DRIVING IMPACT

IN THE WAY THAT WE
BUILD, MOVE, AND
POWER OUR WORLD.

BLACKHORN
VENTURES

OUR MISSION:
Invest in the companies redefining global resource use, led by the world's most innovative entrepreneurs.

Our Mission Gives Us Direction. Our Impact Gives Us an Edge.

We see a rapidly emerging Industrial Data Revolution disrupting and transforming our core sectors. The companies Blackhorn invests in will have the potential to participate in that shift with a goal of generating attractive returns and contributing symbiotic societal benefits. This is accomplished by applying an influx of newly generated data, low-power and high-quality wireless connectivity, and machine learning–fueled processing to create capital-light solutions that revolutionize their spaces.

The result? Direct gains in productivity, resource efficiency, and revenue for adopters of these new technologies, but also indirect gains. By offering actionable insights and technologies that address common grievances across an industry, these solutions can disrupt the everyday operations of a sector by acting as a catalyst for change.

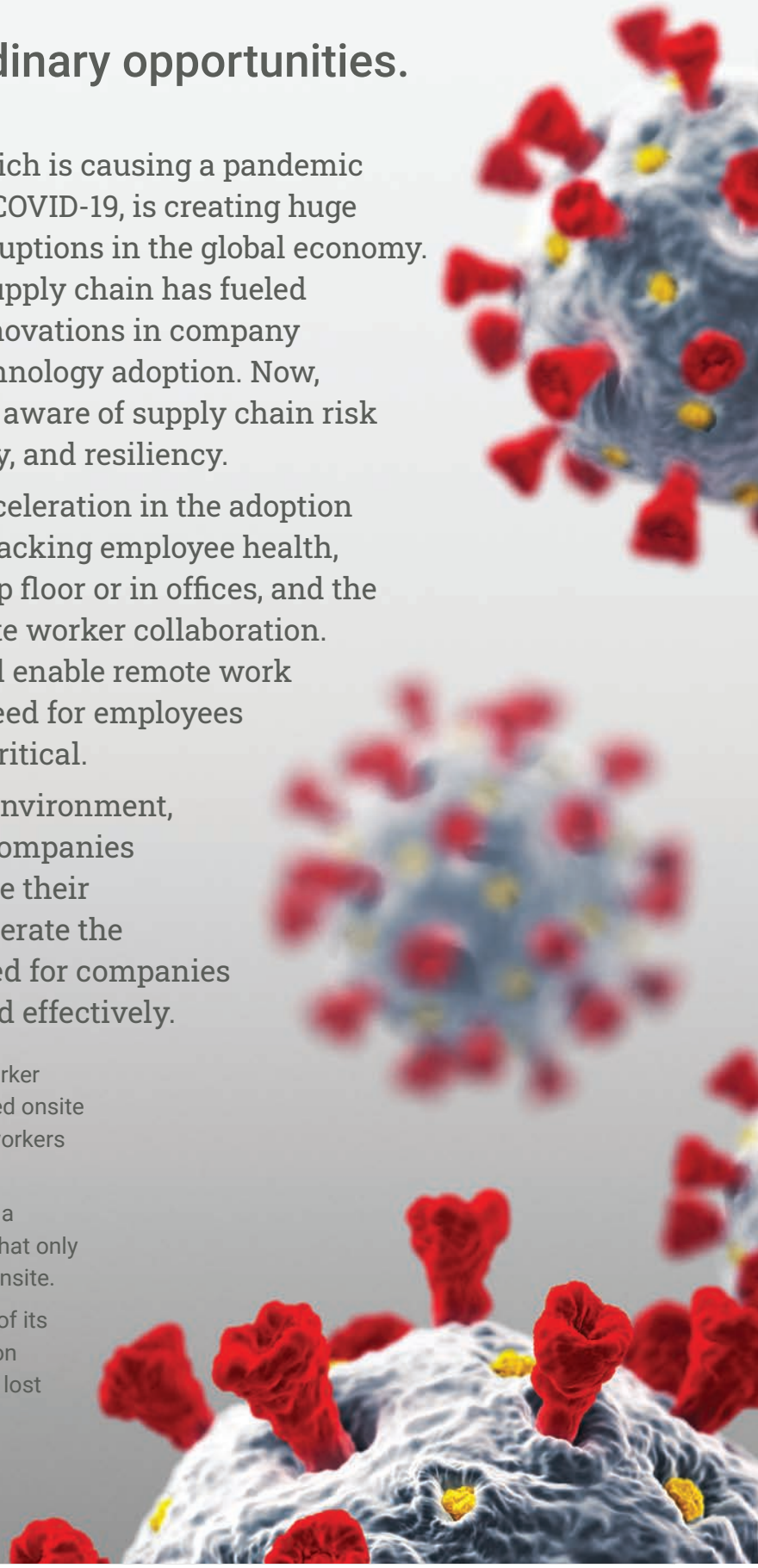
Unprecedented times are also creating extraordinary opportunities.

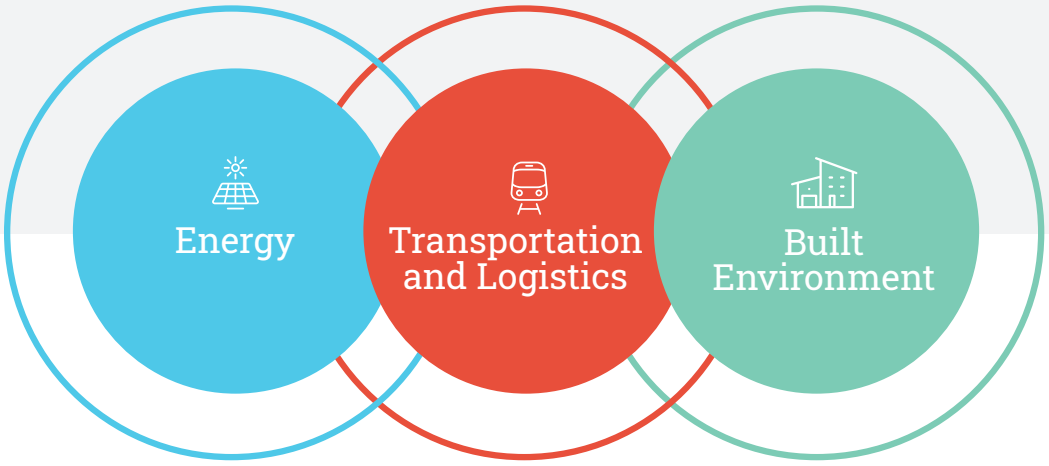
The rapid spread of SARS-CoV-2, which is causing a pandemic of acute respiratory disease, named COVID-19, is creating huge uncertainty and not-yet-defined disruptions in the global economy. The exposure of weak links in our supply chain has fueled onshoring shifts, as well as rapid innovations in company business models and the pace of technology adoption. Now, more than ever, companies are more aware of supply chain risk with regard to security, sustainability, and resiliency.

Across sectors, there has been an acceleration in the adoption of new workplace norms—such as tracking employee health, enforcing safe distancing on the shop floor or in offices, and the need for companies to support remote worker collaboration. Digital technologies that support and enable remote work and collaboration, eliminating the need for employees to leave their homes, are becoming critical.

In the face of this rapidly changing environment, we are proud to be partnering with companies seizing on the opportunity to leverage their existing technology platforms to generate the data and business intelligence needed for companies to continue operating, both safely and effectively.

- **Foresight's** product, SafeSite, provides worker training and tracking features have reduced onsite accidents and injuries, thereby reducing workers compensation costs for companies.
- **Rhumbix** rapidly developed and rolled out a COVID-19 check-in application to ensure that only infection-free workers would be allowed onsite.
- **ALICE Technologies** developed a version of its AI-based, parametric schedule optimization software solution to help projects recover lost time in the most cost-effective manner.





We focus on the three sectors responsible for 70% of greenhouse gas (GHG) emissions in the United States and pursue opportunities driving outsized environmental impact.

The Blackhorn Ventures Industrial Impact Fund, LP (BVIIF) focuses on the most resource-consumptive industries in the global economy: Energy, Transportation and Logistics, and the Built Environment. In all of these sectors, emissions intensity is directly correlated with resource use and resource efficiency. By investing in technologies and business models that are transforming and redefining resource use, we believe that we are pursuing the most direct and effective way to combat climate change.

While technology continues to fuel innovation in the new energy economy, the complexity of the legacy U.S. power grid affords vast opportunities for disruption and ongoing efforts to advance grid modernization.

Momentum in the renewables sector continues, as it grows its share of total U.S. energy production at a rapid pace. Over the past 10 years, wind and solar have grown roughly 450% and 6,100%, respectively, and now represent almost 11% of total U.S. electricity generation[1], according to the U.S. Energy Information Administration. While there is significantly more opportunity to grow and displace nonrenewable sources, much of the future growth will depend on new data-driven analytics to identify, design, finance, and rapidly execute attractive projects in a cost-effective manner.

Modernizing an aging and inflexible grid, advances in system interoperability, and developments related to transactional energy all have the potential to unlock tremendous economic value, while also catalyzing massive environmental impact.

[1] "U.S. Energy Facts Explained - Consumption And Production - U.S. Energy Information Administration (EIA)." 2020. Eia.Gov. https://www.eia.gov/energyexplained/us-energy-facts/.

The rapidly emerging influences of electrification and automation are driving widespread change through the transportation, logistics, and mobility sectors.

According to the U.S. Department of Energy,[2] low-cost and long-life battery technologies are enabling electric drive systems to enter the market and provide at least twice the efficiency of fossil fuel–based systems. Moreover, electric powertrains have fewer moving parts, resulting in lower maintenance cost; and electricity offers a more stable fuel price compared to gas or diesel. Automated vehicles are generating around 30 GB of data per mile traveled, opening the door for better machine learning–powered artificial intelligence controls built on this vast amount of data.

In parallel to on-road applications, within the logistics and supply chain sectors, automation is transforming the way that we move both people and goods. In a COVID-19 environment, companies are faced with the challenges of current worker shortages while trying to implement social distancing measures, in parallel with sudden surges and fluctuations in demand and system capacity. This has caused a massive push to implement solutions improving overall resource efficiency and operational resiliency by automating workflows within facilities, which increases resiliency and productivity.

Globally, we are seeing a complete transformation of how people and goods are transported. Trends like electrification, automation, and changing modes increasingly overlap. Blackhorn actively monitors and invests where these overlapping trends serve to support the advancement of the most impactful and far-reaching investment opportunities.

[2] "Where the Energy Goes: Electric Cars." N.D. https://fueleconomy.gov/feg/atv-ev.shtml

The construction industry, which has historically been slow to adopt technology, now has the ability to capture the massive productivity gains that so many other industries have already proven possible through digitization.

Technological innovation in the built environment has historically been stagnant, as the highly fragmented industry structure and the chaotic nature of a functionality-siloed construction site have led innovators to focus elsewhere. However, recent advances that utilize wireless sensors to capture real-time data, including a smartphone in every worker's pocket, and affordable SaaS solutions are starting to impact core processes, including design, field, asset management, and financial workflows. A report from McKinsey and Company found that productivity-per-worker in the manufacturing sector almost doubled between 1995 and 2011, while productivity-per-worker in the construction sector declined slightly over the same period. This gap highlights the opportunity space within the built environment.

According to McKinsey,[3] 98% of mega infrastructure projects face cost overruns and delays—a huge opportunity for improvement.

[3] "Megaprojects: The good, the bad, and the better." 2015. https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/megaprojects-the-good-the-bad-and-the-better#

Each of our core sectors is becoming increasingly interconnected as technology advances and the need for optimization becomes more apparent.

Electric vehicles offer a clear amalgamation between the energy and transportation sectors. Yet the crossover goes beyond the car itself with the implementation of charging stations, the energy grid required for them, and the potential for independently generated energy sources to create micro-sustainable ecosystems to power these cars in residential or commercial spaces. The emerging electrification movement in transportation requires new load patterns for electric vehicles, the adoption of mobile batteries, and other electric transportation technologies. In the built environment, new and retrofitted construction are utilizing energy efficiency and adapting to renewable energy structures to become more competitive and resource efficient. There will be growing interdependence between these sectors as building materials improve energy efficiencies, new technologies help buildings manage their power usage, and buildings both consume energy from and increasingly deliver energy back to the grid. Finally, there are crossover opportunities extending beyond our three target sectors, particularly at the nexus of energy/agriculture and energy/water. These adjacent crossover scenarios will not be the focus of BVIIF, but we may explore these investment options when they meet our investment and impact criteria.

Emerging opportunities create synergistic benefits between industries that allow for transformational breakthroughs in efficiency and innovation.

Industrial Impact Fund in Numbers

YEAR ESTABLISHED

2019

INVESTMENT COMMITTEE

4

NUMBER OF EMPLOYEES

10

COMBINED INDUSTRY EXPERIENCE

108

INVESTMENTS CLOSED

11

COMMITTED CAPITAL

$79.4M

ESG at Blackhorn Ventures

Avoiding Exposure to Negative Impact

Blackhorn actively seeks to avoid investments in companies that operate in sectors or industries that are deemed to be controversial or that do not comply with our specific investment criteria.

For example, as a firm, Blackhorn will avoid investing in opportunities that have notable exposure to the tobacco, alcohol, armaments, or gambling sectors.

While our objective is not to direct capital towards what might be considered to be additional fossil fuel or natural resource extraction, we may choose to invest in companies whose operations are focused on increasing resource efficiency in a given industrial sector.

As a policy, Blackhorn will not invest in companies that engage in any sort of unethical market behavior, or that refuse to adopt fair and transparent business practices.

Positive ESG

Blackhorn will endeavor to invest in companies that seek to create value for investors by incorporating certain measurable practices or policies into their operations that proactively target positive social, environmental, or governance outcomes.

As a firm, we also believe in actively supporting Sustainable Development Goals (SDGs) 5 and 8, and will proactively pursue internal policies that promote a sustainable and inclusive workplace and gender equality across all of our investment management platforms. Professional development and investment in our own human capital are high priorities for our organization, and we will encourage all employees to pursue opportunities to enhance and expand upon the skill base required to be successful in their specific roles at Blackhorn.

SDGs

The Sustainable Development Goals,[4] also known as the Global Goals, were adopted by all United Nations member states in 2015 as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030.

The 17 SDGs are integrated—that is, they recognize that action in one area will affect outcomes in others, and that development must balance social, economic, and environmental sustainability.

Blackhorn Ventures is committed to advancing the following Sustainable Development Goals: **Decent Work and Economic Growth (#8), Industry, Innovation and Infrastructure (#9), Sustainable Cities and Communities (#11),** and **Responsible Consumption and Production (#12).**

[4] "Sustainable Development Goals | UNDP." 2020. UNDP. https://www.undp.org/content/undp/en/home/sustainable-development-goals.html.

8 DECENT WORK AND ECONOMIC GROWTH

ALICE

Aperia TECHNOLOGIES

briq

Foresight

GRIDRASTER

HUMATICS

Pype

RMBX RHUMBIX

VECNA robotics

SDG 8 seeks to achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including a focus on high-value-added and labor-intensive sectors. In addition, through 2030, the goal seeks progressive improvements in global resource efficiency in consumption and production and endeavors to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programs on sustainable consumption and production, with developed countries taking the lead.

CASE STUDY: VECNA'S IMPACT

Throughout industrial sectors, companies struggle to balance their ability to effectively use hardware needed to automate warehouse space, while keeping humans in the process. Vecna seeks to orchestrate the entire workflow of the warehouse, maximizing automation and limiting human engagement in backbreaking work while freeing them up to do what they are uniquely good at, thus allowing for the greatest level of efficiency.

With one customer, a manufacturer of industrial boom cranes, the use of Vecna Robotics' autonomous tuggers has improved productivity by 30%, through the just-in-time delivery of parts to nine different assembly lines in a 300,000-square-foot facility.

A study at FedEx Ground showed that the use of robots in one facility increased efficiency for their operations by 38%. The company believes that when effectively paired with orchestration, robots and humans together can help companies achieve an 116% increase in overall productivity.

Vecna Robotics

KEY SDGs SUPPORTED

A SYNERGISTIC WORKFORCE THAT OPTIMIZES AUTOMATION WITH HUMANS.

E-commerce has led to a massive shift in the routes through which consumer products are purchased, stored, and shipped, altering every step of the supply line. This often creates a logistical nightmare, as warehouses are failing to adapt and scale in an appropriate manner. These facilities are almost entirely staffed by a human workforce; however, the cost of rising wages, lack of efficiency, and high levels of seasonality and variability in demand leave much to be desired. Vecna Robotics is developing a platform that not only provides the hardware needed to automate the warehouse space, also but pairs this hardware solution with an artificial intelligence-based platform that orchestrates the entire workflow of the warehouse supply chain. This focus on developing the software is necessary to maximize automation while keeping humans in the process, thus allowing for the greatest level of efficiency.

SDG IMPACT

Vecna Robotics' system enables the transformation of the intralogistics industry by creating a synergistic hybrid robotic and human workforce. Its orchestration engine allows the supply chain to be optimized, accounting for multiple variables that fluctuate throughout the year, due to supply and demand peaks.

Beneficiaries

- E-commerce solutions
- Warehousing companies
- Society at large/consumers of e-commerce

Target Outcomes

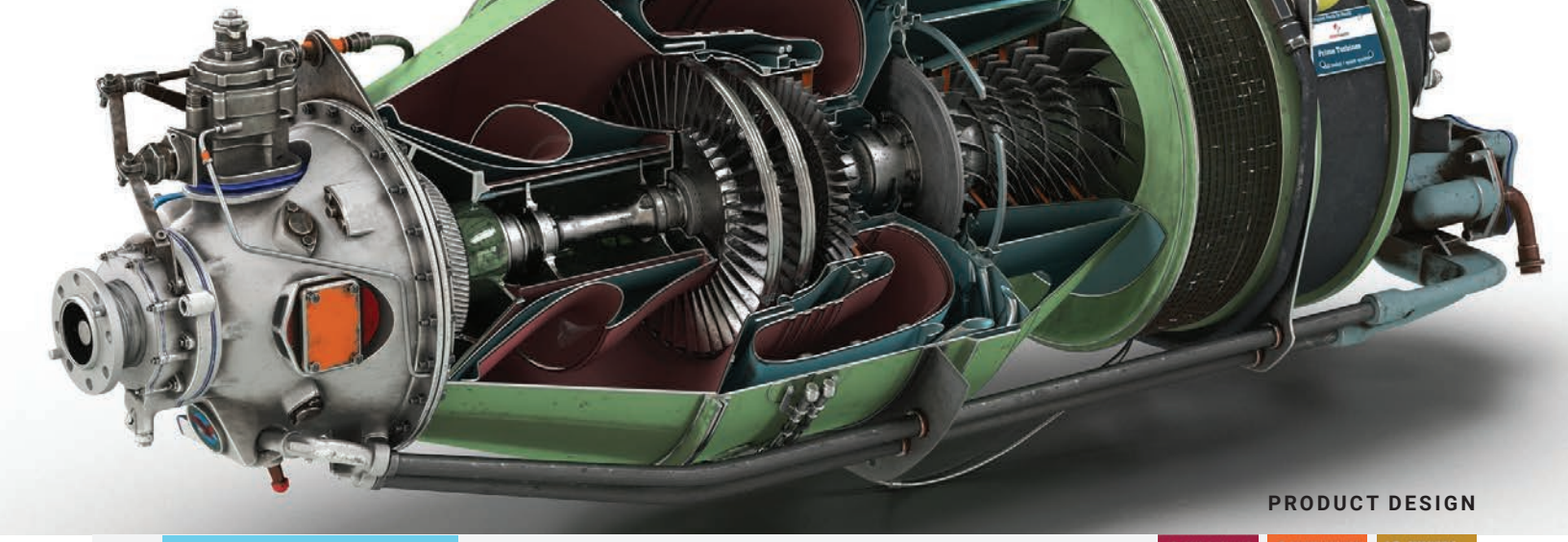
- Workflow optimization of warehouses through both software and hardware.
- By offering flexible, adaptive automated environments, human-robot teams can operate up to 85% more efficiently than either humans or robots independently.

Contribution

- Accelerating the hardware-agnostic approach at the fastest pace.

Risk

- Without this level and kind of automation, the industry is likely to be on a much longer trajectory to sustainability.
- By operating in a hybrid environment, the industry can not only save jobs that would otherwise be eliminated, but can also create better, safer jobs.
- Without proper orchestration, customers would not be able to realize the massive efficiency gains stemming from a hybrid human-robotic approach.



PRODUCT DESIGN

GridRaster

KEY SDGs SUPPORTED

SCALING THE EFFICIENCY OF CLOUD PROCESSING POWER FOR VIRTUAL REALITY, AUGMENTED REALITY, AND MIXED REALITY (VR/AR/MR).

As VR/AR/MR enter the market, there is a challenge in managing large environment models with high complexity. These models require significant processing power, which suggests a cloud approach, but data latency can lead to delays in displaying graphics on headsets that cause users extensive wait times to see results—removing a real-time review potential and even leading to user disorientation.

GridRaster provides a platform solution that is hosted on edge computing resources that are geolocated near the user to allow for the power of cloud processing with a minimization of latency. This solution enables more efficient scaling of VR/AR/MR by decoupling model processing from the view device. This opens the door to cheaper VR/AR/MR devices, as the core rendering hardware can be more efficiently located in an edge cloud.

SDG IMPACT

GridRaster's platform allows firms to utilize AR technology giving workers real-time instruction overlaid on surfaces or materials – allowing for a remote review process. These processes not only significantly increase throughput and productivity while reducing errors, they also decreases the need for excessive travel that can be associated with the review process.

Beneficiaries

- Workers using the system
- Companies adopting the platform
- Downstream consumers of products produced with GridRaster's assistance

Target Outcomes

- Customers are seeing a 40% increase in productivity and an 85% decrease in training time.

Contribution

- Although other similar solutions exist, GridRaster is focused on offering a greater level of precision and expansiveness than other market players.

Risk

- Without the implementation of VR/AR/MR technology, industrial applications will continue to spend excessive resources training employees, experience errors in assembly, and have longer completion times on projects.
- GridRaster allows for faster technology adoption, reducing environmental impact through creating efficiency gains, but also increases human capital more immediately via technological augmentation.

ALICE Technologies

KEY SDGs SUPPORTED

HELPING CONTRACTORS ANSWER "WHAT IF?" IN JUST MINUTES.

ALICE offers an integrated planning and job management solution that parametrically runs thousands of scenarios to help general contractors understand the time and cost trade-offs of utilizing different sequences and resources. ALICE explores different schedule sequences and gives teams the power to answer "What if?" scenarios and completely reschedule in just minutes.

Rescheduling construction projects is both time consuming and error prone, leading to significant inefficiencies in cost, labor, equipment use, and energy consumption. By creating alternative schedules automatically and displaying them in a two-dimensional efficient frontier of duration vs. cost, ALICE enables projects to achieve significant efficiency gains in labor, equipment, material, and energy savings.

SDG IMPACT

ALICE's integrated planning and management solution allows construction firms to simulate millions of scenarios—creating schedules for large efficiency improvements and decreasing errors and delays. Informing firms to understand their options allows for well-informed decisions on how to best utilize their resources and personnel without the need for massive rescheduling efforts.

Beneficiaries

- Contractors
- Subcontractors and workers

Target Outcomes

- Planning process is dramatically reduced to a matter of days versus traditional methods that traditionally took three to four months.
- In recent case studies, firms saw on average:
  - Less than a week to train and implement software
  - Construction durations reduced by 16%
  - Labor costs reduced by 11%
  - Overall project cost reductions of 3.5% in one case (even with time-saving measures that were considered more costly)

Contribution

- Currently, manual approaches can consider only a small subset of scenarios. With the introduction of automation, a greater number of variations can be considered – making clear the trade-offs of cost, time, and resource needs.

Risk

- The current status quo offers less-than-optimal strategies in taking months of planning and resources to develop maximized plans, thereby depleting resources and limiting growth potential.

Locomation

KEY SDGs SUPPORTED

TACKLING THE PROBLEM OF DRIVER SHORTAGES AND TIME EFFICIENCY IN THE TRUCKING INDUSTRY WITH SEMI-AUTONOMOUS PLATOONING.

According to the American Trucking Association, the shortage of truck drivers in the U.S. is predicted to grow to over 200,000 by 2022. In addition, the sector is further challenged by the fact that human drivers are regulated as to how long they can operate a truck continuously. Locomation's system directly addresses this problem by allowing a lead driver to guide a platoon of semi-autonomous trucks with a simplified automation solution that allows trucks equipped with the system to join a convoy platoon led by a human driver.

SDG IMPACT

Locomation's system allows operators to unlock system capacity, while also generating substantial fuel savings and reducing GHG emissions. By improving the asset utilization of trucking fleets, operators can more effectively optimize the use of their trucking physical asset base. These gains allow trucking systems to be competitive in an e-commerce-driven environment, making trucking competitive with rail-based routes and often with air freight alternatives.

Beneficiaries

- Truck drivers
- Trucking and logistics operators
- Supply chain managers

Target Outcomes

- ~8% average fuel saving per truck (~5% leader and ~10% follower), equating to >44 tons per year CO2 reduction per truck.
- Fuel savings combined with 50% labor savings results in ~30% overall OpEx reduction, yielding a 10x improvement in an industry with 3–5% profit margins.
- The autonomous convoy system unlocks previously unavailable capacity, delivering 2x cargo, at 2x the distance, 2x as fast.

Contribution

- There are a large number of players in the autonomous vehicle sector, but Locomation's model is one of the few that balances near-term applicability with a balanced mix of human action and automation.

Risk

- Locomation's technology may serve as a catalyst for the broader adoption of autonomous vehicles, and the societal and environmental outcomes that are made possible. Without the advancement of technologies like Locomation's, the transportation industry will not be able to achieve the fuel and time savings that are required to improve efficiencies in one of the world's largest and most polluting industries.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

By 2030, UN Sustainable Development Goal 9 seeks to upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes.

ALICE

Aperia TECHNOLOGIES

briq

DRAWBOARD

Foresight

GRIDRASTER

HUMATICS

LOCOMATION

Pype

RMBX RHUMBIX

VEENA robotics

CASE STUDY: BRIQ'S IMPACT

In many markets, construction productivity has been on the decline since the 1990s, while financial returns for contractors have remained low and suffered from volatility. In addition to this, the industry also faces a consistently high failure rate. Construction projects are generally 20% over schedule, with large projects often being as much as 80% over budget. Briq focuses on solving the cost creep that takes place from design to estimate, to construction, by automating much of the bloated and inefficient workflows that take place.

In one customer instance, a 121-year-old construction company used Briq to achieve a 61% efficiency improvement for a critical operations workflow.

Problem: The company was in the market for a data platform to help manage its strategic business goals, including to benchmark financial and operational KPIs and scale the business without scaling costs or adding new full-time employees.

Solution: Briq was selected as the platform to help streamline inefficient workflows and prepare the business for a data-driven culture. In less than six months, the company was able to improve the speed of its job cost roll-in by 61% and has more visibility than ever before in the performance of its business.

Briq

KEY SDGs SUPPORTED

TURNING DATA INTO ACTIONABLE INSIGHTS.

Briq has developed a set of Robotic Process Automation (RPA) bots that extract relevant data from key applications that companies are currently using, including their legacy Enterprise Resource Management (ERP) systems. From this unified "data lake," they derive reports that synthesize the data and display them using Briq's own simple visualization tools or export the data into Business Intelligence (BI) apps like Tableau to create custom dashboards. Briq is also creating a set of Machine Learning (ML) algorithms to derive actionable insights about market opportunities, project performance, and human resources.

SDG IMPACT

Briq products allow for higher levels of economic productivity through enhanced decision making, technological upgrading, and innovation. The company's RPA technology allows firms to understand the wealth of data that is currently unused, giving them better insights into market opportunities, project performance, and resource utilization and increasing resource efficiency.

Beneficiaries

- General contractors and contractors
- Project financial planning teams
- Construction laborers

Target Outcomes

- In a recent case study, the client experienced:
  - Freezing overhead costs by revealing operational inefficiencies, up to 82% more efficient when utilizing automation and analytics to streamline business.
  - Forecasts were up to 40% more accurate in some scenarios.
  - ROI increases of ~10% through automation and winning larger projects.

Contribution

- Most of Briq's competitors are focused on data collection, rather than data aggregation and intelligence. Through Briq's unique approach, companies have newfound access to their data. While the incumbents may eventually take a similar approach, Briq is able to move the industry forward much quicker, thus speeding up the impact.

Risk

- Without aggregation and deeper insight, the industry would continue to see less-than-optimal strategies and utilization of resources (both capital and human).

Pype, Inc.

KEY SDGs SUPPORTED

SOFTWARE THAT REVOLUTIONIZES THE PROJECT BIDDING PROCESS.

During the bidding process, general contractors and subcontractors comb through thousands of pages of plans and specifications to understand the requirements, making the processing time consuming and error prone and leading to costly mistakes, rework, and even possible litigation. This process limits the number of projects they can bid on and reduces competition in the marketplace.

Pype's patented SaaS software takes this manual process and automatically creates ultra-accurate submittal logs in minutes. This powerful artificial intelligence natural language processing algorithms and their industry-specific data dictionary "read" and interpret the specs to pull out action submittals, product data, closeout submittals, tests and inspections, and more.

SDG IMPACT

Pype relieves general and specialty contractors from weeks of tedious work spent estimating project bids and reduces the amount of inefficient time spent tracking and managing requirements during the life of a construction project.

Beneficiaries

- Specialty contractors
- Building general contractors
- Building owners and operators
- Construction laborers

Target Outcomes

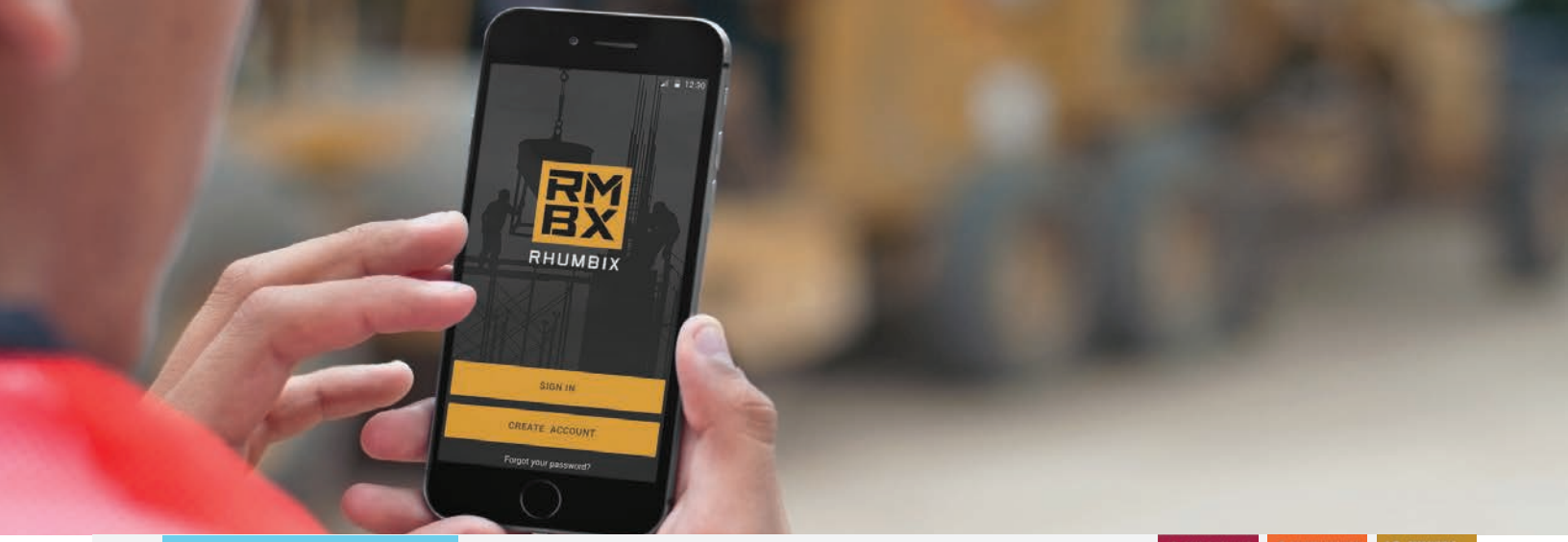
- Pype's suite of products can save two to four months per job.
- In 2018, Pype was used on 1,684 projects. There is a credible pathway to continued growth, thereby changing the resource efficiency of the construction industry writ large.

Contribution

- Currently, Pype has a strong position in the market with a highly differentiated product relative to its competitors. Given this, it's unlikely that another company would develop a product that could quickly yield the same outcomes.

Risk

- Without Pype's technology, contractors and building operators would be stuck in the current cycle of delays, over-budget plans, and excessive material usage as a result of unclear documentation, lack of synthesis and analysis of submittals, product data, etc.



Rhumbix

KEY SDGs SUPPORTED

DIGITIZATION OF WORKER-LEVEL AND FIELD-LEVEL DATA OPTIMIZES LABOR FORCE.

In 2014, Rhumbix began building a "worker first" platform to replace paper and spreadsheets in the field. This platform began with digitizing time cards for payroll and production tracking for labor productivity and has since expanded into daily construction reports and the tracking of time & materials (T&M) tags (a.k.a. field work orders) for change order management. Today, Rhumbix is the industry leader in digitizing field data from workers on project sites, and its platform is being used by seven of the top 15 general contractors in the U.S. and three of the top five specialty subcontractors.

SDG IMPACT

Rhumbix's technological offering and value are directly correlated to the promotion of a safe and secure working environment and creating opportunities for wage-level workers to progress in their training, certification, and career development. Through its data-driven approach, Rhumbix powers the construction industry and makes growth sustainable and efficient. Its platform allows the construction industry, which has lagged behind other sectors in its adoption of technology, to increase overall levels of productivity through increased levels of data. With real-time reporting, foremen can actively track raw materials needed at job sites, ensuring less waste from unused materials and less time spent coordinating with the central office. This optimization of labor and materials usage in the construction sector accounts for a reduction of 23% in all GHG emissions.

Beneficiaries

- Foremen
- Workers
- Project owners and engineers

Target Outcomes

- One client realized a 790% ROI within a month of deploying Rhumbix, resulting in a significant savings in resources.
- 30% reduction in time to collect data from time cards.
- Pilot programs see 100% adoption.
- Digital timekeeping shows 90% accuracy improvement rates.

Contribution

- Most of Rhumbix's competitors offer individual product features that the Rhumbix product offers; however, the market is shifting toward a single-platform, all-encompassing solution.

Risk

- Without access to the field-level data generated on the Rhumbix platform, decision makers are ultimately too far removed from daily operations to gain full understanding of the complexity on jobsites that is required for both value creation and maximizing productivity.

Aperia TECHNOLOGIES

briq

HUMATICS

LOCOMATION

Oype

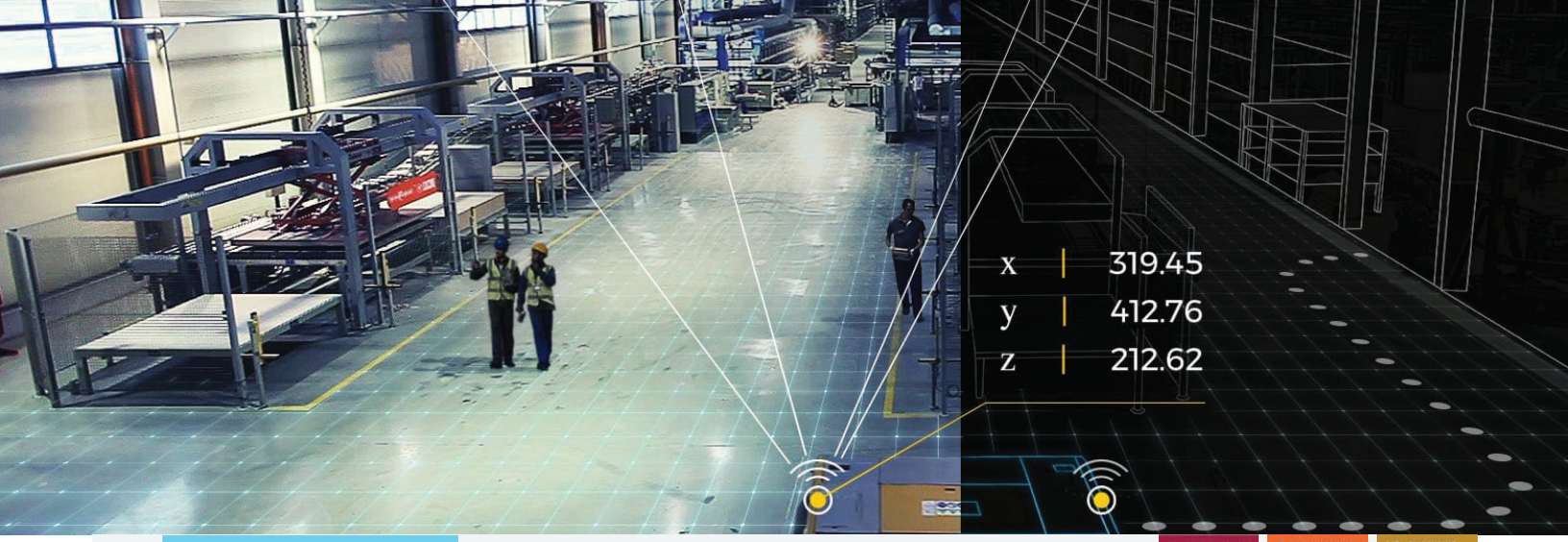
Cities and metropolitan areas are powerhouses of economic growth—contributing about 60% of global GDP. However, they also account for about 70% of global carbon emissions and over 60% of resource use. UN Sustainable Development Goal 11 aims to achieve a reduction in the adverse per-capita environmental impact of cities, including paying special attention to air quality and municipal and other waste management by 2030.

CASE STUDY: HUMATICS' IMPACT

Humatics is in the unique position of working with the NYC Metropolitan Transportation Authority on reworking New York City's vast underground transportation system, one of the oldest public transportation systems in the world. By modernizing the MTA's network, Humatics is able to create new levels of safety, performance, efficiency, and awareness for various stakeholders in New York City. With over 6 million lives affected every day by the MTA, many of these people are lower income, have little other means of transportation, and rely on the subway for their livelihoods; therefore this project has vast implications for the city's various local communities.

On-time performance for the subway is even more important in the time of COVID-19, given the need for social distancing. Ultra-wideband leads to increased capacity, allowing a larger number of trains to operate with a greater level of safety. Maintenance and risk to operators are reduced significantly, as current technology is embedded into the rails and requires technicians to get into the rails, which is often hazardous.

Installation of Humatics' system increases operational resiliency by reducing risks faced by earlier rail installation–based systems (flooding, rodents, etc.)—while also allowing for easier ongoing repairs. This increase in safety leads to life-saving measures, with dramatic spillover including financial, moral, and operational gains. Track intrusion detection is also tracked, preventing more on-track incidents and further increasing safety measures and outcomes.



Humatics

KEY SDGs SUPPORTED

ADVANCING AUTOMATION THROUGH ULTRAPRECISE SPATIAL POSITIONING TECHNOLOGY.

High-precision location and positioning data is critical for advancement in automation across the built environment, transportation, and other industrial sectors. Currently, outdoor Global Positioning System (GPS)- or Global Navigation Satellite System (GNSS)-based systems provide positioning data but have resolution limits unless stationary. Industrial operations inside of buildings, where many industries have heavy automation requirements, are therefore dependent on visual or proximity beacon recognition systems, which generally fall short of user precision and accuracy requirements.

Humatics offers centimeter- and millimeter-scale local positioning systems that are faster, ultraprecise, and more affordable than current technologies. Humatics' products makes it possible for mobile devices to locate, navigate, and collaborate, through the combination of revolutionary sensor technology with machine learning, data analytics, and a location software platform.

SDG IMPACT

Subway systems like the NYC MTA are using Humatics' micro-location sensors to gain insights into how subway cars can be operated more efficiently. This has only become more imperative during the current coronavirus pandemic, as cities need to operate public transportation systems more safely and efficiently. The ability to precisely locate where a subway car is while underground allows for a higher throughput of traffic within the system, helping the city to continue to operate in a time of great uncertainty and change.

Beneficiaries

- Downstream passengers and consumers

Target Outcomes

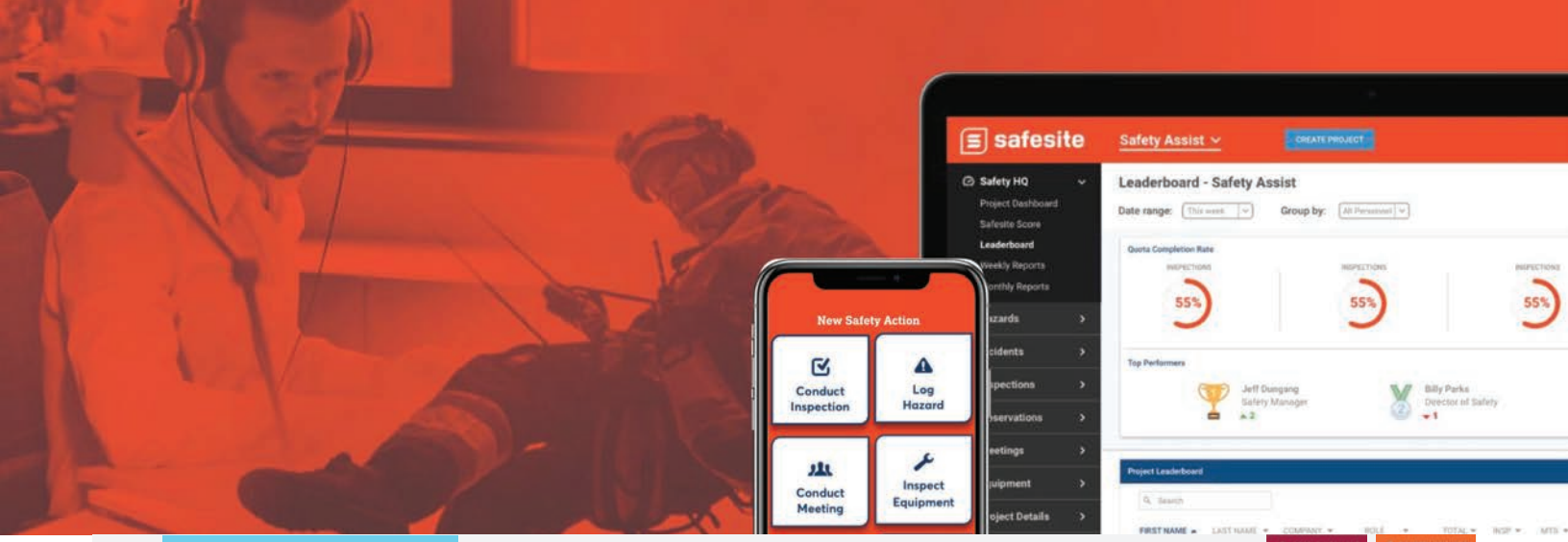
- Helps to enable and improve the efficiency of many customer operations. This includes warehouse and manufacturing, ports, rail, and other applications.
- For the rail application, Humatics will assist a major Transportation Authority in improving the efficiency and throughput of its operations.

Contribution

- With the adoption of technology, greater efficiencies and reduction in emissions can be achieved.

Risk

- Without increasing automation, accelerating technological adoption and improving efficiency, it will be increasingly difficult for cities and municipalities to meet their targeted climate change–focused emission reductions goals due to continued usage of materials, resources, and emissions tied to massive sectors like the transportation sector.



Foresight

KEY SDGs SUPPORTED

IMPROVING SAFETY OUTCOMES THROUGH DIGITIZATION.

Foresight offers companies in heavy industries financial incentive to increase safety on jobsites with their workers compensation insurance offering. When companies use Foresight's SafeSite Safety Platform, they are given a suite of tools to make jobsites safer. The Safesite App provides an easy-to-use interface through which field personnel can input real-time information, including capturing potential safety issues with photos, tagging, and the ability to assign the issue to other personnel for resolution. Capturing the data in a digital platform has the benefit of providing enhanced data for insurance underwriting. When jobsites increase safety practices and reduce risk, they pay significantly reduce workers compensation insurance rates.

Through this platform, Foresight is transforming the way companies in high-risk industries manage their everyday safety and compliance needs. By combining innovative mobile and field-based technologies with ongoing virtual safety coaching, the company has helped customers reduce workplace incidents by up to 57%.

SDG IMPACT

Access to field-level data on jobsites has become critical for employers as they seek to adhere to changing compliance requirements, including COVID-19, while improving overall safety outcomes for their laborers. This data provides the construction industry with valuable insights needed to better assess risk, promoting a more stable and healthier workforce.

Beneficiaries

- Heavy industry workers
- Heavy industry employers

Target Outcomes

- SafeSite has proven that it can help customers reduce workplace incidents by up to 57% and improve compliance by an average of 45%.
- Significant savings from workers compensation cost reduction and lost time incident costs.

Contribution

- While 96% of general contractors report that site superintendents use mobile devices on worksites, there has been limited innovation to better connect the insurance industry with jobsite data.

Risk

- Without the use of the company's platform, jobsites would experience more safety incidents and unnecessary expenses.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

UN Sustainable Development Goal 12 states that by 2030, measures should be taken to substantially reduce waste generation through prevention, reduction, recycling, and reuse. The goal also encourages companies, especially large and transnational companies, to adopt sustainable practices and reporting related to sustainability-focused initiatives.

ALICE

Aperia TECHNOLOGIES

briq

DRAWBOARD

Foresight

GRIDRASTER

HUMATICS

LOCOMATION

Oype

RMBX RHUMBIX

VECNA robotics

CASE STUDY: APERIA'S IMPACT

The impact of Aperia's tire technology allows fleets to reduce tire wear by 20%, while also generating a 1–2% reduction in gas consumption. This can create both substantial savings and gains to efficiency, especially considering the number of trucks in a fleet and the fact that many of these trucks are driving over 100,000 miles per year.

Additionally, the company estimates that product sales thus far have generated a CO2 offset of 757,800 tons. This is equivalent to the use of approximately 148,522 passenger vehicles over the course of one year.

With the total barrels of oil offset greater than 5,700,000 and 312,000 total tires saved, Aperia not only reduces the wasteful process of excess tire manufacturing and the disposal of tires in landfills or by other means, but also drastically increases the safety of the drivers on the road by nearly eliminating the catastrophic tire failure.

Aperia Technologies, Inc.

KEY SDGs SUPPORTED

MAINTAINING OPTIMAL TIRE PRESSURE FOR SAFER TRANSPORTATION.

Aperia offers the only available bolt-on solution for maintaining optimal tire pressure for tractor trailers. The "Halo," Aperia's bolt-on solution, keeps tires at the desired pressure for maximizing fuel economy and tire life. Leaky valve stems, temperature changes, natural leakage, uncalibrated air pressure gauges, and other factors can cause tires to become under-inflated, making tire pressure nearly impossible to manage manually. Tires that are not operating at their recommended pressure experience heating and flexing of the sidewall, which is the primary cause of catastrophic tire failure. Properly inflated tires maximize traction, reduce wear, and reduce rolling resistance. By decreasing tire rolling resistance, properly inflated tires can increase fleet MPG by up to 2.5 percent for every 10 percent a tire was improperly inflated. Fleets may also realize an up to 15 percent longer tire life.

SDG IMPACT

Aperia's bolt-on Halo product dramatically improves trucking efficiency. By maintaining proper tire inflation, trucking companies can extend tire life; reduce tire waste, fuel consumption, and GHG emissions; and experience fewer catastrophic failures requiring downtime and roadside assistance.

Beneficiaries

- Commercial trucking industries
- Other drivers and motorists on roadways
- Customers of trucking and logistics operators
- End consumers

Target Outcomes

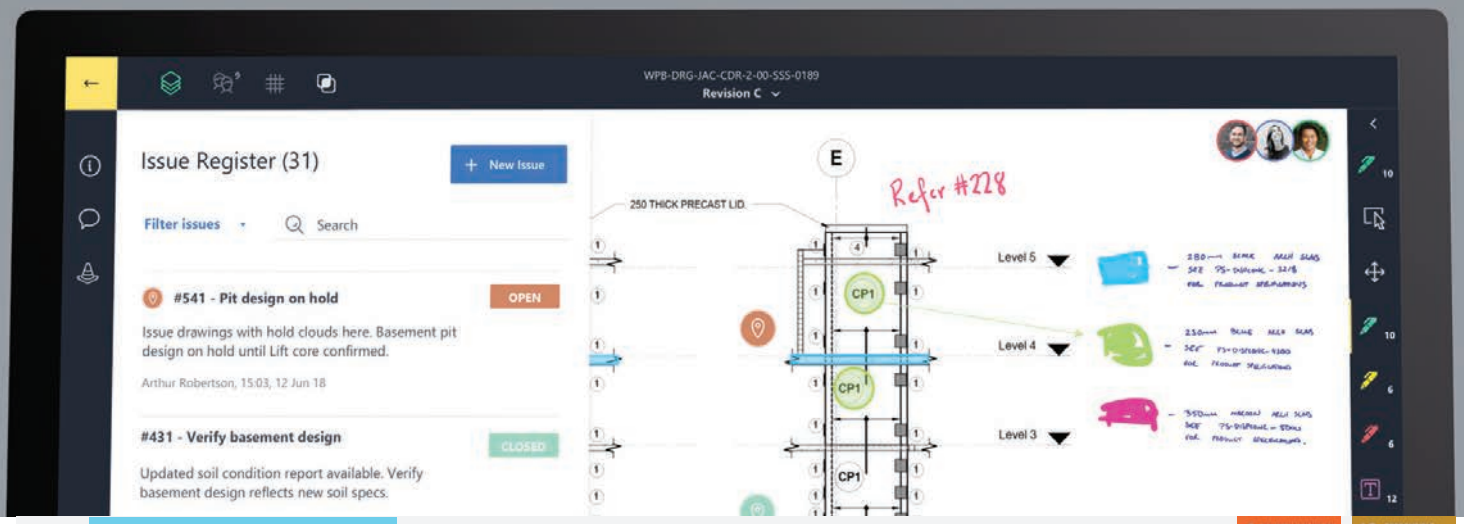
- Estimates show that proper tire inflation could save over 5.5 million tons of CO2 and over $1.5 billion in fuel savings for the U.S. trucking industry alone per year.

Contribution

- Given the current competition it is unlikely that another solution this simple, yet effective would have likely emerged in the immediate future. Most current solutions can operate only on the trailer and do not function on the hub, but rather from a centralized system.

Risk

- Without this technology, the trucking industry will continue in its path with excessive fuel consumption and tire blowouts compromising both efficiency and safety of everyone on the road.



Drawboard

KEY SDGs SUPPORTED

REAL-TIME COLLABORATION AND RESOURCE EFFICIENCY FOR THE INDUSTRIAL SECTOR.

Drawboard creates easy and collaborative PDF software for architecture, engineering, construction and other document heavy industries. This solution increases efficiency by enabling a collaborative approach via an online solution. Drawboard's usability, syncing, and digital inking approach is a promising advance in the way things are done, offering a potential future of intuitive, rapid, and paperless collaboration and documentation. Currently, the design and construction industry relies heavily on paper and available PDF programs for mark-ups. These are expensive, difficult to use, and have an antiquated user-interface resulting in a slow design review process. Conventional pen and paper mark-up experience has been favored since previous solutions lacked real-time collaboration and can only be used for locally stored files.

SDG IMPACT

Drawboard allows a massive industrial sector to use technology to go paperless, making them more resilient, efficient, and sustainable. Their technology helps make the design and construction industry more resource efficient and reduces costly travel needs for design iteration sessions, further pushing the future of construction towards sustainability. Drawboard's system integrates complex workflows into their seamless technology, allowing users easy-to-use UX and UI, real-time collaboration, and easy documentation. This allows for a paperless future but also unlocks new opportunities that come along with digitization.

Beneficiaries

- Large design firms
- Teams that need to plan remotely, asynchronously, and simultaneously

Target Outcomes

- In a 100-user pilot, the client experienced significant gains in their processes, and if annualized, would result in:
  - Internal review cycles increasing in speed by 92%
  - 26,280 hours saved on manual tasks
  - $2.5M in net savings
  - 189 tons in CO2 savings
  - A 97% paperless process

Contribution

- Drawboard's advantage over other similar market solutions is the simplicity and ease of use.

Risk

- Given the current solutions, it requires flights, numerous meetings, and hours working together with paper and pencil to accomplish what Drawboard is doing. This not only is a lack of efficiency, but an immense environmental impact due to travel.

BLACKHORN VENTURES

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Blackhorn Ventures, founded in 2017, is an investment management firm focused on supporting companies whose business success is fully aligned with generating positive societal outcomes, with the potential to drive deep, collinear social and environmental impact.