Feature Stories : Addictive Manufacturing-Plastic & Rubber Technology

22 MINS WITH

Steven Liu
Chairman Founder
Sinoboom

Jürgen von Hollen
CEO
Ultimaker

Associate Professor
Steve Kardinal Jusuf

Associate Professor
Soh Chew Beng

Professor Lock
Kai Sang

Assistant Professor
Sivaneasan Bala
Krishnan

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ANRPC Releases Natural Rubber Trends May 2021

3D Printing Trends: Six Major Developments

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Insight Out

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22 Mins

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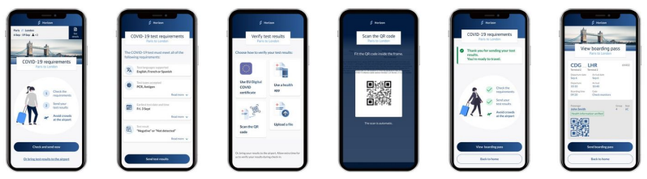
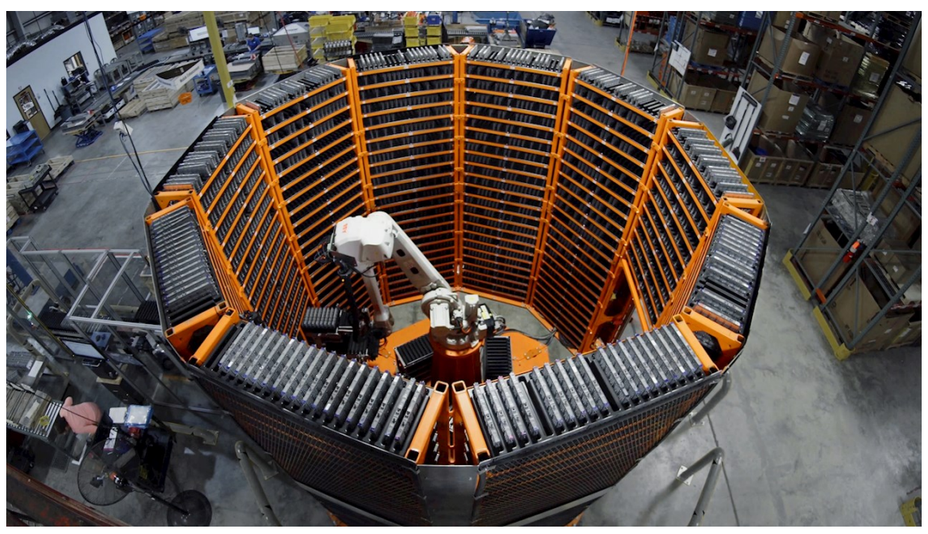


Success Story



Great Opportunity

Welcome!

Hola!

We hope everyone is keeping well during this time.

This August edition brings you a total of 6 personal insights from the Industrial Experts in the 22 mins section. With a growing trends and demand for better material and cost effective 3D printing and prototype, we have see many service provider and manufacturers coming out with greener products. This issue we are looking at how the Plastic and Rubber industries thrive at the same time with companies coming out with ideas and technology to recycle them back to the nature. With countries slowly opening up with mass vaccination and new ruling for vaccinated people, economy is set to a sure and slow recovery in months to come. Over in our Marketplace iiga.shop we have seen an increase numbers of 30% new e-shops and enquiry coming in to look for local partners. We hope that brighter time is coming for all industry.

We are currently preparing for our 2 exciting upcoming projects , one is the e-learning industrial platform and the giveaway of 20 free websites monthly. It is our give back to the community for our 20th Anniversary.

We will update you the link for the free sites in our social media account. Be sure to follow us there. All free sites are done without Coding. So you do not need to worry for any sort of heavy follow up.

Till October, please stay safe and we look forward to having you back again.

Sending you good health, great vibes and happiness

Team Industrial Guide Asia

Revere Plastics Systems Continues Growth in Central U.S. with Acquisition of Ferguson Production, Inc.

Revere Plastics Systems, LLC, one of the nation's premier manufacturers of highly-engineered plastic injection molded parts and assemblies, has acquired Ferguson Production, Inc. of McPherson, Kansas. The acquisition, effective July 2, 2021, comes six months after Revere's acquisition of its first manufacturing facility in Mexico and increases Revere's manufacturing footprint from 8 to 9 locations throughout North America.

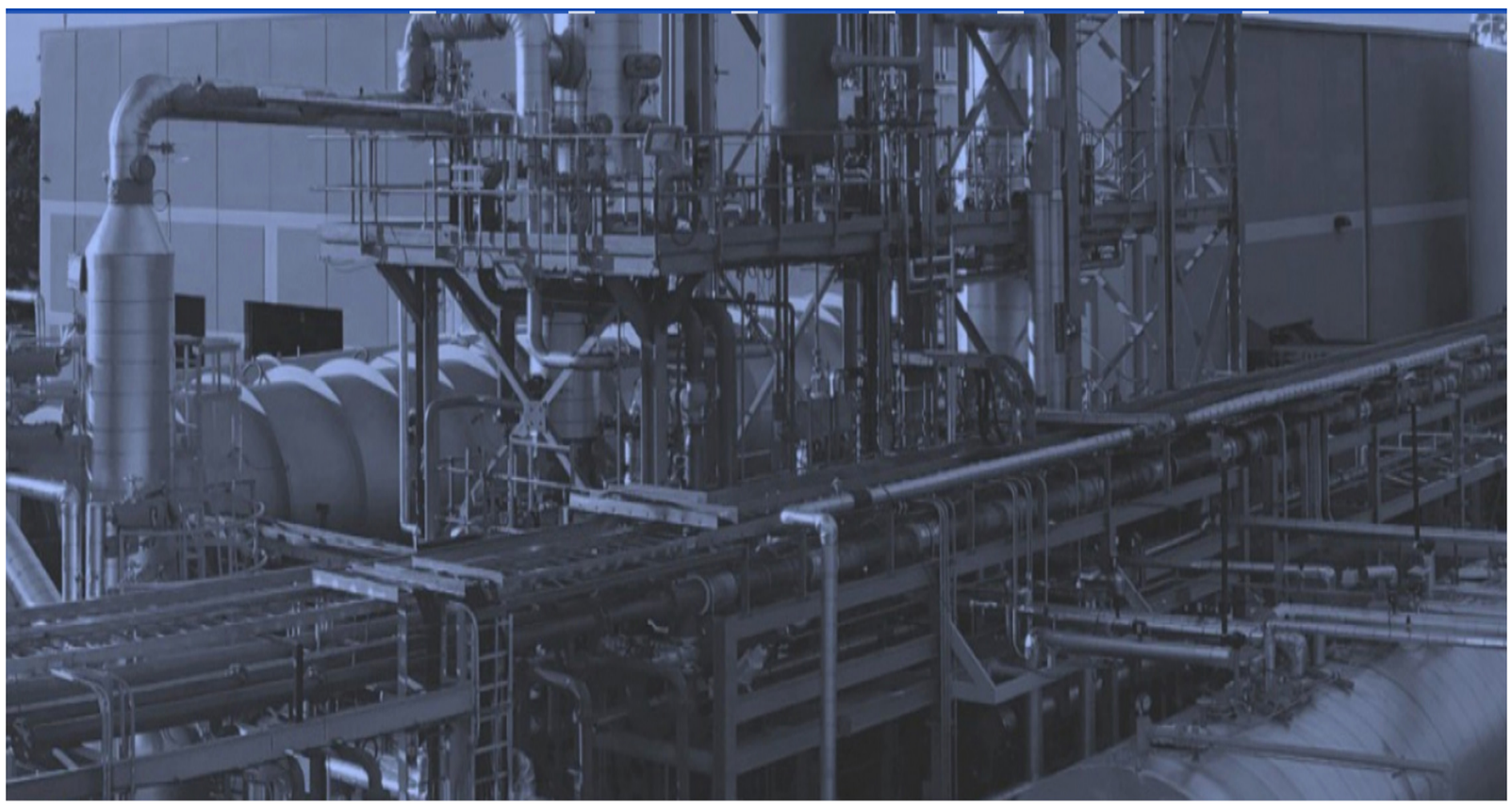
"We are extremely excited to add Ferguson as our fourth acquisition and our fifth new facility over the last 2 ½ years" states Revere CEO Glen Fish. "Ferguson is a great company with a history of impressive growth, a strong management team, and many capabilities that complement Revere's existing portfolio. As part of our continued growth and diversification strategy, we are thrilled to have another facility in a new geographic region with new end markets and robust customers."

"We look forward to working with Scott Ferguson and his team to continue to grow both the Ferguson facility as well as Revere by offering Ferguson's customers access to Revere's multiple facilities to support them in other regions."

Ferguson Production operates 36 injection molding presses ranging from 55 tons to 1,750 tons, as well as other high efficiency equipment enabling a variety of value-added secondary operations and assembly. The modern 66,000 square foot McPherson plant currently serves a variety of industries, including agriculture, automotive, consumer, lawn & garden, pet care, and recreational vehicles. An additional 80,000 square feet of warehouse space is operated as a distribution center for customer inventory.

We are very proud of the business we have built since my father, Norlan Ferguson, founded the company in 1974 and since I purchased it in 2011," states Ferguson President Scott Ferguson. "Our team has been able to grow the company and, with the resources that Revere brings to the table, we will continue this growth while delivering for our customers and stakeholders."

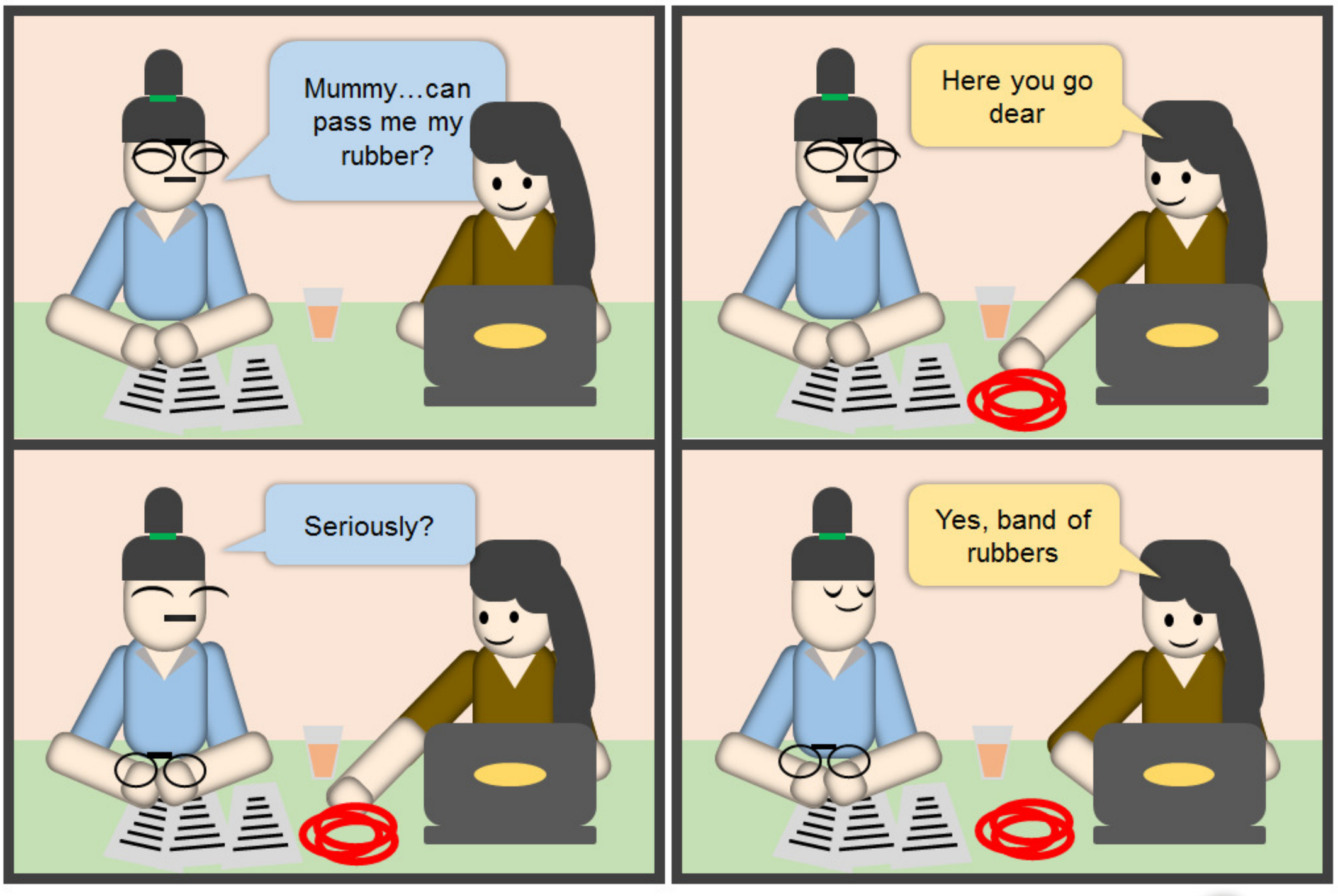
Ravago continuous to push the boundaries in recycling by acquiring equity interest in leading advanced recycling company Alterra Energy

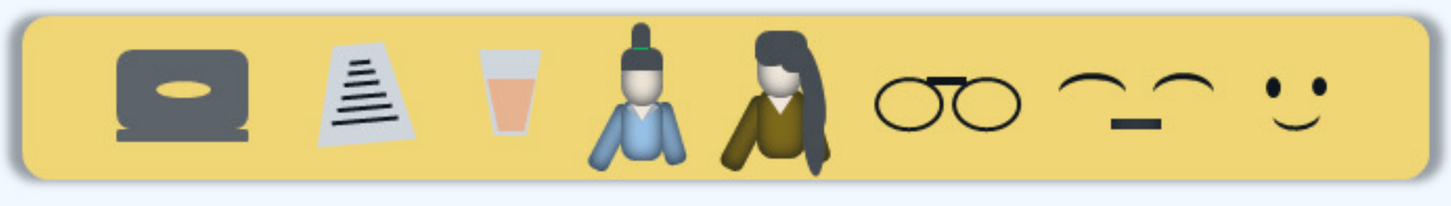


Alterra Energy, an innovative advanced recycling technology company, and Ravago, a global leader in polymer recycling and distribution, announced today that Ravago has acquired an equity interest in Alterra Energy.

Ravago will be a strategic partner in supplying pre-processed waste plastic to Alterra Energy's Akron, Ohio facility - which currently has the capacity to liquefy up to 60 tons per day of waste plastic for use as a feedstock for the manufacturing of plastics and chemicals - as well as for future commercial installations.

Alterra and Ravago plan to combine forces to provide integrated recycling solutions that support the transition towards decarbonization, decreasing virgin fossil resource dependency and increasing circularity for its petrochemical and chemical partners.





Novolex Closes on Acquisition of Flexo Converters USA, Inc.

Flexo products will be sold under the Novolex Duro Bag® brand. The addition of Flexo products to the Novolex portfolio will enable Duro to support customer demand through Flexo's production capacity. Novolex has seen a significant increase in demand for paper bags and sacks as consumer purchasing patterns have shifted.

Novolex is a portfolio company of The Carlyle Group, a leading global investment firm which acquired a majority of the company in December 2016.

Formerly operating as CalRAM, the facility, assets and equipment have been acquired from Carpenter Technology Corporation. In addition to this transaction, Burloak and Carpenter Technology have formed an agreement to collaborate on future product design and development opportunities, and Carpenter Technology will become the preferred powdered metals supplier for certain DFAM projects led by Burloak.

"We are very proud of the business we have built since my father, Norlan Ferguson, founded the company in 1974 and since I purchased it in 2011," states Ferguson President Scott Ferguson. "Our team has been able to grow the company and, with the resources that Revere brings to the table, we will continue this growth while delivering for our customers and stakeholders."

In addition to this expanded collaboration agreement with Carpenter Technology, Burloak has recently announced relationships with The Boeing Company, MDA Ltd., SmithsHP and the National Research Council of Canada, and is actively working with additional leaders in the space, aerospace, automotive and industrial markets. Carpenter is a global leader in high-performance specialty alloy-based materials and process solutions for critical applications in the aerospace, transportation, defense, energy, industrial, medical and consumer electronics markets.

Burloak Technologies Scales Capacity With California Additive Manufacturing Facility

The new 25,000-square-foot (2,300-square-meter) facility bolsters the manufacturing capacity available at the company's 65,000-square-foot (6,000-square-meter) Additive Manufacturing Center of Excellence, located in Oakville, Ontario. Between the two facilities, Burloak offers the industry's most complete set of additive manufacturing capabilities and technologies, including laser powder bed fusion, electron beam powder bed, metal binder jet and powder and wire DED technologies.

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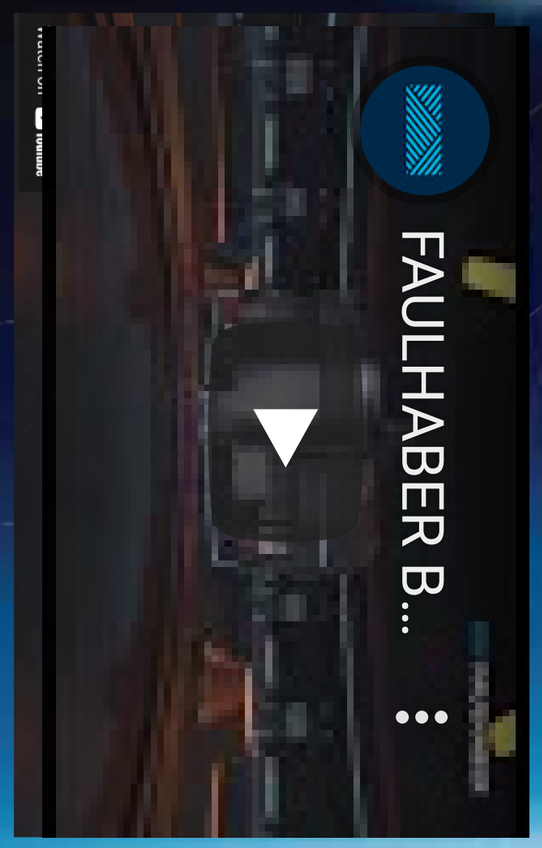

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Cybersecurity Executive Rick Driggers Joins Accenture Federal Services

Rick Driggers

Accenture Federal Services, (AFS), a subsidiary of Accenture , has hired cybersecurity expert and former CISA executive, Rick Driggers. Driggers brings more than 30 years of federal government and military experience to AFS and will play a key role in developing cybersecurity solutions designed to protect our nation's critical infrastructure.

"As the cyber threat landscape becomes increasingly more sophisticated, Rick's extensive cyber operations, national security, and mission execution expertise will prove extremely valuable in supporting our federal clients with proactive risk mitigation and response,"

Prior to joining AFS, Driggers served as the Assistant Director for the Integrated Operations Division at the Cybersecurity and Infrastructure Security Agency (CISA), the federal agency responsible for identifying and addressing significant threats to our nation's critical infrastructure. Driggers also served as Principal Deputy Director of Operations for the National Cybersecurity and Communications Integration Center, and earlier as the Director of Data and Systems Integration Policy for the National Security Council.

"A recent sharp rise in cyberattacks has disrupted the delivery of essential services and have made the public keenly aware of the need to harden our nation's vulnerabilities, from critical infrastructure to government services and the Department of Defense," said Driggers

"Accenture Federal Services' relentless focus on security innovation and helping customers anticipate cyberattacks before they happen was central to my decision to make the leap into the private sector.

I look forward to this next chapter in my career dedicated to leveraging cutting edge technologies and the expertise of Accenture's cybersecurity professionals to provide AFS's customers with a proactive defense posture and end-to-end protection of their IT data, applications, and infrastructure, along with their operational technology and industrial control system (OT/ICS) environments.

In his role, Driggers will continue to focus on cyber issues at the national security level. He will provide thought leadership and direction in cybersecurity strategy, risk assessment, and capability delivery with special emphasis in the requirements for securing critical infrastructure. This includes significant collaboration and joint endeavors that leverage Accenture Security's global Cyber Fusion Centers, OT/ICS ranges, research, development, test, and evaluation facilities.

A former U.S. Air Force Combat Controller, Driggers deployed as a member of several military and international Special Forces operational and tactical teams. He has received numerous military awards including the Jumpmaster Parachutist Badge, the Military Freefall Jumpmaster Badge, Special Operations Combat Diver Badge, and the U.S. Army Ranger Tab.

Driggers holds a B.S. in Applied Science and Technology and is a graduate of the Harvard Kennedy School of Government Senior Executive Fellows Program.

Turning Plants Into Leather: Our Investment in Natural Fiber Welding

BMW thrilled to announce our investment in Natural Fiber Welding's (NFW) financing round. NFW has formulated a unique process to incorporate various plant matter into a "dough," which can then be shaped, tuned, and processed into a 100% natural and fully recyclable alternative material to leather, textiles, and foams. This fundraise will enable the Company to scale up its production from batch processing to roll-to-roll commercial capacity. "Our investment reinforces our commitment to purpose-driven entrepreneurs and underscores our efforts to advance the decarbonization of the automotive industry."

Leather has remarkable characteristics (durability, resistant to abrasion, color fading, etc.) that make it an ideal material to use in a large variety of products, from footwear and apparel to accessories to car seats. However, traditional leather production is quite problematic and can be very harmful to the environment. Petrochemical-based leather alternatives often do not have the same premium look and feel and while the CO2 footprint is better, they are still oil-based and very hard to recycle.

While there is a burgeoning ecosystem of startups making alternative leather using a variety of technologies (e.g. mycelium-based, recycled leather, specific plant-based, lab-grown), they all have shortcomings in one (or more) of the following areas:

1. Perform comparably to leather (durability, resistance to abrasion, color-fastness, etc.).
2. Cost-competitive to existing leathers (i.e. animal or synthetic leathers).
3. Scalable to produce meaningful volumes for a number of customer verticals, particularly automotive.
4. Environmentally friendly with minimal carbon footprint.

NFW so far is the only company that checked all the boxes. This fundraise will support the Company's scale up from batch processing to continuous roll-to-roll production as NFW brings its sustainable materials to the market. With this investment, we are incredibly excited to join other sustainability focused corporations, such as AllBirds and Ralph Lauren, that are backing NFW on its mission to produce all natural alternative materials.

Shell delivers first gas from Barracuda Project

Shell Trinidad and Tobago (through BG International, a subsidiary of Royal Dutch Shell plc) announces that production has started on Block 5C in the East Coast Marine Area (ECMA) in Trinidad and Tobago. This marks a significant milestone in the delivery of gas both domestically and internationally through Atlantic LNG.

"Today's announcement strengthens the resilience and competitiveness of Shell's position in Trinidad and Tobago," said Maarten Wetselaar, Director of Integrated Gas, Renewable and Energy Solutions.

Block 5C, known as Project Barracuda, is a backfill project with approximately 25,000 barrels of oil equivalent per day (boe/d) (140 mmscf/d) of sustained near-term gas production with peak production expected to be approximately 40,000 boe/d (220 mmscf/d). It is Shell's first greenfield project in the country and one of its largest in Trinidad and Tobago since the BG Group acquisition.

"We are immensely proud of our people and the remarkable work it took to achieve this milestone, particularly given that drilling began in May 2020 during the COVID-19 pandemic," said Eugene Okpere, Shell's Senior VP and Country Chair. "Our execution strategy had to be completely overhauled to deliver our business plan, all while working remotely. It required tremendous resilience, adaptability and commitment."

The ECMA is one of the most prolific gas-producing areas in Trinidad and Tobago. As part of Shell's development strategy, the company has sought ways to access the significant volumes that exist in the ECMA and to bring them online.

Intel and Airtel Collaborate to Accelerate 5G

The collaboration is part of Airtel's 5G roadmap as it transforms India's networks to provide the full possibilities of a hyperconnected world.

What's New:

Intel and Bharti Airtel ("Airtel"), India's premier communications solutions provider, today announced a collaboration to drive network development of 4G and 5G virtualized radio access network (vRAN) and open radio access network (RAN) technology to transform Airtel's networks to reap the full possibilities of 5G for its customers. Work by Intel and Airtel will evolve communications networks from fixed-function equipment to virtualized cloud-native deployments and enable edge-to-cloud communications to power our hyperconnected world.

How It Works:

Airtel's network will be powered by a collection of Intel technology: the latest Xeon Scalable processors, FPGAs and eASICs, Ethernet 800 Series, and FlexRAN reference architecture. Transforming its network to meet the growing needs of its more than 345 million subscribers with flexible, software-defined infrastructure will allow Airtel to rapidly respond to varying customer requirements for bandwidth and latency. By providing the foundation for wide-scale enhanced mobile broadband, mobile edge computing and network slicing, Airtel can offer new services for consumers while programming its network to yield long-term cost optimizations.

"Being able to digitally power the vibrant population of India's connected users requires scalable and agile networks that can evolve to address the growing demands of its users. Airtel is delivering their next-generation enhanced network with a breadth of Intel technology, including Intel® Xeon® Scalable processors and FlexRAN software to optimize RAN workloads with embedded intelligence, to scale their infrastructure and deliver on the promise of a connected India."

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Why It Matters:

Led by affordable smartphones and the lowest data tariffs globally, India has the world's second-largest internet population at over 620 million.1 The country's active internet user base is expected to grow to 900 million by 2025.1 The advent of 5G will further deepen the digital adoption through a range of industrial and customer use cases.

"Airtel is delighted to have Intel as a part of its rapidly expanding partner ecosystem for 5G," said Randeep Sekhon, Bharti Airtel CTO. "Intel's cutting-edge technologies and experience will contribute immensely to Airtel's mission of serving India with world-class 5G services. We also look forward to working with Intel and home-grown companies to unlock India's potential as a global 5G hub."

The collaboration is part of Airtel's 5G roadmap for India as it transforms networks to allow its customers to reap the full possibilities of a hyperconnected world where Industry 4.0, cloud gaming and virtual/augmented reality become everyday experiences. Airtel is the first telecom operator in India to demonstrate 5G over a live network and is conducting 5G trials in major cities.

What's Next

As members of the O-RAN Alliance, both companies will work closely to develop a range of "Make in India" 5G solutions and enable world-class telecom infrastructure in India through local partners. Open RAN will be a future area of tremendous innovation and creativity, leveraging Intel FlexRAN, a reference architecture with both software and hardware components, and enabling software-based radio base stations that can run on general-purpose servers located at the network edge.

Telenor Monetizes Fast Growing Mobile Services with Oracle

Mobile services, from voice to video streaming, are on the rise across Asia. To support this growth, Telenor selected Oracle Communications Billing and Revenue Management, including Oracle Converged Charging to lay the groundwork for 5G and provide seamless charging and billing interactions for its 175 million subscribers in the region. This can range from an ongoing monthly subscription to a video on-demand service to mobile banking payments to large scale prepaid voice and data services.

Oracle Communications Consulting is leading the implementation and will deploy the solution in Malaysia, Thailand and Pakistan.

Delivering exceptional customer experiences

Telenor is expanding its territorial coverage globally to improve the wireless experience for its customers. The company is focused on three key initiatives: digitalizing its technical stack to be ready for 5G, innovating its operating model with more touch-free operations, and transforming how it works internally and with partners to deliver more value while containing capital expenditures.

Oracle's fully integrated, cloud native digital billing and charging solution gives Telenor proven monetization and real-time rating capabilities to support any payment model (prepaid, postpaid or hybrid) and any business model, including business-to-business or business-to-consumer account structures.

By selecting billing and charging from a single provider, Telenor will benefit from quicker implementation and streamlined processes to create new offers and provision customers and groups without needing to manage the risk of out-of-sync revenue systems.

In addition to powerful pricing and revenue management, Oracle's cloud native converged charging solution has been validated in rigorous performance testing on Oracle Cloud Infrastructure. It scales to very high subscriber volumes with low millisecond latency, near-linear scalability, and efficient resource utilization, all with real-world prepaid and postpaid charging scenarios.

"Telenor is recognized for its innovation and industry leadership as well as driving standards," said Jason Rutherford, senior vice president and general manager, Oracle Communications, Applications. "Oracle's integrated billing and charging provides a flexible, standards-based platform that will scale to support Telenor's large customer base today and in the upcoming 5G era."

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Mitsubishi Motors (Thailand) Signs MoU with Eternity Grand Logistics to Do a Pilot Study on Commercial Usage of Compact EVs

Mitsubishi Motors Corporation (MMC) announced that Mitsubishi Motors Thailand Co., Ltd. (MMTh), MMC's subsidiary in Thailand, has signed a Memorandum of Understanding (MoU) on June 9 with Eternity Grand Logistics Public Co., Ltd. (Eternity), a logistics company of the Hitachi Transport System Group, to conduct a pilot study on commercial viability of compact electric vehicles (EV) in Thailand.

"This study will enable us to explore opportunities to apply EVs for commercial applications," said Eiichi Koito, president and CEO of MMTh. "It is a part of our New Environmental Plan Package, and is contributing to the Thai government's electrification initiative. Through this study, we will explore ways to form an environment for EVs."

Ryuichi Honda, CEO of Asia Region of of Hitachi Transport System (HQ) and chairman of Eternity, said, "As one of the leading players in the logistics industry, we have a responsibility to reduce our carbon footprint while also cutting operational expenses. We are proud to be partnering with one of the leading automotive companies, Mitsubishi Motors, who has the advanced technology and capability to produce high-tech EVs.

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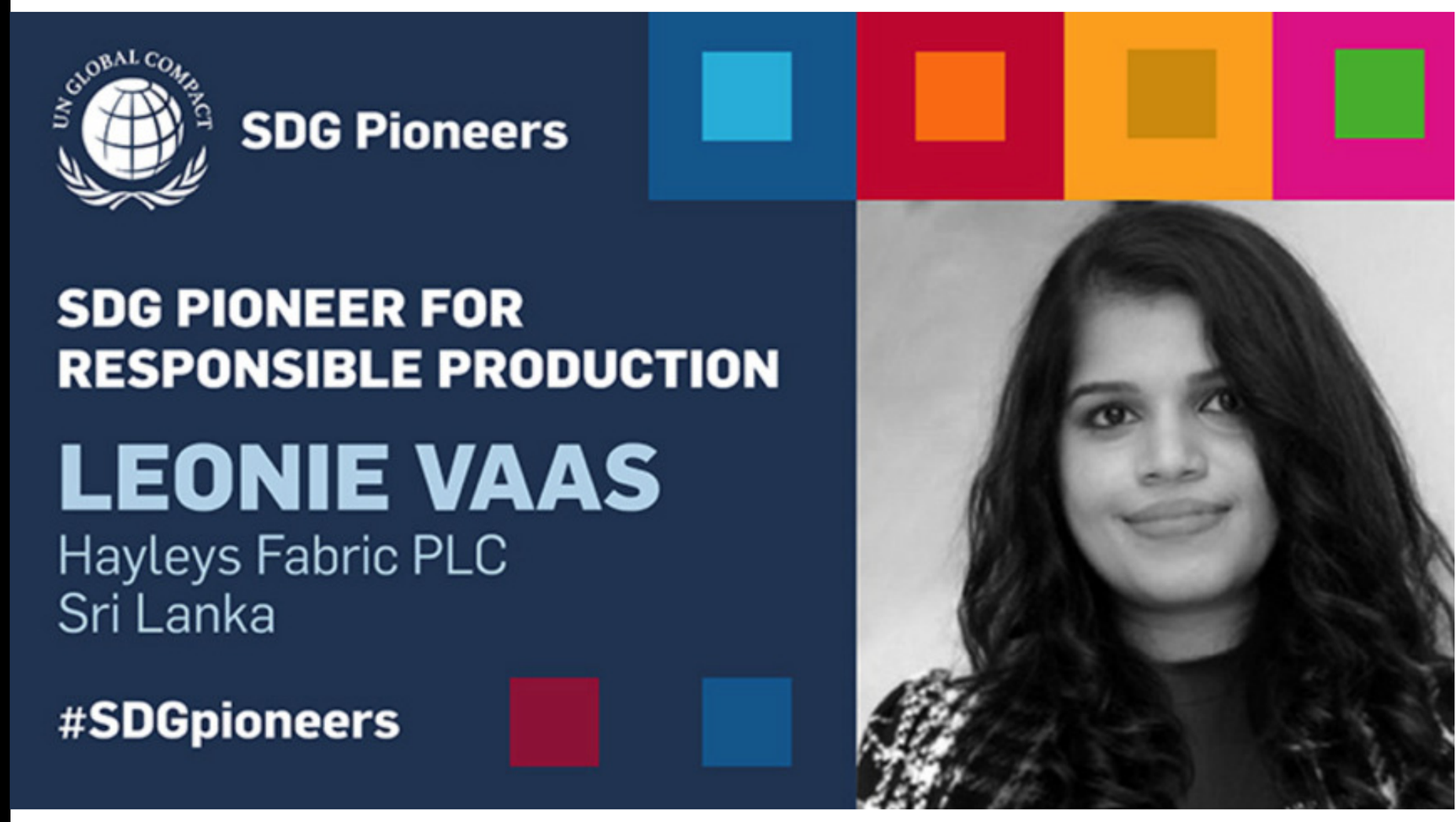
This study will allow us to understand and obtain more information on the potential introduction of EVs into our operations. It is in-line with our aim to become a responsible corporate citizen at the forefront of industrial and environmental sustainability."

MMC plans to improve the Minicab-MiEV, which has established a track record and credibility for 10 years since its launch in Japan, through more experiments abroad, thereby contributing to building an eco-conscious society together with companies in various industries.

Hayleys Fabric's Manager - Sustainability and Innovation Selected as a 2021 UNGC SDG Pioneer!



Continuing to set new benchmarks for sustainability, Hayleys Fabric PLC, Manager - Sustainability and Innovation, Leonie Vaas was selected as a "2021 UN Global Compact SDG Pioneer for Responsible Production".

This unprecedented achievement by Leonie is not just a remarkable milestone in her own career, but it also marks the first occasion in which a Sri Lankan representative has been selected as a pioneer.

In her commitment to take positive action for sustainable development issues whilst promoting positive change, Leonie was selected from a highly reputed pool of candidates to be ultimately ranked amongst the top professionals, recognised for advancing sustainable development.

With this, she has now sealed her position amongst a cohort of 10 SDG pioneers employed within the UN Global Compact companies, who continue to set ambitious, scalable and impactful targets towards delivering on the UN Sustainable Development Goals. More importantly, her selection is emblematic of her breakthrough efforts to advance these global goals, through the implementation of the UN Ten Principles on human rights, labour, the environment and anti-corruption.

Leonie was chosen following a rigorous and highly competitive selection process, with the pioneers being selected from diverse regions of the world. The multi-stakeholder selection committee comprised of representatives from the civil society, academia, the Global Compact Board, the UN, and the previous SDG Pioneers.

The annual Leaders Summit mobilises and connects business leaders, policy makers, civil society and academia representatives, from all over the world, to take action on the Sustainable Development Goals (SDGs).

This year's Leaders Summit will address the converging crises of climate change, the COVID-19 global pandemic, the worsening social and economic inequality and unchecked corruption, to offer a roadmap for sustainable recovery.

Kezzler and Rockwell Automation Announce Partnership

Rockwell Automation, Inc., the world's largest company dedicated to industrial automation and digital transformation, today announced a partnership with Kezzler, a cloud-based product digitization, and traceability platform, to help manufacturers capture the journey of their products from raw material sources to point-of-sale or beyond using cloud-based supply chain solutions that focus on product traceability.

The combined offering is ideal for customers in industries like life sciences, food and beverage, and consumer packaged goods that are focused on complying with regulatory requirements and meeting consumer expectations in areas like product quality, safety, and sustainability.

Rockwell's supply chain capabilities will combine with Kezzler's traceability technologies to help customers connect suppliers, manufacturing, logistics, and consumers into one real-time traceability platform. Kezzler's cloud-based solution provides integration flexibility and ease of access to existing systems of record that incorporate a wide range of technologies from immutable ledgers (blockchain) to traditional databases.

The two companies can also create unique identities that can be used to digitally identify and track products from creation to consumption.

Matt Fordenwalt, Rockwell Automation Vice President and General Manager, Systems & Solutions Business

"Our partnership with Kezzler will provide greater supply chain transparency to enhance safety and quality control measures, ensure regulatory compliance, and meet ESG goals with cloud-based technologies that are easy to implement and easy to use"

For example, Rockwell and Kezzler can provide the data needed for manufacturers to aggregate the total environmental footprint per manufactured product. This data can then be used for evidence and improvement or be shared directly with consumers through the product, allowing a company to use sustainability practices as a competitive advantage.

Serialization solution customized to meet specific business requirements

After closing the recently announced acquisition of Plex Systems, Rockwell anticipates integrating the cloud-native factory floor track-and-trace capabilities of Plex with the end-to-end capabilities of Kezzler, providing supply chain visibility and management capabilities that are both broad in scope and deep in functionality.

"Our partnership with Kezzler will provide greater supply chain transparency to enhance safety and quality control measures, ensure regulatory compliance, and meet ESG goals with cloud-based technologies that are easy to implement and easy to use," said Matt Fordenwalt, Rockwell Automation vice president and general manager, Systems & Solutions Business. "By combining our technology and expertise with Kezzler's, we can quickly design and deliver a serialization solution customized to meet specific business requirements with advanced cloud-native software."

Partnership aims to ease product traceability in manufacturing

Rockwell and Kezzler have already created traceability solutions for customers like FrieslandCampina, one of the world's largest dairy companies. By creating unique QR codes on each of its Friso infant formula products, the company can now track its products from farmer to consumer. Consumers can also scan the codes to check authenticity and learn more about the product and its origin.

Kezzler is joining the Rockwell Automation Digital Partner Program, a centralized resource for best-in-class digital solutions designed to help customers as they guide and simplify digital transformation within their manufacturing operations.

Christine C. Akselsen, Kezzler CEO

"Together, we can help manufacturers connect all points of a product's journey, beginning with its inception and ending with its point of sale, consumption, or even where it's recycled"

New Organizational Reforms and Personnel Changes at Yamaha Motor

Yamaha Motor Co., Ltd. has resolved to implement the following organizational reforms and personnel changes, effective Thursday, July 15, 2021.

1. Quality Assurance Center

• The Land Mobility Quality Assurance Section will be reorganized with the aim of strengthening the quality assurance system and improving the speed of market response.

- Through reorganization of the department management function and finished vehicle inspection function, the name for the Quality Planning Division will be changed to the Quality Administration Division.
- The function of component quality assurance of the QA Innovation Division will be transferred, and the Product Quality Assurance Division will be reorganized to guarantee product changes and modifications.
- Through reorganization of the function to process quality information and its strategic utilization function, the name of the QA Innovation Division will be changed to the Quality Information Division. Along with this, the QA Innovation Division will be dissolved.

2. Marine Business Operations

• The Planning Section will be reorganized with the aim of promoting the marine version of the CASE strategy and accelerating efforts toward carbon neutrality.

- The Strategy Planning Division will be reorganized to be responsible for the formulation and promotion of products, technologies and production strategies and certification work.

• With the aim of maximizing the synergies between marine product and improving development efficiency, the Development Section will be reorganized from a product-specific to a function-specific base. Furthermore, the functions of advanced development and product development will be consolidated to accelerate the speed of market launches.

- The Advance Development Division will be newly established by consolidating -the advance development functions including electric power of the Planning Section and the Development Section.
- The Marine Engine Development Division will be renamed as the Engine Development Division.
- The BPS Development Division will be renamed the Electric System Development Division.
- The WV Development Division and the Boat Manufacturing Division will be integrated into the Boat Body Development Division.

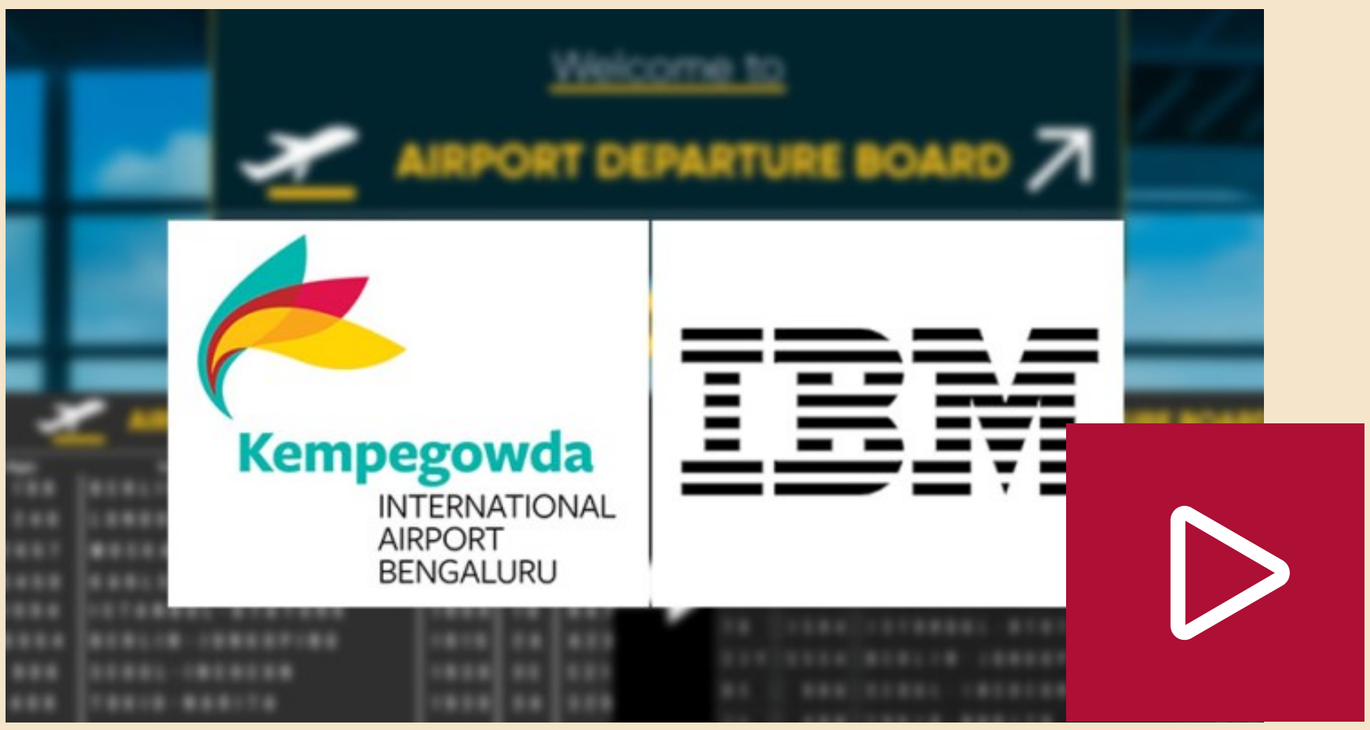
• In working toward sustainable growth in line with the marine version CASE strategy, the Marketing Section will be reorganized with the aim of promoting value provision through products and providing high value-added services by creating new experiences with DX.

- The 1st Marketing Division and the 2nd Marketing Division will be integrated into the Marketing Division.
- The Digital Transformation Division will be newly established by integrating the boat license & rental boat business of the 2nd Marketing Division and the digital solution functions of the Strategy Planning Division, Planning Section.

Bangalore International Airport Limited Partners with IBM for Digital and IT Transformation

- 10-Year agreement to create an "Airport in a Box" platform, which transforms technology, operations and customer experience

- IBM Hybrid Cloud capabilities, Red Hat Automation and Kyndryl managed infrastructure services to help BIAL improve productivity, automate IT and reduce costs



IBM and Bangalore International Airport Limited (BIAL) -- operator of Kempegowda International Airport Bengaluru (KIAB/BLR Airport) -- announced a ten-year agreement under which IBM and Kyndryl will provide best of breed IT solutions to create a new "Airport in a Box" platform that will support transforming the end-to-end travel experience for passengers at BLR Airport.

As one of the fastest-growing airports in the world, BLR Airport needed a nimble, scalable and cost-competitive technology and operations environment that can increase its agility and operational flexibility to handle future growth in passenger traffic. To achieve this goal, BIAL has selected IBM Global Business Services, IBM hybrid cloud capabilities and Kyndryl, the new, independent company that will be created following the separation of IBM's Managed Infrastructure Services business, to design and implement a next generation architecture with robust and dynamic delivery model. One that is highly efficient, secure, and will enable a seamless travel experience for its passengers. The new platform will also enable BIAL to improve employee productivity, better utilization of IT assets, reduce costs through streamlined inventory control and improved incident management.

The state-of-the-art platform IBM is developing to support BIAL's business growth will be enabled by a comprehensive set of IBM technology and services, enabled by an open hybrid cloud approach from IBM and supported Red Hat Ansible Automation. The platform also will generate AI-powered insights from IBM Maximo enterprise asset management technology to optimize inventory management and total cost of ownership.

IBM and BIAL will work to ensure that the platform supports BIAL's commitment to sustainability and the community at large. BIAL recently achieved its goal of net energy neutral status in the financial year 2020-21, consuming energy from renewable sources.

Once the platform is fully operational and enhancing the travel experience for millions of airport passengers, IBM and BIAL plan to explore opportunities to advance the "Airport in a Box" platform as a cornerstone of innovation and transformation for the global travel and transportation industry.

"We are excited to partner with IBM as part of our vision to make BLR Airport the Smart Airport-- a digitalized, seamlessly connected, intuitive airport," said Mr. Hari Marar, MD & CEO, BIAL. "BLR Airport is a pioneer and leader of change in the Indian aviation industry. Our aim is to introduce more digitally advanced, innovative services and products at BIAL to ensure that the passengers and partners have the advantage of future forward technologies, in a seamless operating environment," Mr. Marar added.

"This long-term project capitalizes on our proven ability to deliver a combination of advanced technologies and services that enable the world's leading travel and transportation companies to innovate and transform their businesses," said Mark Foster, Senior Vice President, IBM Services and IBM Global Business Services. "IBM Global Business Services and Kyndryl will apply our expertise in hybrid cloud and building business platforms to help BIAL innovate, improve its operational efficiency and deliver exceptional experiences to its growing passenger base."

IBM works with more than 150 airports globally and has a long history of helping airports, airlines and the aviation industry worldwide to innovate and transform and was named the World's Leading Airport Travel Technology Provider 2020.

Calpine and GE Renewable Energy complete Santa Ana storage project in Southern California

Calpine and GE Renewable Energy announced today the completion of the Santa Ana Storage Project (SASP) in Southern California. The project contains a 20 MW/80 MWh (4hr) standalone battery energy storage system using GE's Reservoir energy storage technology. The system, now in commercial operations, is supported by a 20-year Resource Adequacy Power Purchase Agreement (PPA). The project will be able to provide energy to up to 12,000 households during peak events, and/or 24,000 households during normal load conditions.

This grid-connected battery energy storage system represents a major step forward in Calpine's plans to grow the company's energy storage footprint. The SASP facility itself will be capable of considerable expansion in future phases.

Alex Makler, Senior Vice President West Region of Calpine, said: "It is critical that consumers have affordable, reliable electricity as we work to integrate more renewable energy sources into the U.S. power supply. Calpine already operates the world's largest geothermal facility in California, and this cutting-edge battery storage project represents another major investment in meeting the clean energy demands of an increasingly electrified world. We are proud to work with GE and the community of Santa Ana to showcase the very latest in energy storage solutions."

Mike Bowman, Renewable Hybrids Chief Technology Officer, GE Renewable Energy, said: "The energy storage system provides targeted local capacity to enhance grid reliability during peak periods. And, as fast-acting stabilization devices, the battery energy storage systems can charge and discharge rapidly to regulate frequency and contribute to grid stability, helping to balance and facilitate the ever-growing penetration of variable renewable energy. These assets will assist with making California's state targets of 60% by 2030 & 100% by 2045."

GE's Battery Energy Storage solution is a flexible, compact solution that combines GE's advanced technologies and expertise in plant controls, power electronics, battery management systems and electrical balance of plant - all backed by GE's performance guarantees.

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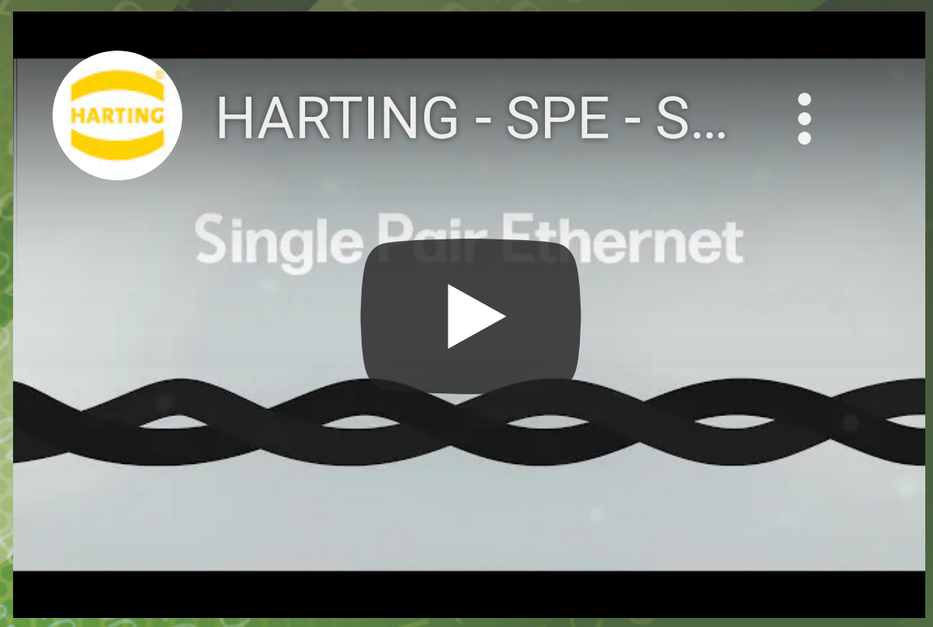

HARTING T1 Industrial - The standard for the IIoT Single pair

Single Pair Ethernet (SPE) will revolutionize the industry. It has never been so easy to connect small sensors to the Internet. With the HARTING T1 Industrial, we recognized the trend towards one-pair cabling, defined standards in consultation with users, and have now implemented interfaces in series production. Three important steps that show our users: SPE is not just a short-term appearance but an investment-safe standard for IIOT at the field level.

Find more information, phone +65 6225 5285 or write to sg@HARTING.com

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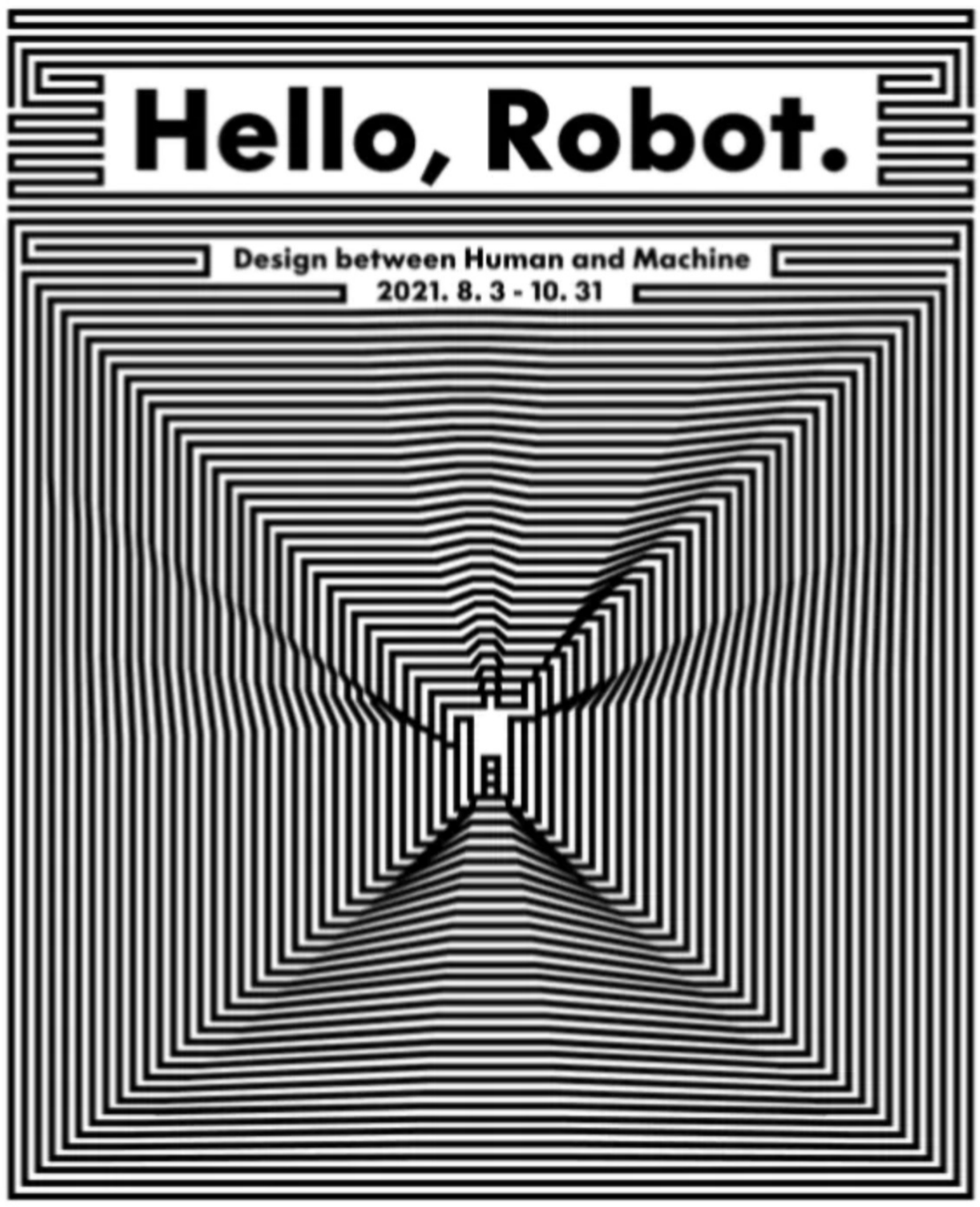
People | Power | Partnership

Hyundai Motor and Vitra Design Museum Join Hands to Present Design Innovations and Future Technologies



Hyundai Motor Company today announced a three-year partnership with the Vitra Design Museum, one of the world's leading design museums, to host innovative travelling exhibits focusing on the future of technology, mobility and sustainability.

Through this partnership, Hyundai Motor will be showcasing five traveling exhibits of the Vitra Design Museum from 2021 to 2023 at Hyundai Motorstudio locations worldwide. The partnership aims to strengthen the cultural presence of design and future technology at exhibition venues around the world and to foster cultural exchange between creative institutions in Europe and South Korea. The partnership will commence with the 'Hello, Robot. Design between Human and Machine' exhibition from August 3 through October 31, at Hyundai Motorstudio Busan, followed by an exhibition in Beijing.

The Vitra Design Museum, founded in 1989 in Germany, is among the world's leading museums of design, and is known for exhibitions that cover highly relevant contemporary concerns, such as future technologies, sustainability, mobility and social awareness.

'Hello, Robot. Design between Human and Machine' explores the broad spectrum of robotics technology that increasingly enhances our daily lives and showcases designs that influence the interfaces between humans and machines. Since its debut in 2017, the exhibition has toured Europe and will now

makes its first appearance in Asia through Hyundai Motor's partnership with the Vitra Design Museum. The new exhibition will also feature robots developed by Hyundai Motor, offering visitors a glimpse into the current state of robotics technology and its future in the contemporary society.

"Hyundai Motor continues to pursue open innovations through our investment in mobility and robotics, seeking to reinvent people's everyday lives under our vision of Progress for Humanity," said Thomas Schemera, Executive Vice President and the Head of Customer Experience Division at Hyundai Motor. "Together with the Vitra Design Museum, we will present new possibilities of how innovative designs can can enhance the positive impact of technology on our everyday lives and offer global audiences a glimpse into the future of mobility that Hyundai Motor is moving towards."

Mateo Kries, Director of the Vitra Design Museum, added, "The collaboration with Hyundai Motor will help to spread knowledge about design's importance in our contemporary world, be it as a part of modern life, or as a tool that can help to tackle global challenges in sustainability, digitalization or diversity. The 'Hello, Robot. Design between Human and Machine' exhibition is especially relevant in this respect, as it touches all these areas and shows how essential it is to use digital technologies in a responsible manner."

Hyundai Motorstudio is part of the company's vision to provide customers with enriching experiences supported by technological innovation. Hyundai Motorstudio Busan, launched in April of this year, is the sixth Hyundai Motorstudio in the world.

SIEMENS

Siemens to build one of Germany's largest carbon-free hydrogen generation plants in Wunsiedel

•Bavarian Minister-President Dr. Markus Söder kicks off H 2 lighthouse project for energy transition in Germany.

•With 8.75 megawatts of electrical power, it will be one of Germany's largest carbon-free hydrogen generation plants.

•Siemens Financial Services, Rießner Gase GmbH and SWW Wunsiedel GmbH are investors in Wunsiedel's WUN H2 operating company.

•Plant to go into operation in summer 2022 with an annual production of up to 1,350 tons of hydrogen and CO 2 savings of up to 13,500 tons.

•WUN H2 to supply Northern Bavaria, Thuringia and neighboring part of Czech Republic with hydrogen.

Kickoff for one of the largest green hydrogen projects in Germany: The official groundbreaking ceremony in Wunsiedel marked the start of construction of a hydrogen generation plant with a capacity of 8.75 megawatts. The facility will produce up to 1,350 tons of hydrogen per year using only renewable energy,

for example from solar or wind power. Using the generated hydrogen in transportation and industry allows for CO 2 savings of up to 13,500 annually.

Siemens Smart Infrastructure is the general contractor for the entire plant, with Siemens Financial Services (SFS) participating in the equity financing as well as holding a share of 45 percent in the operating company WUN H2 GmbH. The electrolyzer will be supplied by Siemens Energy. Attended by Dr. Markus Söder, Minister-President of Bavaria, Hubert Aiwanger, Bavarian State Minister of Economic Affairs, Regional Development and Energy, Thorsten Glauber, Bavarian State Minister of Environmental and Consumer Protection Affairs, Professor Dr. Ralf P. Thomas, Chief Financial Officer of Siemens, Dr. Philipp Matthes and Dr. Thilo Rießner, Managing Directors of WUN H2, Nicolas Lahovnik, Mayor of Wunsiedel,Marco Krasser, Managing Director of SWW Wunsiedel, and Andreas Schmuderer, Siemens Project Manager, the groundbreaking ceremony marked the start of construction of this lighthouse project.

In his remarks, Minister of Economic Affairs Hubert Aiwanger said: “The WUN H2 project is an important contribution to implementing Bavaria’s hydrogen strategy. Green hydrogen ‘Made in Bavaria’ demonstrates domestic technological expertise and increases acceptance through local value creation.” Minister of Environmental Affairs Thorsten Glauber added: “Hydrogen is a key technology on the road to a climate-neutral future. The energy transition will only succeed if there are many innovative approaches like the one pursued in Wunsiedel.”

According to a recent analysis by the OECD, global energy demand is estimated to increase by 80 percent by 2050. Meeting this demand while addressing the challenges of climate change will require massive investments in clean energy generation, power distribution, and digitalization. To this end, all energy-consuming sectors, including transportation and industry, must push ahead with their decarbonization efforts.

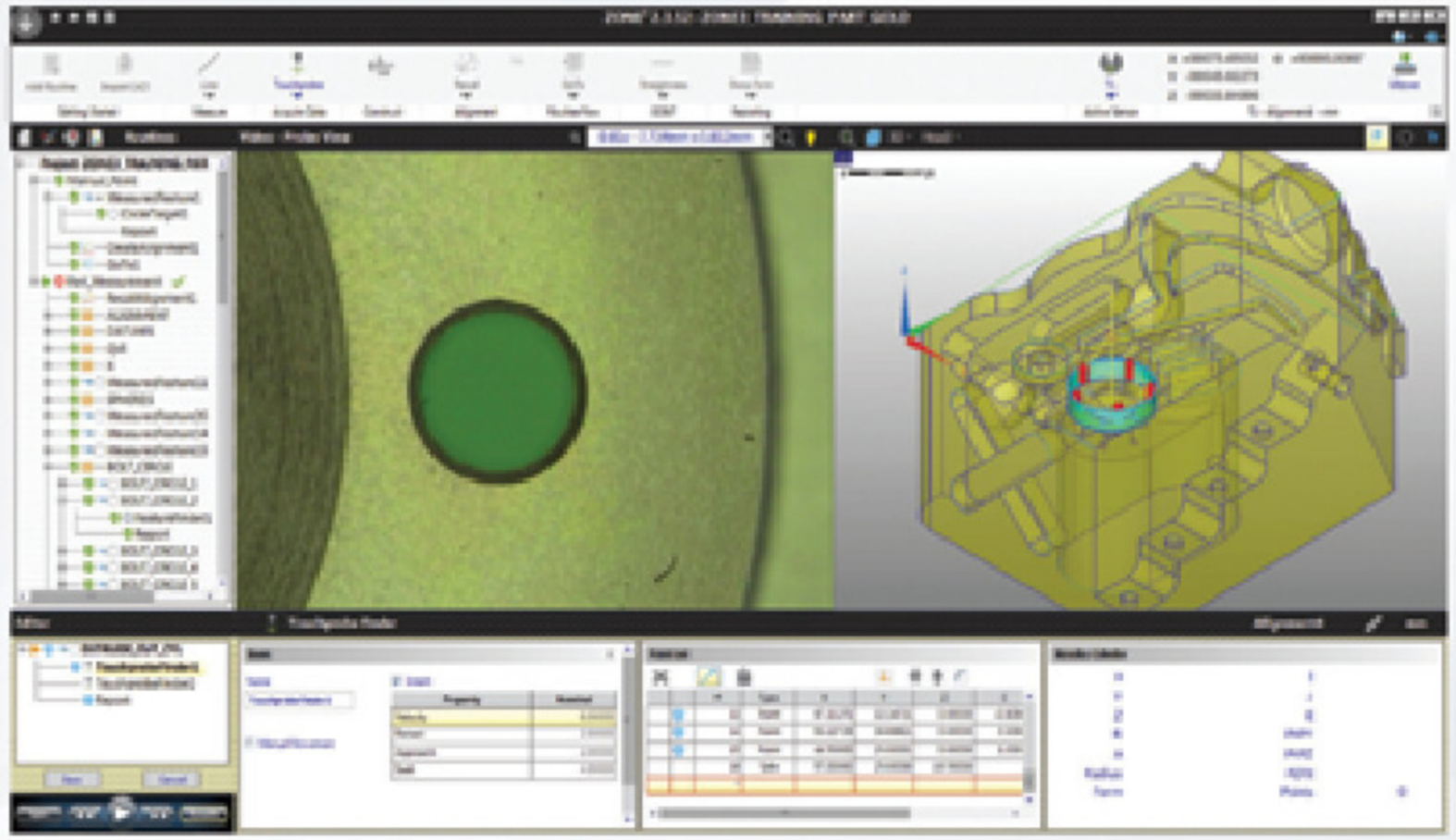
The plant will be constructed at Wunsiedel

SmartScope® Flash CNC 300

Unique High Capacity Benchtop Multisensor Measurement System

SmartScope® Flash™ CNC 300 is one of the most versatile benchtop systems OGP offers. With an expansive Z-axis of 250 mm to accommodate large parts, it combines state-of-the-art video and autofocus to deliver high productivity.

ZONE3® Express/Pro



The World Most Comprehensive Metrology Software

ZONE3 Metrology Software represents a totally new way of working with multisensor measurement systems. Its interface clearly displays relationships between parts, sensors, datum alignments, and machine tooling. ZONE3 uses CAD models and other innovative features to automatically and effortlessly generate measurement routines.

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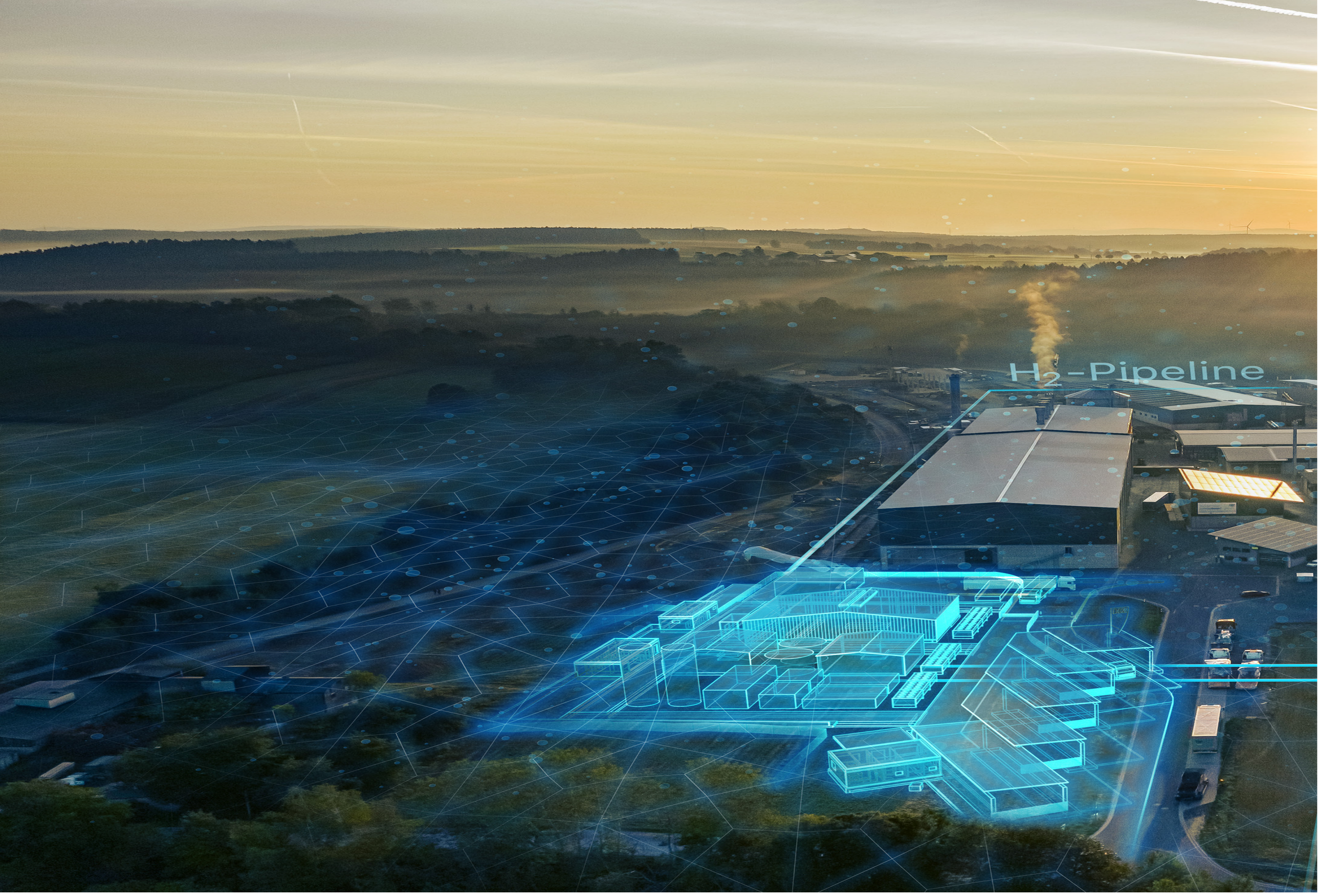


Energy Park and connected to the existing Siemens battery storage facility and adjacent industrial enterprises. These can use waste heat, or the oxygen split off during electrolysis. This connected infrastructure will serve as a model for the whole of Germany.

“Converting our energy supply to new, climate-neutral energy sources is one of the main objectives of the energy transition. Hydrogen plays a key role in this,” said Siemens CFO Professor Dr. Ralf P. Thomas at the groundbreaking ceremony. “In this respect, Wunsiedel, with its existing distributed energy system and the use of digital technology, is a lighthouse project for a sustainable energy future.”

For Siemens, digitalization and sustainability are increasingly becoming the focus of business activities. At an event for investors, Siemens had presented its new “Degree” framework for sustainable commitment to environmental, social and governance issues.

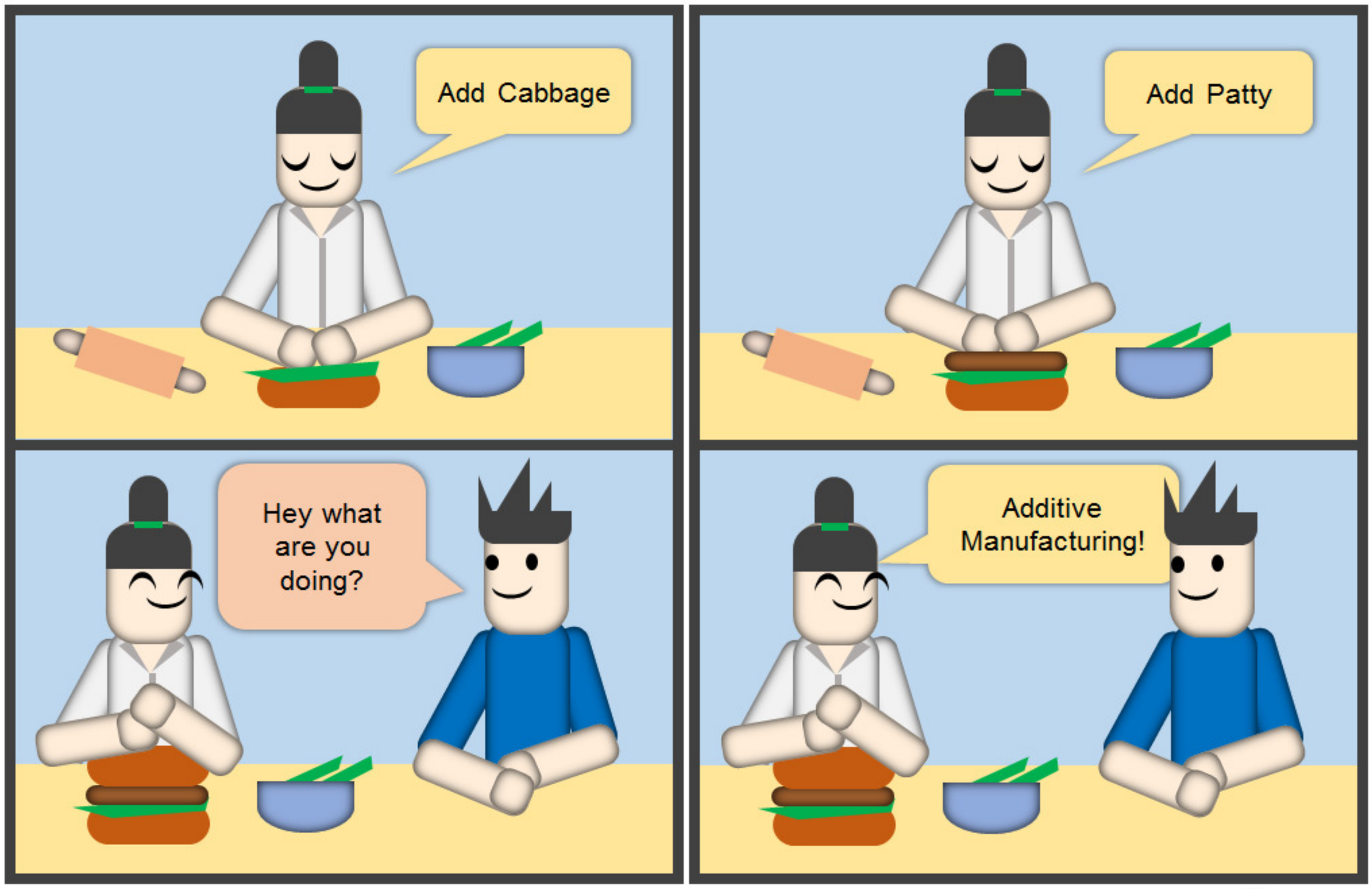
For the project in Wunsiedel, SFS, the financing arm of Siemens, is in charge of commercial project development and structuring the financing. SFS holds a 45 percent share in the project’s operating company WUN H2; Rießner Gase GmbH also holds 45 percent and Stadtwerke Wunsiedel (SWW) the remaining 10 percent. At the same time, SFS was able to implement non-recourse project financing, i.e. without counter-liability to the shareholders, with UmweltBank as an external lender to secure financing for the project. “WUN H2 is a pilot project for Germany that will demonstrate innovative technology in practice and ultimately prove the feasibility of industrial production of green hydrogen. Our concept is scalable and can easily be transferred to other locations. If every city had its own H2 plant, the energy transition would already be much further along,” said Dr. Philipp Matthes, Managing Director of WUN H2 GmbH.

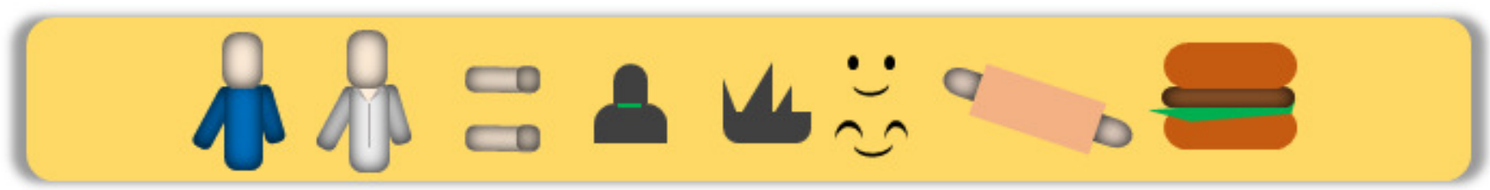
If hydrogen is produced through

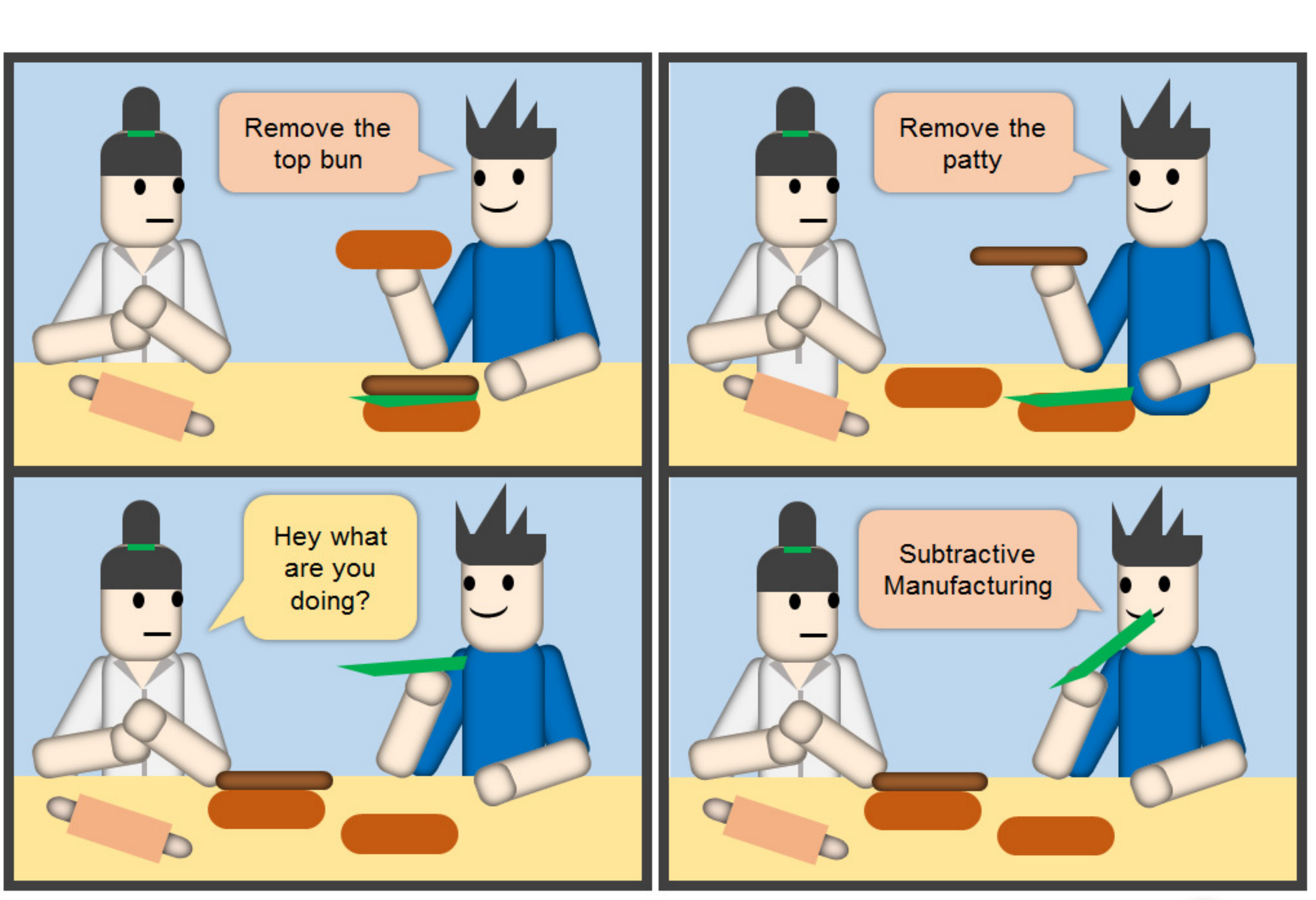
the electrolysis of water by only using power from renewable energy sources for this process, it is referred to as “green”, i.e. carbon-free hydrogen. The Wunsiedel plant uses Siemens Energy’s most advanced electrolyzer. “Green hydrogen plays a crucial role, especially in the decarbonization of industries and the transportation sector,” said Dr. Christian Bruch, CEO of Siemens Energy AG. “With our latest generation of electrolyzers, we are continuing to commercialize this technology. The plant not only supplies green hydrogen from renewable energy sources, it also makes full use of the resulting byproducts, oxygen and waste heat.”

The hydrogen is delivered via truck trailers to local and regional end customers for local distribution, mainly in the regions of Upper Franconia, Upper Palatinate, Thuringia and Saxony as well as Western Bohemia (Czech Republic). The plant also helps alleviate grid bottlenecks and provides flexibility for the power grid. The option to build a public hydrogen filling station for trucks and buses at the same location will make it possible to create an offering for carbon-free heavy goods transportation as well as regional public transportation. “Thanks to our ‘Wunsiedler Weg’ concept, we’re ideally positioned to achieve climate neutrality. Hydrogen technology will position Wunsiedel as a model city for the energy future far beyond the region, and indeed beyond Bavaria,” said Wunsiedel Mayor Nicolas Lahovnik. “This allows us to create new and sustainable forms of energy use for our residents.”

The new hydrogen production plant is scheduled to go into operation in the summer of 2022.







Zebra Technologies To Acquire Fetch Robotics

Zebra Technologies Corporation an innovator at the front line of business with solutions and partners that deliver a performance edge, today announced it intends to acquire Fetch Robotics, a pioneer in on-demand automation. Fetch's Autonomous Mobile Robots (AMRs) are used for optimized picking in fulfillment centers and distribution centers, just-in-time material delivery in manufacturing facilities and automating manual material movement in any facility.

Fetch features the largest portfolio of AMRs in the industry and offers seamless integration with warehouse and manufacturing systems without the need for changes to facilities or infrastructure. Workflow Builder, Fetch's drag and drop workflow development studio, enables out-of-the-box automation so that customers and partners can deploy automated material handling workflows in hours instead of months. Fetch Robotics' AMRs help reduce the impact of labor shortages by improving throughput, efficiency and productivity while working alongside people in fulfillment, distribution and manufacturing environments.

"The acquisition of Fetch Robotics will accelerate our Enterprise Asset Intelligence vision and growth in intelligent industrial automation by embracing new modes of empowering workflows and helping our customers operate more efficiently in increasingly automated, data-powered environments," said Anders Gustafsson, Chief Executive Officer of Zebra Technologies. "This move will also extend our ongoing commitment to optimize the supply chain from the point of production to the point of consumption. We are excited to welcome the Fetch team to the Zebra family."

In addition to Fetch Robotics' broad portfolio of AMRs, it offers cloud-based Enterprise Software, FetchCore as the foundational platform for deploying and fully integrating a broad range of automated workflows into manufacturing and warehouse operations and providing unique insights into facilities through machine learning on AMR sensor data. The planned acquisition furthers Zebra's vision to bring advanced robotics solutions to customers who have labor-intensive operations.

Zebra's focus on robotics automation combines workflow solutions for human workers, including current Zebra offerings such as FulfillmentEdge and SmartSight with Fetch Robotics' solutions. The result will provide an innovative offering that drives greater efficiencies and higher ROI through better orchestration of technology and people.

"The Fetch team is excited to join Zebra and accelerate the adoption of flexible automation through AMRs and our cloud-based robotics platform. Together we have the right team with the right technology to provide end-to-end solutions that solve real customer problems," said Melonee Wise, Chief Executive Officer of Fetch Robotics. "By helping customers dynamically optimize and holistically orchestrate their fulfillment, distribution, and manufacturing operations, together we help enable their ability to stay ahead of growing demand, minimize delivery times and address shrinking labor pools."

Fetch has made strong progress as a Zebra Ventures portfolio company.

In its early-rapid growth phase, this high gross-margin profile business is generating annualized run-rate sales of approximately $10 million. Zebra's go-to-market footprint and vertical market expertise is expected to drive synergies as we integrate and invest in the business.

"Our goal is to give robots and people the opportunity to do their very best work," said Bill Burns, Chief Product & Solutions Officer, Zebra Technologies. "This acquisition is a continuation of what we expect to be a series of innovations that reflect our commitment to creating solutions that help our customers improve their operations through robotics."

Zebra expects to fund the $290 million purchase price – for the 95% of the business it does not already own – with cash on hand. The transaction is subject to customary closing conditions, including regulatory approval, and is expected to close in the third quarter of 2021.

Vedder Price is serving as legal counsel to Zebra. Fenwick & West is acting as legal counsel and Evercore is acting as financial advisor to Fetch.

New – HASCO cycle counters for high-temperature applications

The new mechanical cycle counters A5730HT/... and A57300HT/... mark a further addition to the HASCO counter range. They are used wherever there is a need to monitor process data. As a high-temperature version, the cycle counters can be used at temperatures of up to 200 °C.

Maximum flexibility in assembly

The possibility of left and right-hand operation provides for a high level of flexibility in assembly. The cycle counters can be mounted both on the fixed and the moving mould plate.

Optimum process data monitoring at high temperatures

The high-temperature cycle counters feature a 7-digit mechanical, non-resettable counter, are quick and easy to mount, completely maintenance-free and independent of the power supply. The reliable counting with each injection moulding cycle guarantees optimum process data control.

Improved ScrapSaver™ Fluff Feeder from Conair Offers Higher Film-Scrap Capacity and Better Reclaim Efficiency

A redesigned ScrapSaver™ fluff feeder from the Conair Group makes high-volume film-scrap reclaim easy by feeding granulated film scrap (fluff) into a stream of virgin material and delivering the mix to an extruder for processing.

Designed for use with in-line granulation systems, the latest ScrapSaver feeder features an enlarged and strengthened main hopper and top plate for greater fluff surge capacity, a beefed-up auger and auger shaft to deliver higher fluff-to-virgin ratios to the extruder,

an integral control panel, and mounting adapters for varied extruder feed throats from 2 to 8 inches in size.

The special twin-chamber hopper of the redesigned ScrapSaver feeder holds granulated film fluff in a large main chamber and virgin material in a smaller side chamber, keeping both separate until just before they are introduced into the screw flights. To prevent fluff from bridging and keep it flowing smoothly downward, the new ScrapSaver unit employs a longer, stronger one-piece auger, capable of driving higher fluff re-feed ratios to the extruder throat. Virgin pellets feed in by gravity on one side at the base of the auger, maintaining a smoother infeed and a steady fluff-to-virgin ratio.

The enlarged fluff auger is mounted on a new, solid-core auger shaft and powered through a reduction gearbox by a variable-speed drive motor. The most typical feeder configuration combines a 3 HP motor and 20:1 reduction gearbox, but larger motors (5 or 7 HP) and other reduction gearboxes (10:1 or 30:1) are available to handle varying mass-flow rates and bulk densities. The standard feeder enables users to set maximum fluff re-feed ratios of up to 28 percent of extruder output, but can be factory--modified to provide even higher fluff ratios if required.

The ScrapSaver unit mounts, via the appropriate adapter, directly atop the extruder feed throat. The unit is powered and controlled by wiring it through a new, integral control panel that is equipped with displays showing auger speed and auger drive load. This panel also provides remote network communications capability using the Modbus TCP/IP protocol.

The speed of the motor and auger drive are factory-calibrated for precise regulation by a 0-10 VDC reference signal from the customer's extruder control. In operation, the feeder uses this signal to automatically adjust to any change in extruder rate, maintain the specified scrap/virgin ratio and ensure consistent, surge-free feeding. The drive system comes equipped with current overload protection and status alarms to prolong drive life.

Honeywell

New Line Of Honeywell Rugged, Mobile Computers Empowers Workers To Better Support Growing E-Commerce Demands

- CT45 mobile computers are all-purpose productivity tools ensuring reliable performance, data connectivity and communications for workers in retail, logistics and fieldwork.

- First rugged mobile computer device featuring Wi-Fi 6 communications and capable of software support through 2032

Honeywell announced its latest family of rugged enterprise mobile devices designed for workers that pick, pack, sort and deliver e-commerce orders to keep the retail supply chain moving smoothly from factory to consumer.

Honeywell's CT45 and CT45XP mobile computers are rugged, all-purpose productivity tools enabling mobile workers to efficiently execute tasks and access to business-critical data. These handheld devices are used by workers throughout a changing retail supply chain – including logistics, warehousing, in-store retail and last-mile delivery – that play a critical role in e-commerce fulfillment.

"Retailers are investing in technology to implement new consumer shopping options like click-and-collect and curbside pickup while asking their employees to work smarter and more efficiently," said Kevin Dehoff, president of Honeywell's Productivity Solutions and Services business.

"The combination of high customer expectations and a more digital-savvy workforce gives businesses the option to roll out these advanced mobile devices without the fear of a steep learning curve. We designed our CT45 to be the ultimate tool in the mobile workers toolbox to engage consumers and raise sales conversion while holding down costs."

Shopping options like next-day home delivery, click and collect and curbside pickup have rapidly accelerated due to the COVID-19 pandemic, and retailers are pushing digital transformation strategies to keep up with demand.

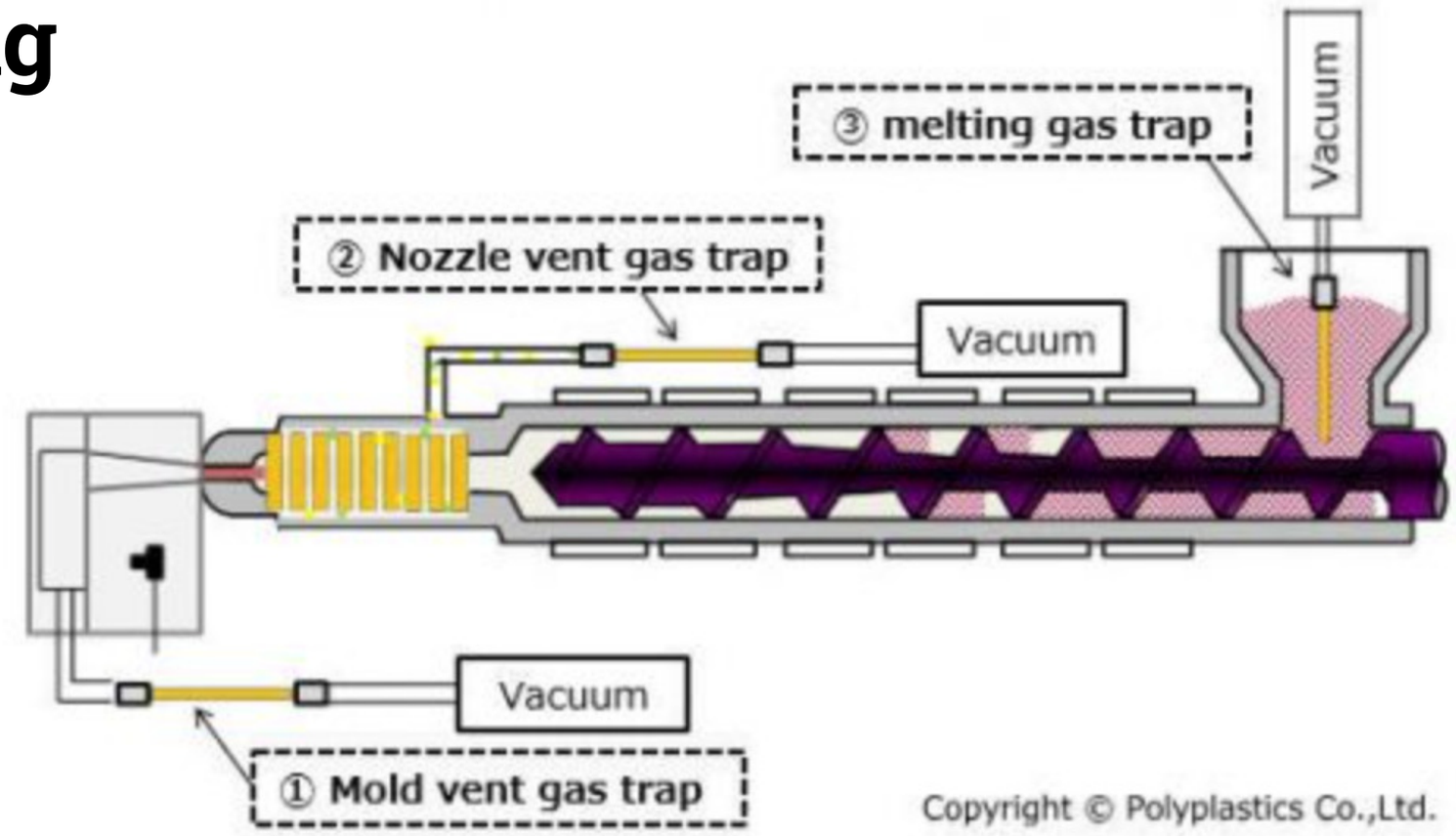
A recent Euromonitor International/National Retail Federation Survey revealed nearly three quarters of retail professionals said the pandemic accelerated their company's digital transformation by at least a year and accelerated their company's technology-related investments.

Built on the Honeywell Mobility Edge platform with the latest cutting-edge Qualcomm IoT mobile solutions, the CT45 offers a future-proof guarantee of continuous Android version support through AndroidTM 13, with a commitment of support through Android 14 and 15 if feasible. With the Honeywell Android Service, this ensures software patch support through 2032, enabling users to maximize the return on investment in their solution.

The CT45 XP is the first rugged handheld device in the industry featuring Wi-Fi 6 capability, allowing for faster, more reliable connections for multiple devices in crowded distribution centers, warehouses and retail stores.

Combined with Honeywell's rich software ecosystem, including apps that can be downloaded through the Honeywell Marketplace, the CT45 family of devices gives businesses and mission-critical mobile workers the tools to make sure they can be successful in a hyper-competitive landscape.

Polyplastics Develops New Testing Method to Identify Gas Formation during Injection Molding



Polyplastics Co., Ltd., a global supplier of engineering thermoplastics, has developed a testing method that identifies gas formation during the injection molding process and helps to reduce mold deposits. The company's Gas Investigation Method in Injection Molding (GIMIM) facilitates continuous molding and improves production efficiency.

During the injection molding process, harsh conditions (high temperature, high speed) and deterioration of plastic additives can release high volumes of decomposition gases. Mold deposits, gas burns, and short shots caused by pyrolysis gas can lead to quality problems, including undesirable effects on the dimensions and appearance of products, resulting in a higher defect rate. Maintaining highly efficient production operations is important as manufacturers work to meet today's highly challenging applications such as automotive electrification and automation.

Polyplastics' proprietary method captures and evaluates the gases formed during molding and identifies the mechanism by which pyrolysis gas forms during injection molding. The innovative proprietary method traps gases according to mold-based methods, uses gas chromatography mass spectrometers (GC/MS) to qualitatively and quantitatively analyze their composition, identifies the gases that are formed, and makes fundamental improvements to the sources of their formation.

This simple system configuration is divided into the three stages of plasticization, metering, and injection, and each unit is fitted with gas traps to seclude the gases that form within each part of the process. GIMIM can reflect the actual circumstances during molding by directly trapping and analyzing the gases formed during molding.

GIMIM makes it possible to measure high-molecular-weight substances that can cause mold deposits. Since this method directly analyzes gases that are formed inside the mold during filling, the company believes it yields results that are closest to real-world conditions. In further research, Polyplastics plans to examine other problems caused by pyrolysis gas such as short shots and gas burn defects, as well as mold deposits.

Aluminum electrolytic capacitors: TDK offers a new screw terminal series with high current capability and long service life

TDK Corporation presents the EPCOS aluminum electrolytic capacitors B43706* and B43726* series with screw terminals. The new components are designed for rated voltages between 400 V DC and 500 V DC and cover a capacitance range of 820 µF to 15,000 µF.

A special feature is the high-rated current capability of up to 56.1 A AC (100 Hz, 85 °C). In case of standard operating conditions (for example, at 300 Hz, 60 °C, 2 m/s), currents of up to 100 A can even be reached. These values mean an approx. 25 percent increase in the current capability in the case of rated conditions in contrast to previous series.

The robust capacitors are designed for a service life of 12,000 hours at 85 °C. A precise service life calculation can be performed with the online AlCap Tool. Similar to other EPCOS screw terminal series, a range of options such as heat sink mounting or special terminals are available as reverse polarity protection.

The new capacitors are particularly well suited to frequency converters and industrial power supplies as well as UPS systems. Furthermore, the capacitors can be effectively used for converters in the renewable energies sector, such as wind power and photovoltaic systems.

Main fields of application

- Industrial frequency converters and power supplies as well as UPS systems
- Wind power and photovoltaic systems

Main features and benefits

- High-rated current capability of 56.1 A AC (100 Hz, 85 °C)
- Current capacity increased by up to 25 percent at rated conditions compared to previous series
- Long service life of 12,000 hours at 85 °C

Fluke Process Instruments Releases Latest Thermalert 4.0 Series Pyrometers with ATEX and IECEx Certification Options

Fluke Process Instruments, a global leader in infrared imaging and thermal profiling solutions for industrial applications, launches the latest Thermalert 4.0 Series Pyrometers, adding intrinsically safe ATEX- and IECEx-certified models.

The complete lineup of Thermalert 4.0 Series Pyrometers includes numerous integrated infrared temperature sensors with our widest selection of spectral ranges that can be used for a wide variety of process control applications.

Each pyrometer conforms to Industry 4.0 standards, can withstand ambient temperatures up to 85°C (185°F) without extra cooling, combines innovative digital technology with standard two-wire installations for all setups (such as optional HART communications) and can now be ordered with ATEX and IECEx certification.

With multiple communication optall setups (such as optional HART communications) and can now be ordered with ATEX and IECEx certification.
ions, this smart infrared sensor provides users with the features they need to understand temperature data and control their unique processes in a compact, integrated package that is easy to install and operate.

“We’re pleased to release the latest models in our Thermalert 4.0 Series of Pyrometers,” says Dr. Martin Budweg, Product Marketing Manager at Fluke Process Instruments. “These smart, easy-to-install infrared sensors can help users across a variety of unique processes and applications improve their process control while taking their temperature data to the next level.”

AEye Establishes New Benchmark for LiDAR Performance with 1000 Meter Range in Rain, Behind Windshield Glass

Breakthrough Adaptive LiDAR Performance Independently Validated by VSI Labs at American Center for Mobility

Go find someone who does PET plastic bottles

YES BOSS!

I need to quickly find that someone!!

Look! He is PETTING plastic bottles!! He is the one!!

My boss always tell me to check the specification sheet before making any decisions

Hmm…
I don't understand…
next page…

PET PLASTIC
SPECS SHEET

Young's Modulus	xxx
Tensile Strength	xxx
Elastic Limit	xxx
Notch Test	xxx

I wondered if this man is able to melt at 482° F

My boss says testing is important!

HELP!!

Page 2

PET PLASTIC
Melting Point
482° F

AEye, Inc., the global leader in adaptive, high-performance LiDAR solutions, announced its LiDAR sensor – already known for extreme long-range capabilities – has achieved yet another milestone: 1000 meter range in rain, behind windshield glass. The test was performed at the American Center for Mobility (ACM) test track in Ypsilanti, Michigan, with results verified by active safety and automated vehicle technologies researcher, VSI Labs, and witnessed by industry analysts and press representatives.

AEye LiDAR Out-Performs in Rain, Behind the Windshield

AEye's sensor has already been independently verified to have twice the range as the nearest LiDAR competitor. The new test shows that – not only does AEye's adaptive LiDAR achieve groundbreaking range capabilities, it does so in adverse weather conditions, and behind a first surface: in this case, a windshield.

The test was conducted using VSI's research vehicle, which integrated AEye's sensor into its AV stack to study the impact of adaptive LiDAR on the performance and safety of automated functionality. The team used a rain machine to simulate wet weather, and mounted the sensor behind a piece of windshield glass to gauge long-range sensor performance in heavy rain.

"The ultra-long-range capabilities of our adaptive LiDAR enables OEMs to release new revenue-generating applications like highway autopilot or hub-to-hub autonomous trucking," said Jordan Greene, GM of ADAS and VP of Corporate Development at AEye. "Being able to deliver this performance in all weather conditions ensures these applications can be safely implemented in even the toughest driving environments."

"Having already verified AEye's extreme long-range detection, this was an important follow-up test to ensure that 1000 meter performance would stand up in less than ideal weather conditions, and when mounted behind the glass of a windshield," said Phil Magney, founder and president at VSI Labs.

help users across a variety of unique processes and applications improve their process control while taking their temperature data to the next level."

AEye Detects Pedestrians, Through the Rain, in the Dark

In a second test of its LiDAR at the ACM track, the AEye sensor mounted on VSI's test vehicle detected small objects in a tunnel, through rain and a second surface, at 120 meters. This test was conducted amid heavy rain, with the sensor peering into a dark tunnel. The AEye sensor detected five bricks and a black dog not visible to the human eye at 120 meters, as well as a pedestrian and child at 110 meters.

"I've never seen a demo like that one before – in a real-world scenario under poor weather, behind the windshield, while still being able to achieve the distance and detection. What we saw was really impressive," said Sam Abuelsamid, principal research analyst at Guidehouse Insights.

In March, AEye announced VSI Labs verified AEye

LiDAR's breakthrough range, resolution and speed capabilities, as well as its ability to place the sensor behind first surfaces, such as the windshield or grill, with minimal performance impact. The latter is critical to automotive OEMs, as it provides OEMs flexibility in implementing sensors within their designs, without compromising aesthetics or changing the aerodynamics of the vehicle.

This design-centric vehicle integration is made possible by AEye's unique bistatic architecture, which separates the transmit and receive paths, providing optical isolation that – unlike traditional coaxial LiDAR systems – ensures any light reflected back doesn't blind the sensor. The architecture also ensures optimal performance, even in the most adverse weather conditions. This performance is further enhanced by AEye's use of 1550 nanometer lasers, whose longer wavelength better penetrates obscurants, providing superior detection in rain, snow, and smoke.

AEye's intelligent LiDAR uses adaptive sensing to deliver this industry-leading performance, which addresses the most difficult challenges facing autonomous driving, while meeting automotive functional safety requirements. Unlike traditional sensing systems, which passively collect data, AEye's adaptive LiDAR scans the entire scene, while intelligently focusing on what matters in order to enable safer, smarter, and faster decisions in complex scenarios. As a result, AEye's LiDAR uniquely enables higher levels of autonomous functionality (SAE L2-L5) at the optimal performance, power, and price.

AEye is the first and only LiDAR provider to have its performance independently verified and published by reputable third-party testing organizations. In addition to performance testing by VSI Labs, the ruggedness and reliability of the sensors has been validated by global product test, inspection, and certification leader NTS, which put the sensors through extreme automotive shock and vibration tests.

The NRG Digital Solid State Relays Can Now Adapt to Line Voltage Variations

Ensuring stable power output for optimal product quality.

Carlo Gavazzi Automation, the international electronics group with activities in the design, maufacturing, and marketing of electronic equipment, today presents a new feature on the NRG digital solid state relays, the voltage compensation. With switching, monitoring and diagnostic capabilities available via the communication interface, the NRG digital solid state relays provide greater connectivity in industrial automation machinery offering manufacturers unlimited opportunities to improve productivity, predict equipment failure and provide remote access possibilities down to the solid state relay level.

Variation in mains voltage is a common issue that impairs the accuracy of the heating process. With voltage compensation, the NRG solid state relays are able to keep a constant power output despite any voltage fluctuations.

Available on the RGx1P..N variants, voltage compensation ensures reduction of scrap and improved end-product quality.

“This new feature will complement the switching functionality of the NRG solid state relays to guarantee better temperature regulation”, Dora Lee Borg International Product Specialist says. “This is particularly useful for sensitive heating applications
and also open loop temperature control systems.”

Developed in our competence centre in Malta, the NRG has been designed to suit any heating application where precise temperature control is crucial and where unplanned machine stoppages can result in a considerable loss of revenue. Typical applications are plastic injection machines, packaging machines, drying and curing processes, semiconductor manufacturing, and glass tempering machines.

• NRG controller with PROFINET, EtherNET/IP™ or Modbus RTU interface
• Max. 32 NRG solid state relays (RG..CM..N) in 1 NRG bus chain
• NRG solid state relays go up to 660 VAC 65 A, 90 A (versions without heatsink)
• Selectable switching modes: ON/OFF, Burst, Advanced Full Cycle, Distributed Full Cycle, Phase Angle and Soft Start
• Voltage Compensation
• Predictive failure detection with Load deviation indication
• Read-outs: Current, Voltage, Power, Energy consumption kWh, Load and SSR Running hours
• Malfunction detection: Mains loss, Load loss, SSR short circuit, SSR over-temperature, Voltage/ Current / Frequency out-of-range

Light Science Technologies launches sustainable nurturGROW LED lighting range

90% recyclable and interchangeable design enables growers to simply upgrade and replace

UK AgTech company Light Science Technologies (LST) has launched nurturGROW to the market, its new sustainable grow lighting product range, offering an innovative, high-performance and cost-effective solution for indoor farming, covering greenhouses, vertical farming, polytunnels and medicinal plants.

Created with four core component parts, the patent-pending nurturGROW range is made of high quality, durable materials to give growers the ideal balance between strength and optimal performance.minimising the amount of materials needed to drastically cut down on waste and reduce carbon footprint. Thanks to its sustainable, future proof design, 85% of nurturGROW is also reusable, allowing growers to easily upgrade components, cost effectively and with no downtime, making nurturGROW easy to maintain. Backed by a 25-year product lifecycle, it ensures indoor farmers maximise use of every element over a longer lifespan to generate maximum yields and save them a third on future costs.

In-house UK scientific and manufacturing expertise

nurturGROW features industry-leading, high performing LED lighting innovation by drawing on its own in-house manufacturing capabilities, assuring growers of nothing less than high quality and high performance grow lighting. This is supported by a successful tried and tested approach in real environments to prove nurturGROW's long-lasting lighting technology.

Backed by science, LST works with growers to create the perfect recipe for crop growth. Using light testing equipment and data gathered from LST's purpose-built laboratory, its in-house team of scientists can help identify the right spectral waveforms and PPFD levels by recreating various environment scenarios in one of its accredited grow chambers.

Grow more, with less

Founded in 2019, LST's approach from the beginning was to create a bespoke, fully integrated lighting solution which met key criteria for CEA farmers and growers: sustainability, cost effectiveness and high performance. Knowing that each growing environment has its own set of unique requirements, nurturGROW gives growers optimum control over their crops with the potential to deliver optimal yield and minimise both CAPEX and OPEX costs.

Craig Price, Operations Director at Light Science Technologies, said:

"Being customer-focused by design means that as an experienced LED grow light partner, we understand every variable and can help indoor growers to design a sustainable solution that fits their unique growing parameters."

"This extends to adjusting the light recipe for growers, as nurturGROW will allow you to increase, decrease or change the recipe depending on preference, thanks to an interchangeable luminaire body."

"The unique aspect of our design also means that we have already allowed for future integration of sensor technologies, offering significant added value. By choosing to add in our new sensor technology, which is under development, indoor growers and farmers can look to control their environment in much more granular detail. This will enable them to reduce any sub-optimal performances, whether that be in any environmental controls or from the light itself."

New Inductive Couplers from Balluff

Powerful and fast Non-contact power transmission, fast data transfer and condition monitoring in one: the new BIC M30 inductive couplers from Balluff are particularly suitable for production lines where flexibility is required.

Inductive coupling systems are always used when a particularly large amount of power is transmitted. This is the case, for example, in robotics applications involving controlling gripper arms. "Inductive couplers are indispensable in many different applications today," says Balluff Product Manager Dr. László Herczeg.

The new BIC M30 inductive couplers from Balluff leave comparable models far behind in terms of performance. They can transmit up to 1.5 amps of continuous output. The energy is transmitted without contact. The IO-Link interface of the inductive couplers enables a frictionless, transparent, and very fast exchange of data between the IO-Link device and the IO-Link network module.

"A unique feature is the second IO-Link channel, which can be used for process and diagnostic data and thus for condition monitoring," explains Herczeg.

With the compact stainless-steel housing in IP67 and UL certification, the inductive couplers can be used flexibly – for example in the packaging or automotive industries or on special machines. "The contactless energy transmission and transparent bi-directional COM2/COM3 IO-Link data transmission is particularly suitable for product lines where flexibility is required," says Herczeg. Thanks to their extended operating temperature range of -5 to +70 degrees Celsius and their robust stainless-steel housing, the inductive couplers can even cope with harsh environmental conditions.

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The way we normally recycle plastics is a downward spiral of waste and degraded materials, but there is another option – turning plastic back into the oil it was made from.

There is one man-made material that you can find in the earth, the air and in the deepest ocean trenches. It is so durable that the majority of what has been created is still present in our ecosystem. Having made its way into the food chain, it permeates our bodies, flowing from our blood into our organs, even finding its way into the human placenta.

It is of course plastic, and this durability is also what makes the material so useful. Cables stretching across ocean floors, water pipes under the ground and packaging that keeps food fresh all rely on this property.

Efficiently recycling plastic by conventional means is notoriously difficult, and only 9% of all plastic ever made has been recycled into new plastics. But what if there was a way to turn plastic back into the stuff it was made from? The "next grand challenge" for polymer chemistry – the field responsible for the creation of plastics – is learning to undo the process by turning plastics back into oil.

This process – known as chemical recycling – has been explored as a viable alternative to conventional recycling for decades. So far, the stumbling block has been the large amount of energy it requires. This, combined with the volatile price of crude oil sometimes makes it cheaper to produce new plastic products than to recycle existing plastic.

Every year, more than 380 million tonnes of plastic is produced worldwide. That's about the same as 2,700,000 blue whales – more than 100 times the weight of the

entire blue whale population. Just 16% of plastic waste is recycled to make new plastics, while 40% is sent to landfill, 25% to incineration and 19% is dumped.

Much of the plastic that could be recycled – such as polyethylene terephthalate (PET), which is used for bottles and other packaging – ends up in landfill. This is often due to confusion about kerbside recycling or contamination with food or other types of waste.

Other plastics – such as salad bags and other food containers – find their way to landfill because they are made up of a combination of different plastics that can't be easily split apart in a recycling plant. Litter dropped in the street and lightweight plastics left in landfill sites or illegally dumped can be carried by the wind or washed into rivers by the rain, ending up in the ocean.

Instead of a system where some plastics are rejected because they are the wrong colour or made of composites, chemical recycling could see all types of plastic fed into an "infinite" recycling system

Chemical recycling is an attempt to recycle the unrecyclable. Instead of a system where some plastics are rejected because they are the wrong colour or made of composites, chemical recycling could see all types of plastic fed into an "infinite" recycling system that unmake plastics back into oil, so they can then be used to make plastic again.

The way plastic is currently recycled is more of a downward spiral than an infinite loop. Plastics are usually recycled mechanically: they are sorted, cleaned, shredded, melted and remoulded. Each time plastic is recycled this way, its quality is degraded. When the plastic is melted, the polymer chains are partially broken down, decreasing its tensile strength and viscosity, making it harder to process. The new, lower grade plastic often becomes unsuitable for use in food packaging and most plastic can be recycled a very limited number of times before it is so degraded it becomes unusable.

The emerging industry of chemical recycling aims to avoid this problem by breaking plastic down into its chemical building blocks, which can then be used for fuels or to reincarnate new plastics.

The most versatile version of chemical recycling is "feedstock recycling". Also known as thermal conversion, feedstock recycling is any process that breaks polymers down into simpler molecules using heat.

In the UK, Mura Technology has begun construction of the world's first commercial-scale plant able to recycle all kinds of plastic

The process is fairly simple – take a plastic drinks bottle. You put it out with your recycling for collection. It is taken, along with all the other waste, to a sorting facility. There, the rubbish is sorted, either mechanically or by hand, into different kinds of materials and different kinds of plastics.

Your bottle is washed, shredded and packed into a bale ready for transportation to the recycling centre – so far, the same as the conventional process. Then comes the chemical recycling: the plastic that formerly made up your bottle could be taken to a pyrolysis centre where it is melted down. Next it is fed into the pyrolysis reactor where it is heated to extreme temperatures. This process turns the plastic into a gas which is then cooled to

condense into an oil-like liquid, and finally distilled into fractions that can be put to different purposes.

Chemical recycling techniques are being trialled across the world. UK-based Recycling Technologies has developed a pyrolysis machine that turns hard-to-recycle plastic such as films, bags and laminated plastics into Plaxx. This liquid hydrocarbon feedstock can be used to make new virgin quality plastic. The first commercial-scale unit was installed in Perth in Scotland in 2020.

The firm Plastic Energy has two commercial-scale pyrolysis plants in Spain and plans to expand into France, the Netherlands and the UK. These plants transform hard-to-recycle plastic waste, such as confectionery wrappers, dry pet food pouches and breakfast cereal bags into substances called "tacoil". This feedstock can be used to make food-grade plastics.

In the US, the chemical company Ineos has become the first to use a technique called depolymerisation on a commercial scale to produce recycled polyethylene, which goes into carrier bags and shrink film. Ineos also has plans to build several new pyrolysis recycling plants.

In the UK, Mura Technology has begun construction of the world's first commercial-scale plant able to recycle all kinds of plastic. The plant can handle mixed plastic, coloured plastic, plastic of all composites, all stages of decay, even plastic contaminated with food or other kinds of waste.

Mura's "hydrothermal" technique is a type of feedstock recycling using water inside the reactor chamber to spread heat evenly throughout. Heated to extreme temperatures but pressurised to prevent evaporation, water becomes "supercritical" – not a solid, liquid, nor gas. It is this use of supercritical water, avoiding the need to heat the chambers from the outside, that Mura says makes the technique inherently scalable.

"If you heat the reactor from the outside, keeping an even temperature distribution is really hard. The bigger you go the harder it gets. It's a bit like cooking," explained Mura's chief executive, Steve Mahon. "It's hard to fry a big steak all the way through but if you boil it, it's easy to make sure it's cooked evenly all the way through."
The plastic waste arrives on site in bales – contaminated, multi-layer plastic such as

flexible films and rigid trays that would otherwise have gone to incineration or energy-from-waste plants. The bales are fed into the front-end sorting facility to remove any inorganic contaminants such as glass, metal or grit. Organic contaminants such as food residue or soil are able to pass through the process. The plastic is then shredded and cleaned,
before being mixed with supercritical water.

Once this high-pressure system is depressurised and the waste exits the reactors, the majority of liquid flashes off as vapour. This vapour is cooled in a distillation column and the condensed liquids are separated on a boiling range to produce four hydrocarbon liquids and oils: naphtha, distillate gas oil, heavy gas oil and heavy wax residue, akin to bitumen. These products are then shipped to the petrochemical industry.

As with other feedstock techniques, there is no down-cycling as the polymer bonds can be formed anew, meaning the plastics can be infinitely recycled. With a conversion rate of more than 99%, nearly all the plastic turns into a useful product.

Mahon said: "The hydrocarbon element of the feedstock will be converted into new, stable hydrocarbon products for use in the manufacture of new plastics and other chemicals." Even the "fillers" used in some plastics – such as chalk, colourants and plasticisers – aren't a problem. "These drop into our heaviest hydrocarbon product, heavy wax residue, which is a bitumen-type binder for use in the construction industry."

The hot, excess gases generated during the process will be used to heat the water, increasing its energy efficiency, and the plant will be powered by 40% renewable energy. "We want to use as much renewable energy as possible and will be seeking, wherever practical, to aim for 100%," says Mahon.

Mura's Teesside plant, due for completion in 2022, aims to process 80,000 tonnes of previously unrecyclable plastic waste every year, as a blueprint for a global rollout, with sites planned in Germany and the US. By 2025, the company plans to provide one million tonnes of recycling capacity in operation or development globally.

"[Our] recycling of waste plastic into virgin-equivalent feedstocks provides the ingredients to create 100% recycled plastics with no limit to the number of times the same material can be recycled – decoupling plastic production from fossil resource and entering plastic into a circular economy," says Mahon.

Scientists such as Sharon George, senior lecturer in environmental science at Keele University, have welcomed Mura's development. "This overcomes the quality challenge by 'unmaking' the plastic polymer to give us the raw chemical building blocks to start again," says George. "This is true circular recycling."
Yet in the past 30 years, chemical recycling has shown serious limits. It is energy-intensive,

has faced technical challenges and proved difficult to scale up to industrial levels.

In 2020, a report by the Global Alliance for Incinerator Alternatives (Gaia), a group of organisations and individuals who promote social movements to reduce waste and pollution, concluded that chemical recycling is polluting, energy intensive and prone to technical failures. The report concluded that chemical recycling was not a viable solution to the plastic problem, especially at the pace and scale needed.

Additionally, if the end product of chemical recycling is an oil used for fuel then the process does not reduce the need for virgin plastic, and burning such fuels would release greenhouse gases just as ordinary fossil fuels do.

"Environmental NGOs are keeping a close eye on emerging recycling methods," says Paula Chin, sustainable materials specialist at the conservation organisation WWF. "These technologies are in their infancy and they are by no means the silver bullet solution to the plastic waste problem. We should focus on increasing resource efficiency as a way to minimise waste through greater reuse, refill and repair systems – not relying on recycling to be the saviour."

But Mura argues that their plant will fill a much-needed niche. "[Chemical] recycling is a new sector, but the scale at which it is developing, specifically for Mura, shows both the urgent need for new technology to tackle the rising problem of plastic waste and environmental leakage, and an opportunity to recycle a valuable ready-resource, which is currently going to waste," Mahon says.

Mura's process aims to complement existing mechanical processes and infrastructure, not compete with them,

recycling materials that would otherwise go to landfill, incineration or into the environment. All the waste plastic they process will be made new plastics or other materials, none will be burnt for fuel.

Mura hopes its use of supercritical water for efficient heat transfer will allow them to scale-up to industrial levels, lowering energy use and costs. It could be a crucial factor for success where others have failed.

One of the main reasons chemical recycling has failed to take off so far has been financial collapse. In a 2017 report, Gaia noted multiple projects that had failed, including the Thermoselect facility in Germany which lost more than $500m (£350m) over five years, the UK's Interserve which lost £70m ($100m) on various chemical recycling projects, and many other companies that faced bankruptcy.

Financial difficulty is something that has held back not just chemical recycling but all kinds of plastic recycling. "The economics do not stack up. Collecting, sorting and recycling packaging is simply more expensive

than producing virgin packaging," says Sara Wingstrand, New Plastics Economy Project Manager at the Ellen MacArthur Foundation.

Wingstrand says the only path to "dedicated, ongoing and sufficient funding at scale" for recycling is through mandatory, fee-based Extended Producer Responsibility schemes. These would see all industries that introduce plastic contributing funding to collect and process their packaging after its use. "Without them, it is very unlikely recycling of packaging will ever scale to the extent required," says Wingstrand.

But Mahon believes a system like Mura's is another way to shift the balance sheets in favour of plastic recycling by producing an oil that can be sold at a profit. Mura has recently announced partnerships with the plastic manufacturers Dow and Igus GmbH, and the construction firm KBR.

"The interesting thing here is that Mura can find value in plastics that aren't usually economically viable to recycle mechanically," says Taylor Uekert, researcher at the Cambridge Creative Circular Plastics Centre, University of Cambridge.

Even with the ability to unmake all types of plastic so they can be reused again, it is unlikely to make all of the problems with plastic pollution go away. With so much ending up in landfill and the environment, plastic will continue doing what it was made to do – endure.

Source from BBC

ANRPC Releases Natural Rubber Trends May 2021

The Association of Natural Rubber Producing Countries (ANRPC) releases the Natural Rubber Trends, May 2021.

The world has changed after pandemic landed in a year ago and more. Most countries are still battling with Covid-19 and its mutation variants, millions of lives taken by the pandemic and reshuffled the ordinance of people and economy under a new norm of standard operation procedures during this pandemic era.

Based on the preliminary estimates up to May 2021, the world production of natural rubber (NR) in 2021 is anticipated to grow at 5.8%, year-on-year, to 13.812 million tonnes; while world demand of NR is estimated at 6.7% growth to 13.679 million tonnes in the same reference period. This revised outlook has projected a relatively balanced global NR market for the prevailing year.

Despite solid post-pandemic recovery led by two giant economies, China and United States, managing pandemic with low infection rate is still key for smooth recovery for all countries. The high broken records daily infection cases in some ASEAN countries may have given indirectly impact to the rubber economy through the various covid-19 restriction measures to contain the pandemic.

Mass inoculation programme is crucial to revive the economy and livelihood for all, hence attaining herd immunity requires countries to speed up their vaccination programme –

regional cooperation such as ASEAN and China have pledged for greater vaccine cooperation for ensuring vaccines supply distribution to tackle this pandemic.

The incessant support and cooperation extended by the esteemed users, statistical correspondents, and stakeholders are once again gratefully acknowledged.

3D Printing Trends: Six Major Developments

Today, time is our most precious commodity. Competitive pressures and evolving business models mean companies must shrink development cycles to innovate and implement new ideas with speed and agility. With a new class of better-performing machines, more materials available and greater ability to deliver 3D printed parts that are true to their mechanical properties, 3D printing proven itself to be a significant time- and cost-saving option for design and manufacturing.

From its conception, 3D printing has had the potential to change the way goods are manufactured. The benefits have strategic implications: flexibility, design freedom, time-to-market, mass customization, distributed manufacturing and much more. Although challenges remain, the results of using 3D printing are demonstrating their value.

Over the past several years, Jabil has sponsored three 3D printing trends surveys to enable us to explore where additive manufacturing is headed and current realities. Our 2021 survey contains insight from more than 300 participants responsible for decisions around 3D printing at manufacturing companies and"

1. Use Cases for 3D Printing Are Skyrocketing

While three decades of 3D printing may not seem particularly long in comparison to traditional manufacturing methods, additive manufacturing has been highly transformative in a wide range of industries.

The results we've gathered in the last two studies contrast sharply with the information we gleaned in our first survey back in 2017. Even in just the past two years, 3D printing use skyrocketed. Our research clearly demonstrates an upward trajectory of the popularity and applications of additive manufacturing.

In 2017, when our participants responded to how their companies were using 3D printing technology, the most popular answer (by far) was rapid prototyping. At the time, nearly seven out of 10 respondents affirmed using 3D printing for this purpose. No other option even came close in popularity; only three in ten selected the runner-up (jigs, fixtures and tooling). Since then, use-cases have soared.

Today, research and development surpassed prototyping as the most popular 3D printing application and every other use case has dramatically increased. The percentage of companies leveraging additive manufacturing to build production parts and jigs, fixtures and tooling has roughly doubled since 2017 and use for production parts has nearly tripled.

Close to 100% of participants say they use 3D printing to produce functional or end-use parts. Of course, the levels at which they do varies. Almost 80% report using additive manufacturing to produce at least 25-50% of their functional or end-use parts.

The strides made in 3D printer technology are empowering companies to experiment with previously impossible applications. As the cost for 3D printers decreases and the speed at which they can help a company scale mass production increases, they will become more accessible to transform the entire manufacturing industry.

2. The Growth Projections for 3D Printing is Higher Than Ever

The outlook for the future of 3D printing is extremely positive. The manufacturing stakeholders involved in decisions around 3D printing expect significant growth. Ninety-seven percent of manufacturers polled expect their use of 3D printing to grow within the next five years.

Most participants said they expect their company's use of 3D printing to at least double in the timeframe. Nearly half expect their use to double, while almost four out of 10 expect the increase to be dramatic (five times or more). In addition to the growing acceptance of the practice industry-wide, once again, the accessibility of the technology will drive this growth.

While companies aim to grow their overall 3D print capabilities, expectations are set high to use it for production parts or goods. A little over 80% of respondents expect their additive manufacturing use for production parts to at least double within the next five years.

3. Brands are Enjoying a Wide Range of 3D Printing Benefits

When we conducted our first survey, many of the benefits were still intangible concepts. But with the increased use and applications we've observed in the last few years, these are now proven realities, and survey participants are even more excited about the benefits of additive than they were two years ago. We've outlined the top three benefits companies report enjoying thanks to additive manufacturing.

This recent rise in optimism toward 3D printing may not be a coincidence as we've leaned on additive manufacturing to survive the COVID-19 crisis. As the pandemic spread, companies with 3D printing capabilities jumped into producing and scaling much-needed but all-too-scarce medical personal protective equipment (PPE), such as respirators and face shields. In developing new diagnostic equipment and testing kits, 3D printing helped safely speed up the prototyping and design process.

Survey respondents chose the ability to deliver parts faster as the top benefit of additive manufacturing. We've seen this play out in our own experience; in fact, wanting to forgo the time-consuming, iterative process of going back and forth between tooling and design was a driving factor for our Auburn Hills facility to start using additive manufacturing to meet their tooling needs. Not only did this help them accelerate the manufacturing process but by printing the exact geometry they needed (as opposed to cutting away excess material), they were able to cut costs. In fact, they saved 30-40% on tooling and 80% on delivery time.
Source:Jabil

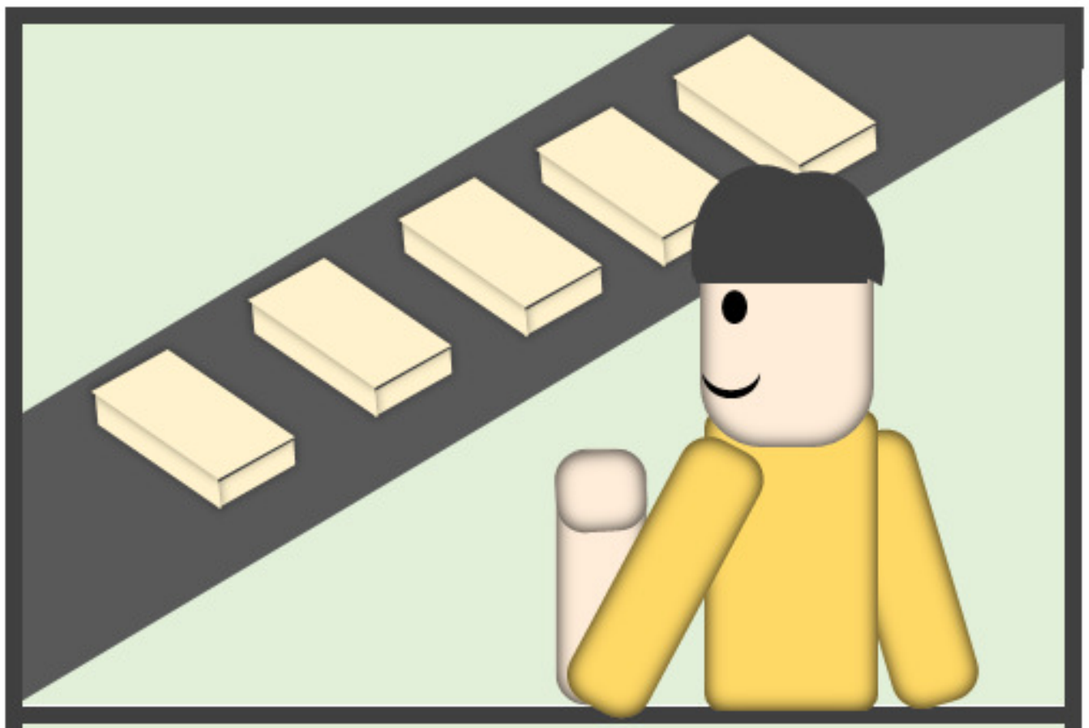
We need a food packaging solution to make sure the food is fresh!

YES BOSS!

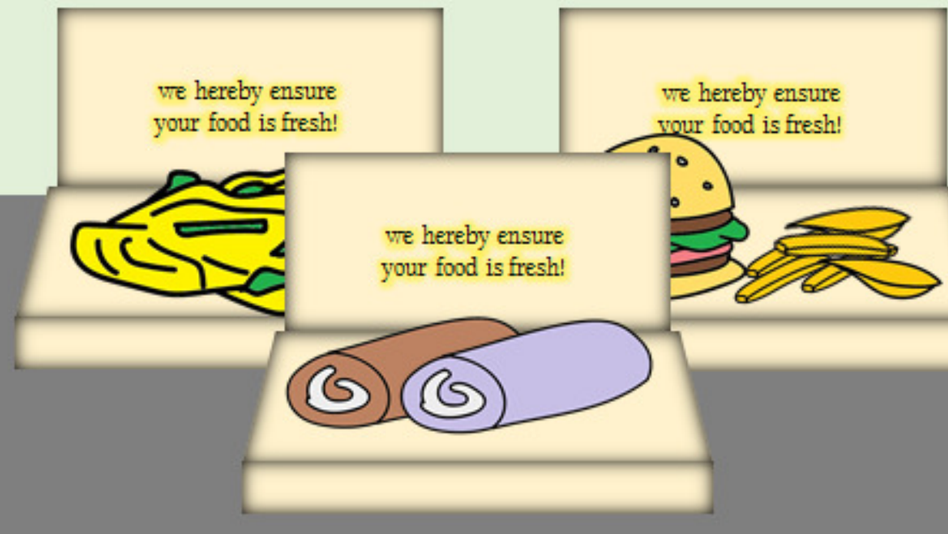
Today, I present you, this magnificent packaging solution!!

we hereby ensure your food is fresh!

Good job! Get it into Production!



And this box becomes so popular!



"Every aspect of the process has been significantly improved by having this [3D printing] ability within our facility," John Wahl VI, tooling engineer at Auburn Hills, concluded. "The first being time, the second being more creativity, the third being cost, fourth being materials."

When we looked at the data by job level, we discovered that executives are more optimistic about the benefits of 3D printing than team managers. Since executives are the ones casting visions (and planning budgets) for the company's future, this supports the indications that 3D printing will continue to grow.

4. Accessible 3D Printing Material Options are Surging

Since 2019, we've seen a dramatic increase in the 3D printing material types that companies are using. Although plastics/polymers still reign supreme, other materials have taken great strides in catching up. This corresponds with our finding that use cases are increasing.

When it comes to primary usage, the discrepancy between plastic and metal 3D printing isn't as big as you might think. More than a third of respondents answered that they use plastics and metals equally, and even between those who selected either plastics or metals, plastics led by just a little over 10%.

Of course, there are still challenges to overcome before some materials become fully accessible. More than half of respondents noted that the materials they need take too long to develop, almost double the percentage as 2019. A slightly elevated percentage of respondents

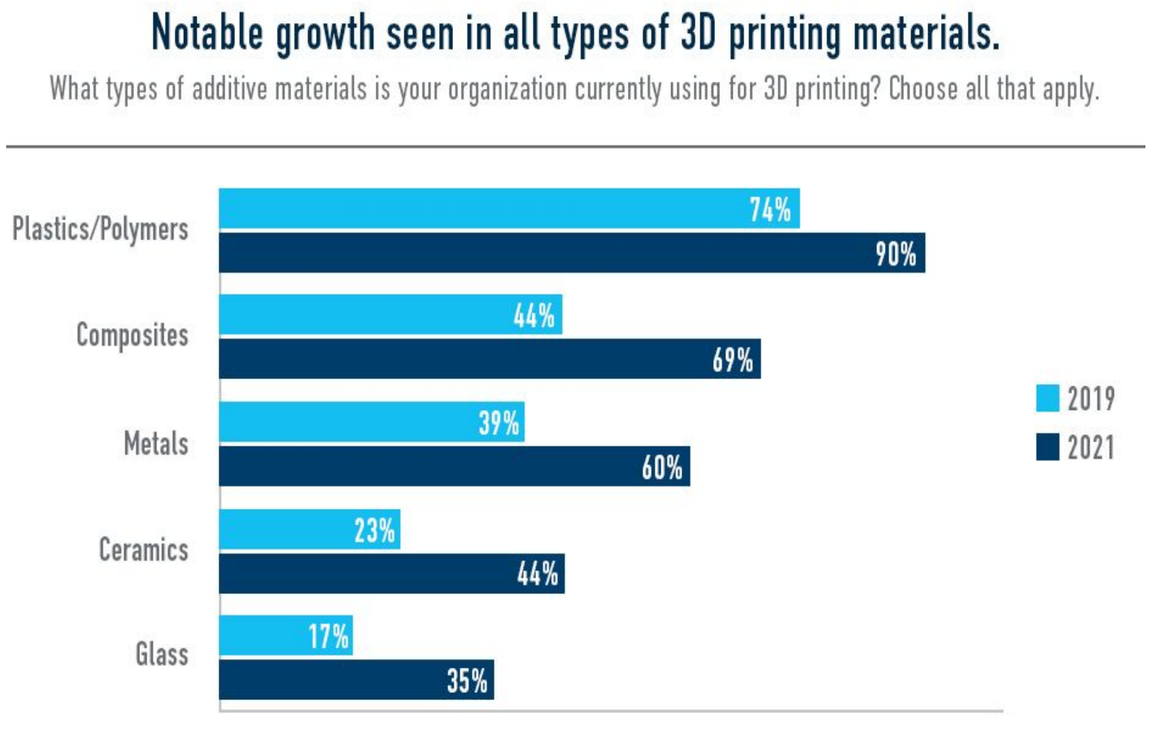
But when those challenges are overcome - or alleviated - interest in different materials is high. When we look at what materials are currently using compared to what they want to use, plastics remain the top choice. However, the desire to use almost all other materials surpasses the current use. Most noticeably, the desire to use glass surpasses current usage by 20%; desire to use ceramics exceeds use by 14%; and interest in metals surpasses current use by 10%. Based on these findings, it will be interesting to see how additive material usage evolves in another two years.

Top 3D printing materials challenges have shifted in the last two years.

What challenges does your organization face with 3D printing materials?

	Materials are too expensive to use at scale	We do not have confidence in part reliability	Needed materials are not available	Materials are not certified	They take too long to develop
2019	27%	47%	30%	27%	39%
2021	53%	49%	33%	30%	27%

JABIL



5. Companies Still Need to Solve Problems with Additive Manufacturing

Despite the optimism for growth in additive manufacturing, organizations have yet to solve all the challenges with 3D printing. Whereas almost half of 2019 respondents listed "cost of materials" as an issue, only about two-fifths did this year. Few challenges rise significantly above the others; most hover around 40%.

However, many of the existing problems are related to cost, which makes sense since 95% of respondents reported financial barriers to additive manufacturing. Obtaining the appropriate qualifications and certifications is number one, but capital expenditures associated with machines and having to gain in-house expertise closely follow.

The top challenge in 2021 was the cost of pre- and post-processing. It does appear that companies are branching out in their pre- and post-processing methods. In 2019, a little over half of respondents said that they were using machining; now, almost three-quarters of respondent are, dethroning polishing as the most popular option. Considering that all processing methods increased significantly, it may be that companies are experiencing some growing pains and these challenges will lessen as companies continue to make this a priority.

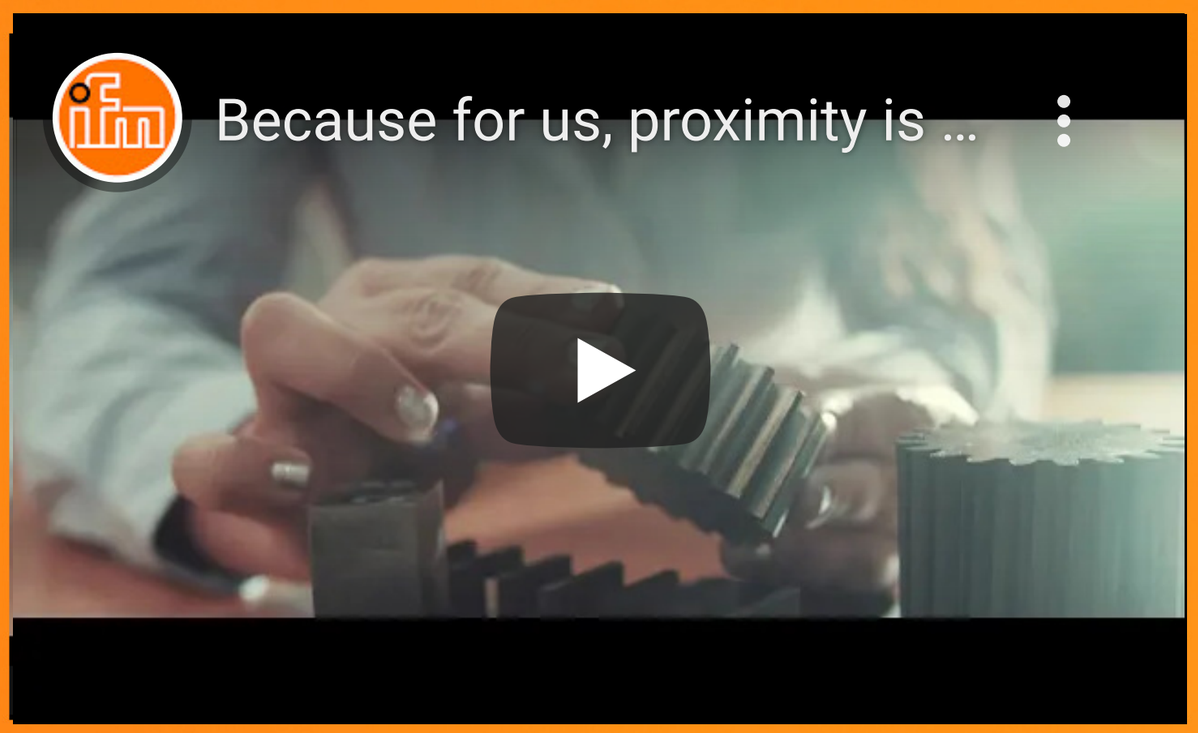
6. Companies Are Prioritizing In-House Expertise

Currently, about three-quarters of survey participants are doing their additive manufacturing in-house. Considering that half as many survey respondents selected "lack of in-house expertise" as a challenge compared to the 2019 survey, we can assume that companies are prioritizing either educating their employees about additive manufacturing or hiring personnel with previous 3D printing knowledge and experience.

This doesn't mean that businesses are opposed to outsourcing their additive manufacturing; in fact, almost 100% indicated that they would consider this an option. When examining potential manufacturing partners, companies take a wide range of criterion into account. Design capabilities top the list but ability to scale, pricing and experience all follow closely behind.

From the 1950s to the 1980s, the U.S. manufacturing industry relied on low-tech labor that was powered largely by human strength and stamina. Since then, we've come a long way, from human-made to human-and-machine-made. 3D printing is becoming steadily integrated into the whole supply chain.

In some areas of the 3D printing industry, we're still seeing a steep incline in growth. In others, we're seeing gentle increases. Four years ago, companies saw little use for 3D printing beyond fast and inexpensive prototyping; not many companies relied on additive manufacturing for full-scale production. But in just four years, we've seen that start to change, and as we solve issues around additive manufacturing materials and use-cases increase, 3D printing is sure to take many product industries by storm and show more market growth. It may not happen in dramatic leaps and bounds, but additive manufacturing is growing steadily - and it's here to stay. This is the world of digital manufacturing.



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22 MINS WITH

Interview by Kaori Kitamura

Steven Liu Chairman Founder Sinoboom

Steven Liu Guo Liang, Chairman and Founder of Sinoboom Intelligent Equipment, began working in the construction machinery industry as a product development engineer 30 years ago. Steven relished researching industry-leading technology and products when he joined the construction machinery sector, and was responsible for multiple R&D plans for tackling specific issues.

As a professional expert, he recognized the prospects for MEWPs in China when he first saw a MEWP advertisement. This realization prompted Steven and his wife Susan (Hong Xia)Xu to set up their own company to produce MEWPs. Their first MEWP was produced in2007, and the couple named their own company as Sinoboom the following year.

Susan Xu, General Manager and founder of Sinoboom Intelligent Equipment, has over 20 years' experience in the construction machinery industry, covering areas including technology and management, overseas market development and more. She and Steven Liu founded Sinoboom on February 28th, 2008.

What methods do you use to comply with industry regulations during Pandemic?

In China, Sinoboom closely followed local community regulations for social distancing and proper PPE requirements, and made arrangements for the safe and systematic return of employees to work step by step.

To help the wider industry, we sourced and donated PPE to customers in China's access sector to help them safely back to work, as well as participating in the construction of shelter hospitals.

Sinoboom also donated PPE to partners and customers overseas to help them stay safe.

Walk me through the latest trend in the petrochemical and heavy machinery industries during this time?

Sinoboom's booms are popular in the petrochemical industry, especially the larger models with over 25 meters' platform height. I believe the intelligent operation, coupled with high-efficiency functions, will find further favor in various industries, along with other customized functions.

Sinoboom MEWPs (Mobile Elevating Work Platform) are also popular in shipyards and ports for cargo ship maintenance. Sinoboom customized and launched an optimized telescopic boom model specifically for shipyard work, with high resistance to rust, wind and waves. To reduce working time, this boom range features our HV function, which allows one-click vertical/horizontal reciprocating movement, to dramatically reduce shipyard operators' workload.

Sinoboom will launch MEWPs especially customized for extreme working conditions, especially for cargo ship management. These platforms will enhance the automated and intelligent operation functions, innovatively reducing the operator's workload.

What are the most helpful technological platforms and tools Sinoboom have used for the petrochemical field?

The largest articulated boom in the world was produced by Sinoboom; with a working height reaching 48 meters, it has been designed with an extremely stable base for super high operation. Sinoboom designed this boom with wheels on the outriggers which can be extended or stowed;when extended, the four wheels are the ideal working width, and when stowed the perfect width for flatbed truck transportation. This model also features a real-time dynamic stability optimization and prediction system, ensuring that the equipment has the best stability status at all times. This model, GTBZ46J is ideally use in the construction of petrochemical.

What are the newest technology that been used in the company now? And what are the obstacles that the company faces due to it?

At Sinoboom we have introduced IoT-based technology to the product range, providing telematics information including equipment status and operating information, service requirements, machine locators, operating data analysis and more. In terms of challenges this technology presents, our focus is to harness advances in digital technology to ensure convenient management tools to maximize the effectiveness of the equipment.

Today, marketis demanding environmentally friendly equipment, is there any planning towards more environmental sustainability during this time?

Yes, we have accelerated the development and launch of electric and hybrid models, compared to traditional diesel models. Several of these models have been launched since the beginning of 2021.

Additionally, we have researched and developed lightweight scissors which nevertheless have the strength for heavy load capability. This is to reduce metal resources waste and to save energy during the manufacturing process, as well as lighter machines offering operational and transportation advantages.

Is there more demand for used machinery during this time and for which industry?

Yes, we have observed a boost to used equipment sales in 2020 globally, which includes both scissors and booms across multiple industries. The used equipment sector has clear economic and sustainability factors in facilitating the re-use of existing machines.

Sinoboom has a reconditioning subsidiary, Xiaoban, and a used equipment business subsidiary based in Singapore.

Which continents and sectors has the most growth in terms of sales for your company?

So many. For example, our global expansion plan has seen us establish subsidiaries in Europe, North America, Australia and Singapore since the end of 2019, with all successfully growing the business in these key regions despite the effects of the global pandemic.

Jürgen von Hollen CEO Ultimaker

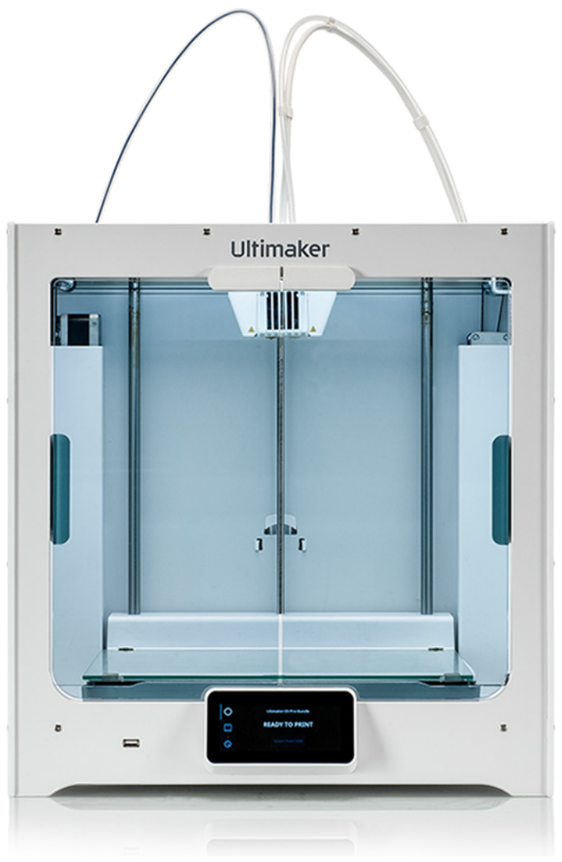
22 MINS WITH

Interview by Kaori Kitamura

What is the possible future in the printing industry after the Pandemic?

Increasing volatility in global markets driven by events such as the current pandemic highlight the need for businesses to increase the flexibility of their operations. 3D printing technology can help every company – large, medium, or small – stay on top of their supply chains and keep innovating anywhere, any time. Flexibility, customization, and specific, scalable solutions are key to maintaining a strong foothold for any company in a pandemic-stricken world. These are also areas in which additive manufacturing has both a notable advantage and a positive effect on the wider adoption of 3D printing, post-pandemic.

At Ultimaker, our plan is to accelerate the concept of providing companies with a solution, not just a printer. We do this with a new ecosystem approach that gives users a cloud-based platform to access our software, education, Marketplace, library, and services. Network functionality enables remote monitoring, so Ultimaker engineers can troubleshoot any issues from anywhere at any time. The Ultimaker platform offers businesses an end-to-end workflow, from enabling engineers to collaborate on a design, to storing applications, and printing on



demand. We enrich the platform with our ecosystem of partners to contribute to their areas of expertise, and our open platform to enable companies to push the boundaries. Each company has unique processes, needs, and timelines, and we don't want to offer them just one solution, but a whole platform to customize that solution.

Ultimaker now bundles all new 3D printers with Ultimaker Essentials. For companies that wish to further scale and professionalize their 3D printing activities, Ultimaker also launched two new software plans:

Ultimaker Professional, which helps professionalize 3D printing innovation through collaboration and advanced software. And Ultimaker Excellence, a complete and custom solution aimed at accelerating the business' digital transformation.

Ultimaker Excellence offers open interfaces, APIs, consultancy, and other tools for companies and developers to further innovate and make it happen.

How your company ensure the environmental sustainability during this time?

Companies worldwide are currently considering the complete workflow in regard to pollution and carbon footprint. 3D printing can be a strategic changemaker in this process to work in line with their strategy of running a greener factory.

One solution in which 3D printing can make a difference is, for instance, that creating, storing, and sharing files digitally helps to reduce your carbon footprint, since less needs to be shipped from A to B. Furthermore, there is an opportunity here to reduce the amount of waste. Because you're producing only what you need – where and when you need it – you're reducing the amount of potentially unused stock parts. And collaborating on designs and prints with colleagues across the globe has never been easier, with our recently launched software plans. This helps speed up the innovation process and helps companies that are working on sustainable solutions to go from concept to prototype much faster. A simple tool printed to reduce the number cans falling from a production belt, thus less waste, can make a small but significant impact.

Furthermore, thanks to our open ecosystem, customers can select from the widest range of filament available, including recycled filament – for instance Fishy Filaments, which is made from old fishing nets.

What are the new trends that customers can look forward in the printing industry?

The rise of digital warehouses, in which customers will centrally store and share designs throughout their locations. The new Digital Library, which is hosted in the cloud, allows for collaboration and application development among teams, and is a secure place to house your digital part inventory. The reporting and analytics tool provides useful insights into the usage of individual printers, print fleets, projects, and applications. It's designed to provide a full oversight of your entire 3D printing operation, while reducing costs with robust data on costs per part, material usage, and more.

Are there any exciting developments coming up from your side?

At the recent the Ultimaker Transformation Summit, we announced Ultimaker's transformation, from a product to a platform company, to drive innovation and growth globally. We are uniquely positioned as a leader in the professional 3D printing segment, delivering both hardware and software solutions. We will ensure this platform stays futureproof, stable, and flexible to enable the development, nurturing, and orchestration of ecosystem products and services, including hardware add-ons, materials, and software. Our belief is that all businesses should have the opportunity to take advantage of the platform and ecosystem. This allows them to remain flexible and productive in a volatile world.

What is the next technology disruption that you foresee in this sector?

The expected global market growth for 3D printing is, depending on market research, between 20-30%.
Further elimination of the typical barriers for adopting 3D printing will have a big impact on the sector; there is still much that can be done to reduce the complexity of getting from design idea to finished printed part and ensure the printed output is exactly what was intended with minimum user input.

Faster machines and ever higher printing and build volume temperatures will continue to be developed, but repeatability, reliability and quality will be key for businesses to succeed and sustain.
Continued research and development in the area of materials will increase the number of applications within

the reach of FFF – softer elastomers, tougher and stronger polymers and a wider range of metals and composites.

What is the next step to make this sector greener?

By simplifying the process of slicing, printing and managing component data, Ultimaker continues to reduce the trial and error that is symptomatic in the FFF industry, reducing material and energy consumption. This also helps drive AM adoption, increasing the number of companies making parts on demand and in-house rather than ordering from distant manufacturers, saving transport and logistics, as well reducing lead times. Further enhancements in printing profiles and the hardware's ease of use will continue this trend.

Ultimaker also welcomes partners to our ecosystem who drive sustainability – whether by making filament available made from recycled products, software solutions that optimize print settings in such a way that less material is used, or hardware add-ons that help to ensure first-time right prints.

Do you think 3d printing can take over a big chunk of part replacement market?

The need for businesses to increase the flexibility of their operations is key. During the pandemic, many turned to 3D printing technology to stay on top of their supply chains.

Static or inflexible production lines, from which companies enjoyed a stable operating environment, with returns of investment targets of more than three years things of the past. The increased volatility of the business environment has dramatically changed, forcing many companies to adopt much shorter ROI requirements.

Companies now have to ensure that their production assets and resources are flexible, and can be quickly repurposed to address market requirements or changes. Integrating technologies such as 3D printing into production and manufacturing enables greater flexibility for companies, which has been highlighted by the COVID-19 pandemic. Some interesting examples of how 3D printing has enabled companies to adapt are:

Critical spare parts:

Companies were able to print spare parts on demand, minimizing downtime and inventories, as well as ensuring business continuity.

Tools, jigs, and fixtures:

These help to reduce damage, increase safety and/or enable more operating efficiencies in a production environment.

Innovation and prototyping:

3D printing allows designing, testing, embedding, and iterating in a very short period of time. This mindset also helps to quickly change production processes, when, for example, a company that normally packs shampoo bottles wants to suddenly shift to packing bottles that hold valuable vaccines, a simple 3D printed gripper can be rapidly and locally produced to ensure the changes in production lines can be made more quickly than ever before.

Cost efficiencies:

Companies with 3D printing were able to produce parts with the same functionality of those created using previous manufacturing methods, more quickly and at a fraction of the cost. Like these aluminum gripper fingers, which were converted to polymer gripper fingers, with added, replaceable hardened dowel pins.

The above use cases highlighted by the COVID-19 pandemic clearly identify the important role that 3D Printing can and has played over the last year. Additive manufacturing will play an increasingly important role in helping companies to become more flexible and agile.

How has the digital manufacturing transformed this sector?

Digital Manufacturing has allowed industry to become more flexible and efficient; the rise of automation and simulation has given manufacturing engineers many tools to streamline day to day operations; Ultimaker's Digital Factory is one such tool.

Ultimaker's Digital Factory allows for efficient manufacturing by storing design data securely in the cloud; components can be accessed at any time and printed on demand at any location. This eliminates the need to transfer data between sites via email/usb/ftp, ensuring the latest file

is always being used and prints/printers can be monitored from anywhere. The Digital Factory automatically manages the printing queue, ensuring jobs are sent to the next available printer with the correct setup. The reporting and analytics tool provides useful insights into the usage of individual printers, print fleets, projects, and applications. It's designed to provide a full oversight of your entire 3D printing operation, while reducing costs with robust data on costs per part, material usage, and more.

Digital Factory also allows for Projects in Ultimaker Digital Factory can track the costs and print time associated with the parts as well as displaying the traditional cost and lead-time for comparison, allowing for easy make vs. buy decisions and ROI calculations.

Digital manufacturing helps accelerate the adoption of 3D printing. Detailed digital simulation, testing, and analysis of manufactured parts help ensure a part will fulfil its function the first time it is printed. It also helps define the right production method per part.

One such software solution, integrated in the Ultimaker ecosystem, is Teton Simulation – a smart slice solution that allows users to validate and optimize print parameters based on end-use requirements. Speaking generally, users will see a print time reduction of between 30-50%, and a reduction in iterations from between 5-25 to 1-2. These advantages will help further accelerate both the usage of 3D printing and its environmental sustainability.

Another such example is Castor Technologies who produce software capable of analysing a company's design data to ascertain which components would be efficient to fabricate by additive manufacturing, allowing for local manufacture when required. This helps break down barriers and speed up adoption of AM.

Which industry has the most demand for 3d printing during this time?

Working more efficiently and effectively is a goal of essentially every business, regardless of sector or industry. Today's business environment makes this more challenging than ever. 3D printing is a tool for companies of all sizes that can be leveraged in warehouses, assembly lines, offices, and factories, enabling them to achieve results otherwise impossible.

22 MINS WITH

Interview by Bridgette Van Hooff

Associate Professor Steve Kardinal Jusuf

Associate Professor
Steve Kardinal JUSUF
PhD (Building Science), National University of Singapore, Singapore
Cluster: Engineering

What are the drivers of and barriers to sustainability research in this program?

Agrivoltaics is gaining renewed interest in Singapore due to new governmental target areas for both renewable energy and food production. This would pave the way for innovations in food security where solar energy could be used to power agri-food tech innovations in a more sustainable manner.

Driver: Singapore faces a competing need for space for different sustainability goals. Therefore, there is a need to develop optimum solutions for these different goals, so that they can co-exist in the same space.
However, one barrier that remains is that the capital cost of agrivoltaic implementation in Singapore is prohibitive.

How do you feel about the state of architectural education today? Can Singapore be more sustainable?

There is a need to have a stronger emphasis on the use of passive design and introduce a super-low energy

building air-conditioning system, specifically for our tropical climate, as part of the skill sets and knowledge that architecture students should have.

By encouraging the adoption of innovative architectural design and energy-saving technologies, Singapore has emerged as a model of green building in Asia — an important development in a region that is urbanising more rapidly than any other in the world. Singapore is known as a green city, however, on the path towards becoming fully sustainable, it is curtailed by factors such as dependence on air-conditioning - given the warm climates around the region, which furthers the need for air-conditioning as an essential design component.

As such, the pedagogy for architecture students' needs to be based on understanding the importance of promoting designs that emphasise passive technologies such as optimisation of shading and ventilation - aimed at reducing the carbon footprint as a whole.

To build green Singapore, which is better, a recycled material or a natural material? Explain why.

Recycled materials would be better in building a green Singapore. To use natural materials, Singapore will incur hidden environmental costs from importing and transfers given our lack of natural resources.

In terms of the green economy, what types of environmentally friendly investment projects can boost Singapore's economic growth?

Green economy investment projects should have a direct positive impact on the economy which includes: employment creation, income through tax revenue and multiplier effect through the value and supply chains.

Some opportunities on green economy project domestically and regionally are:

a) Renewable energy-based power plants (especially solar power/nuclear)

b) Water treatment technology

i) The Deep Tunnel Sewerage System (DTSS). The DTSS uses deep tunnel sewers to convey used water entirely by gravity to centralised WRPs located at the coastal areas. The used water is then treated and further purified into ultra-clean, high-grade reclaimed water called NEWater, with excess treated effluent discharged to the sea.

c) Waste treatment technology

i) NEA is looking into the development of an Integrated Waste Management Facility (IWMF) to help Singapore

meet its future waste management needs and achieve long term environmental sustainability. As a state-of-the-art flagship facility, it will be developed with innovative solutions that can maximise both energy and resource recovery from solid waste.

ii) NEA's IWMF and PUB's Tuas Water Reclamation Plant (TWRP), jointly known as Tuas Nexus, will be co-located at the Tuas View Basin Site to maximise both energy and resource recovery in solid waste and used water treatment processes.

Can the concept of a net-zero energy city be implemented in Singapore?

It would be difficult. In order to achieve net-zero energy, Singapore must be able to produce its own renewable energy to meet the energy demands of its population which is limited by its lack of natural resources.

SINGAPORE INSTITUTE OF TECHNOLOGY

22 MINS WITH

Interview by Bridgette Van Hooff

Associate Professor Soh Chew Beng

What are the drivers of and barriers to sustainability research in this program?

The development of photovoltaic energy requires extensive land plots.

The key barriers in PV adoption for local context is as follows:

- Land scarcity and competition of resources by facility assets such as chillers and cooling towers on rooftops.
- How to manage the power generation and crops yield by current operators as urban farming and PV deployment comes under two separate entities.
- Current height limitations of buildings set by defence requirements and safety clearance prevents raised PV deployment on rooftops.

Drivers include:

- An Agrivolt system that combines an agricultural and an electrical production on the same land unit may be a viable option. This caters to Singapore's urgent need for food and energy security
- The PV and Agrivolt system can be used for driving of pumps and

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and chillers in the farms, this ensures the economy of sustainable systems in generating revenue needed for operation.

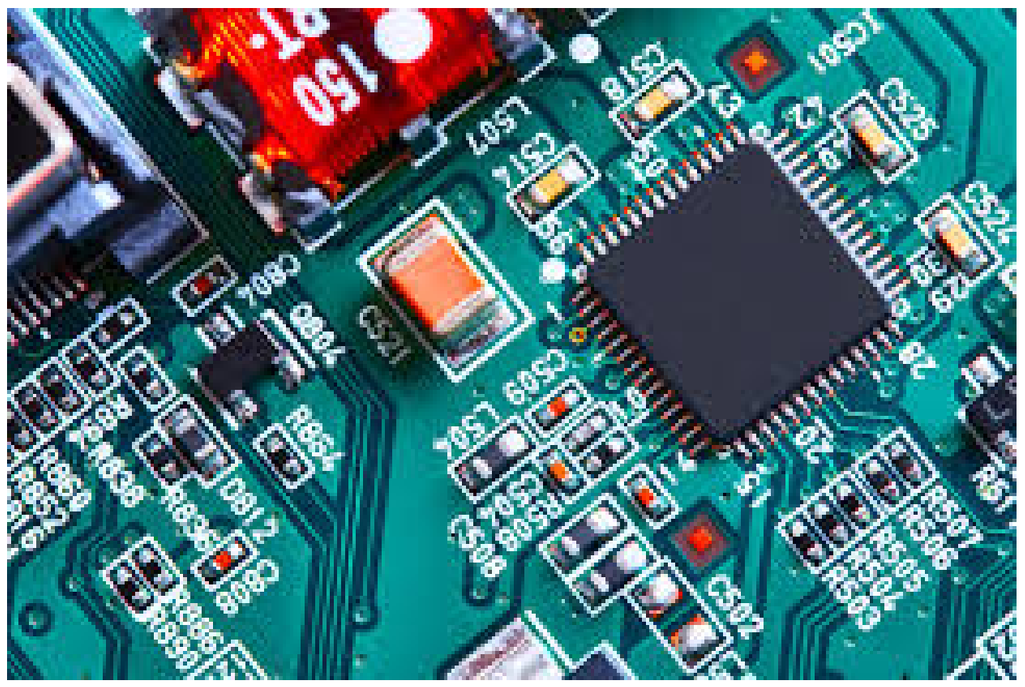
To what extent is sustainability research already practised in this program?

Sustainability is an important aspect in the degree program of Sustainable Infrastructure Engineering (Building Service) which Jerome is undertaking. Jerome's project is a showcase of the effort of faculty and students in implementing digitization control of energy harvesting with advancement in urban farming from traditional know-how.

What are your projections for the program's future?

Our students are greatly involved in the Integrated Work Study Programme (IWSP) with industry partners. The program on Sustainable Infrastructure Engineering (Building Service) equips our students with the competencies to be proficient mechanical engineers in Built Environment.

Our MEngTech students can actively participate in applied research with the skills they have accrued in Building energy modelling, use of energy simulation tools and involvement in building automation and design.



Can the concept of a net-zero energy city be implemented in Singapore?

The Paris Agreement requires countries to limit the temperature increase by 1.5 °C. Driving the vision for net zero energy cities, it aims to work towards achieving zero emissions sometime between 2030 and 2050.

In the context of Singapore, this is challenging for two reasons. We are a small country with little to no renewable sources with the exception of solar; we lack large urban forests to serve as carbon sinks.

That being said, there are other ways that we could navigate this challenge. For example, Singapore government has channeled great efforts through agencies such as N-Parks in creating green corridors and park connectors to help alleviate this issue.

With the recent rise of EVs, electrification of transport is also a viable way for Singapore to reduce pollution. On the domestic front, relying on passive cooling with good design for natural or hybrid cooling can lower the demand for air conditioning. Hence, we are on the right track to reduce carbon emissions.

22 MINS WITH

Interview by Bridgette Van Hooff

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SINGAPORE INSTITUTE OF TECHNOLOGY

Professor Lock Kai Sang

The Energy Efficiency Technology Centre (EETC) at the Singapore Institute of Technology (SIT) has been operational since June 2020. The collaboration with the National Environment Agency (NEA) taps on its energy specialists with access to its verification management equipment. In the past one year, the focus of the EETC has been directed to conducting energy audits for the industrial facilities of small and medium enterprises (SMEs) in Singapore and applying existing technologies innovatively to customise the implementation of energy efficiency measures.

The knowledge gained on the energy performance of various industrial sectors and the data of major energy consuming systems can serve as catalysts for our applied research projects that are scheduled to be launched during the second phase of the EETC's activities, commencing in early 2023.

In addition to helping SMEs implement energy efficiency measures through low-cost high quality energy audits, the EETC also undertakes two other key initiatives:

What innovative energy technologies are developed at the institution itself? To what extent could those be directly installed and tested in buildings?

- **Developing a robust talent pipeline**

o The EETC employs engineering undergraduates as Assistant Engineers (AEs) through the Integrated Work Study Programme (IWSP) to work on energy assessment projects over a period of 6 to 12 months. The competency gained from hands-on energy audits will enable them to subsequently take on energy efficiency projects at their workplace upon graduation.

- **Developing a robust talent pipeline**

o The EETC conducts a series of intensive Energy Efficiency Upskilling Programmes (EEUP) for energy managers in the industry. The EEUP is a 5-day specialised training programme which dives into the major industrial systems such as, compressed air systems, boilers, steam systems and electrical power systems. Each EEUP comprises two parts, a three-day classroom-sharing by experienced instructors on key principles and theories, followed by a two-day authentic energy audit and assessment of the industrial system. The holistic infusion of theories and hands-on experience will enable course participants to confidently take on energy-efficiency auditing opportunities at their industrial plants.

What exactly is driving the call for sustainable or "green" buildings these days? In addition to the continual rise of energy prices, quality of life issues in the workplace, such as indoor comfort, lighting, and air quality, are increasing in importance.

The World Green Building Council defines a "green" building as a building that, in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment. A few characteristics of green buildings include: efficient use of energy, water and other resources; use of renewable energy, such as solar energy; use of materials that are non-toxic, ethical and sustainable; a design that enables adaptation to a changing environment, and more.

In Singapore, today, the major driving force behind the call for sustainable or "green" buildings are:

- Government policies and regulations such as the Building & Construction Authority (BCA) requirements for green buildings
- Financial incentives for Green Buildings entail lowered life cycle cost through inherent energy saving processes, lowered operations and maintenance.
- Green Buildings are increasingly desirable to market demands, as business & commercial tenants seek to enhance corporate image by having an office in a green building.
- Green buildings meet corporate social responsibility (CSR) of stakeholders as organisations are associated with being socially responsible thereby bolstering organisational image.
- Green buildings enhance the quality of the workplace environment, as comfort, lighting and air quality brings about improved productivity.

Do you think it is feasible to have a 100% Renewable Energy-based Electricity System in Singapore in the distant future?

It does not seem feasible now, or anytime in the near future, for Singapore to have a 100% renewable energy-based electricity system. Singapore's limited physical land mass prevents the installation of large facilities to deploy major renewable energy sources such as wind energy and photovoltaic solar energy.

Despite this, Singapore can still encourage the adoption of a more renewable energy-based electricity system by importing renewable electricity from regional power networks to access energy that is cost-competitive. This could be realised through bilateral cooperation or regional initiatives. The idea of regional power grids entail building transmission lines that connect Singapore to its neighbouring countries that are currently producing renewable sources of energy through solar and wind. By connecting power plants and customers across Southeast-Asia, there is greater access to more energy options that meets with our collective energy needs.

What are the major technical challenges Singapore is facing today in the path of achieving sustainable energy goals?

There are two major technical challenges that Singapore face today in the path of achieving its sustainable energy goals.

Firstly, Singapore's limited physical land mass limits the installation of large facilities that deploy major renewable energy sources such as wind energy and photovoltaic solar energy.

Secondly, although Singapore can import large amounts of renewable electricity from regional power networks, being a small island state makes us prone to high energy prices due to the absence of proper policies and practices surrounding energy security. Therefore, we need to strike a balance between keeping our economic vibrancy, while ensuring our energy security, and safeguarding our environment.

The EETC aims to help companies, in particular small and medium enterprises (SMEs) through energy consultancy services, discover and implement energy efficiency improvement measures, and build up local industrial energy efficiency capabilities. This will help us h inch a step closer to becoming a more green and smart city.

What are your projections for the program's (EETC) future?

For the EETC, the program is looking to continue delivering and expanding on:

- Conducting low cost high quality assessments for manufacturing SMEs, and expanding this process to SMEs from different industrial sectors beyond manufacturing;
- The training programme to include new graduates from different university programmes, as well as mid-career professionals looking to transit into the energy efficiency industry. This will build up the talent pipeline for energy efficiency professionals;
- Providing training for existing professionals aimed at building up their confidence and skills in energy assessments, through the establishment of a regional training centre that focuses on training and research in the field of energy efficiency.

The EETC is currently looking to conduct benchmarking studies for different industrial sectors with the purpose of enabling government agencies to develop relevant policies backed by credible data. This is in addition to various applied research projects on the industrial applications of energy efficiency to study the feasibility of implementing new technologies across different manufacturing sectors.

Is it possible for someone who is no longer a student to participate in this program?

Yes, the EETC will be looking to take in fresh graduates across different university programmes, as well as mid-career professionals looking to transit into the energy efficiency space. In addition, the EETC is already looking to pilot a mentoring programme for SMEs where students will work together with the EETC team on energy assessments and efficiency modules.

SINGAPORE INSTITUTE OF TECHNOLOGY

Assistant Professor
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Cluster: Engineering

22 MINS WITH

Interview by Bridgette Van Hooff

Assistant Professor Sivaneasan Bala Krishnan

What's the impact of electric vehicles on a green and sustainable Singapore?

Electric vehicles (EVs) will play a major role in Singapore's drive towards reducing carbon emissions and promoting sustainability.
Although the reduction in carbon emissions may not cause a significant shift in Singapore's emission levels, it will be a good first step in promoting sustainable living within the population. Furthermore, the promotion of EVs coupled with increased deployment of solar photovoltaics (PVs) around the island will allow the zero emission energy generated from solar (PVs) to be used for EV charging. This also eliminates any upstream emission associated with the electricity that is used to charge the Evs.

Is it possible for us to build a fully autonomous energetically and ecologically smart city in this program?

Singapore is well positioned to build a fully autonomous smart city that is not only full of vitality but also intertwined with ecological integrity. Through the Smart Nation initiative, we have ramped up efforts to build an extensive communication network throughout the island which helps us further develop an information network of interconnected sensors and automation devices. This information and communication system forms the foundation to support the introduction of various new technologies aimed at improving operational efficiency

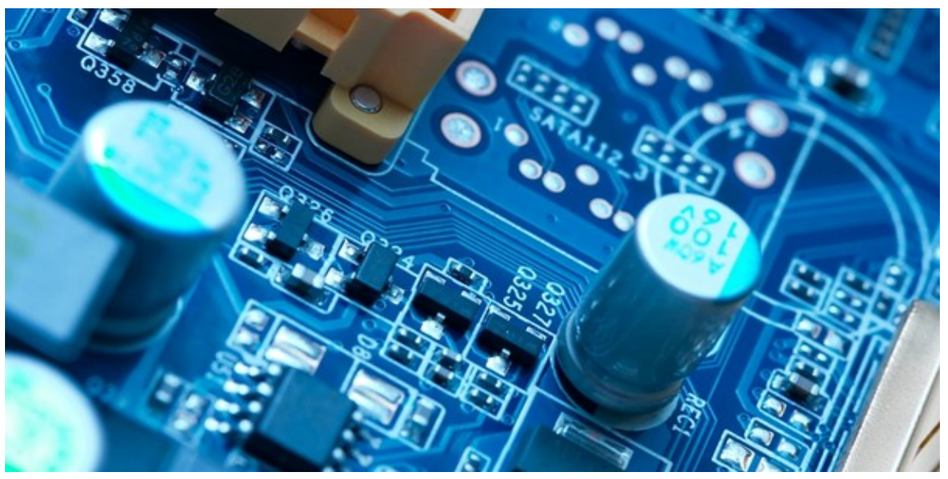
easing information sharing, providing a better quality of government service and citizen welfare.

The information and communication system spans not only across urban areas but also covers other ecosystems such as the terrestrial and marine ecosystems. Together with the government agencies overseeing these ecosystems, we are continually developing new technologies to allow these ecosystems to thrive, keeping up with the pace of urban development in Singapore.

What are the major technical challenges Singapore is facing today in the path of achieving sustainable energy goals?

To align with the Smart Nation objectives, industries are moving towards digitising their manual, manpower intensive and paper-based processes. In this project, the Singapore Institute of Technology (SIT) collaborated with Sembcorp Marine Integrated Yard Pte Ltd (SMIY) to develop an Electrical Asset Management System (EAMS) to enable efficient asset management and condition monitoring at their shipyard. The EAMS is built upon a low-cost IoT-based sensor network that spans across their 2km square shipyard for the condition monitoring of electrical assets. The EAMS leverages on a utilisation analysis solution that minimizes asset downtime and cost.

The asset utilisation analytics helps the industry collaborator to gain a solid understanding of their assets operation in one, unified system. This enables them to continuously monitor asset availability, usability as well as their location in order to better optimize the utilization of these valuable assets. The information obtained from the asset utilisation analytics over a long period of time will allow the industry collaborator to plan ship building or repair jobs based on the utilization data which in turn reflects the productivity of the shipyard. Proper usage trend analysis will also allow them to make more informed decisions on new asset purchases or defer new purchases thus reducing costs and improving profit margin.



What are your projections for the program's future?

The electricity distribution system in Singapore comprises a complex power supply network in the form of an electrical grid which consists of a huge number of power lines and electrical assets. Many of the assets have been in operation for more than 50-years and are ageing. Failures are becoming common with mechanical damage, excessive heat and electrical stresses being the major contributors. Monitoring and management of such complex networks presents a major challenge in the daily work of companies for electricity distribution and power supply.

Through this project, condition monitoring with a predictive maintenance program will enable timely detection of defects and failures. In the long run, this will eliminate costly shutdowns through early intervention. Beyond this project, we are applying the knowledge and experience that we have accrued to explore the development of customisable asset condition monitoring solutions for other electricity distribution and power supply companies in Singapore.

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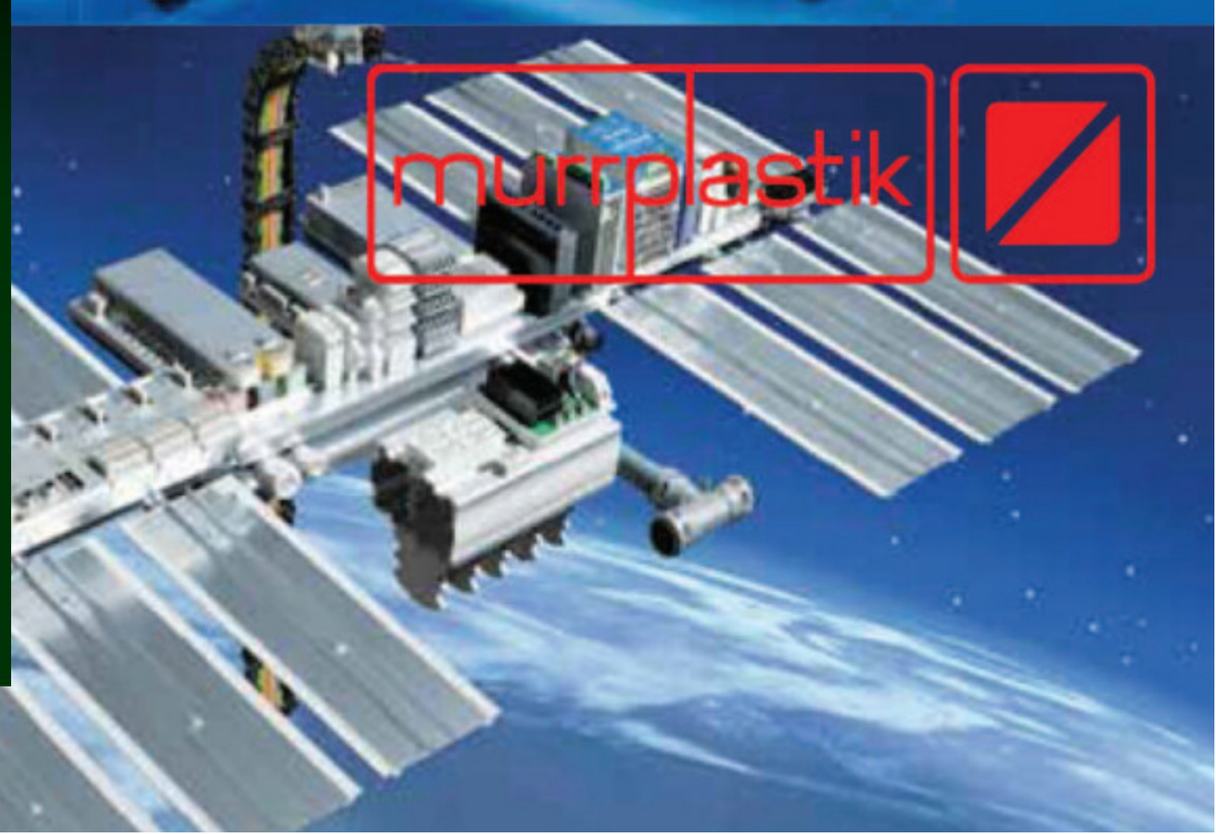
ELECTRONICS IN THE CONTROL CABINET

INTERFACES

CONNECTION TECHNOLOY

I/O SYSTEMS

LÜTZE
SYSTEMATIC TECHNOLOGY



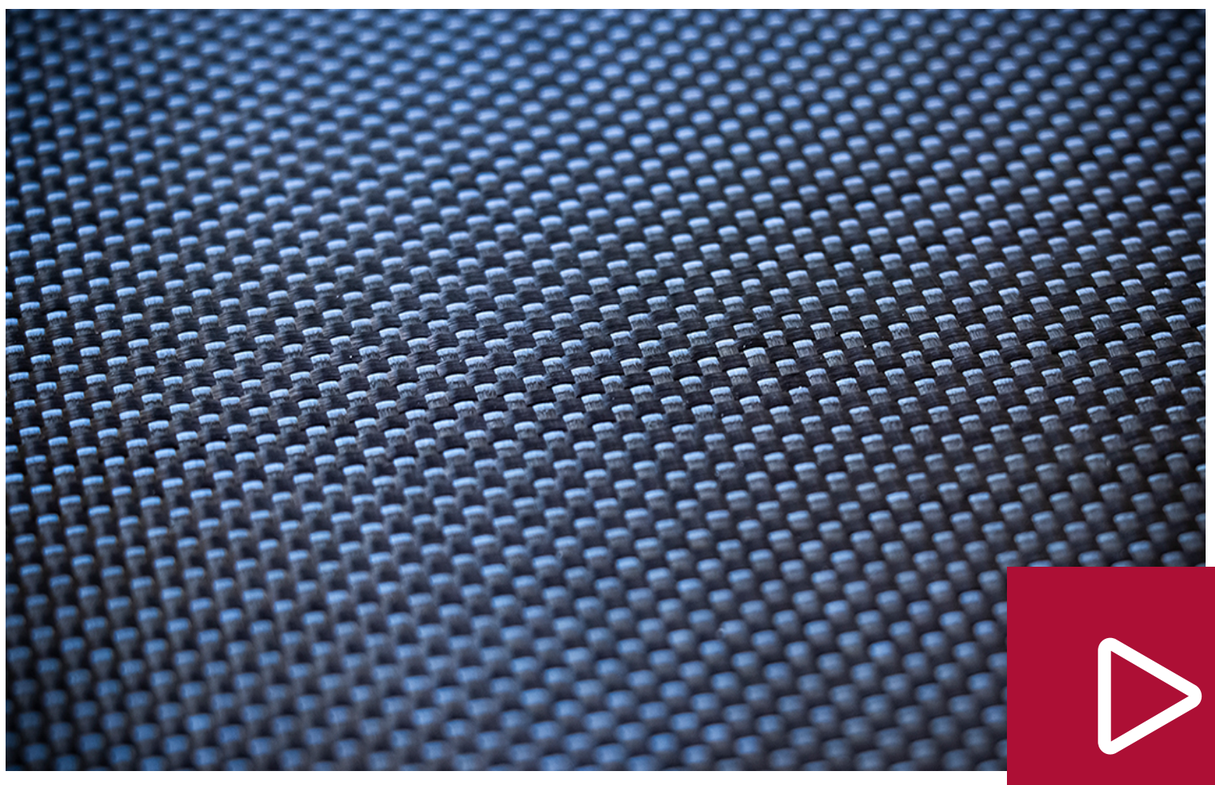
Integrated simulation model produces twist-free ribbon yarn through reliable feeding technology

TwinCAT 3, Simulink® modeling and digital twin help modernize textile looms

The Zero Twist Feeder textile feeder from the company Vandewiele Sweden AB delivers ribbon yarn to looms without any twisting. The basis for this is an extensive simulation model from Belgian specialist Vintecc, which has been deeply integrated into the Beckhoff control software via the TwinCAT 3 Target for Simulink®. In this way, the bobbin speed can be precisely synchronized with the gripper movement.

"A big player in a small niche," says Pär Josefsson, head of Vandewiele's R&D department, describing the company based in Ulricehamn (east of Gothenburg) that supplies more than 60% of the world's textile feeder market. "The fact that we place a strong focus on innovation is demonstrated by more than a hundred active patents." For the development of the Zero Twist Feeder, however, Vandewiele wanted to break new ground with the integration of simulation into the machine controller, which is why they sought exceptional external support. This was found in the Belgian company Vintecc, which specializes in model-based software development and is located in Roeselare, close to the headquarters of the Vandewiele parent company. Both development partners also agreed that Beckhoff PC-based control with TwinCAT 3 software would be the best technology to meet the demanding requirements of the application.

Defect-free textile fabric is the goal



When weaving carbon fiber, glass or plastic fiber into ribbon yarn, twisting or balling up of the supplied yarn is one of the biggest problems. The resulting defects would not only be visible but would also mean a weakness in the fabric. From Pär Josefsson's point of view, conventional thread guides do not offer a solution here: "In such machines, the thread must be pulled off at a constant velocity. However, looms operate at high velocities and tend to pull on the bobbin at very irregular intervals."

The Vandewiele team therefore developed a machine from scratch. The idea was to use an arm made of carbon fiber as a buffer between the

bobbin and the gripper. Pär Josefsson explains: "The bobbin delivers the yarn at an average velocity. The buffer arm then buffers the yarn, which is unwound at a continuous velocity from the bobbin, and keeps it constantly under tension. It is essential to find the perfect balance for the yarn tension – strong enough to avoid sagging, but sufficiently flexible to prevent the yarn from tearing. The buffer arm then delivers exactly the right amount of yarn to the looms at the right velocity."

Simulation model integrated directly into the controller

In order to create a controller for this process, Vintecc implemented its extensive modeling expertise in a corresponding Simulink® model. The responsible project manager, Brecht Vermeulen, explains: "First of all, we created a digital twin of the machine in which all the software was programmed in Simulink®. The model includes several sub-models, each representing one aspect of the machine design, such as parameters, security, alarms and HMI." From his point of view, the combination of Simulink® with the TwinCAT control software has a particular advantage: "No separate PLC code is required. Instead, the TwinCAT 3 Target for Simulink® seamlessly integrates, visualizes and tunes the model directly and seamlessly, and automatically connects to the I/Os and drives. Changes to the parameters, whether in the model, in TwinCAT or in the hardware, are immediately transferred to a non-volatile memory module. All parameters are stored securely and reliably in this way. This kind of deep integration is only possible with the Beckhoff platform."

The decisive factor in the implementation was the high precision required. The buffer arm is about 650 mm long and must provide an accuracy of ±1.5 mm in order to constantly achieve the perfect angle control. In practice, velocities can reach up to 850 m/min. "Before production begins, the machine must therefore perform two calibration steps based on the Simulink® model in slow motion – to calibrate the bobbin diameter and the movement of the buffer arm. This is done by calculating the feed curve as well as the actual velocity and tension required for feeding the machine. During the entire insertion cycle, the model also compensates for changes in the bobbin diameter and the tension in the arm according to the data from two sensors," explains Brecht Vermeulen. The entire process and the performance of the machine can be visualized and analyzed conveniently via TwinCAT HMI.

According to Brecht Vermeulen, the Zero Twist Feeder benefits in particular from the Beckhoff Industrial PC, dynamic drive technology together with powerful EtherCAT communication and I/O terminals: "The AX8000 multi-axis servo system with the AM8000 servomotors and EtherCAT is the optimal combination to meet the required short cycle times.

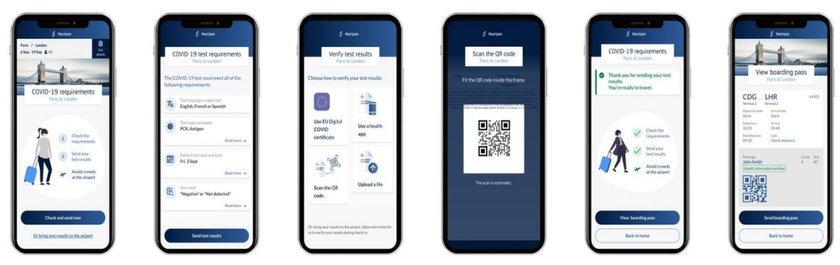
Another important element was the precise drive tuning, which we could always count on support from Beckhoff to accomplish, both in Belgium and Sweden. Safety functions were implemented directly in the drives with TwinSAFE, so that no separate safety PLC was required – another way to increase flexibility and save costs. That's the nice thing about this application: the functionality of standard hardware is further enhanced by the deep integration of a Simulink® model into TwinCAT without additional hardware requirements."

Virtual commissioning

Extensive simulations were carried out in Belgium before the algorithms were tested on the real hardware in Sweden. Each prototype was analyzed using measurements displayed on the TwinCAT Scope software oscilloscope in order to mechanically optimize the Zero Twist Feeder. Pär Josefsson sums up: "The cooperation with Vintecc and Beckhoff went very smoothly. Vintecc combines a high level of modeling knowledge with very direct and fast communication, so that we were able to advance quickly in the development of the Zero Twist Feeder. Our team also received all the necessary support from the Swedish branch office of Beckhoff. This was our first experience with the direct implementation of a simulation into the machine controller, and it was virtually the only way to achieve the desired results. Today, the first Zero Twist Feeders are already proving themselves in the field with our customers – as a single-channel device with one buffer arm or as a weft thread mixing version with two buffer arms."

Amadeus Integrates IBM Digital Health Pass Into Its Digital Health Verification Technology

Integration is designed to help streamline the validation of air travelers' COVID-19 health documentation, reducing friction during check-in, and supporting airlines as the industry works to increase international travel volumes



IBM and Amadeus announced that they are working together to help meet one of the major challenges facing travel companies today: checking and validating the COVID-19 health documentation of travelers at checkpoints where required.

As part of that effort, IBM Digital Health Pass is now integrated into Traveler ID for Safe Travel, Amadeus' digital health verification solution. This enables airlines to integrate the use of COVID-19 digital health credentials into their existing reservation and booking system, allowing airline passengers the option to scan or upload documentation to show their health credentials.

As passengers move through the online check-in process, Traveler ID

for Safe Travel checks the requirements for that particular trip against destination country regulations. This then prompts passengers with the option to generate a secure COVID-19 digital credential by scanning paper documents or uploading a digital version from their mobile or desktop.

These COVID-19 digital health credentials are then verified using IBM Digital Health Pass, which uses a combination of encryption and blockchain technologies to authenticate COVID-19 health credentials against a global ecosystem of labs, vaccination centers and healthcare providers. Airlines receive a simple status confirming a passenger is ready to fly. This secure approach provides passenger privacy since only the compliance with border entry requirements is confirmed; no personal health information is stored by the airline, IBM, or Amadeus.

"While countries across the globe are beginning to slowly reopen borders to welcome back visitors, specific border entry requirements may vary greatly country to country. The need to check COVID-19 health documentation is causing significant delays during the journey for airlines and other travel providers, as well as the traveler," said Greg Land, Travel and Transportation Industry Lead, IBM. "The integration of IBM Digital Health Pass into Amadeus' Traveler ID for Safe Travel is designed to provide airlines with open technologies they can build into existing digital solutions. This can help airlines safely meet border entry requirements while delivering a smoother customer experience."

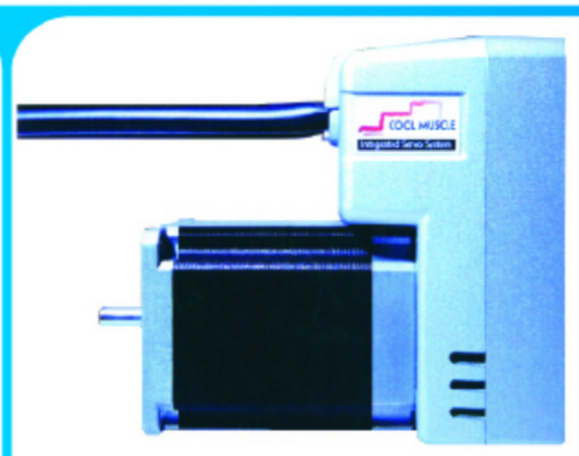
"The integration with IBM is a step-change for Traveler ID for Safe Travel. The combination of the IBM Digital Health Pass with our Traveler ID for Safe Travel technology means that COVID-19 health documents can be digitized and read, verified, and authenticated. This avoids cumbersome and time-consuming checks while traveling, and adds further reassurance to airlines and their passengers," said Christian Warneck, VP Safe Travel Ecosystem, Amadeus. "This is another milestone in the collaboration we are driving through our Safe Travel Ecosystem. By working hand in hand with customers and partners such as IBM, we can deliver the capabilities needed by travel providers and travelers to help provide a smooth passenger journey once more."

Traveler ID for Safe Travel is currently live with multiple airlines, with additional airline customers to be announced soon. Traveler ID's digital identity and health verification capabilities are also relevant for other customer groups, including hotels and airports.

THK

● LM Guide
● Lead Ball Screw
● LM Guide Actuator
● Super FA
● Actuator

Linear Motion Systems



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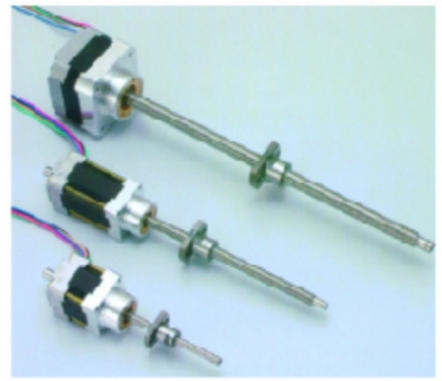

Direct Motor Drive Ball Screws

Miniature Ball Screws

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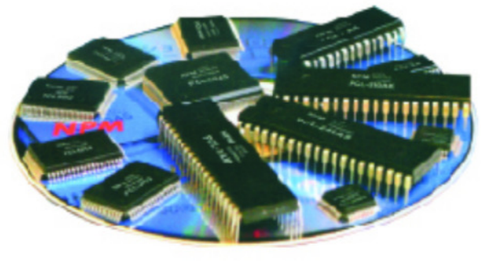
Instrumentation Gears

Flexible Shaft Couplings



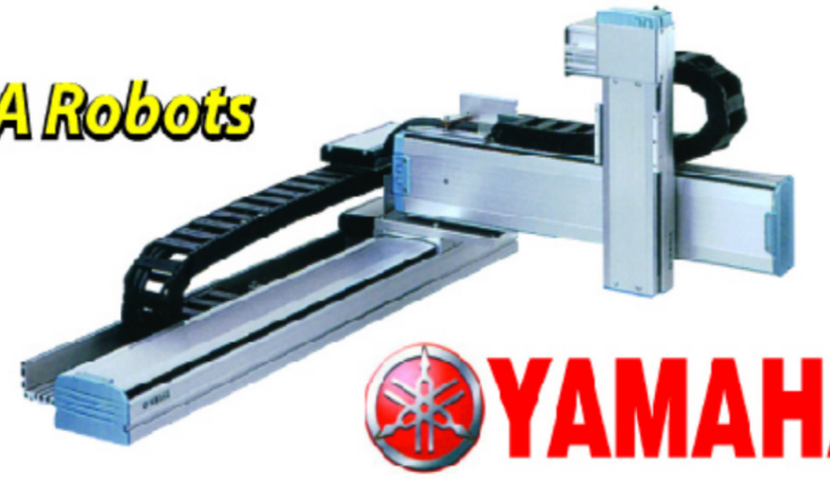
Motion Control Chips

Programmable Pulse Generators
Supporting the Control of
Stepping Motors and Servomotors

Linear-type Stepper Motor

NPM

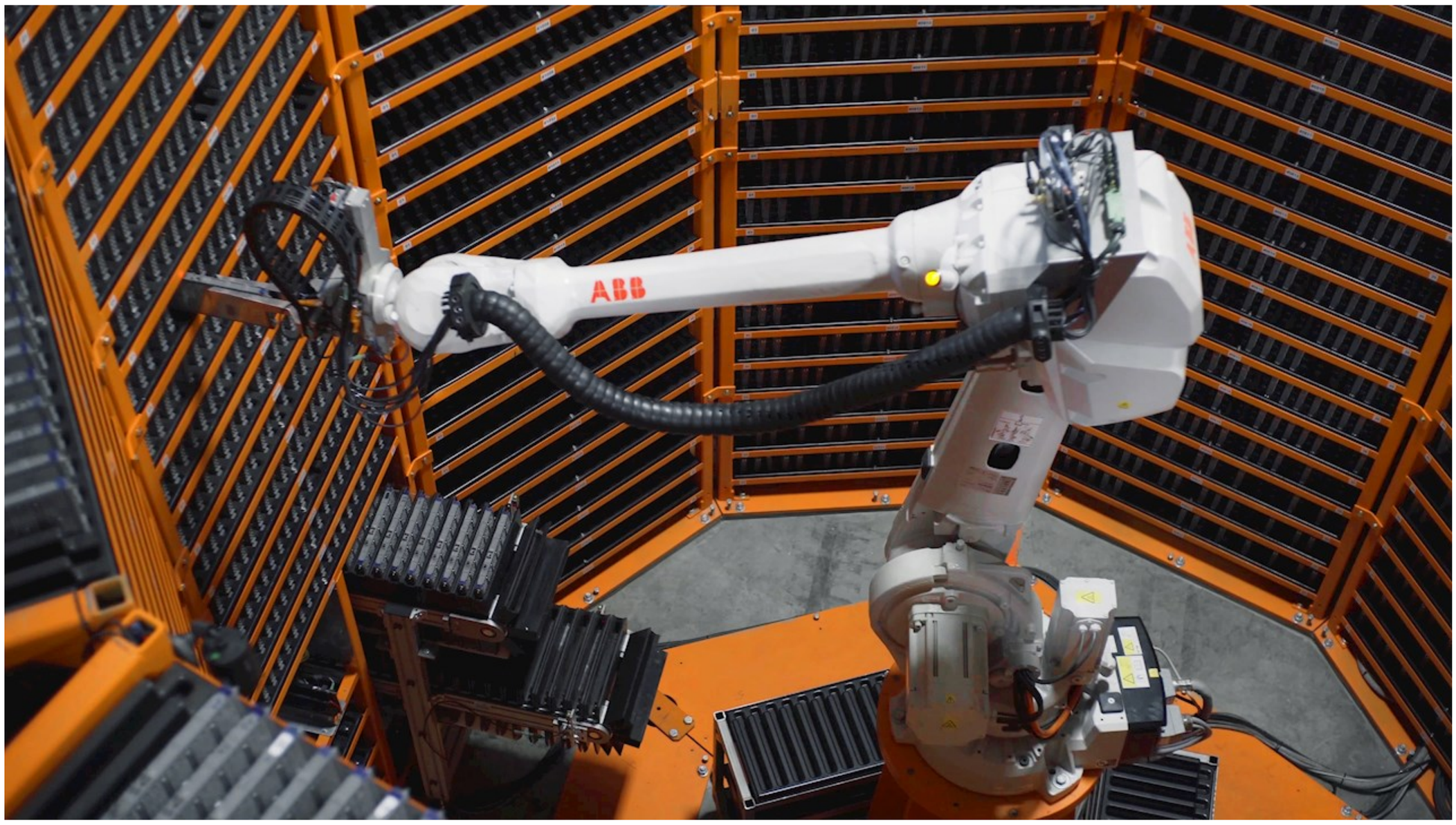
YAMAHA Robots



YAMAHA

Distributed Control with PAC - Motionnet® & EtherCAT®

Kingservo AC Servo System



Robot-powered intelligent selection for automotive batteries boosts daily output by 300 percent

With demand for electric and hybrid vehicles booming worldwide, a US remanufacturer is using a combination of robotic automation and intelligent software to manage the critical selection of battery components

The agility of ABB's RobotStudio design software in modelling automated solutions to complex manufacturing problems has been amply demonstrated by a project for US The agility of ABB's RobotStudio design software in modelling automated solutions to complex manufacturing problems has been amply demonstrated by a project for US automotive battery-pack

> "Customers were not having an acceptable experience with the product, orders were taking too long to fill and there were too many returns," said Michael Menta, Dorman's vice president of engineering. "We had to take a step back, evaluate the entire process from beginning to end and find out where the breakdowns were occurring."

A partial automation of the process, with a focus on the front-end grading system for incoming modules, did not address the bottleneck of the matching operation either in terms of the speed of order fulfilment or the quality of the resulting battery-packs.

Menta and his team turned to Pennsylvania-based Production Systems Automation (PSA) to explore potential customised automation solutions. “We had no preconceived notion of what form an automated module-matching system would take, or if it was even possible,” he said.

PSA project engineer Chris Lesnefsky applied ABB’s RobotStudio simulation software to the problem, with no comparable end-use applications on which to base any solution.

“The simulations that can be created in RobotStudio are incredibly realistic, virtually identical to how a concept and its various components will perform on the factory floor,” he said. “I was able to experiment with various concepts, complete with various concepts, complete with accurate reads on reach, speed, distance, conveyor location, and so on, allowing us to optimize the layout and robot paths to achieve the best cycle times.

RobotStudio is an incredible tool for system design, proof-of-concept and ultimately programming robots.”

The solution Lesnefsky hit upon, offering the best compromise between factory footprint and capacity, involved arranging 10 stacks of shelving housing up to 5,000 modules in a ‘decagon’ around a central ABB IRB 4600 six-axis industrial robot. The 40kg-payload robot, with a reach of 2.55m, can identify and retrieve modules from any storage slot through 360 degrees.

A linear slide on the robot arm ensures it can reach every position on the shelves, and the end-of-arm-tooling (EOAT) is equipped with a Schunk gripper and sensors to ensure handling is gentle and without collisions. Any module subject to impact has to be discarded.

To one side of the cell, there is an opening for a split-level, servo-operated conveyor. One belt brings modules in to be put into position in the module ‘library’, while the other removes modules which have been picked as probable matches within a specific battery-pack.

The robot can store or retrieve one module every eight seconds. The

system typically runs for a total of 104 hours every week, divided into periods when the modules are being put into storage and other periods when target modules are being retrieved.

The 'thinking' part of the Dorman installation is just as important as the physical handling aspect. It consists of an ABB IRC 5 robot controller, which interfaces through a PLC with a LabVIEW software program.

As modules enter the storage area, a SICK Inspector camera scans the QR code to correlate the item's entry date and grade with its storage location. The LabVIEW program stores this data and, critically, includes a feature which identifies likely good matches across each 28-module battery-pack. QR codes are also scanned on exiting the area.

"When the robot begins the matching process, the LabVIEW software program instructs the robot which modules to pull, and in which order they need to be pulled, based on the specifications of the specific order," said Dorman's Menta. "There are multiple proprietary parameters that pair the modules."

Two modules go together to make a pair. Fourteen pairs make a pack. Each module must be perfectly matched with its partner, and all pairs must be perfectly matched with each other.

The software offers an additional, valuable advantage to Dorman in terms of inventory management. It monitors those modules which have sat idle for several months, or failed repeated matching attempts for battery-packs, and removes them from the storage area.

As well as establishing – with the help of RobotStudio – the optimal system configuration to automate the process, PSA was also instrumental in identifying the necessary system components and ensuring that communication across this system was complete and seamless, said Dorman. "The ABB IRC 5 robot controller interfacing with the PLC and the LabVIEW software program is the central brain of the operation," Menta added.

It has also proved much more efficient for the business and, with demand for electric and hybrid vehicles set to continue climbing, this is not likely to be the last automated battery module-matching system of its kind.

"The circular robotic storage tower has dramatically improved our remanufactured hybrid battery pack business," Menta concluded. "We went from an exceedingly drawn-out manual process, endlessly pulling modules from bins to find precise matches, to the automated process, which is much easier on our staff."

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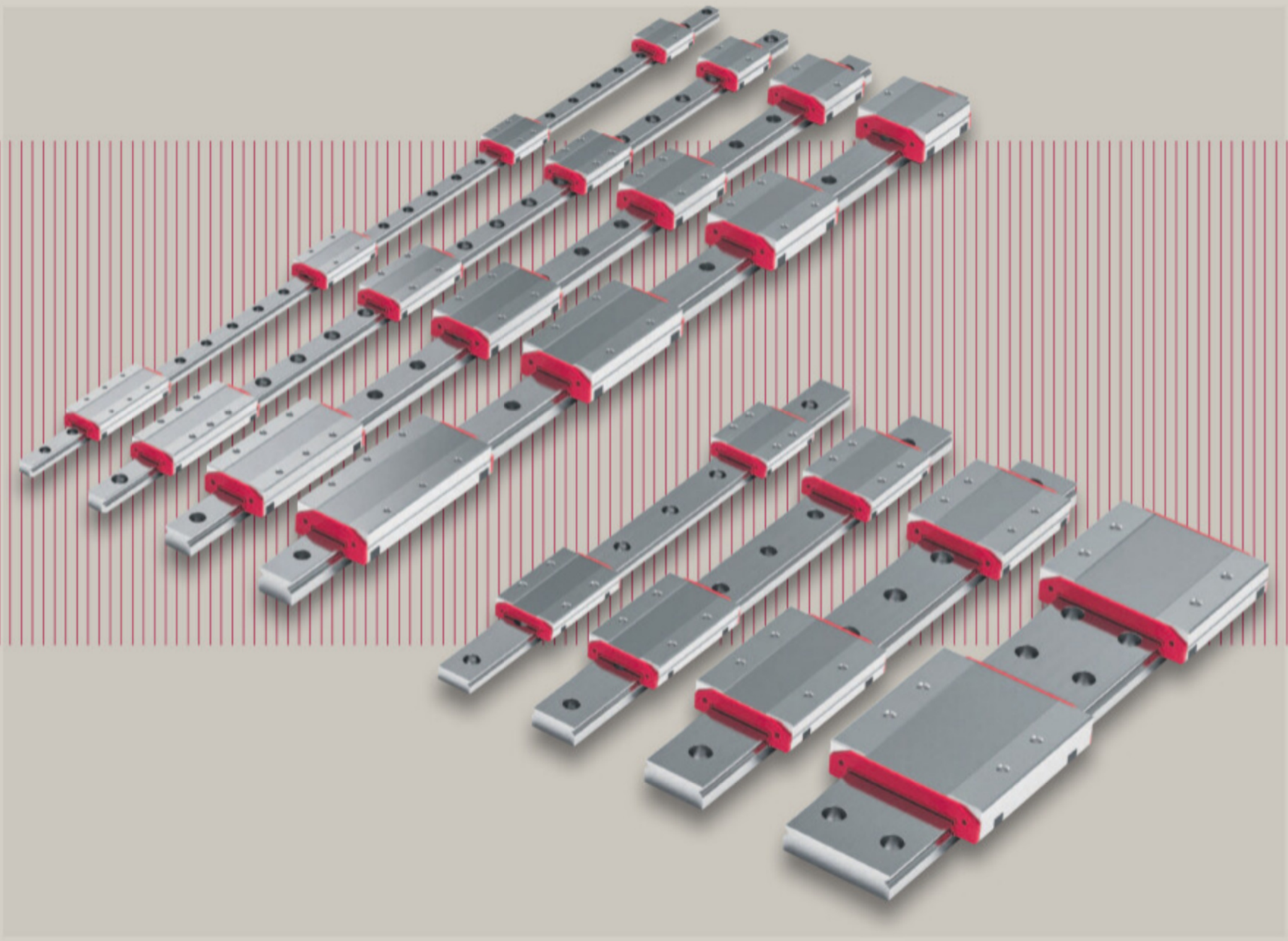

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L A M P 2021 International Lighting Design Competition is in partnership with Design Milk

The competition is open to 3 Categories:
MANUFACTURED, PROFESSIONAL & STUDENT
3 Subcategories for Manufactured and Professional:
Floor, Table + Pendant/Sconce
Entries welcome from all disciplines including, but not limited to: Artists, Industrial Designers and Architects.
Read eligibility requirements below and be sure to submit to the correct category.

ENTRY FEES:
MANUFACTURED: $150 Additional entries $112.50
PROFESSIONAL: $100 Additional entries $70
STUDENT: $50 Additional entries $25

FURTHER INFORMATION https://lampthecompetition.com

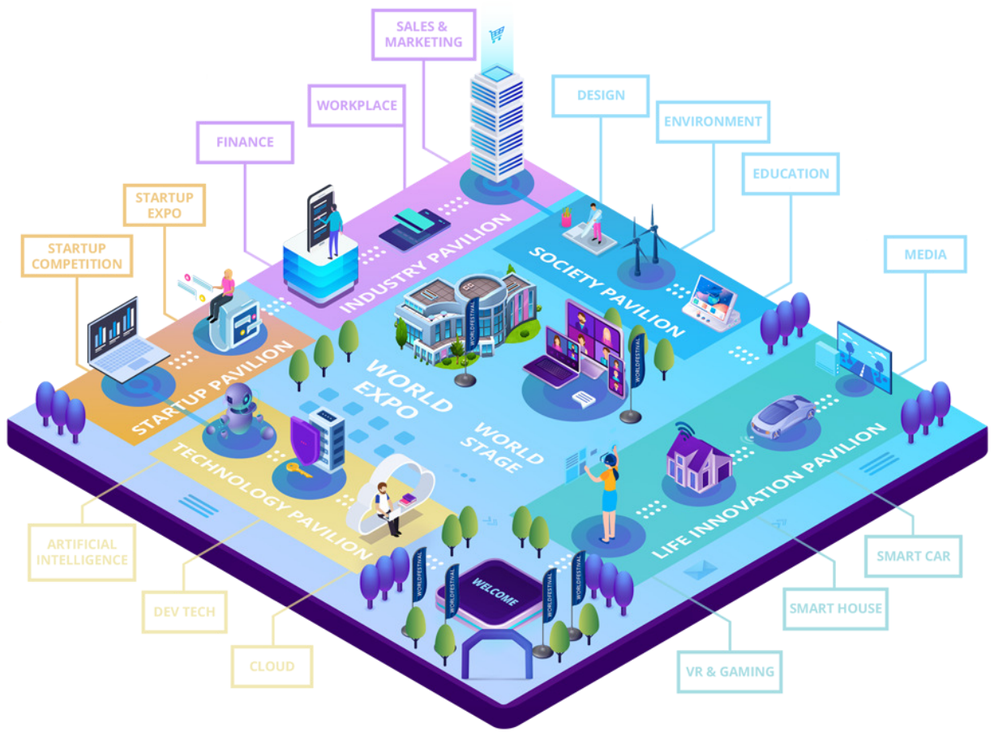
Submission Open
1st June 2021

Submission Close
1st September 2021

People's Choice Online Vote
1st - 20th October 2021

Winner Announced
1st December 2021

World Festival 2021



Technology innovation moves the world forward. WorldFestival is the global virtual conference supporting worldwide technology innovation. Join 20,000+ participants across 130+ nations in discovering and learning about the top 1,000 emerging innovations and trends of 2021.

WorldFestival includes:

- **Technology Innovation Conference:** Hear talks from 300+ speakers covering the newest innovations in 20 industry verticals: from Virtual Reality and Blockchain to Cloud Computing and Artificial Intelligence.
- **Award Competition:** Discover and vote on the top 1,000 innovations of 2021, from 6 continents, competing to pitch on-stage as the Top 50 WorldFestival Innovations.
- **Virtual Expo:** Visit and learn about 100+ emerging technologies at our virtual expo.
- **Networking & Receptions:** Certain pass types will be invited to 1:1 networking breaks and our VIP receptions, where you can meet and chat with top executives, supporters, and contributors.

FURTHER INFORMATION

https://worldfestival.com/

AI Expo Africa 2021 (ONLINE)

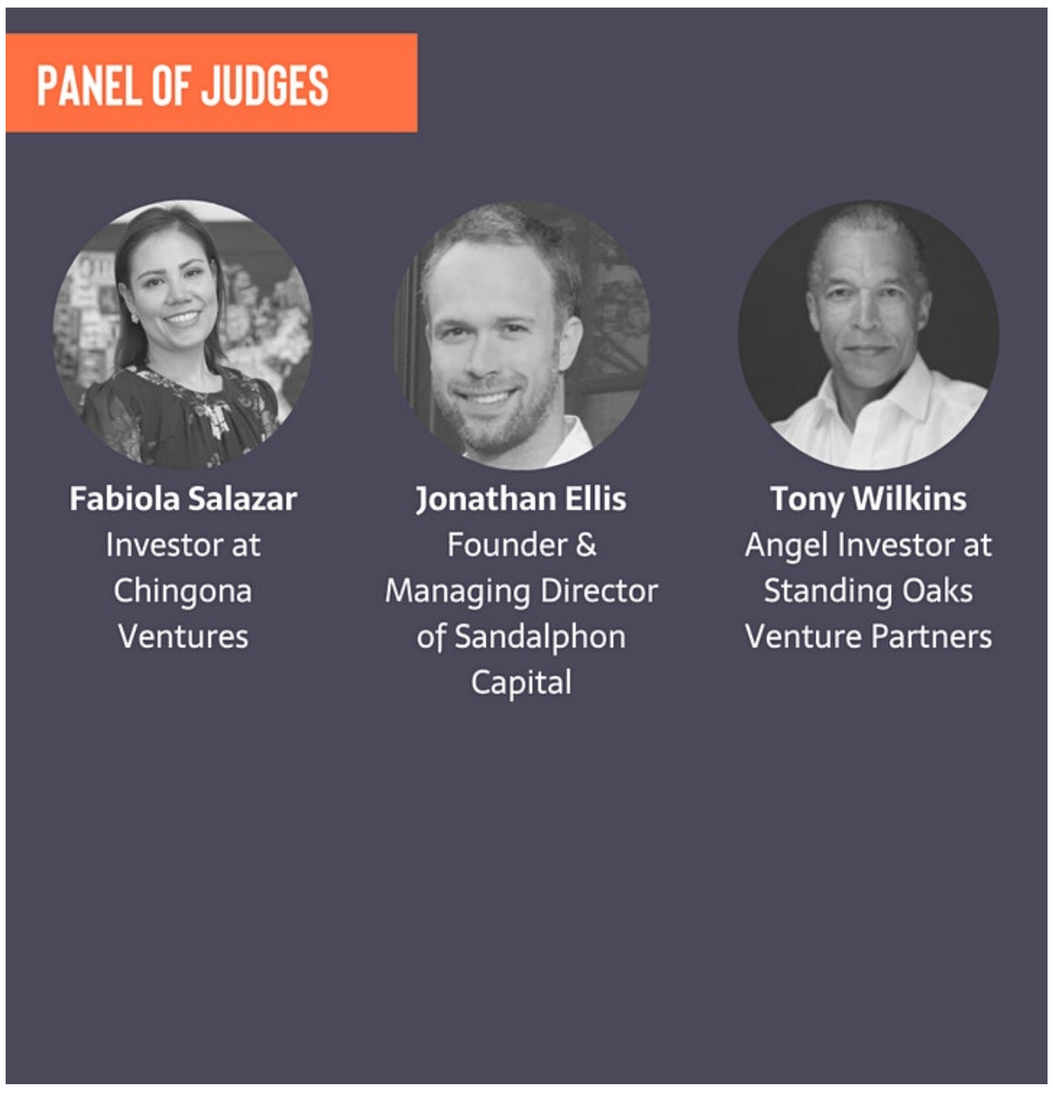
Our 2021 show is built upon the phenomenal success of the 2018 / 2019 / 2020 events that have cemented AI Expo Africa as the largest business and trade gathering of its kind in Africa. Attended by Entrise buyers, Governments, thought leaders, decision makers, international trade missions, vendors, SMBs and global brands all focused on real world business applications ypu can deploy TODAY.

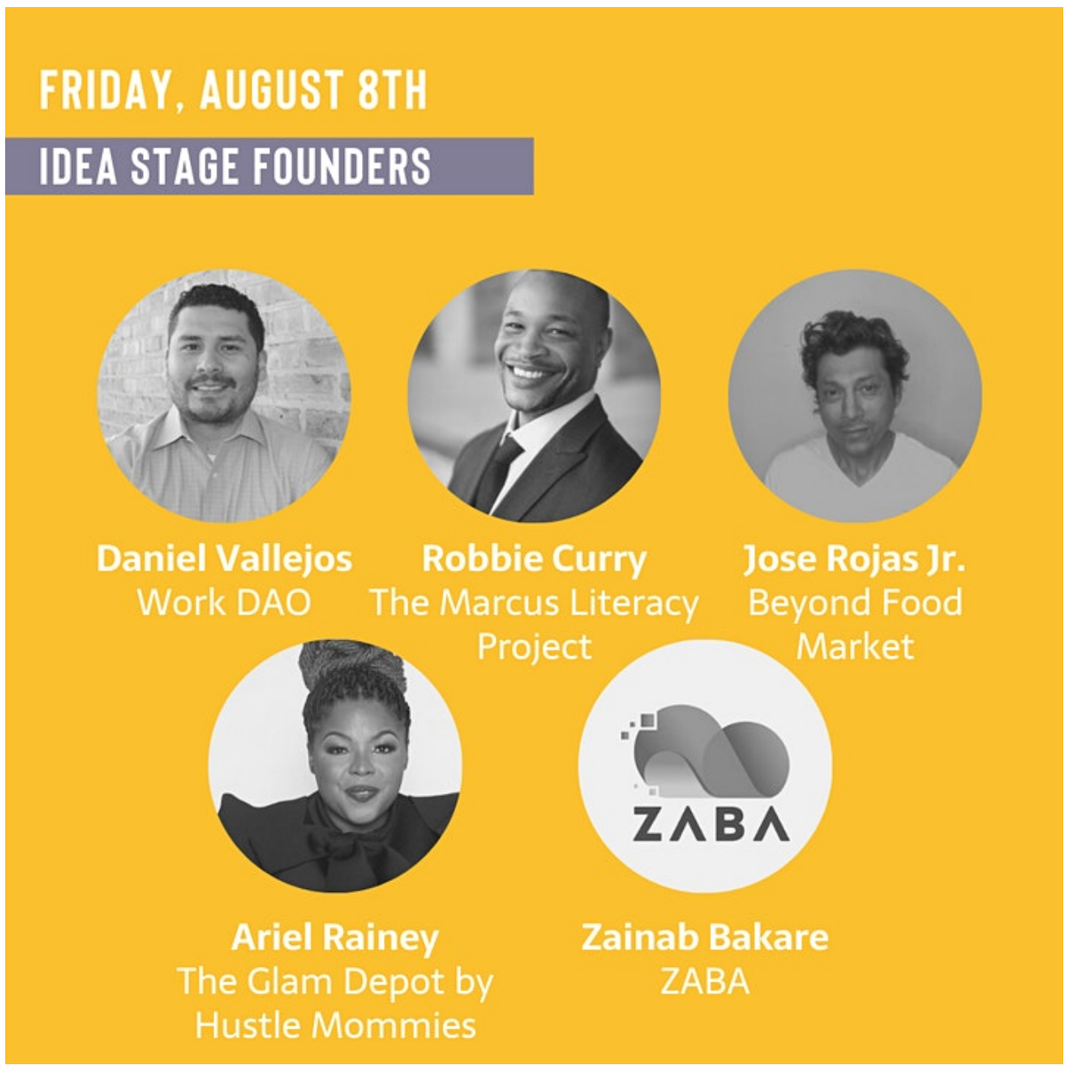
AI Expo Africa 2021 ONLINE will run as a 3 Day LIVE event (7th-9th Sept), followed by a 30 Day ON-DEMAND event (10th Sept-8th Oct) so you can watch all the talks, visit expo hall and review posters 24/7 once the main live show ends. Your FREE ticket gives you access to both the live and on-demand event.

FURTHER INFORMATION

https://aiexpoafrica.com/

TechRise Weekly Pitch Competition - Idea Stage





Each week, founders will have 3 minutes to pitch their visions to a panel of judges via a live streamed competition.

One team will be chosen as the winner each week, and the other competitors will be invited to pitch again in a future series.

August themes:

August 6 - Idea Stage Founders
August 13- Seed Stage Founders
August 20 - HealthTech Founders
August 27- Women in Tech Founders

FURTHER INFORMATION https://techrise.co/apply/

MakeX Spark 2021 Robotics Online Competition

MakeX is a robotics competition platform that promotes multidisciplinary learning within the fields of science and technology. It aims at building a world where STEAM education is highlyappreciated and where young people are passionate about innovation by engaging them inexciting Robotics Competition, STEAM Carnival, etc.

MakeX Robots Competition is hosted by the MakeX Robotics Competition Committee,organized by Shenzhen Hulu Maker Co., Ltd. and supported by Shenzhen Makeblock Co., Ltd.As the core activity of MakeX, it aims that through the competition, young people will discoverthe spirit of creativity, teamwork, fun and sharing. It is committed to promoting innovation inscience, technology, education through high-level competition events, guiding young peopleto learn Science (S), Technology (T), Engineering (E), Art (A) and Mathematics (M) and applysuch knowledge in solving practical problems through the exciting and challengingcompetitions.

Theme : Family Care (competition rules as per attached)

Details: Students aged 6 – 16 can participate

1 - 2 student(s) , 1 - 2 mentor(s) per team

2 categories: primary and secondary

$25 per team

COMPETITION SCHEDULE

PROJECT SUBMISSION

25TH OCTOBER – 7TH NOVEMBER

PROJECT ASSESSMENT

8TH NOVEMBER - 21 NOVEMBER

RESULT PUBLICITY

22ND NOVEMBER - 24TH NOVEMBER

AWARD CEREMONY

6TH DECEMBER

FURTHER INFORMATION

http://spark.makex.io/2021-makex-spark-family-care/

Global XR Conference 2021

This free, non-profit, three-day event is organized for the community around extended reality (XR). It will have content related to Virtual Reality, Augmented Reality, Mixed Reality and Web XR. Sign up as attendee to experience it in its entirety. You will be kept informed of everything that is going on!

The conference takes place on three days between 16u CET and 23u CET.

MORE INFORMATION

We have decided to once again organize an online event this year. And it will be awesome! Last year we did a 24 hour event. This year there will be 3 days of sessions, workshops, panels and more!

Become an attendee to experience the Global XR Conference 2021 to its fullest. Sign up and we will start keeping you informed from August 1st.

All registered attendees automatically enter our raffle – your chance to win a seat on a panel discussion with community experts from all over the world.

FURTHER INFORMATION https://globalxrconference.com/

BraunPrize 2021

The BraunPrize is looking for innovative product design concepts for today aswell as visions for the future.
Entries must be product design and/or product interaction
concepts that are not yet on the market or in production.
The focus of the BraunPrize is on product design.
Software, interaction or media design will be considered as an integral part of an
overall product concept (hardware and software).

BraunPrize 2021 shape tomorrow

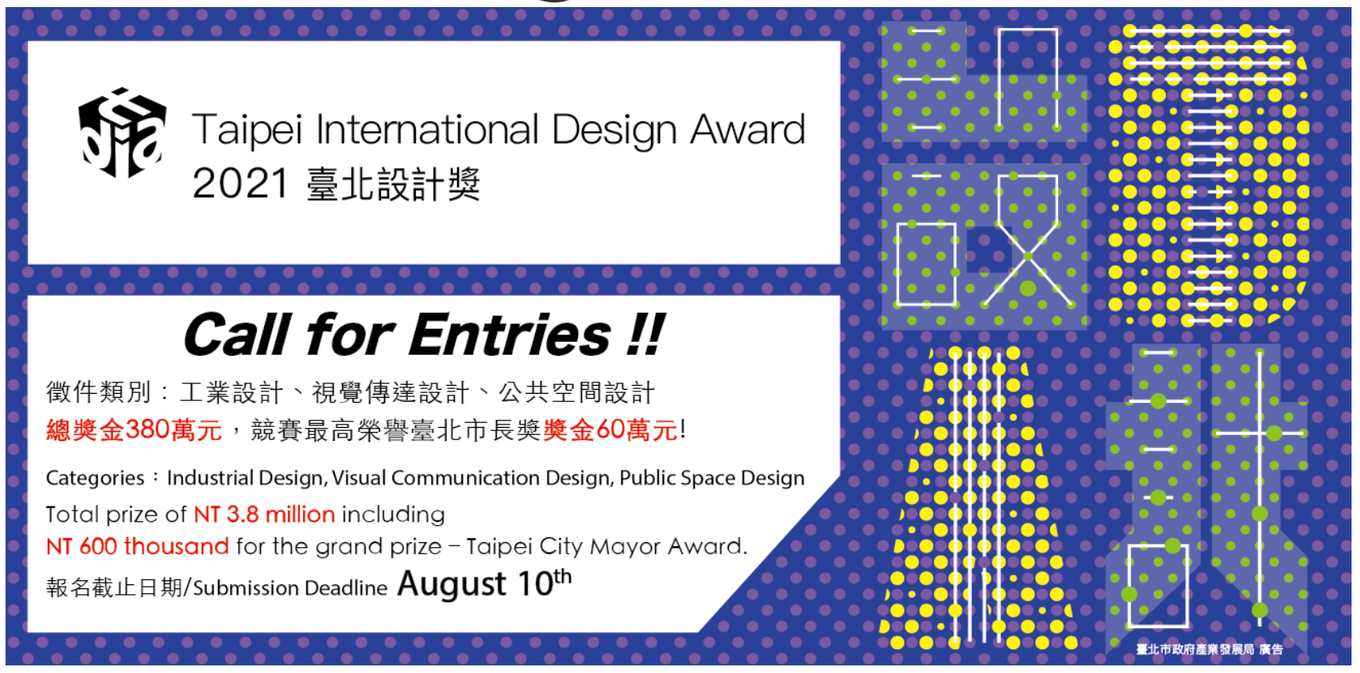
FURTHER INFORMATION https://uk.braun.com/en-gb/braunprize

Participation; Globally and free of charge
Submission Period: July 1st to August 31st 2021
Winner announcement: October 2021
Online Submission at: braunprize.org

Taipei International Design Award 2021

Submission closed:
10th August 2021

Total Prize:
NT 3.8 million including NT 600K for the grand prize



The Taipei City Government has followed the spirit of “Design for Adaptive City” and dedicated itself in building Taipei as a hub of creativity and innovation for designers and design companies through policy-making, business opportunity matching and cross-disciplinary promoting. TIDA has entered 14th year and has consistently collaborated with and endorsed by international design organizations, including International Council of Design (ICoD), World Design Organization (WDO), and International Federation of Interior Architect/Designers (IFI). Last year, there were 5,508 entries from 72 countries and regions and the entries have set a new record.

FURTHER INFORMATION https://www.taipeidaward.taipei/en/

iF DESIGN AWARD 2022

Register two entries until 15 October 2021

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AUGUST

26 - 28 AUGUST 2021

Plastech Expo Vietnam 2021

Saigon Exhibition & Convention Center (SECC), Ho Chi Minh, Vietnam

19 - 22 AUGUST 2021

Taiwan 3D Printing & Additive Manufacturing Show

Taipei Nangang Exhibition Center Nangang District, Taipei City

5 - 8 AUGUST 2021

International Printing, Paper, Packaging Machinery Exhibition

World Trade Centre, Kuala Lumpur, Malaysia

25 – 27 AUGUST 2021

INAMARINE 2021

Jakarta International Expo (JIExpo) Kemayoran, Jakarta – Indonesia

06 - 08 AUGUST 2021

Baoan Industry Development Expo

Shenzhen International Convention & Exhibition Center ,Shenzhen, China

27 - 28 AUGUST 2021

Techpoint Build

Event Centre Lagos, Nigeria

25 - 27 AUGUST 2021

Intertextile Shanghai Apparel Fabrics

National Convention & Exhibition Center, Shanghai, China

20 AUG - 06 SEPT 2021

Canadian National Exhibition

Exhibition Place, Toronto, Canada

24 - 28 AUGUST 2021

China International Industry Fair 2021

National Convention & Exhibition Center, Shanghai, China

10 - 12 AUGUST 2021

Pacific Design & Manufacturing

Anaheim Convention Center, Anaheim, USA

19 - 21 AUGUST 2021

IIAE 2021

Jakarta International Expo (JIExpo) Kemayoran, Jakarta – Indonesia

26 - 29 AUGUST 2021

EAST PACK SURABAYA 2021

17 - 19 AUGUST 2021

SEMICON Southeast Asia

PARKROYAL COLLECTION Marina Bay, Singapore

07 - 10 AUGUST 2021

Thailand International Electrical Appliances Expo

Bangkok, Thailand

SEPTEMBER

10 - 11 SEPT 2021

National Imprint Canada Show 2021

The Toronto Congress Centre, Toronto, Canada

22 - 25 Sep 2021

Automation Expo Mumbai

Nesco Centre Hall, Mumbai, India

29 SEPT - 02 OCT 2021

International Natural Stones, Design & Technology Exhibition

Veronafiere, Verona, Italy

30 SEPT – 02 OCT 2021

INAGREENTECH 2021

JIExpo Kemayoran, Jakarta-Indonesia

23 SEPT - 26 SEPT 2021

Philippine World Building And Construction Exposition

World Trade Center Metro Manila, Manila, Philippines

23 SEPT - 25 SEPT 2021

China (Shenzhen) International Logistics And Supply Chain Fair

Shenzhen International Convention & Exhibition Center ,Shenzhen, China

15 SEPT – 17 SEPT 2021

InterCHARM Korea

COEX Mall, Seoul, South Korea

19 SEPT – 21 SEPT 2021

The Leading International Footwear Industry Trade Fair

Istanbul Expo Center, Turkey

03 SEPT – 05 SEPT 2021

Shenzhen E-Cig Expo2021

Shenzhen Convention & Exhibition Center,Shenzhen, China

12 SEPT – 15 SEPT 2021

The Big 5: International Building And Construction Show

13 SEPT – 16 SEPT 2021

Koplas 2021

Daehwa-dong, Goyang-si, South Korea

10 SEPT – 12 SEPT 2021

MegaBuild 2021

Jakarta International Expo (JIExpo) Kemayoran, Jakarta – Indonesia

08 SEPT – 11 SEPT 2021

Oil & Gas Indonesia 2021

Jakarta International Expo (JIExpo) Kemayoran, Jakarta – Indonesia

OCTOBER

12 – 14 OCT 2021

Trade Fair For Deburring Technologies And Precision Surfaces

DeburringEXPO Karlsruhe, RheinstettenAnd Precision Surfaces

11 – 13 OCT 2021

INMEX SMM India Mumbai

INMEX SMM India, Mumbai, India

20 – 22 OCT 2021

TAITRONICS 2020 (46thTaipei International Electronics Show)

Taipei Nangang Exhibition Center, Hall 1 (TaiNEX 1) Taipei, Taiwan

13 –15 OCT 2021

International Metal Technology Indonesia 2021

Jakarta International Expo, Kemayoran, Indonesia

15 – 19 OCT 2021

Canton Fair International Pavilion - Phase 1

China Import and Export Fair(Canton Fair Complex), Guangzhou, China

15 – 16 OCT 2021

The Property Investor Show

ExCeL London - UK

06 – 10 OCT 2021

VIETNAM INTERNATIONAL INDUSTRIAL FAIR 2021

Hanoi International Center for Exhibition (I.C.E.), Hanoi, Vietnam

27 – 29 OCT 2021

Japan IT Week Autumn

Osaka, Japan

27 – 29 OCT 2021

Automotive World Nagoya

Nagoya International Exhibition Hall, Nagoya, Japan

19 – 21 OCT 2021

KORMARINE 2021

BEXCO, Busan, South Korea

NOVEMBER

04 – 07 NOV 2021

Philconstruct

SMX Convention Center Manila, Manila, Philippines

14 – 27 NOV 2021

India International Trade Fair

Pragati Maidan, New Delhi, India.

28 - 30 NOV 2021

International Apparel & Textile Fair

Jakarta Convention Center (JCC), Jakarta - Indonesia

03 - 06 NOV 2021

VINAMAC EXPO 2021

Saigon Exhibition and Convention Center, Ho Chi Minh City, Vietnam

16 - 19 NOV 2021

The Leading International Trade Fair For The Medical Sector

Düsseldorf, Germany

30 NOV - 01 DEC 2021

Be 4.0 Industries Du Futur 2021

Parc Expo de Mulhouse, Mulhouse, France

17 - 20 Nov 2021

The 33rd International Plastics & Rubber Machinery, Processing & Materials Exhibition

Jakarta International Expo (JIExpo) Kemayoran, Jakarta – Indonesia

10 - 12 Nov 2021

Electric & Power Vietnam 2021

Saigon Exhibition and Convention Center, Ho Chi Minh City, Vietnam

DECEMBER

4 - 16 DEC 2021

Automechanika Dubai

Dubai World Trade Centre, Dubai

06 - 08 DEC 202

Middle East Organic And Natural Product Expo - Dubai

Dubai World Trade Centre, Dubai

09 - 11 Dec 2021

China Machinex India 2021

Bombay Exhibition Centre, Nesco Complex, W.E. Highway, Goregaon East, Mumbai

04 - 07 DEC 2021

Vietnam International Electrical Appliances ExpoFair International Pavilion - Phase 1

Saigon Exhibition and Convention Center, Ho Chi Minh City, Vietnam

BEST FAIR
Auto Parts

第18届广州国际车用空调及冷藏技术展览会

The 18th Guangzhou International Auto Air-conditioning & Refrigeration Technology Exhibition

www.a2echina.com

同期举办

广州国际车用散热系统及设备展览会

广州国际车用电机电控及检测设备展览会

广州国际汽车空气净化系统及设备展览会

Concurrent Show

Guangzhou International Auto Radiator & Equipment Exhibition

Guangzhou International Automobile Motor Electric Control & Testing Equipment Exhibition

Guangzhou International Automobile Air Purification System & Equipment Exhibition

- Car air-conditioning products and accessories
- Production equipment and materials for automotive air conditioners
- Commercial vehicle air conditioning systems and accessories
- Automotive thermal management system and accessories
- Frozen and refrigerated transportation equipment and materials
- Car cooling system
- Vehicle motor electric control and vehicle testing equipment
- Car air purification system

Our Partner Companies

* Listed at random

3-5 March 2022

广州·琶洲·灵感创新展馆

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协办单位|Co-organizer Longquan Automotive Air-conditioning parts Association

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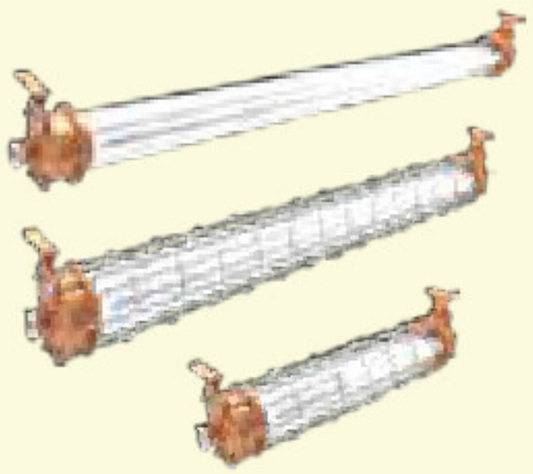

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