readily available.

In the world of textile fibers, COVID-19 is a particularly challenging topic, as it has had a tremendous negative impact on some of the industries fibers serve, such as transportation and fashion, while it has thrust others into such a white hot light that they are having trouble seeing past the incoming requests for material.

Meltblown nonwovens, which are a key material component of facemasks of various kinds and personal protective equipment, were recently dubbed the "golden fleece" by the UK's *Financial Times*, which reported that one Hong Kong trader was recently offering €100 per kg for meltblown – 10 times the pre-crisis price. In large part, this is because of the surge in demand for facemasks, surgical gowns, etc. for healthcare workers combined with a scenario where the public at large is seeking facemasks for every-day use. It quickly became apparent there was not nearly enough meltblown to meet the need. Simple supply and demand economics there.

Ah, but the meltblown issue is not so simple after all, as the shortage of this much-needed material revealed just how unprepared the world is to respond to a COVID-19-like pandemic. For one, there was no extra capacity to quickly ramp up production of meltblown material. In order to increase capacity, new machines needed to be brought online, which is a process that typically takes six months (or more), or existing lines had to be converted. In some cases, manufacturers pivoted their operations to focus on meltblown, and some equipment suppliers shortened their delivery times, but it was still a three-plus month process to get a new meltblown machine up and running.

For more on this story, Brad Kalil, INDA's director of market intelligence and economic insight, provides an in-depth look at the supply chain challenges the nonwovens industry faced as the COVID-19 pandemic spread worldwide (pages 30-31). He also highlights some examples of how industry players stepped up to the challenge to help meet the need for materials.

Another equally important issue that has bubbled up as the demand for single-use synthetic-based facemasks and personal protective items has surged is what this means for the sustainability movement in the textile fiber industry. If a large portion of the world population is wearing and disposing of several plastic-based facemasks per day, what is the environmental impact? Geoff Fisher (pages 18-22) and Adrian Wilson (pages 24-28) touch upon this issue.

And finally, we take some time to consider the lessons learned from COVID-19 and the potential way forward to ensure we are in better position to respond to the next pandemic. For this we interviewed Li Lingshen, president of the China Nonwovens and Industrial Textiles Association (CNITA), Dave Rousse, president of INDA, and Pierre Wiertz, general manager of EDANA (pages 34-37). This article provides a global perspective on how COVID-19 has and will impact the nonwovens industry.

I hope you find this important issue of *IFJ* informative, and I wish you good health, safety and positivity in the challenging times we currently face.

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MISSION

International Fiber Journal covers fiber-related trends and material science developments and how they impact the supply chain from raw material to end use. *IFJ* provides thoughtful insights and perspectives to global producers, users and business leaders who need to know about what's next in fibers, filaments and processing solutions.

No alternatives to synthetics and single-use in the fight against COVID-19

By Adrian Wilson, International Correspondent, *International Fiber Journal*

With shortages of PPE constantly making headlines over the past few months, the COVID-19 pandemic has emphasized, more than ever, the world's current reliance on synthetic polymers and fibers in single-use disposables.

Where will this leave initiatives to develop more sustainable fibers and encourage longer lasting products, with the end goal of eventually achieving a circular economy?

Facemasks

A number of unique factors led to the international trade disputes that have raged in March and April over the supply of disposable facemasks for frontline workers and hospital staff.

A big bottleneck in meeting the huge surge in the demand for masks meeting N95 levels of efficiency – filtering 95% of contaminants down to the size of 0.3 microns – has been largely due to the lack of availability of meltblown polypropylene nonwovens.

Meltblown nonwoven beams are most typically integrated into composite systems with spunbond beams (SMS materials) for the absorbent hygiene products (AHPs) markets.

The AHP markets, for baby diapers, feminine hygiene and continence care, however, have only surged during the current crisis, and all of the raw materials for them are in any case sold under contract many months ahead, with little spare capacity available.

Supply pipeline

In a webinar on April 28th, Brad Kalil, INDA's director of market strategy opportunities and economic intelligence, explained the second major obstacle.

"Disposable finished goods based on nonwovens and including AHPs, generally tend to stay where they are produced, with one big exception," he said. "Disposable medical apparel items – including facemasks, as well as surgical gowns, scrubs, caps shoe covers and disposable bedding – all have to be individually sewn, as opposed to being converted by automatic equipment as diapers and other AHPs are."

Labor rates for sewing machinists in the U.S. average about $9 an hour, compared to $1 in China, he added.

As a consequence, in 2019 the U.S. imported some 92.5 million dozen packs of disposable medical apparel – 1.1 billion items – directly from China.

This figure does not even include facemasks, which INDA includes in its statistics under the separate filtration category.

Reicofil has turned over testing lines at its technology center in Troisdorf, Germany, for emergency meltblown production. *Reifenhäuser Group*

In January 2020, the pipeline of supply from China to the U.S. was completely cut off.

Cut and sew

Apparel manufacturers across the U.S. and Europe have subsequently rallied to pivot their otherwise largely idled cut and sew operations to the conversion of disposable medical apparel, but the shortage of suitable spunmelt nonwovens, and especially meltblown for facemasks, has continued to be a problem.

Major nonwovens manufacturers including Berry Global, Don & Low, Fitesa, Innovatec, Johns Manville, PFNonwovens and Sandler have all announced investments in new meltblown installations, while the major German technology suppliers Reinfenhäuser Reicofil and Oerlikon have endeavored to shorten delivery times and given over their own pilot plants to emergency production.

N95 facemasks have a 95 percent efficiency at filtering out contaminants down to a size of 0.3 microns. *3M*

With the latest Reicofil 5 system for SMS fabric production, throughput for spunbond fabrics is now up to 270 kg per hour per meter of beam width, but for meltblown it is still restricted to a maximum of 70 kg per hour per meter width – and this is the state of the art.

Filtration

Meltblown nonwovens are also widely employed by the filtration industry, where demand has also dropped with a reduction in industrial output. Here, filtration leader Mann+Hummel is shipping around 3,500 HEPA filter elements per day from manufacturing sites in the U.S. and Germany to automaker Ford, which is making powered air purifying respirators (PAPRs). PAPRs use a battery-powered blower that sends filtered air into a hood or head top and can provide increased levels of respiratory protection.

3M has also partnered with Cummins to utilize labor and equipment typically used for producing diesel engine filters to manufacture high efficiency particulate filters for PAPRs.

Cummins is using existing manpower and equipment at its Neillsville, Wisconsin facility to pleat the media, assemble it into cartridge housings and do final testing before shipping the filters to Valley, Nebraska, where 3M's PAPRs are manufactured.

Cummins' NanoNet and NanoForce filter media employ DuPont's Hybrid Membrane Technology (HMT) based in nanofiber layers.

Nanofiber layers can achieve even greater efficiency than N95 requirements, of up to 99% of 0.3 microns. The industrial production of nanofibers, however, is even slower than that of meltblown nonwovens, and existing lines have very limited output.

INDA is now working with the manufacturers of sorbents for oil spill containment, as a potential further source of the vital meltblown materials.

Synergex ONE

Berry Global has rushed out a new fabric with the potential to relieve this severe bottleneck that the need for meltblown is causing.

Synergex ONE is described as "a multilayer nonwoven composite product in a single sheet" and has been initially developed to meet the new facemask categories for the general population.

The aim, however, is to quickly bring the media up to N95 standard for surgical masks.

The new material is being manufactured in Europe with immediate availability.

Bicomponent alternative

In what may or may not be a related development to Synergex ONE – Berry Global declined to either confirm or deny it, or supply any further details on its new product – the Nonwovens Institute (NWI) at North Carolina State University has created a new bicomponent spunbond material that can serve as an effective N95 filter without the need for a meltblown filtration layer.

Nufabrx Theramasks contain the benefits of copper. *Nufabrx*

"We took the spunbond technology and created a new generation of unique filters that have excellent filtering capability and can potentially be reused after cleaning with peroxide, or potentially alcohol solution," said Executive Director Benham Pourdeyhimi. "Because these materials are strong, unlike classical meltblown filters, they can also be cut and sewn by traditional techniques.

"Typically, one meter of spunbond material provides enough for about 20 to 25 masks when using the current designs. One of the NWI's production lines started producing 2,000 meters of spunbond material per hour, with the potential to create some 20,000 meters in a day."

The Nonwovens Institute (NWI) at North Carolina State University has developed a new bicomponent spunbond polypropylene said to compete with meltblown fabrics. *NWI*

Patented Bigelo three-layer masks for general consumers retain 99.9% of their antimicrobial effect after 30 wash cycles. *Bigelo*

Sustainable fibers

The new nonwoven fabric can be based on bicomponents of Ingeo PLA biopolymer and polypropylene, and NatureWorks is donating enough Ingeo to produce as many as two million reusable N95 masks per week to the NWI.

Ingeo is said to improve the productivity of the spunbond process by at least 30%. It has been widely promoted as a

sustainable alternative to synthetics, being currently based on plant sugars, with a view to eventually making it directly from greenhouse gases. The present crisis, however, calls for its sustainable attributes to be compromised.

Even cellulosics leader Lenzing – a champion of sustainable raw materials with its closed-loop Tencel production and many other initiatives – has had to put aside its principles for the time being.

Lenzing has just founded a new joint venture company with fellow Austrian company Palmers Textil which started producing and selling protective masks for the domestic and European markets in May.

The new company, Hygiene Austria, plans to build up capacity to over 25 million facemasks per month, but at the moment is having to rely on a third-party supply of spunmelt based on polypropylene, as it works to develop ways to process its own fibers.

One area where there is the scope to do things differently, however, is in the production of disposable facemasks for consumer use, and indeed, many initiatives are already underway.

Single use

For the time being then, there is no real substitute for synthetic fibers, but what about the single use of medical disposables, is that something that could be addressed?

In medical settings, probably not. Hospitals returning to durables and all that their sterilization entails, is as unlikely as resurgence in the use of cloth diapers, detergent and buckets by young mothers.

One area where there is the scope to do things differently, however, is in the production of disposable facemasks for consumer use, and indeed, many initiatives are already underway.

It is likely that after COVID-19 the use of face masks in everyday situations may become as commonplace in the U.S. and Europe as it is in many parts of Asia for some time.

Here, masks that can be washed a number of times and can be recycled after use make perfect sense.

The German company Bieglo, for example, has introduced three-layer polyester fabric facemasks that incorporate zinc and copper molecules to both provide antimicrobial properties and to allow their reuse.

In testing, the anti-microbial effect of the masks was shown to be still 99.9% intact after 30 wash cycles and Bieglo recommends washing them by hand or in a washing machine with a base-detergent at a maximum of 60 C.

Nufabrx, based in Conover, North Carolina, has launched reusable facemasks containing the benefits of copper.

The company's Theramasks are engineered to provide dependable and sustainable protection for consumers and can be washed up to 30 times. They are currently available by mail order in the U.S. and consignments have already been delivered to the New York Police Department and other government institutions, as well as organizations such as Fed-Ex, American Airlines and a number of restaurant chains.

Two Japanese companies, TBM and Bioworks are meanwhile producing Bio Face knitted masks for consumers made from PLA yarns, with the help of technology provider Shima Seiki.

"As face mask consumption increases, the appropriate disposal of them is becoming critical," says TBM CEO Nobuyoshi Yamasaki. "Biomass-based and reusable facemasks for the consumer market make perfect sense."

It could be that while single-use disposables made from synthetics remain vital to hospitals and frontline workers, the growing consumer facemask market will prove a testing ground for much new sustainable innovation in fibers and fabrics. IFJ

Adrian Wilson is an international correspondent for *International Fiber Journal*. He is a leading journalist covering fiber, filtration, nonwovens and technical textiles. He can be reached at adawilson@gmail.com.

COVID-19 supply & demand

By Brad Kalil
Director of Market Intelligence & Economic Insights, INDA

Brad Kalil is director of market intelligence and economic insights, INDA, Association of the Nonwoven Fabrics Industry. He is responsible for providing industry thought-leadership through the gathering, analysis and dissemination of market information and industry reports for INDA. He is the author or co-author of INDA's biennial Industry Outlook reports on North America and the Global Nonwovens Industry, in addition to authoring the annual North American Nonwovens Supply Report and quarterly Market Pulse. He can be reached at bkalil@inda.org or +1 919 459-3734.

As we consider how the COVID-19 pandemic is impacting the nonwovens industry, it is important to start with an understanding of the numerous nomenclature issues associated with nonwovens.

The majority of the nonwoven material in demand as a result of the pandemic is spunlaid. The primary method for categorizing nonwoven capacity and production is by the forming process. The nonwoven material forming process can be classified into four distinct categories: Drylaid, Spunlaid, Wetlaid, and Airlaid Short-Fiber. Spunlaid is a web-forming process in which the production line extrudes and supplies its own fibers from a molten polymer in one continuous process. The spunlaid processes are further defined by the web-forming processes below:

• **Spunbond:** A spunlaid technology in which the filaments have been extruded, drawn and laid on a moving screen to form a web.

• **Spunmelt:** A multiple-layer material that is generally made of various alternating layers of spunbond and meltblown webs, referred to as SMS, SMMS, SSMMS, or other beam configurations.

• **Meltblown:** A nonwoven web-forming process that extrudes and draws molten polymer resins with heated, high-velocity air to form fine filaments that are deposited onto a moving screen. In some ways the process is similar to the spunbond process, but meltblown fibers are much finer and generally measured in microns.

• **Other Spunlaid Processes:** Other processes are flashspun, coform, and a few other unique lines.

Given the demand is greater than the supply during the pandemic, nonwoven producers with other types of nonwoven web-forming processes have been able to adapt to provide some of the needed material.

The primary end-uses that are currently in high demand due to the COVID-19 outbreak, not surprisingly, are protective medical apparel, medical facemasks/surgical respirators, and disinfecting wipes. Estimates of the increase in demand run up to 20 times the normal level. In addition, the stockpiling of absorbent hygiene products has caused a surge in that end-use as well.

Supply chain

From a supply-chain perspective, the pandemic has challenged the availability of nonwoven materials that are employed for end-uses related to the COVID-19 response.

Nonwoven material, being light in weight, tends to stay where it is produced, and as the demand for nonwovens increases, capacity investments are made in the areas where they are consumed. For example, in a 4.8 million tonne U.S. market, the net trade difference is negative 67,000 tonnes. Similarly, with goods made mostly of nonwoven material. An exception to this is "Nonwoven Medical Apparel" (HTS Code 6210.10.50), as it involves the labor of sewing. It is estimated 85% of the commodity nonwoven medical apparel used in the U.S. is produced abroad.

China's share of these imports was 80%, and Asia's share was 92% in 2019. There is not a specific HTS code for respirators and facemasks, but the Department of Health and Human Services estimate 95% of surgical masks and 70% of tighter-fitting respirators, such as N95 masks, are made abroad.

Tenowo of Lincolnton, NC, quickly converted from its normal production of automotive materials to the production of AAMI Level 2 gowns and facemask materials. *Tenowo, Inc.*

So ... the exception to "nonwovens stay where produced" is nonwoven medical apparel and medical facemasks/respirators. And this is why we find ourselves facing the current shortage, as the pipeline of finished goods from China and Taiwan was cut off in January, essentially breaking the supply chain and triggering an immediate need for these items.

The industry's response

Many of the spunlaid nonwoven producers are multi-

nationals that began ramping up production globally in early January. The U.S. nonwovens industry has been working on ways to increase output of the needed nonwovens by changing production grades and customer mix from other end-uses (meltblown is also used in wipes, absorbent hygiene, vehicle components, sorbents, medical/surgical, and apparel), as well as utilizing any idled capacity to free up more production for facemask media and protective medical apparel. According to INDA's *North American Nonwovens Supply Report*, the spunlaid operating rate has been increasing the last three years, from 80% at the end of 2016 to 90% at the end of last year.

Spunlaid has been sold-out and at full-capacity utilization since February. All the spunlaid producers have been receiving dozens of inquiries every day for at least the last three months. If they were able to increase output, they have.

The industry has adapted by: 1. engineering material from other web-forming processes to meet the requirements of needed items; and, 2. creatively increasing capacity for needed items. For example:

• **Tenowo**, a producer of nonwoven automotive material, pivoted to medical gown and facemask materials by developing AAMI Level 2 gown and facemask materials in less than two weeks. Instead of having idled lines, the company was able to bring its employees back to work to help fight against the pandemic.

• **HDK Industries**, a supplier of nonwovens mask materials amongst others, expanded its workforce to utilize excess capacity and align its development focus to produce a new line of medical gowns that met Level 1-3 criteria. The speed of this initiative took only five weeks to develop the entire product line, a project that would normally have taken 6-8 months. HDK engaged its sister facility, Fiber Innovation Technologies, to develop a brand new fiber for use in the gown applications.

• **Lydall Performance Materials**, a manufacturer of specialty materials for filtration, sealing and advanced solutions, was receiving 10 to 12 times its normal order volume for meltblown, greatly exceeding its capacity. To address the need for facemask filtration media, it dedicated its Rochester, NH, meltblown production exclusively to this demand. This allowed Lydall to supply the filtration media for 29 million N95 masks and 34 million BFE 98/95 masks per month. The company also developed and manufactured supporting materials (comfort layers, protective layers, and tie straps) at its other locations, notably Green Island, NY.

• **ExxonMobil, INDA and others** are providing assistance to several U.S. meltblown producers—primarily sorbent producers—to change their current production to the ability produce the inner filtration layer of a facemask .

• **INDA and a key member** worked with the FDA to fast-track the approval process for disinfecting wipes to be delivered in different packaging: soft-sides as opposed to a hard canister. The approval process was completed in weeks, compared to a normal 8 to 12-month federal and state approval process, delivering billions more disinfectant wipes to retail shelves this summer.

In the longer term, we expect to see capacity additions in the U.S. to provide a greater self-sufficiency for facemask and protective medical apparel. For example, there have been some recent U.S. capacity announcements worth noting:

• **Lydall** stated "In May, we secured a major long-term agreement with Honeywell to supply meltblown filtration media for their N95 mask production facilities. Our proven technical and production capabilities were key factors in our selection. As a result, we have already committed additional capital to acquire a new meltblown production line to satisfy this and related demand."

• **PFNonwovens** announced in a press release "that the PFN Board of Directors has approved a new nonwoven line investment in Hazleton, Pennsylvania" and "this line will also increase the capacity to produce medical fabrics in Hazleton to address medical health crises, such as COVID19".

In addition, there have been capacity announcements in countries throughout Europe, in Asia and in South America.

Government response

The U.S. government response is still to be determined. At one end of the spectrum, things go back to the way they were, with material being supplied by offshore sources, to the other end of spectrum, with the U.S. being entirely self-sufficient. The latter will require government intervention, be it through the Domestic Production Act (DPA), the Strategic National Stockpile, and/or requirement to purchase U.S.-produced materials.

There has been one specific announcement at the end of April, when the U.S. Department of Defense executed the first military use of the DPA during the COVID-19 pandemic crisis, awarding $133 million in contracts for N95 mask production. The contracts were issued to 3M, Honeywell, and a unit of Owens & Minor.

The road ahead

One of the biggest remaining questions impacting the supply side of the U.S. nonwovens industry is the possibility of government intervention. If that's the case, further investments in capacity will be made. Other developments that could impact the demand side:

• Does the use of sanitizing and disinfecting wipes return to its historical base usage or do behaviors by institutions, businesses and/or consumers change?

• Same holds true for facemasks … do we return to the historical base or do consumers adjust their behavior and wear a mask when they are sick as a courtesy to protect others?

• Do consumers, businesses, health care facilities make upgrades to their Indoor Air Quality through the use of HEPA or other higher-efficiency filters? and

• Will a new "civil" facemask grade be introduce in the U.S., and will it impact usage?

My conjecture is that we end up somewhere between the two ends of the spectrum and behaviors will change in the short-term, but in the long-term settle slightly above baseline usage. IFJ

As director of market intelligence and economic insights at INDA, Brad produces a number of market reports related to the nonwovens industry. Recent reports include: *Special Report on the Meltblown Market*, 2019; and *Worldwide Outlook for the Nonwovens Industry*, 2018 – 2023. Coming this fall, *North American Nonwovens Industry Outlook*, 2019-2024. For more information, visit *inda.org*.

Wipes in the age of COVID-19

By Chris Plotz
Director of Education & Technical Affairs, INDA

Chris Plotz is the director of education & technical affairs at INDA, Association of the Nonwoven Fabrics Industry. Plotz is a business leader with 19 years of technical nonwovens- and filtration-related experience in global product management and product development within leading manufacturers including Parker Hannifin, ITW Pro Brands, and BHA Technologies, Inc. Most recently, Plotz was the director of innovation with The Green Edge, management consultants, where he led product lifecycle activities for sanitizing technologies. He can be reached at cplotz@inda.org or +1 919 459-3748.

Wipes are an important technology for minimizing the impact of viral outbreaks like COVID-19 because they are a tool that is premeasured, premoistened and not susceptible to human error – in that they require no mixing or measuring to be effective.

Bacteria vs. virus

Bacteria and viruses are both too small to be seen without the aid of a microscope, but that is where the similarities end.

Bacteria are single-celled microorganisms, and they are huge in comparison to a virus. Bacteria are relatively complex single-cell creatures, which can reproduce on their own on a hard surface and/or on the skin. They can cause infection but they can also be helpful. The only way to stop them is by killing them, as even a small fraction of bacteria can reproduce quickly.

Viruses, on the other hand, are not actually living and are not cellular. They need a host to reproduce by entering and multiplying inside the host's cells. Viruses can also reside on hard surfaces and the skin, but they can't reproduce there. However, unlike bacteria, most viruses cause disease, and a virus is not really killed, it is deactivated. When deactivated on a surface, it has no means of replicating.

This distinction of how the threat is eliminated is important because when utilizing a wipe, not only do you kill or deactivate, you also remove from a surface through mechanical action.

Marketing vs. regulatory claims

It is important to differentiate between marketing claims like "cleaning" and "antimicrobial" and regulated claims such "sanitizing" and "disinfecting."

Cleaning refers to the removal of germs, dirt and impurities from surfaces. Cleaning does not kill germs, but by removing them it lowers their numbers and the risk of spread of viruses.

Antimicrobial refers to a general killing agent that destroys or inhibits growth of microorganisms, but is not specific.

Sanitizing refers to the use of chemicals to reduce a microbial population or bacteria, but not viruses since viruses are technically not alive.

Disinfecting refers to the use of chemicals to kill germs or deactivate viruses on surfaces. This process does not necessarily clean dirty surfaces or remove germs, but by killing germs on a surface, it can further lower the risk of spreading infection.

Wet wipes are a great tool for disinfection because they are simple to use. Unlike liquids that have to be accurately measured and still require some form of wipe as a finishing step, wet wipes provide a complete solution for disinfection.

Ababoolutum/iStock

Regulatory concerns

In the U.S., the Food and Drug Administration is responsible for sanitizing wipes (sometimes called antibacterial wipes). Sanitizers and antibacterial wipes both have a kill rate of 99.99%. Both terms mean the same thing. There isn't generally a specific call out of organisms that they kill.

In the U.S., the Environmental Protection Agency regulates disinfectants as pesticides. For wipes, the formulation of disinfectants (composition and amount) must be pre-registered for use with the EPA using what is called a CSF Form, which stands for Confidential Statement of Formulation. Neither composition nor quantity employed can be varied without re-registration. This is import to note, especially now because many nonwovens, active agents and packaging are unavailable due to high wet wipe use, and there is no substantiation of materials or chemistry if it's not on the CSF list. The registration for wipes includes the disinfectant formulation, the nonwoven and packaging (including labeling).

Every EPA-registered wet wipe product's label features a list of organisms that the product is approved to kill. Along with this list is the time it takes the wipes chemistry to kill these organisms and other directions for use. Some wet wipes require a precleaning of the surface prior to wiping with a disinfectant

wipe to remove dirt and other soils, and this information is communicated on the label.

In the U.S., the Federal Trade Commission (FTC) enforces truth-in-advertising laws, and it applies the same standards no matter where an ad appears – it could be in newspapers and magazines, online, or on the wipes package. The FTC monitors "kill claims" and other marketing copy for wet wipe formulations. These claims are not regulated by the EPA because they are considered advertising. Federal law states that this information, when appropriate, should be backed by scientific evidence.

Appropriateness for COVID-19

Wet wipes and dry wipes can be utilized to reduce the spread of COVID-19. Wet wipes are a delivery system for chemistries that kill bacteria or deactivate viruses. These products must be validated to perform and meet the claims listed on their packaging. These claims, at a minimum, are directions for use, how long the surface must remain wet to be effective and what pathogens the product is effective against.

Dry wipes do not have kill claims associated with their use. However, there are several products in the market that reference their ability to remove pathogens, dead or alive, from hard surfaces. Third-party testing associated with these wipes show that with water alone, they remove 99.9% of pathogens, including Norovirus, Listeria, E coli, MRSA, and Salmonella. While COVID-19 is a small virus, it is similar in size to Norovirus, which suggests this dry wipe technology may be effective at removing COVID-19 as well.

Technology improvement

As fibers get smaller, they can be become more effective at capturing very small particulate like COVID-19 from surfaces. When utilizing microfibers in a disposable nonwoven wipe, they prevent cross contamination that is common in launderable products. These products are also more efficient than standard products based on the fiber. Electrostatically charged fibers also have the capability to attract small particles when wiping a surface and remove live or deactivated viruses from hard surfaces.

Looking past the pandemic

I think Sun-Tzu said it best, "In the midst of chaos, there is also opportunity." These uncertain times are birthing a new normal in which cleanliness and cleaning protocols have been heightened and changed. As a result, there will be new products for hand and surface sanitization with wipes helping to lead the charge. I believe that finer fibers with higher surface areas combined with simple chemistries, like general surfactants and water, will increasingly be employed. One thing is for sure, the future will be one of the cleanest in history. IFJ

As director of education and technical affairs, Chris presents regular training related to nonwovens and filter media from INDA's headquarters in Cary, NC. For more information about upcoming training opportunities, visit *inda.org/education*.

Global perspectives on the challenges, opportunities and lessons learned from COVID-19

By Matt Migliore, *International Fiber Journal*

In light of the ongoing coronavirus (COVID-19) pandemic and the supply chain challenges this global emergency has presented for the manufacture of critical nonwoven-intensive products, such as personal protective equipment (masks, gowns, hair covers, shoe covers, etc.) and wipes of various kinds, *IFJ* reached out to leading nonwoven industry associations in China, Europe and North America with the aim of providing a global view. The nonwovens industry's response to the pandemic, while commendable, presents challenges, opportunities for improvement and ultimately lessons to be learned as we consider the way forward in a world where global pandemics may be a more common reality. To this end, we asked our subject matter experts,

Li Lingshen is the vice president of China National Textile and Apparel Council (CNTAC) and the president of the China Nonwovens and Industrial Textiles Association (CNITA). He earned a Ph.D. in Management Science and Engineering from Donghua University. He has been engaged in technology innovation and management in nonwovens and industrial textiles for many years, and made outstanding contributions to the technological progress and industry development of China's nonvowens industry. He continues today in his aim to bring the industry to a higher level.

Dave Rousse is the president of INDA, Association of the Nonwoven Fabrics Industry. He has more than 35 years' experience in various senior leadership positions in the pulp and paper and textile industries. In his role with INDA, Rousse is responsible for advancing the application of nonwoven textiles worldwide through educational events, tradeshows, and other forums tailored to the needs of nonwoven fabric manufacturers, equipment suppliers, raw material suppliers, converters and end-use customers.

Pierre Wiertz, who started at EDANA in 1982 as a research associate, has held the position of general manager since February 2004. As head of the organization, he is responsible for the association's strategy, delivery and operations and has initiated a new business orientation for its activities and membership benefits and given impetus to the association's geographic expansion. He regularly speaks at European and international conferences on topics related to the nonwovens industry. Wiertz earned his degree in Economics from the University of Liège (Belgium).

what do you see as the nonwoven industry's:

primary challenges in responding to COVID-19 and similar pandemics we may face in the future?

Li Lingshen: Since the outbreak of the coronavirus, personal protective equipment (PPE) and wipes have become very important products in the fight against COVID-19. The production and supply of these products were a high concern for the government, the public and the media.

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China 's Ministry of Industry and Information Technology, the National Development and Reform Commission are responsible for the production and supply, the National Administration for Market Regulation is responsible for the quality supervision. China Nonwovens and Industrial Textiles Association (CNITA), as a national industry organization in this field, has provided a lot of support for the work of these government departments. In responding to COVID-19, China's nonwovens industry faces the following challenges:

• First, industrial information is insufficient. China is the largest producer of masks in the world, but masks account for a very low proportion in China's nonwovens industry. Before the outbreak, the daily production capacity was about 20 million. Mostly small and medium-sized enterprises are engaged in mask production, and they are scattered in different fields, such as textile, medicine, health, etc. Obtaining comprehensive information of these enterprises in the early stage of the outbreak and accurately assessing the supply capacity have become the most important issues.

• Second, supply chain collaboration was not sufficient during the early stage of the outbreak. The outbreak occurred at the Spring Festival, the most important festival in China. Enterprises in the entire industrial chain had stopped production, and workers returned to their hometowns for the holiday. Therefore, gradually restarting the industrial chain on the premise of COVID-19 prevention was the primary task in the initial stages of the pandemic. As the pandemic worsened, a large number of enterprises purchased mask machines, and clothing and home textile companies began to convert to medical protective clothing. By the end of April, the daily production capacity of masks exceeded 500 million, and the daily production capacity of medical protective clothing exceeded 1.5 million. The supply of raw materials, such as meltblown, spunbond, spunlace, hot air nonwovens has become the biggest bottleneck in the entire supply chain, and the price of these materials has risen sharply.

• Third, the standards and regulations for masks and protective clothing are not uniform. A large number of China's companies adopt the EU and U.S. standards to produce protective clothing for exports. In the early stage of the outbreak, although not adopting Chinese standards, the products of these companies were urgently permitted by China Regulatory Authority to be used for prevention and control of COVID-19. This measure effectively alleviated the contradiction of production capacity. In April, with the spread of the coronavirus around the world, the export of Chinese masks and protective clothing once again faced inconsistencies in the standards and supervision of various countries, which caused great problems to the production and supervision.

Dave Rousse: The COVID-19-driven need for personal protective equipment and for disinfectant wipes, and other wet wipes in light of the toilet paper shortage, has required the full engagement of the nonwovens industry.

Prior to 2020 (i.e., pre-COVID-19), over 80% of the U.S. demand for medical and surgical facemasks (N95 Respirators, N95 Masks, ASTM Level 1,2,3 Masks) was supplied by China and Taiwan. Many of the Level 3 and Level 4 Surgical Gowns were cut-and-sewn in Asian countries, even if the nonwoven fabric was made and coated/laminated in the U.S.

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When the COVID-19 situation took hold, many of these supply chains were disrupted as countries withdrew exports of these items to supply their own national demands. These developments exposed the risks related to long supply chains subject to local mandates, low inventories (because supply chains had been working well), and single-source suppliers (as backups add cost and time), and risk-avoidance was secondary.

For wipes, the issue was the shear volume of demand, which continues today, as more people are using more wipes for the surface and skin cleaning associated with Centers for Disease Control guidance.

Addressing these structural issues in a competitive market economy may require some policy changes by the federal government to maintain a level playing field in the private sector, and to eliminate the "bidding war" each state went through in trying to secure their own hospital supplies during the early stages of the COVID-19 pandemic.

Pierre Wiertz: The primary challenge presented by the COVID-19 pandemic was, of course, surprise and an unprecedented need for nonwoven products. Our industry is used to stable, long-term demand. Now nonwovens and related industries are proving to be an essential partner in the fight against the coronavirus pan-

demic, and facemasks, personal protective equipment, medical supplies and wipes are among the nonwoven-intensive technologies particularly relevant to the COVID-19 response effort. The availability of disposable hygiene and medical products is an essential element in the fight against COVID-19.

Another challenge has been the "knowledge gap" about the crucial role of nonwovens. Industry in general and trade associations, such as our own, have an important role in relaying information on supply chain issues, production capacity and lead times so that authorities can plan accordingly.

But we are still dealing with the unknown and unexpected. Before now meltblown has not been a strategic commodity, and predicting prices and ensuring steady supply will not be easy.

Early on during this crisis we sent a letter to the European Commission, requesting its support in working with Member States to ensure that all production facilities where these products are manufactured are kept fully operational in the interest of public health. And we continue to work closely with the services of the European Commission to find solutions to the continued provision of the essential medical and protective equipment and to any bottleneck in the supply chain.

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Facing numerous requests from start-ups and new ventures with little or no experience in our sector has forced us to open the eyes of their initiators about the aforementioned realities.

primary opportunities for improvement and/or new technology development to better position for similar pandemics in the future?

Dave Rousse: Out of every crisis comes opportunity, and we have seen some new material developments in facemask media to address the shortage of meltblown for N95-quality facemasks. We have also seen a nimbleness and adaptability of some producers of meltblown for the sorbents industry quickly pivot some equipment to the lighter-weight meltblown required for N95-quality facemasks. And we have collaborated with other trade associations serving the textile sector to enable woven fabrics to satisfy the demand for Level 1 and Level 2 isolation gowns. Some equipment makers for converting nonwovens quickly came up with facemask converting machines to supply the overnight demand for more facemask manufacturing.

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All of these developments indicate an adaptability and flexibility so much needed to deal with the next pandemic.

Pierre Wiertz: Industry is already pushing capacity limits to meet the exponential rise in demand, and along with this we need continued coordinated and collective action from the EU and member states to maintain open trade and efficient supply chains, both within the EU and with the EU's trading partners. Already the European Commission has created a strategic common European reserve of medical equipment such as ventilators, personal protective equipment, reusable masks, vaccines and therapeutics and laboratory supplies.

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With the support of the European Commission, EDANA is setting up a new working group, one the missions of which will be to promote the sustainable development of an independent and self-sufficient supply chain for medical facemasks and personal protective masks in the EU.

Li Lingshen: China's nonwovens and related industries have provided a very sufficient guarantee of products and technical capacity to combat the pandemic. China has achieved the localization of spunbond, meltblown nonwovens and polypropylene. In 2019, the output of polypropylene spunbond nonwovens in China reached 1.989 million tons, and the output of meltblown nonwovens was 66,000 tons. During the pandemic, enterprises and research institutes cooperated to install and debug new production lines and transform SMS lines.

Meltblown nonwovens for masks increased from the usual daily production of 200 tons to 1,000 tons.

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The outbreak of COVID-19 is not only a test, but also an opportunity for China's nonwovens industry. In response to possible outbreaks in the future, China's nonwovens industry will strengthen the research and development of PPE and raw materials, especially high filtration efficiency meltblown nonwovens, electrospinning, high-protection grade fabrics and washable reusable fabrics to protect the safety of medical staff.

In response to the needs of ordinary people for pandemic prevention, we have developed civilian masks with different levels of protection to achieve a balance of protection and cost. We will formulate and improve the standards, evaluation and certification systems of masks and protective clothing for different groups of people and application scenarios, and regulate the order of production and go-to-market practices.

primary lessons learned as we consider COVID-19's impact on the nonwoven industry's supply chain for critical products such as PPE and wipes?

Pierre Wiertz: As I touched upon earlier, self-sufficiency will be key, and we are seeing support to encourage European production and ensure future production capacity and supplies. In Germany a new subsidy scheme is being developed in which the government will cover 30% of the cost of a meltblown production line.

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We estimate that Europe is set to triple its output of meltblown between March and the end of the year, from about 500 tons a month to 1,500 tons.

Li Lingshen: CNITA took the initiative in the PPE and wipes supplies, and actively cooperated with the government to facilitate information collection, enterprise resumption of production, coordination of efficient operation of the supply chain, regulation of industry operation, and standardization of products. Good results have been achieved. There are some experiences to share:

• First, for severe natural disasters and large-scale public health incidents, we need to establish an integral database of production enterprises of raw materials, equipment and products, establish whitelists of key enterprises, and reserve emergency supplies of technology and production capacity to facilitate the mobilization of the nonwovens industry's plunge into supplies in a short time.

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• Third, countries all over the world should strengthen the unification of standards and certification of anti-pandemic products, and mutual recognition in emergency, reduce non-tariff barriers to trade, and facilitate the cross-border transaction of these products.

Dave Rousse: There are many lessons to be learned from this experience, some at the federal policy-making level and some at company operating levels. From a federal policy-making level, we have exposed the risks of having supply chains extending to Asia on products critical to the safety of our citizens. While this is the likely outcome of the free-market system and the need to drive costs down on key products, there are some products where the risk premium in price is worth it.

We need to relearn that when it comes to facemasks and medical gowns, paying a little more for assuredness of supply (and quality) may need to be mandated to get above the private sector profit motives. This was done for military apparel with the Berry Amendment mandating U.S. sourcing of the material, thread, and manufacture of U.S. military apparel. Something like that may be needed for essential medical/surgical PPE. Incenting investment in the PPE precursors may also be needed.

Monolithic meltblown capacity (i.e., not the "M" in SMS) in the U.S. could be incented through the Defense Production Act, and demand steadied by a National Stockpile with rotating stock. These, among other options, will likely be looked at.

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Regarding private sector practices, cost reduction strategies have reduced the maintenance of second sourcing of some key materials. Again, a "premium" may be worth paying to assure supply when one key supplier gets disrupted, as the Taiwanese N95 respirator/facemask supply chain has been.

We do hope that there will be valuable learnings and reassessments coming out of the COVID-19 pandemic. IFJ

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