From Smart Helmets to 'Body Thermostats' to to EVs to Solar Cows, CES Has it All

The annual tech extravaganza in Las Vegas never fails to amaze

By Robert Grace

"We spent the last 30 years connecting people. We will spend the next 30 years connecting *things*." So says Brian Modoff, executive vice president of Qualcomm Inc. Whether it's the seamless connectivity of consumer devices, or of machines on the shop floor, digital interconnectivity will dominate our future in countless ways.

Nowhere is this theme more on display each year than the massive CES consumer electronics show. The 2019 event, held Jan. 8 to 11 in Las Vegas, attracted 4,500 exhibitors and more than 180,000 attendees from 155 countries. Many topics were front and center, including artificial intelligence (AI), augmented and virtual reality (AR and VR), smart homes and cities, robotics, future mobility in the form of autonomous and electric vehicles, digital health and wellness devices and services, and 5G cellular wireless connectivity.

It is more challenging at a marketing-oriented tech show to uncover the materials angles to these innovations and developments, but they exist. Plastics and composites have a huge role to play in making so many of tomorrow's products feasible.

- 5G, the fifth generation of cellular wireless that will enable lightning-fast transmission of data, will require millions of sensors, housings, nodes and towers. (And 2019 marks the launch of the first 5G smartphones on the market.)
- Autonomous vehicles will similarly require all types of sensors, lighting, touchscreens, and integrated electronics, while also reshaping vehicle interiors to resemble mobile living rooms.
- Health and exercise wearables will need to provide durability, comfort, safety, reliability, and aesthetics--all features that lend themselves to innovative polymer applications.

Key Tech Product Trends

For starters, let's look at some of the key trends revealed by the Consumer Technology Association in the latest edition of its semi-annual "U.S. Consumer Technology Sales & Forecasts" report, released at CES.

The CTA projects that "artificial intelligence and fast connectivity—critical ingredients for the next era of category leaders such as smartphones, smart home devices, and smart speakers—will drive the U.S. consumer technology industry to a record-breaking $398 billion in retail revenues ($301 billion wholesale) in 2019."

They listed the following product groups as likely to contribute significantly to the tech sector's growth in the United States this year:

- Voice-controlled **smart speakers** such as Amazon Echo and Google Home (+5 percent year-on-year unit growth, to 36.6 million units);
- **Smart home products**, particularly those related to home monitoring and security (+23 percent, to 29.4 million units in 2019);

» **Wireless earbuds** are considered a "standout audio product" (+44 percent, to nearly 16 million units this year);

» **Smart watches** growth is being driven by fitness tech companies that are shifting their focus from basic trackers to more sophisticated smartwatches (+25 percent, to 20.5 million units shipping in 2019); and

» **Drones**, which are seen reaching 3.4 million units this year (+4 percent) as more consumers and businesses adopt these devices for aerial photography, drone racing, and recreation.

Let's take a quick look at some of the more intriguing, plastics-relevant products spotted on the show floor at CES this year.

Byton Electric Vehicles

Nanjing, China-based electric vehicle (EV) startup Byton for the second straight year made a big splash at CES. At the show in January 2018 it introduced its all-electric M-Byte SUV Concept and one year later it's readying that model for production, scheduled for late 2019. It is due to go on sale in China by the end of 2019 and in Europe and the U.S. in mid-2020. Its 48-inch-wide, curved digital display in an otherwise spartan dashboard is the real attention grabber.

The initial M-Byte model will be offered at a baseline price of $45,000 without self-driving car technology. But Byton says the vehicle will be upgradeable to level 3 autonomous driving--where the car does most of the driving—in the future. It will have a 325-mile range and be able to recharge 80 percent of its batteries in 30 minutes.

After building its first prototypes in May 2018, the company has built about 100 vehicles so far, and expects its Nanjing plant to be able to produce 300,000 units per year once fully operational. The firm opened its first showroom, called Byton Place, in Shanghai in mid-January.

Co-founder, Chairman, and Chief Executive Officer Carsten Breitfeld (a former BMW executive) told CES attendees that he considers Byton to be "a digital startup" that has made such fast progress by switching from "thinking mechanically to thinking digitally."

Byton calls the dashboard screen a Shared Experience Display (SED), and it is the world's largest in-car display for a production automobile. It displays vehicle and driving information and offers various content options in an intuitive way. The position of the display has been carefully developed and tested to not affect driver line-of-sight and can automatically adjust brightness according to changes in ambient lighting to avoid further distraction.

It is not a touchscreen but can be controlled with hand gestures or via the 7-inch, digital "driver tablet" at the center of the steering wheel just above the driver's airbag, which serves as one of the main interfaces for the driver to configure the vehicle and interact with the SED.

Chinese EV startup Byton says its all-electric M-Byte SUV--with this curved, 48-inch digital display screen--is going into production this year, and will be available in the U.S. and Europe by mid-2020, at a base price of $45,000. Courtesy of Byton

Byton also has added an 8-inch touch pad between the driver and the front passenger seats on the production model, enabling the front passenger to control the SED. It is one of seven tablets in the vehicle.

The dashboard features a new wraparound design with air conditioning vents, gear selector, and other hard buttons located in the center along with a driver monitoring system to ensure safety during assisted-driving modes. And Byton says it will offer multiple interaction modes with the vehicle, including voice control, touch control, physical buttons, and gesture control. (Learn more at www.byton.com.)

CrossHelmet X1

Japan's Borderless Inc. showcased an accessory for another type of transportation. It was one of several interactive motorcycle helmets on display at the show, but CEO Arata Oono, a motorcycle designer, says he foresees the firm's 360° camera technology also being applied to bicycle and ski helmets, and more.

The five year-old firm designed its full-face helmet to integrate a camera in the back for "total spatial awareness" and increased safety. The camera's image of what is behind you is projected onto a clear polycarbonate, heads-up visor just above your line of sight in the front. The helmet itself, currently offered in matte black or silver, is also molded out of rugged PC resin, lead designer Kevin Tseng said in an interview on the Borderless booth.

The all-polycarbonate CrossHelmet X1 features an integrated camera in the back for "total spatial awareness" and increased safety. Courtesy of Borderless Inc.

The first-generation, smartphone-integrated model also offers Bluetooth connectivity, voice commands, noise cancellation and sound control, a capacitive touchpad, and LED side lighting. The company calls the product "the world's smartest helmet," and Tseng said he expects it to retail for about $1,799. (See the camera in action at www.crosshelmet.com.)

Solar Cow

At first glance, an innovation designed to help encourage poor, young children to attend school daily in rural Africa would seem out of place at a glitzy technology show. But that didn't deter SungUn Chang, a South Korean native who nine years ago earned an industrial design degree from the Art Institute of Chicago.

Her mission: Try to address the child labor issue in such places by rewarding parents with free access to electricity in exchange for sending their children to school. She targeted participants who would value electricity but had scarce access to it, and then developed a device--dubbed Solar Cow--that could harness solar energy from which the entire family could benefit.

Chang founded her company, called Yolk, six years ago in South Korea. About 18 months ago she began developing this concept. To help tell the story and capture the attention of the kids, she decided to create a tubular steel structure in the shape of a cow. She fits each such structure with a storage battery, several small solar panels, and an array of small, portable, lithium ion batteries that she has named Power Milk. One Solar Cow can serve 250 students, since that's how many of these white, opaque, polycarbonate-encased batteries one Cow can hold.

The school gives one dedicated, rechargeable Power Milk to each student. When placed in the Solar Cow, the batteries look similar to udders and charge during the day while the students are in class. Each can store 3,000 milliamps and when the students take them home at night, they can provide up to four hours of free electricity to the family.

Asked if she was thinking of creating larger version of Power Milk that could store more energy, Chang said, "No, because if we give them too much power, then they don't need to come to school every day." The school can digitally track who

South Korean designer SungUn Chang created this cow-shaped solar charging station to incentivize parents of poor children in Africa to send their kids to school each day (for the free electricity), rather than making them work to support the family. (above) Each student gets one of these polycarbonate "Power Milk" lithium ion batteries, and each Solar Cow can hold 250 such batteries that recharge during the school day. The device has been designed so that the batteries resemble the udders on the cow. (right) Courtesy of Yolk

attends school and when, since each Power Milk has a unique code. The devices also are useless to anyone else if stolen or lost, since they have no power cord and can only be recharged in the Solar Cow.

The first Solar Cow is being installed in Kenya at a school serving students from preschool to the eighth grade. Chang says she hopes to ship 1,000 Cows—equal to a quarter-million Power Milk batteries—this calendar year.

Schools investing in solar energy tend to install large solar panel systems, but those benefit only the school and not the villagers. She wants her innovation to benefit those at "the bottom of the pyramid," or the poorest of the poor, and suggests that this likely "is the first energy solution to target" such individuals.

Chang notes that she is looking for more financial partners, particularly governments and non-governmental organizations. (http://yolkstation.com)

Embr Wave

Wellness-related wearables were everywhere at CES, designed to help individuals monitor and take control of their health, simplify and enhance medical routines, and just promote calm and happiness.

Embr Labs, a Somerville, Mass.-based startup, was showcasing what it calls "a thermostat for your body." The Embr Wave is an intelligent bracelet that uses scientifically developed waveforms to precisely stimulate a person's thermoreceptors. This, according to CEO and co-founder Sam Shames, leverages the body's natural systems to make the wearer feel cooler or warmer by 5° F in just a few minutes.

The user wears the aluminum-bodied like a wristwatch, since there exists a higher density of temperature-sensitive nerve endings on your wrist. The company

This "intelligent bracelet," called the Embr Wave, has been dubbed "a thermostat for the body." It uses waveforms to stimulate nerve receptors on the wrist to help the wearer feel cooler or warmer by 5° F. in just a few minutes. Courtesy of Embr Labs

designed precisely calculated algorithms to deliver temperature sensations in "waves," giving the body more consistent relief than an ice pack or a hot pad could. Developed over years, the patent-pending technology has been shown to be effective in 89 percent of users, according to independent research.

Embr—which stands for Environment, Mind, Body Resonance—chose to use a frosted light pipe with LEDs as the primary user interface. Working with German resin supplier Covestro (on whose booth Embr was exhibiting at CES), Shames said his team opted to use Makrolon® 2407, a UV-stabilized grade of polycarbonate and then compounded diffusers and optical brighteners into the resin to achieve the desired visual effect.

The Embr Wave has been on sale since March 2018 at the retail price of $299. (www.embrlabs.com)

French startup Moona is using thin TPU layers, with a PU foam covering, in a pillow pad that, when used in conjunction with the bedside controller, can help regulate the pillow's temperate to promote a better night's sleep. Courtesy of Moona

Moona Sleep System

We've all heard the saying about "the cool side of the pillow." Well, French startup Moona wants to regulate the temperature of your pillow to make it permanently cool, with a view to improving your sleep patterns.

Numerous medical studies have shown the correlation between body temperature and sleep cycle regulation. To get good sleep, we need to lose 1° C of core temperature, they suggest. The most restorative sleep happens when body temperature reaches its minimum, according to Moona CEO and co-founder Coline Juin.

So, in March 2016 she and David Stoikovitch founded the company and worked to find a solution. Stoikovitch, the company's chief technology officer, explains the technology:

"The pillow pad is made out of thin TPU (thermoplastic polyurethane) layers in a grid, with a low-density PU foam covering the interstitial parts of the grid to make it comfortable for the user. We spent many iterations trying to find the right mix of materials and properties—thickness, rigidity, density—with comprehensive user experience tests each time. It was very important for our pillow pad to be as comfortable as possible and to fit every pillow so that the user would feel the membrane only very slightly, enabling temperature transfer without producing discomfort."

The accompanying bedside device, he noted, is made of polycarbonate/ABS, which is standard in the consumer devices industry. The temperature is adjustable on the device, which is quiet (less than 25 dB).

There are no electronics in the pillow pad, no signal transmissions during the night, and the pad is compatible with any pillow.

Regarding commercialization, Stoikovitch says, "We are entering the final stages of production. Moona should be delivered to the first customers and Kickstarter backers in May or June. We will start selling the product on our website and then we'll expand to third-party online marketplaces, such as Amazon." Pre-orders take $100 off the $399 price. (Cool off at www.getmoona.com.)

ABOUT THE AUTHOR

Robert Grace is a writer, editor and marketing communications professional who has been active in B2B journalism since 1980. He was founding editor of and worked for 25 years at *Plastics News*, serving as editorial director, associate publisher and conference director. He was managing editor of *Plastics Engineering* from July 2016 through October 2017, and is now both editor of SPE's *Journal of Blow Molding* and directing content strategy for SPE. He runs his own firm, RC Grace LLC, in Daytona Beach, FL., and can be contacted at bob@rcgrace.com.