A Sustainable Year
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NH Industrial is now fully focused on agricultural and construction equipment following the recent spin-off of its commercial vehicle and powertrain operations. As a new CNH Industrial emerges, sustainability will continue to drive the decisions we make and the priorities we set for our future. We are taking a proactive and holistic approach to environmental, social and governance (ESG) issues and ensuring our facilities, products and processes, including our supply chain, are sustainable. This creates value for our business, our customers, internal and external stakeholders, and our wider world.

At the Company’s Capital Markets Day in February 2022, CNH Industrial announced a new purpose, entitled Breaking New Ground, based on three supporting pillars that will propel our strategy moving forward: Innovation, Sustainability, Productivity. We are continually searching for better solutions and breakthrough ideas to meet the enormous challenge of feeding and sheltering a growing global population. Our second pillar demonstrates our commitment to continuing our track record of excellence in sustainability. We will strengthen our sustainable transformation by setting challenging targets across our plants and along our value chain. In addition, we will accelerate our environmental and social initiatives and improve discipline and governance internally. This is absolutely critical as we have all realized that sustainability is vital to the future of our planet.

Our sustainability strategy will be centered around four areas linked to six of the United Nations Sustainable Development Goals (SDGs). We are globally recognized as a sustainability leader in the agriculture and construction segments and have committed to maintaining this prestige status. We have also committed to reporting on science-based measurable targets according to formal procedures; becoming the employer of choice in our industries; and continuing to be accountable for our sustainability performance.

In 2021, we achieved key results and, among other things, also strengthened our commitment to diversity and inclusion across the Company. A Sustainable Year showcases some of the projects and initiatives of which we are particularly proud.

We hope you enjoy it.
A Sustainable Year

ABOUT CNH INDUSTRIAL

OVERVIEW
CNH Industrial is a world-class equipment and services company that sustainably advances the noble work of agriculture and construction workers.

As a pure player in agriculture and construction, we provide the strategic direction, R&D capabilities and investments that enable the success of our brands. We do this by supplying 360-degree agriculture applications from machines to implements and the digital technologies that enhance them — and delivering a line-up of construction products that make the industry more productive. A full suite of financing and aftermarket solutions complete this offering.

CNH INDUSTRIAL FAMILY OF BRANDS
CNH Industrial offers a portfolio of brands specialized in products and services in the agriculture and construction sectors. Some of them are shown on the right.

KEY FIGURES

- COMPANY: 1
- BRANDS: 10
- R&D CENTERS: 30
- MANUFACTURING PLANTS: 42
- LOCATIONS AROUND THE WORLD: 160+
- FULL-TIME EMPLOYEES: 37,000+
- CONSOLIDATED REVENUES*: $19.5 BN

*2021 FY pro forma combined results (CNH Industrial excluding Iveco Group) as per Company’s press release distributed on February 8, 2022.

Our optimized organizational structure drives efficiency, agility and accountability, enhances customer-centricity, and targets digital and technology leadership.

OUR SEGMENTS

AGRICULTURE
- World’s second-largest manufacturer of agricultural machinery
- Leader in machine automation and precision technologies
- Pioneer in alternative propulsion

CONSTRUCTION
- A global player in construction equipment
- Extensive synergies with Agriculture segment
- Co-investment in digital/electrification

FINANCIAL SERVICES
- Global financier supporting the brands, customers, importers and dealers
- Enhanced customer experience to offer a competitive edge to our brands

Note: all figures provided are on a US GAAP $ basis and updated at the end of 2021.

CNH Industrial is listed on the New York and Milan stock exchanges (NYSE: CNHI / MI: CNHI).
At CNH Industrial, we created a sustainability strategy centered around four areas. This framework is designed to focus investment, drive performance and create long-term value for our company well into the future. Delivering against these areas remains in line with our stakeholders’ expectations, positioning our company and our employees to have a positive impact on our planet, enabling us to win the race for talent and delivering on our key results.

2024 Sustainability Targets

Carbon Footprint
New targets and clear actions.
- A commitment to near-term and long-term targets on CO₂ emissions in line with a temperature rise of no more than 1.5°C
- A renewed commitment to our record of excellence on Scope 1 and Scope 2 emissions
- 50% reduction in CO₂ emissions per hour of production by 2030 compared to 2018
- 90% of electricity to be renewable by 2030

Circularity and Eco-Efficiency
Redesigning products for the circular economy, reducing water use and waste, and improving efficiency through precision farming.
- 100% of new products to be developed according to sustainability design criteria by 2024
- New products to be 90% recyclable by 2030
- 33% reduction in water withdrawal per hour of production by 2024 compared to 2018
- 50% reduction in water withdrawal per hour of production by 2030 compared to 2018
- 95% of waste recovered at Company plants by 2024
- 97% of waste recovered at Company plants by 2030

Inclusion, Equity and Engagement
Creating an attractive work culture for the future with more female representation, improved Employee Resource Group training and a global disaster response program in partnership with dealers.
- 20% of women in leadership roles by 2024
- 100% of employees trained in unconscious bias by 2024
- 100% of employees trained in “speak up” (whistle-blowing) by 2024
- 35% reduction in injuries by 2024 compared to 2018
- 100% increase in people benefitting from local community initiatives by 2024 compared to 2018

Governance and Commitment
Discipline to drive results with a governance committee, leadership compensation and new CNH Industrial business system

New governance committee
- New quarterly Executive Sustainability Committee chaired by the CEO, and Environmental, Social and Corporate Governance Board Committee

Leadership compensation linked to sustainability
- 20% leadership variable compensation linked to sustainability

New CNH Industrial Business System
- Next-level lean approach to increase agility and focus on customers

We are making every effort to reduce our carbon footprint and increase our use of clean energy. Between 2020 and 2021, for example, five of our plants around the world were fitted with photovoltaic solar panels.

To support the circular economy and improve eco-efficiency, we are developing precision farming technologies to save water and reduce fertilizer use and waste, and we have introduced a target to develop design criteria for all new products to make them fully recyclable. Internally, we are training our employees to ensure an injury-free workplace, promoting a culture of diversity and inclusion, building community initiatives and strengthening governance to monitor and reward sustainability targets.
RECOGNITION AS A SOCIALLY RESPONSIBLE COMPANY

CNH Industrial’s commitment to sustainability and results achieved in this regard have once again ensured the Company’s inclusion in some of the world’s most prestigious sustainability equity indexes and resulted in ratings from specialized sector-specific agencies.

Our commitment has earned us recognition as one of the world’s leaders in sustainability. We are determined to advance this cause as a business focused on agriculture and construction. Some of these recognitions are shown below.

- Platinum Ecovadis Sustainability Rating 2021
- INDUSTRY TOP SCORER in the Dow Jones Sustainability World and Europe Indexes for the 11th consecutive year
- Gold Class 2022 Sustainability Award from S&P Global
- A LIST for tackling climate change as well as acting to protect water security in CDP’s assessment
- AAA MSCI ESG Ratings

Note: info refers to 2021 as presented at the Company’s Capital Markets Day on 22 February 2022

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ENGAGING our staff, suppliers and local communities in sustainability initiatives
THE BEACH CARE PROJECT

CASE CONSTRUCTION EQUIPMENT HAS JOINED WITH SCHOOLS AND SCIENTIFIC RESEARCHERS TO CLEAN UP PLASTIC WASTE ON BEACHES IN ITALY AND FRANCE. AS WELL AS TACKLING POLLUTION, THE INITIATIVE IS BUILDING LOCAL ENGAGEMENT AND INCREASING AWARENESS OF ECOSYSTEMS.

Some of the best-loved beaches in the Mediterranean have also become some of the most polluted. As well as garbage washed up from the sea, plastic waste left behind by sunseekers litters the coastline. In 2020, CASE took part in a beach-cleaning project near Naples, where the River Sarno, one of the most heavily polluted in Europe, joins the sea. The response to the clean-up from people living nearby was so positive that CASE resolved to do more.

“There was a lot of interest from the local community, so we decided to create a more structured project where a beach clean-up would be the first step. The engagement would continue with teachers and children in the classroom, learning about the beach environment”, says Francesca Asteggiano, Head of Marketing and Commercial Operations for CNH Industrial’s Construction segment in Europe.

In 2021, CASE joined with researchers from the Consiglio Nazionale delle Ricerche (CNR) in Italy and the Comité National de la Recherche Scientifique (CNRS) in France to launch the Beach Care Project. Local schoolchildren helped to collect plastic waste from beaches, and researchers are now analyzing the impact of the pollution on the beach ecosystems.

The project is also being used to highlight the potential of the circular economy, with plans to produce an educational, interactive toy made from recycled waste and recyclable materials. These toys will be sold in shops across Italy and the proceeds reinvested into future beach-cleaning projects.

ENGAGING LOCAL COMMUNITIES

In just two days, using a CASE 621G Evolution wheel loader on beaches in Apulia and Sicily, five tonnes of waste were collected. Sixty-five percent of the rubbish was plastic — this included bottles and cups, as well as disposable masks and gloves used during the COVID-19 pandemic.

“More than half the litter on the beaches is there because there’s no proper waste management on land, which also results in a continuous stream of litter into the sea”, says Daniela Ropolo, Head of EMEA Sustainable Development Initiatives at CNH Industrial.
The ‘skeleton bucket’ on the wheel loader used for the beach clean-up is designed so the sand that is scooped up can be easily separated from the rubbish. With the help of the researchers working on the Beach Care Project, the schoolchildren taking part learned to separate the materials collected and discussed what could be recycled and what could not.

In France, as well as cleaning up waste, the researchers are looking into the best way to protect an endemic seagrass species called *Posidonia oceanica*. Dead leaves from Posidonia seagrass meadows wash up on Mediterranean beaches during the autumn, building up into mounds, known as banquettes, which play an important role in preventing coastal erosion during winter storms.

Close to four hundred schoolchildren have taken part in the clean-up days in Italy and France, and Ropolo says educating them about the impact of pollution has a double benefit for local communities. “It’s so important to educate the younger generation as their parents become involved, too”, she explains.

Two celebrity endorsers have also been recruited to raise the profile of the project. Italian TV presenter Roberta Morise and Sergio Parisse, captain of the Italian rugby team, who also plays for Toulon on the Mediterranean coast of France, joined the children for the beach clean-up near Nice in December 2021.

For the next phase of the initiative, more coastal clean-ups are currently being investigated and they could include additional locations in Spain and the UK during 2022, although feasibility and details are still being finalized. The scope of the project will also expand beyond the schools in France and Italy that have taken part in beach clean-ups in 2021. Educational kits created by CASE’s research partners will be distributed to teachers in both countries in 2022, teaching ten thousand children about beach ecosystems and sustainable lifestyles.

To increase its impact and secure its legacy, the Beach Care Project is also sponsoring two postgraduate research scholarships linked to beach ecosystems — one place has already been awarded in Italy.
FEMALE EMPLOYEES FROM CASE CONSTRUCTION EQUIPMENT VOLUNTEERED FOR HOUSING CHARITY HABITAT FOR HUMANITY AND FOUND IT HIGHLY REWARDING. AS WELL AS HELPING TO BUILD HOMES FOR VULNERABLE WOMEN IN WISCONSIN, THEY LEARNED VALUABLE LEADERSHIP SKILLS AND STRENGTHENED CNH INDUSTRIAL’S COMMITMENT TO DIVERSITY AND INCLUSION.

CASE has leveraged its expertise in the building sector to support the housing needs of some of society’s most vulnerable. In August 2021, twenty CASE employees, all of them women, volunteered to support non-profit housing organization Habitat for Humanity in Racine, Wisconsin, on the shores of Lake Michigan, in its first ever Women Build event.

Founded in Georgia, USA, in 1976, Habitat for Humanity today operates around the globe and has helped build, renovate and repair over 600,000 decent, affordable houses for more than three million people worldwide.

In Racine, the NGO is building affordable housing to support single mothers and draw attention to housing inequality.

“It was especially powerful because we were able to celebrate being women together, and also help other women”, says Jessica Klein, Marketing Communications Manager at CASE Construction Equipment in Racine, who was one of the volunteers.

AFFORDABLE HOUSING

Habitat for Humanity has sold around one hundred new or refurbished homes in Racine to date, providing safe, affordable housing for 164 adults and 213 children. Each is priced at fair market value. Loans are interest-free and mortgage payments are calculated to remain below 30 percent of the homebuyer’s monthly income.

Single women, and especially single mothers, face many challenges to access safe, affordable homes in the USA. They can pay up to 2 percent more for their homes and sell them for up to 3 percent less than single men due to implicit bias and prejudice built into the home-buying process, according to Grant Buenger, Executive Director of Racine’s Habitat for Humanity.

Buenger argues that the Habitat for Humanity projects ensure affordability regardless of gender and protect women from paying higher costs for their homes. “Our homeowners start their homeownership journey with no deficit and gain the strength, stability and self-reliance needed to care for their families”, he says.
PROMOTING INCLUSION, EQUITY AND ENGAGEMENT

Our Company is committed to creating a diverse, equitable and inclusive environment where all employees are valued, empowered and encouraged to make a difference.

In 2021, CNH Industrial adopted new diversity and inclusion (D&I) targets, which it is aiming to achieve by the end of 2024. These include a commitment to increase year-on-year the representation of women across the total workforce, institutionalizing gender equality practices on career and compensation, and women in 20 percent of leadership roles by 2024.

To further strengthen D&I efforts and outcomes, the new position of Chief Diversity & Inclusion, Sustainability and Transformation Officer was introduced in 2021 and is included within the Company’s Senior Leadership Team. The mission of this new role is to maximize the impact and efforts of D&I on CNH Industrial’s new Strategic Business Plan and overall corporate culture.

To establish a diverse, inclusive and attractive workplace well into the future, the Company is carrying out initiatives that ensure women and minorities are represented in our talent pipeline, as well as increasing the number of women in leadership positions across the organization. In addition to providing unconscious bias training to all employees, we are encouraging them to start new Employee Resource Groups (ERGs) while increasing membership and participation of existing groups. The Company is also creating region-specific initiatives that advance our D&I efforts.

WOMEN HELPING WOMEN

As part of their volunteering project, CASE women helped prepare wood boards for building, first cutting them to size. The women then fastened the boards together with nails and screws to create the four walls of a new house.

“It was very empowering”, Klein says.

The most powerful experience for the twenty CASE volunteers was welcoming families to the new homes that they had spent the day helping to build. Seeing women and children get their first sight of the “beautiful homes, which are open-plan with white woodwork and pale-yellow walls” was particularly emotional.

“This was incredible to see”, says Klein. “These women were so appreciative. But we were more appreciative that they shared their experience with us.

“The day created a wonderful warm environment and a good energy among us, and it also provided a safe place for these families to overcome their struggles and get back on their feet”, she adds.

The volunteer day helped to empower women both within the business and the communities in which CASE operates, building on CNH Industrial’s ambitious new diversity and inclusion targets.
During the pandemic, Nathalia Godinho, Talent Development Specialist at CNH Industrial’s plant in Sorocaba, Brazil, came up with an idea to simultaneously solve a skills shortage and a gender imbalance. Working with her colleagues and federal training program Emprega+, she created a training initiative called Emprega+ Women.

As a result of this, 13 women were hired at the plant.

“When CNH Industrial talks about diversity and inclusion, it makes it happen“, she says. “Leading this project has allowed me to see our values take concrete shape”.

EMPOWERING WOMEN

Women account for just 15 percent of the 2,500 employees at the plant in Sorocaba, an industrial town near São Paulo. The new initiative offers candidates courses to become logistics operators, mechanical adjusters, production line feeders and quality inspectors. People with these skills are in great demand at Sorocaba’s factories, so the hope is that women who complete the course increase their chances of employment.

The course consists of two hundred hours of study and training that take place in the evenings from 6pm to 10pm, so that women who are stay-at-home mothers or who have day jobs can attend. They are also offered additional support including meals, transportation and uniforms or workwear, as well as the protection equipment that’s essential for on-site training.

“In addition to creating job opportunities for low-income women, we want to debunk the idea that industry is a place for men only”, says Cláudio Costa, HR Manager in Sorocaba and Piracicaba.

To enroll, women must have completed high school. They also undergo means testing to analyze minimum family income. The candidates are interviewed before being offered a place in the program.

Costa says demand has been greater than anticipated. He wants to organize a new edition of the program in 2022. What’s more, he says other plants in Brazil want to add new courses, such as finance, where there are also skills shortages.

Godinho is thrilled. “It’s the best project I’ve ever worked on”, she says.
EMPLOYEE VOLUNTEERS DEDICATE THEIR FREE TIME TO SAVING A STRETCH OF THE CHESAPEAKE BAY WATERSHED FROM POLLUTION AND EROSION

Throughout the growing season in New Holland, Pennsylvania (USA), employee volunteers from the campus of CNH Industrial's agricultural machinery manufacturer New Holland are out walking through an immature streamside forest, monitoring the vitality of acres of newly planted trees.

These employee volunteers are part of the constantly growing New Holland Campus Sustainability Team, which has been dedicated to a vast project that planted more than two thousand trees to help improve the health of the Chesapeake Bay watershed.

THE NEW HOLLAND CAMPUS SUSTAINABILITY TEAM IS CONSTANTLY SEEKING OUT OPPORTUNITIES TO PLANT NEW RIPARIAN FOREST BUFFERS.

A FRAGILE ECOSYSTEM AT RISK

The Chesapeake Bay watershed is a vast drainage basin fed by a giant system of creeks, streams and rivers, which extends over 16.5 million hectares (40 million acres) and spans six states — Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia. This beautiful expanse of waterways is home to more than 18 million people and is one of the most ecologically and economically important parts of the US east coast, but its future is at risk from pollution and erosion. Within the watershed sits the 141-hectare (348-acre) New Holland site.

The New Holland Campus Sustainability Team has taken on the challenge of re-instituting vegetation along the stretch of watershed on their doorstep. The trees, shrubs and other plants that grow next to streams and rivers are critical to the health of the Chesapeake Bay. These forest buffers, which are also called riparian or streamside buffers, prevent pollution from entering waterways, stabilize stream banks, cool streams during hot weather and keep agricultural land productive by helping to prevent flooding and soil erosion. More than half of the Chesapeake Bay region's native animal species — including wood ducks, bald eagles, turtles and amphibians — depend on forest buffers for food, shelter and access to water.

The buffer planted on the New Holland campus used native trees and shrubs, such as American sycamore, white oak, red maple, pawpaw and many others, to keep invasive non-native plant species at bay while improving pollinator habitat and boosting local wildlife.

COMMITMENT TO THE ENVIRONMENT

Ryan Romanowski, who is a Gross Margin Improvement Engineer for CNH Industrial in his day job, is also co-chair of the New Holland Campus Sustainability Team. He describes its volunteers as a “grassroots team of employees who are passionate about environmental sustainability”. Working alongside partners from the Alliance for the Chesapeake Bay, the team was able to get the buffer planted even in the midst of the pandemic. “We are so passionate that we want to get this done”, says Romanowski. The team continues to maintain the buffer planted on the campus and is constantly seeking out opportunities to plant new ones.

In three to five years’ time, the riparian forest buffer should have grown enough to become mostly self-maintaining. The New Holland Campus Sustainability Team has also grown since the moment of its first great achievement and some team members have been inspired to form sub-committees to take on new sustainability projects. They are focused on various initiatives including recycling and reducing energy consumption, growing and donating produce to the local food bank, enhancing pollinator habitat and implementing agricultural best management practices on the Company farm.

The riparian forest buffer project continues to be a source of inspiration, as environmental sustainability increasingly becomes a topic of conversation among the 1,200 employees on the New Holland campus.

“We care about farmers’ land, that’s our business”, says Romanowski. “We want to work in tandem with farmers, the community and environmental enthusiasts to affect positive environmental change for everyone, locally and downstream”.

A SUSTAINABLE YEAR
A Sustainable Year

Benefits of a Sustainable Supply Chain

CNH Industrial has championed sustainable practices among its suppliers for many years. Despite the pandemic, this has continued to be managed with determination to make progress on the company’s sustainability priorities.

Francisco Rondinelli, Head of Purchasing at CNH Industrial, has had a rollercoaster year. Pandemic lockdowns created supply-chain bottlenecks in essential supplies that challenged the company’s manufacturing activities throughout 2021.

But for Rondinelli, more than a decade of working hand-in-hand with suppliers, promoting dialogue and sustainable practices have remained fundamental regardless of the crisis.

Close collaboration with suppliers in the quest for sustainability allowed CNH Industrial to remain committed to its sustainability goals while overcoming the challenging supply-chain situation together.

“We believe that our sustainable approach fosters long-term relationships with suppliers in the interest of both parties, as it helps to ensure continuity of supply and improves overall sustainability along the entire supply chain”, Rondinelli explains.

The pandemic has further evidenced the importance of maintaining a resilient supply chain going forward. It’s now also about “rethinking how to best manage the supply chain to remain effective, sustainable and competitive in the changing scenario”, Rondinelli says.

That includes fundamental changes such as bringing manufacturing nearer to home. “We need to have suppliers close to our production plants to increase the sustainable aspects, for example, reducing the carbon emissions associated with transport”, he says.

Monitoring the Entire Supply Chain

In 2021, nearly 1,400 suppliers, who provide three-quarters of the company’s direct material purchases, completed a questionnaire about their sustainable practices. The questionnaire is drawn up by the Automotive Industry Action Group, according to globally embraced sustainability principles. It asks suppliers for information on their record on human rights, the environment, compliance and ethics, diversity, and health and safety. In addition, in 2021, 95 sustainability audits took place mainly remotely at supplier plants.

Even in 2021, as businesses faced unprecedented stress due to the pandemic, no critical issues emerged from the audits and no contracts were suspended or terminated.

Rondinelli hopes that this will encourage suppliers to cascade CNH Industrial values to their own networks. “Outstanding suppliers already monitor and promote sustainability [themselves]”, he says. He concludes that the pandemic has reinforced the company’s ambition to champion supply-chain sustainability “to be more competitive for ourselves and more attractive to our stakeholders”.

Note: the figures in this article refer to CNH Industrial pre-demerger (including also Iveco Group suppliers).
Over the past year, CNH Industrial has covered the roofs of five of its manufacturing plants with photovoltaic panels that generate clean electricity.

Together, the amount of energy they produce cuts the company's annual carbon footprint by 2,500 tonnes of CO₂ a year. To put this in context, a tree growing in a city with a temperate climate is capable of absorbing about 20 kilos of CO₂ on average per year — so this solar panel initiative is equivalent to the annual absorption of about 125,000 trees. And this is just the beginning.

The roof panels are part of the company's net-zero emissions strategy and by 2030 all its plants are expected to have them. Giorgina Negro, now Energy Department Head at Iveco Group, was head of the Energy Department at CNH Industrial in 2021 when the project was launched. "It makes perfect sense", she says. "Given we have enormous amounts of roof space, these panels are going to help us achieve our renewable energy targets by 2030. They are easy to install and quick to deliver the renewable energy".

A program to install solar panels on the roofs of all CNH Industrial’s manufacturing plants by 2030 will significantly cut the company’s carbon footprint and is already delivering cost benefits.
She estimates that a typical plant has about 50,000 square meters of roof, an area equal to seven football (soccer) pitches. Many are situated where the sun shines throughout the year, providing the perfect opportunity for generating significant amounts of clean energy. To maximize the benefits, the Company takes a systematic approach to prioritizing which plants get the panels first.

“To choose which plant to prioritize for solar system installation, we consider multiple technical factors: solar radiation levels, plant location, energy consumption and cost for that plant, to see where we might have the greatest benefit”, Negro explains.

According to these criteria, the top five were plants in Greater Noida, Uttar Pradesh (India); Zedelgem (Belgium); Querétaro Mexico; Saskatoon (Canada); and Belo Horizonte, Minas Gerais (Brazil). The largest — India’s Greater Noida plant in Uttar Pradesh — has a weighty 3,388 panels with an annual output of 1.745 million kWh of renewable energy. Just on its own, this power-generating roof cuts CNH Industrial’s CO₂ emissions by 1,304 tonnes a year.

The energy produced by the photovoltaic system is consumed by the plant itself, which in addition to reducing its CO₂ emissions reduces its energy bills.

Given the span of the solar panel project across three continents, CNH Industrial uses local experts who can advise on the best way to get things done. “We work with a number of partners who have great local knowledge about regulations, legislation and the different renewable energy grants”, says Negro. “In each case, the preparation, planning and form-filling is quite different. Even within Europe, Germany is different from France in terms of deadlines or the process for qualifying for grants, for example”.

Local bureaucracy is not the only challenge. To complete the installation in time, it is crucial to find the right partner who knows all safety, legal and other requirements of the project in that specific country.

Despite the challenges, the results are well worth the effort.

“As energy costs are rising, photovoltaic panels make even more sense. But that isn’t the motivating factor. This is about zero emissions”, says Negro.

“One of the questions we get when we visit our facilities is about when photovoltaic systems will be installed. This topic is very close to the hearts of all employees, who are increasingly aware of sustainability issues. Everyone knows the benefits and everyone’s very proud of what we’ve started”, she says.

■

**SPOTLIGHT ON THE NUMBERS**

- **Five plants**
- **12 months**
- **More than 7,800 solar panels**
- **Around 4G Wh of clean energy a year**
- **Cuts CNH Industrial’s carbon footprint by about 2,500 tonnes of CO₂ a year**
- **The equivalent of planting about 125,000 trees**
INVESTING IN PRECISION FARMING EXPERTISE

RECENTLY ACQUIRED RAVEN’S EQUIPMENT CONTROL AND AUTOMATION TECHNOLOGY WILL ENABLE FARMERS TO GET BETTER RESULTS USING FEWER CHEMICALS AND REDUCE THE STRAIN ON TRACTOR OPERATORS

“We’re learning how the workflow is impacted when you take the driver out of the equation.”

In November 2021, CNH Industrial bought Raven Industries, a pioneer in precision agriculture and automation, and a long-term partner of the Company. The acquisition, for $2.1 billion, has helped CNH Industrial expand its precision agriculture technology and automation capability as it works toward its goal of fully autonomous vehicles. Greater control and automation have significant sustainability benefits.

“Getting the right product in the right place at the right time is what you’re striving for”, says John Preheim, VP of Engineering at Raven Industries, which is based in Sioux Falls, South Dakota (USA). Human error is the most common reason why this doesn’t happen. Raven’s precision farming technology is designed to ensure farmers spray crops with just the right amount of pesticides, or apply just the right amount of fertilizer at the right time.

As the sprayer passes through the field, a control system makes sure the boom remains at the optimum height off the ground, compensating for changes in terrain. Each nozzle is individually controlled and ensures droplets are the right size, which is one of the biggest factors determining the efficacy of the chemicals being applied. Path-planning technology ensures that every part of the field is covered without duplication.

“The application controls are very positive from a sustainability standpoint because they maximize the impact using fewer chemicals”, says Eric Shuman, General Manager of Raven. The two companies have worked together since 1993. Raven’s technology is offered as an add-on to New Holland and Case IH equipment. Although Raven technology has been included out of the factory for many years, now the Case IH Patriot 50 Series Sprayers, which will go on sale at the end of 2022, will be the first machines to launch with Raven’s technology post acquisition.
Raven’s VSNTM visual guidance system will be among the advanced technologies on the Patriot 50 Series. Easier to use and more efficient than expensive and complex RTK networks, it uses camera technology to guide the sprayer along the row without damaging the crops on either side.

The system also mitigates misapplication, which can cost farmers up to 2 percent of their yields and profits, and speeds up the spraying process, allowing operators to cover 20 percent more land, and improving field planning efficiency. Drivers are less fatigued and operators can increase the average length of their working day.

“Customers who have used it really don’t want to go back to not having it”, says Preheim.

Raven carried out a study on the stress levels of operators using VSN and those driving the sprayer without it. Measurements taken from a bracelet monitoring heart rate and perspiration showed 50 percent fewer stress events when drivers had the guidance system.

“Vehicle autonomy brings sustainability benefits as well, particularly from path planning”, says Shuman. “Fewer passes through the field mean lower emissions from the vehicle and less soil compaction”.

Raven has also developed a fully driverless agricultural vehicle that can autonomously change between a range of implements including a sprayer, spreader and seeder. The vehicle has no cab and follows a path plan set by the farmer using the OMNiPOWER™ software. “It is being used commercially by a small number of ‘early adopter’ customers. Raven is also leveraging it for technology development and demonstration”, says Preheim.

“Vehicle autonomy brings sustainability benefits as well, particularly from path planning”, says Shuman. “Fewer passes through the field mean lower emissions from the vehicle and less soil compaction”.

Raven’s fleet management technology is improving sustainability and building on CNH Industrial’s in-house expertise, putting the Company at the forefront of precision farming. Its logistics planning tools let big farm owners keep track of where all their vehicles are at any one time, cutting out unnecessary journeys and reducing the amount of time spent idle.
BY SWITCHING DELIVERIES OF TRACTORS FROM ROAD TO RAIL IN INDIA, CNH INDUSTRIAL IS LOWERING CARBON EMISSIONS, MAKING SIGNIFICANT SAVINGS AND CUTTING DELIVERY TIMES.

On September 2, 2020, the first train fully loaded with one hundred new, gleaming red and blue Case IH and New Holland tractors from CNH Industrial’s plant in Greater Noida (India) pulled out of the nearby station heading for Benapole in Bangladesh, 1,545 kilometers (960 miles) away.

The journey from plant to final destination took just seven days, compared with up to 21 days by road alone. But it wasn’t just quicker — this new route, which is mainly by rail, was also more sustainable, cutting the amount of CO₂ emissions associated with transporting that number of tractors by road by more than four tonnes. It was more cost-effective and safer, too.

“It’s not just about lower emissions and being quicker. Rail is also safer.”
“Sustainability is of course good. But it’s also about money. We only undertake sustainable actions if they are cost-effective”, explains Fabrizio Sanna, the Company’s APAC Transport Logistics Head.

In the 15 months since that pioneering rail journey, CNH Industrial has commissioned a further 27 trains and transported a total of 3,394 tractors by rail, saving more than 142 tonnes of CO₂. Of that total, 1,003 tractors have been exported to Bangladesh.

“Before, all the tractors would have gone by road freight”, says Dileep Singh, Head of Transport Logistics, India, at CNH Industrial. “But it’s not just about lower emissions and being quicker. Rail is also safer. There’s less chance of damage to the tractors and they are kept cleaner during the journey in closed wagons”. It all adds up to better quality products delivered to our customers.

The switch to rail transportation is an extension of CNH Industrial’s Transport Logistics experience in Europe, where Sanna previously worked. First, he and his team in India looked at what was possible and reviewed the potential savings — whether CO₂ emissions, money or time. Once they knew that it was indeed worthwhile, they turned to the practicalities.

COMPLEX LOGISTICS
“It takes a lot of planning with internal and external stakeholders — from production at our plant to booking the trains, transporting the tractors to the stockyards and loading them, crossing state boundaries and even transiting the international border after customs clearance at Ranaghat, and getting the tractors to their final destination”, says Sanna.

But perhaps most importantly, the team knew it had to fill a train to gain maximum benefits without leaving customers waiting too long for their order.

For travel within India, the maximum number of tractors CNH Industrial can put on a train is 150; for export to Bangladesh, this number falls to one hundred. “We started working with our colleagues at the plant to synchronize production with demand”, Sanna says. “Production planning had to be adjusted so that we could fill a train for a particular destination”.

The planning for a journey has to be meticulous. Whether for export or domestic use, the right documents must be completed within a timeframe and the different stages of transportation seamlessly lined up. For help with this, CNH Industrial’s strategic partners are Indian Railways and Indian Vehicle Carriers, which manage the entire flow from the plant to Benapole in Bangladesh.

SPEED, EFFICIENCY AND SCALABILITY
Once enough tractors are ready to fill a train, it is booked and the tractors are sent to the stockyard by trailer. On the day of travel, there is a seven-hour window to prepare and load the tractors and make all the necessary safety checks. Any delay incurs fines.

The tractors are transported inside wagons that look like huge metal boxes, rather than on an open flatbed. This way they are protected from the elements, helping them stay clean during the journey. Inside, they are lashed into place to prevent them moving about, and the tools, documentation and operator’s manual for each one are placed inside.

“The type of lashings we use had to be tested and approved. But it’s been an iterative process”, says Sanna. “The more journeys you make, the more you learn and improve what you’re doing, so that you minimize damage while becoming faster and more efficient”.

Looking down the line, Singh is hoping to almost double the number of trains during 2022 to 2023, taking the proportion of tractors transported with the majority of their miles done by rail from 9 percent to 11 percent. Nepal is also being considered as an export destination.

“We’ve got ten stockyards across India where we can store tractors before they are sent to distribution centers or their ultimate owners. This offers a great opportunity to expand our tractors by train strategy. That will mean we save more money, cut our carbon footprint further and improve our customer service”, says Sanna. ■
A NEW PLUG-IN SYSTEM THAT TRANSFORMS MECHANICAL ENERGY GENERATED BY A TRACTOR INTO ELECTRICAL POWER WILL HELP FARMERS REDUCE CARBON EMISSIONS, IMPROVE SAFETY STANDARDS AND SAVE FUEL, ALONG WITH OTHER BENEFITS

“This generator is a game-changer. Until now, no diesel-powered tractor could run electric machinery, so no manufacturers made electric versions. With no electric machinery available for diesel-powered tractors, no one wanted to make a system that would convert the tractor power. It’s been a bit of a chicken-or-egg situation”, says Stefano Fiorati, Head of Zero Emissions and Advanced Drivetrains at CNH Industrial.

The Company’s new e-source external electric generator offers a solution to this deadlock. In fact, it has already been recognized at the prestigious EIMA agriculture exhibition in 2021.

“Our entry was the only one last year to win two awards. The e-source generator stood out to the judges in the technical innovation and sustainability categories”, says Fiorati. “And we were the only company, together with Nobili, to present a total tractor-implemented system for electrification”.

MULTIPLE BENEFITS
The e-source generator is plugged into the tractor and converts the power from a diesel engine — mechanical power — into electrical power. It was developed in collaboration with Nobili, the Italian machinery manufacturer. While CNH Industrial was responsible for the generator itself, Nobili created a compatible electric sprayer and a mulcher for vineyards and orchards.

This new generator allows farmers to continue to use their diesel tractors, but in a more environmentally friendly and efficient way. When coupled with electric-powered machinery, it delivers a number of sustainability, safety and economic benefits.

By combining the tractor — a New Holland T4.110V — with the e-source generator and an e-sprayer or e-mulcher, the farmer can run the tractor at a lower engine rpm and enjoys less noise, saving fuel and reducing carbon emissions while continuing to perform the task at the same ground speed of a full diesel application. Safety is also improved.

When a tractor engine directly powers equipment such as a sprayer, they are connected by a rotating cardan shaft, which can trap clothing and body parts. The electric sprayer and mulcher, on the other hand, plug directly into the tractor via an electric socket, removing the cardan shaft and the possibility of anything becoming trapped.

The electrified system has improved responsiveness and accuracy when implementing the hydraulically driven functionalities. And as the system is electric, it is possible to collect data about the machines’ performance that can be fed into maintenance programs to prolong their useful lives.

The decision to focus on mulchers and sprayers for vineyards came from the fact that among vineyard equipment they are the most used, meaning electric versions would deliver maximum benefits. In terms of fuel savings, tests show that a reduction in fuel consumption of 27.8 percent and 34 percent (depending on power take-off speed) can be achieved using the electrified system when compared to a conventional one.

REFINING THE DESIGN
Although the decision to focus on vineyard equipment promised the biggest savings, it also threw up the biggest challenge. According to Fiorati, it was tough to make the e-source generator small enough. The New Holland T4.110V is only one meter wide so it can run between rows of vines.

“We had to make the generator fit. The first prototype was around a cubic meter, which was much too big. But our final version is about 65 percent smaller than that and 300 kg lighter. We had to completely review the design and the components”, he says. But the teams didn’t just take into consideration practicalities — they also paid attention to aesthetics. CNH Industrial’s design team looked at details to better integrate the tractor and the e-implements, designing a bespoke cover compatible with the tractor hood and painting the wheels on the sprayer white so they match those on the tractor.

Now that the two companies have working proofs of concept, they are making sure the equipment complies with all safety standards and other regulations. “We’re working on that now and hope to get the system in production in the next few years. Like everything else, COVID-19 has slowed us down”, he says.

“The technology can be scaled up so it can work with larger tractors that operate bigger pieces of machinery and it can be plugged into the front or the back. This allows it to power machinery that is connected to the front or rear of the tractor”, Fiorati adds.

The connector is also flexible, so it can work with machinery of different sizes and heights, and it is compliant with the upcoming standards around electrification.

The e-source generator has given the CNH Industrial team the know-how to support future projects.

“This really is a great piece of after-market kit”, says Fiorati. “It will allow farmers to continue to use their diesel tractors in a more efficient way and is an enabling factor for future automation. It’s helping to make farming safer and more sustainable. It’s what’s CNH Industrial is all about”. ■
"If we can increase productivity and become more sustainable in one of the most productive agricultural areas in the world, we can do it anywhere", says Eduardo Penha, Marketing Head for Case IH South America.

Brazil’s Mato Grosso — a state three times the size of California — is the country’s leading producer of grains and a major contributor to the world’s food basket. Case IH’s Connected Farm initiative could prove a viable solution as it increases production, reduces carbon emissions and cuts water use, thereby increasing return on investment.

A UNIQUE PROJECT AT A FARM IN BRAZIL THAT DELIVERS 100 PERCENT CONNECTIVITY 100 PERCENT OF THE TIME IS PROVING THAT DIGITAL AGRICULTURE WILL BE THE FUTURE OF FARMING

"Fazenda Conectada (connected farm in Portuguese) is located about ten kilometers (6.2 miles) from the city of Água Boa in this fertile state. Formerly known as Fazenda Jerusalem, it is a three thousand-hectare working soybean and wheat farm owned by a Case IH dealer. In September 2021, the brand, working with telecoms company TIM, set up new infrastructure including two masts to bring 4G to the property. This facilitated digital connectivity for the farm’s machines and workforce, allowing them to access digital services that will help them operate at optimum efficiency with a minimal carbon footprint."
A Sustainable Year

“Our connected farm is unique as it demonstrates the benefits of what can be done by real people with real machines that are connected 100 percent of the time”, says Penha. “We chose a farm in an area that already has high levels of field productivity to showcase to our customers how digital agriculture can make a difference”.

SEAMLESSLY LINKING MAN AND MACHINE

The connectivity runs across five Magnum™ and Steiger® tractors, seven Axial-Flow® 230 and 250 series combines, two Patriot® sprayers and Easy Riser planters. Each element delivers data to the AFS® Connect Center, an office where operators monitor and interpret it, update software and diagnose error messages. This is state-of-the-art agro-management.

“If a sprayer develops a fault, someone from the center calls the machine operator to discuss what’s happened and they try to resolve it. If necessary, an engineer can be dispatched. We’re already seeing this is saving time and improving uptime on our machines”, says Penha.

All communication is done over the 4G network, which also gives the farm workers access to a whole range of information online. This includes location-specific weather forecasts to help plan optimum planting, spraying, watering and harvest times, help with diagnosing parasites or harmful crop diseases, access to online training and much more.

MONITORING FOR MAXIMUM EFFICIENCY

To assess the impact of 100 percent connectivity across the farm, the working area has been divided into three. One section has no enhanced connectivity and uses only traditional machines; the second section is connected to all the solutions; the third is divided into smaller plots to test each connected service to help quantify their individual benefit. The results are being monitored against strict key performance indicators by two independent bodies — Unicamp, one of Brazil’s top universities, and agriculture consultants Agricef. With the first harvest due in March 2022, the full results will be known shortly after.

“Other projects just compare the machines against each other. We wanted the project to take account of everything — people, services, machines — and see what difference each element makes and all of it together”, explains Penha.

He is cautious about pre-empting the final findings of Unicamp and Agricef, but is clearly pleased with how things appear to be going. “It’s fair to say that it seems as if all inputs are already down. This means less fertilizer, which is better for the soil, less water and fewer journeys made by the machines, so less fuel. The machines are breaking down less often and we’re able to maintain them better, so they’ll have a longer life. I think we’ll see productivity and environmental benefits — all externally verified”, he says.

SUPPORTING THE WIDER COMMUNITY

While the agricultural benefits are core to the Connected Farm project, there are also considerable social benefits. Bringing 4G to the farm opens up access to the internet to the wider population — in this case 16,000 people, including 93 adjacent farms, 21 schools and numerous businesses. Today, they can access training courses, telehealth and other useful services. This is important because, according to Anatel, the National Telecommunications Agency, just 19 percent of rural areas across Brazil have internet connection.

“We already know it helps improve productivity, but we’ve never seen it all put together. The Connected Farm will give us hard data so we can help other farmers increase their incomes while reducing the stress on the environment”, says Penha. And it’s good to know the wider population benefits, too.
To feed the world’s growing population, we must produce more food from the same amount of land. At CNH Industrial, we have been looking at how automating some of our machinery can help. What we found was that not only can it increase production, but it also helps to reduce fuel consumption and speed up operations. As a welcome bonus, automation is also helping to address the skills shortage faced by farmers.

Harvesting Benefits from Automated Combines and Balers

With proofs of concept showing significant productivity increases and lower fuel consumption, integration teams at CNH Industrial are now working on production models while the innovation teams are looking at how to repurpose and continue to evolve the technology.

The Complexities of Harvesting

“We started by looking at automation on combines because the combine is a very complex piece of machinery that demands a lot of attention from the operator. Many things can go wrong and harvesting requires highly skilled operators. By adding automation, the machine can start to measure the situation and make value-add decisions”, says Sergio Soares, Head of Machine Productivity, Efficiency and Automation at CNH Industrial.

The present-day combine harvester is a complex and costly piece of machinery that requires highly trained operators to use. However, the machine is still very much under the control of the operator, and the operator has to ensure that the machine is working properly.

Sensors inside the combine, for example, check the crop for density and its condition. If they detect a lot of undesirable material like leaves or rocks, the machine automatically adjusts the rotor speed, cleaning fan and sieves to improve harvest quality and then speeds up to improve productivity.

“This is the sort of event that is very difficult for the operator to see, but that can have a significant impact on the quality of the harvest”, says Soares.

There are also sensors on the back of the combine, checking the flow of the residue straw. “The residue can be used in two ways: it can be spread across the field for organic soil coverage or left in rows to be baled and used for animal feed. The way the residue falls affects the agronomic results for farmers in both cases”, he says.

For optimal crop productivity, farmers need the residue to be evenly distributed across the width of the field just harvested by the combine header, so the whole field is covered with a uniform amount of straw. This uniformity improves the subsequent crop yield. For baling, the baler works best picking up from a uniform bale swath. A crosswind can adversely affect both.

“We’ve put radar sensors on the back that constantly monitor how the residue is falling. If it’s uneven, the software can quickly adjust the spreader speed and deflectors to compensate”, he says.

Besides the automated combine, Soares’s team has been working on an automated baler. Sensors monitor the size of the window and the software adjusts the tractor speed and the packing mechanism so each bale reaches the weight desired by the farmer, while maximizing the machine output. When working in automated mode, the baler can work faster and deliver higher-quality crop and bales.
**IMPROVING EFFICIENCY AND REDUCING EMISSIONS**

Initial tests on soybeans and corn show 5 to 15 percent better fuel economy in liters per tonne, depending on crop and conditions, while at the same time the machines could achieve near 10 percent additional productivity, in tonnes per hour.

One reason why the machines are more productive per hour is that human operators need to be overly cautious, and also suffer fatigue from long working hours in the short harvesting time windows. Automated machines are programmed to keep searching constantly for the optimum settings based on sensor data and artificial intelligence algorithms.

“Automated machines do the same or more work with less fuel, with a more productive and sustainable operation”, says Soares. “So there are lower CO₂ emissions with lower total cost of operation. It makes an unskilled operator as good as a highly skilled one, 100 percent of the time”.

The benefits haven’t gone unnoticed by the farming community. Both the New Holland residue radars with closed-loop spreading automation for combines and the New Holland baler automation system for the BigBaler Plus and BigBaler High Density large square balers and tractors won silver medals at the Agritechnica Innovation Awards 2022, among the most prestigious prizes in the sector.

The New Holland CR combine harvester with its IntelliSense™ automation system and the Case IH Axial Flow 250 series with Harvest Command were launched in 2019 and the technology is now being adapted for balers such as the BigBaler Plus series and the BigBaler High Density series.

“We can definitely repurpose the radar system for fertilizer spreaders and the windrow perception with the laser scanner and control system for windrowers in the USA and self-propelled forage harvesters in Europe”, he says. “This is all working toward making a 100 percent connected farm, where emissions are reduced and productivity increased. This also mitigates the skills shortage, making it a major benefit to the final customer and to society”.

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**ABOVE: THE NEW AUTOMATION SYSTEM IS WORKING TOWARD A 100 PERCENT CONNECTED FARM. ABOVE RIGHT: THE NEW HOLLAND BIGBALER HIGH DENSITY FEATURES AWARD-WINNING LOOP MASTER™ KNOTTING TECHNOLOGY.**
The New Holland T6 Methane Power tractor is the first of its kind to be powered by methane, reducing emissions without compromising on performance. It is also the final piece in the puzzle to complete the virtuous cycle of New Holland’s Energy Independent FarmSM concept and its Clean Energy Leader® strategy, which aims to make the agricultural sector fit for the challenges of the 21st century.

The methane-powered tractor was conceived with the principles of the circular economy and zero waste in mind. Farmers can use animal and agricultural waste to generate biomethane. The fuel powers the tractor. The tractor then helps to grow more crops to feed the animals and for sale. Alternatively, farmers can fill up at biomethane stations or directly from the gas grid network.

REDDUCING EMISSIONS

Mark Howell, New Holland Agriculture’s Global Product Manager Alternative Fuels, says the launch of the New Holland T6 Methane Power tractor represents a paradigm shift in sustainable agriculture. It is especially important for cattle farms because cows produce methane, a greenhouse gas that traps 86 times more heat than CO2. As the impact of methane on climate change has become clearer, dairy farms have come under pressure to reduce their emissions.

According to the Food and Agriculture Organization of the United Nations, about 1.5 billion cattle globally produce 60 percent of livestock emissions — almost 40 percent in the form of methane. Agricultural activities as a whole account for 10 to 12 percent of global greenhouse gas emissions.

But while agriculture contributes to global warming, it can also be part of the solution. Farmers, scientists, engineers, entrepreneurs and food companies have been collaborating to find ways to rethink farming practices. New Holland has been investing in R&D in low-carbon farming for over 15 years. This complements the strong technological know-how built over the years within CNH Industrial. In addition, the Company has recently acquired a minor stake in, and begun collaborating with, alternative fuels tech company Bennamann, based in Cornwall (UK).

This partnership is further evidence of CNH Industrial and New Holland’s long-standing commitment to investing in productivity-enhancing, sustainable technologies, which bring real-world benefits to farmers.
Bennamann has pioneered a way to convert fugitive methane into valuable biofuel. Cattle manure is swept into enclosed lagoons or slurry pits where it gradually decomposes, emitting (fugitive) methane and other greenhouse gases. Unwanted pollutants are filtered out and a processing unit converts the remaining gas into compressed methane for use in vehicles. This solution is quite a breakthrough as it even works for small-scale farms — anywhere in the world and with as few as 100 cows — that often cannot take advantage of many energy solutions due to their size.

When used in the T6 Methane Power tractor, this biofuel produces negative CO2 emissions, 85 percent less particulate matter and 80 percent less overall emissions. Biomethane reduces emissions by replacing fossil fuels, abatement of fugitive methane from manure, producing green fertilizers and enabling carbon reuse.

As well as processing and producing the fuel, Bennamann manages metering, storage, collection, aggregation and local distribution using satellite and Internet of Things technology.

**HIGH PERFORMANCE, HIGH RETURN ON INVESTMENT**

The T6 Methane Power tractor’s engine was developed in-house by FPT Industrial and features an all-new NEF 6.7L powertrain, specifically developed for agricultural applications. The new tractor has the same power and torque as New Holland’s traditional tractors.

“You cannot tell the difference. Even though the technology is completely different, the driveability of the tractor and the performance are identical. It lives up to the brand reputation”, says Howell. “Farmers ask me if they can replace their old traditional tractor with the T6 and if it will be able to do the same things. The answer is yes”.

New Holland launched the tractor in 2021, with visits to customers in the USA, Brazil and Europe. There has been such enthusiasm for the vehicle that there is already a waiting list to get one delivered.

Howell explains that the technology driving the T6 Methane Power tractor can also be harnessed by farms to create new revenue streams, such as providing an independent fuel station and powering the farm with electricity.

“Not only do we keep our customers in business, we provide a profitable second source of income for them”, he says. “We can reduce their current costs, or they can sell excess gas back to the general public. We can also portray dairy farmers in a positive light and help the climate by reducing our use of fossil fuels”, he adds.

**PROOF OF CONCEPT AND FUTURE PLANS**

This circular economy model is already a reality at Il Raccolto, New Holland’s smart farm in Bologna (Italy). Biogas is produced, stocked and used on-site, allowing the farm to be carbon-neutral and energy independent.

Kelly Manley, Chief Diversity and Inclusion, Sustainability and Transformation Officer at CNH Industrial, says the success of the New Holland T6 Methane tractor has set the bar for future developments across the whole Company. “Our biomethane tractor is a perfect example of our commitment to innovation. We will also accelerate our efforts on product water and waste optimization”, she says.

By 2024, CNH Industrial will design all new products according to the criteria. And by 2030, new CNH Industrial equipment will be 90 percent recyclable. This gives customers the ability to have a direct and personal influence on sustainability — and do it profitably.
Since January 2021, a new interdisciplinary team at CNH Industrial has been working to achieve the target of developing 100 percent of the Company’s new products according to sustainability design criteria by 2024.

The team is composed of experts who come from a number of different departments — product development, innovation, simulation, sustainability, materials engineering, manufacturing and compliance. Their first goal was to create a complete Life-Cycle Assessment (LCA) of one of the Company’s most energy-hungry products — a CASE F Series compact wheel loader — which is produced at the Lecce plant in southern Italy. The project was carried out in collaboration with the University of Salento (Italy).

“We want to promote a circular life-cycle approach”, says Gennaro Monacelli, Head of Design Analysis and Simulation at CNH Industrial. “This is the first time we have developed the Life-Cycle Assessment methodology for a full vehicle, rather than only for some vehicle systems”, he adds.

LIFE-CYCLE METHODOLOGY
LCAs analyze the environmental impact of a product throughout its useful life. The process starts with an assessment of the energy use and environmental impact of the materials needed to assemble a particular product, including transportation to the manufacturing plant, and repeats this exercise through production, use and end of life. At each stage, the LCA totals up the environmental cost of materials, energy, waste and emissions, including fuel and maintenance during operations and the cost of disposing of the product once its work is finally done.

PRIORITIZING LIFE-CYCLE THINKING
CNH INDUSTRIAL HAS BROUGHT TOGETHER A MULTIDISCIPLINARY TEAM TO UNDERTAKE THE LIFE-CYCLE ASSESSMENT OF ITS CASE CONSTRUCTION EQUIPMENT COMPACT WHEEL LOADER, A FIRST STEP TOWARD ASSESSING THE FULL ENVIRONMENTAL IMPACT OF ALL ITS PRODUCTS FROM CRADLE TO GRAVE
The advantage of this 360-degree exercise is that Design Analysis and Simulation Teams can intervene at any stage of the process with the goal of lowering the overall environmental footprint of a product.

Vito Martina, Head of Vehicle Integration Technology and Engineering Services, says the compact wheel loader was an ideal candidate for an LCA assessment. “It’s one of the products used in the most intensive way. In particular, a huge quantity of energy is used to run the machine, in the farm of oil”.

The engineering team redesigned the engine of the compact wheel loader to allow it to run on electricity instead of fuel oil, significantly reducing its carbon footprint. Martina says he is really proud that the team has managed to electrify the machine. “It’s another step in the direction of zero emissions”.

Monacelli says the advantage of considering the life cycle of a product from cradle to grave is that it allows the team to completely rethink how products are made. “When you start a new product design you have more freedom to choose materials and solutions that are eco-friendly, and bring fewer design constraints”.

Stefano Largo, Structural Analysis Expert, says there’s another clear benefit of team members working together. “We share information from the beginning of the project to the end. This is positive in terms of sustainability and a strong point in terms of getting to eco-design solutions”.

The assessment was carried out in two phases. The first, completed in 2021, quantified the carbon footprint, human health, ecosystem quality and impact on climate change of the entire life cycle of the product. It began its second phase in 2022, which involves an application for the internationally recognized ISO TS 14067 certification that determines the carbon footprint of a product, and Life-Cycle Assessment ISO 14040 Series certification.

LIFE-CYCLE THINKING ACROSS THE COMPANY AND SUPPLY CHAIN
CNH Industrial recognizes the real importance of promoting a circular product life cycle in which resources are used fully and for as long as possible, and whereby products and materials are recovered and regenerated at the end of their service. The Company offers a range of products that can run on fuels derived from renewable sources, and it is committed to adopting sustainability criteria from the design stage to develop more environmentally friendly products.

To maximize product life, the Company also offers its customers a range of remanufactured spare parts, in line with its circular economy approach. In manufacturing processes, particular emphasis is given to improvements that increase waste recovery and reuse, and the Company has pledged to recover 95 percent of waste at its plants worldwide by 2024.

The compact wheel loader project is just the start of the quest. Monacelli says the intention is to apply this methodology to more product lines, such as small and medium-sized tractors and other crop harvesting products.

“In this way we are going to make sure the criteria of sustainability are embedded into development, design and engineering of all product lines”.

Mario Girardi, Chief Compact Wheel Loader Product Engineer at the Lecce plant, says another focus of the team has been to work not only across CNH Industrial’s functions, but also to extend this approach to the Company’s suppliers.

“It’s important to have everyone on board — both internal teams at the Company and external stakeholders. It is crucial to engage the supplier base so we can also consider how raw materials are produced”.

ENSURING the safety and wellbeing of our people through design, training and technology
The health and safety of employees is a high priority for CNH Industrial across all its sites. But with physical jobs, strains resulting from lifting, pulling and repetitive actions on plant production lines can still occur. Back, shoulder, wrist and hand problems are most common among employees.

To minimize and treat such strains on the body, health and safety teams in North America are carrying out a range of ergonomic improvements. A combination of solutions, including new wearable technologies and deep-tissue massage, is paying off.

As a result of the ergonomic investments at five sites in North America — Grand Island (Nebraska), New Holland (Pennsylvania), Racine (Wisconsin) and Wichita (Kansas), in the United States, and Saskatoon in Canada — the cost of work-related long-term strain incidents fell by 34 percent when compared to the previous year.

Wearable Technologies and Massage Make Facilities Healthier and Safer

New technology and more traditional therapies combine to prevent and treat work-related strains among employees at CNH Industrial’s plants in North America.
TECHNOLOGY TO MONITOR POSTURE
At the Saskatoon site, which makes New Holland cultivators, planters and combine heads, the health and safety team is using wearable devices to gather ergonomic data from employees. The project has two goals: the first is to increase self-awareness of hazardous movements; and the second is to build an accurate picture of where movements likely to cause strains are most commonly occurring, and take remedial action.

"People clip the small device onto the back of their shirt and through the day it detects the movement of their spine", explains Zoey Bourgeois, Health and Safety Specialist at the plant. "If they move in an awkward or straining position, it gives them a vibration on the back of their neck. It makes people more aware when they are in a poor ergonomic posture".

Employees wear the device over a period of ten days and the data it produces is shown in real time on a dashboard of metrics viewed by the health and safety team. They are looking at different groups of employees in turn, starting with those they consider to be most at risk of strains. The data has already produced surprises, says Bourgeois: for example, forklift drivers have been shown to be less at risk than the team expected, but welders had higher risk.

"One of the welders found that every time he did a specific task he was getting the vibration from the device", she says. "It was starting to annoy him, so rather than standing to do the job, he grabbed a step tool and sat, and there was no vibration. We were then able to encourage the whole team to do that weld at a step tool".

There are around 701 employees at the plant and the team are assessing them in groups of ten. The project started in September 2021 and is due to run until January 2023.

EXOSKELETON SUITS TO SUPPORT THE SPINE
At the New Holland, Pennsylvania site, which makes balers, mowers and other agricultural equipment, the safety team are using exoskeleton suits with employees working in the logistics department to reduce the impact on their backs when they're lifting and unpacking boxes of parts.

"It's like having a second spine", says Eden Blevins, Safety Specialist at the site. "It can alleviate up to 75 pounds in weight off your spine when you're bending and lifting".

Blevins says the exoskeleton is very discreet and, despite its name, does not look like something from science fiction. "I thought that nobody would want to wear an exoskeleton, but you would not really know somebody had it on under a jacket", she says.

The suits, which consist of a chest piece and two tension back straps, are fitted to a specific individual. At present, five people in the logistics team in New Holland are using them, and the safety specialists are looking into using them for some assembly-line jobs, too. They estimate using the suits could have prevented three of the back strains that happened last year when employees were lifting heavy items. The same suits are being used at CNH Industrial’s plant in Racine.

DEEP TISSUE MASSAGE
The New Holland site also offers employees active release technique (ART) therapy, a type of deep-tissue massage that is particularly effective on repetitive strains.

The same technique is offered to staff in Wichita and Grand Island. Julie Mayer, Occupational Nurse Manager at the Grand Island site, assesses employees who come to her with strains and recommends them for ART if the initial changes she suggests, including stretching and wearing anti-vibration gloves to help with hand and wrist problems, are ineffective.

Mayer and her team perform risk assessments in every area of the plant, which has 726 employees and makes CASE and New Holland machines, and introduce ergonomic changes wherever possible. The most common strains they see are to shoulders and wrists. They are the result of repetitive work on the assembly line or impact strains from putting nuts and bolts through metal parts.

The ART practitioner comes to the plant every Thursday for five hours and employees sign up for 15-minute appointments.

"Typically, after three sessions they are much better and don't need to be seen again", says Mayer, although she adds that some more complex pain such as carpal tunnel syndrome may need more attention. "Employees absolutely love it — I often have a waiting list".
LONG DAYS WORKING IN TOUGH ENVIRONMENTS, IN TRACTOR CABS WITH BADLY LAID-OUT CONTROLS, PUTS STRESS ON OPERATORS' BACKS AND JOINTS. VIRTUAL-REALITY TOOLS HAVE BEEN USED TO DEVELOP A SOLUTION

Driving a tractor is very different to driving a car — for a start, the operator spends a great deal of time looking behind them rather than straight ahead, to check that the equipment they are pulling is doing what it is meant to. The ground they’re traveling over is rough and uneven, sending vibrations up through the cab where the driver is working for many hours every day, and at night too during busy times. There are also numerous controls for the various functions the tractor can carry out and in the past, these were not laid out for the driver’s convenience.
As a result, “tractor operators might have a lot of back issues”, says Claudia Campanella, Manager of Ergonomics, Human-machine Interface, Virtual Reality and Augmented Reality for CNH Industrial’s technology and innovation group in Modena (Italy). To address this occupational hazard for farmers, Campanella’s team designed an entirely new control panel built into a moveable armrest, which launched at the end of 2021 in the biggest New Holland T7 HD, Case IH Magnum™ AFS Connect™ Series and STEYR Terrus CVT tractors.

“Rather than the operator moving to reach different controls and looking in different directions, we grouped the controls in a logical way that meets the needs of the operator”, says Campanella. “They always have their elbow supported, which is important because of the vibrations in the cab coming from the ground beneath. They can find the proper position for their body, whatever their height”.

The SideWinder armrest with built-in controls, which CNH Industrial has patented, is part of the Company’s new cab, which is also quieter, more spacious and has a seat with automatic suspension to absorb the impact of traveling over rough ground.

The armrest and the seat can move through 30 degrees, so the operator spends less time craning their neck to see behind them. Controls are grouped together, for example all the primary functions such as the gears, the shuttle shift and the throttle, on one main lever, while the buttons for the rear hitch are located on a mouse. The hydraulic controls for the implement attached to the tractor are set out in a row with different colored LED lights so the driver can easily see and distinguish between them when working at night. These are all lined up under the operator’s hand.

The data for the digital mannequin was created by scanning the dimensions of people with a wide range of body types. On screen, engineers could then scale the digital figure up or down and change the angle of their back, arms, hips and ankles to find the positions that put their joints under least stress. CNH industrial also added its own data on the specific posture of tractor drivers, which is more upright than the way a driver typically sits in a car. Thanks to the digital mannequin, CNH Industrial’s ergonomics team was able to demonstrate that the new seat position and armrest guarantees leg and arm comfort for all body sizes.

In the virtual-reality room at CNH Industrial’s Modena factory, engineers, sales and marketing teams and key customers were able to put on the VR headset and have a 360-degree look around the virtual version of the cab to assess the space and position of the buttons. As the data used covered people up to the 99th percentile for height, even the tallest operators would be able to sit in comfort in the new cab and use the control panel, rather than cramming themselves into a standard cab.

Using VR tools from the very start of the project cut down the time spent on design and prototyping significantly, says Campanella, from around five years for the new cab to three years. With prototype tractors costing in the range of €100,000, reducing the number of changes that need to be made offers significant financial benefits.

“We grouped the controls in a logical way that meets the needs of the operator”
VIRTUAL REALITY TRAINING FOR SAFETY AND EFFICIENCY

VIRTUAL REALITY (VR) IS NOW BEING TRIALED AS PART OF INITIAL TRAINING FOR SEASONAL STAFF TO HELP THEM GET UP TO SPEED AT ONE OF THE COMPANY’S LARGEST SPARE PARTS SITES

NH Industrial’s spare parts logistics center in San Matteo, northern Italy, is one of the Company’s largest plants. It covers 32,000 square meters of floor space and the shelves of replacement parts for agricultural equipment and construction machinery reach nine meters up into the air. New employees, navigating the many rows of shelving on forklifts to pick just the right type and number of bolts or screws, can quickly lose their way. Some also discover, as the seat of the forklift travels up to the highest shelves, that they have no head for heights.

“Wearing the headset, you have a full 360-degree view of the site and it’s so immersive”, she says. “It really feels like you are traveling forward or up, so if you do have vertigo, you will feel it with the VR. This will help our HR team choose the right people for the job”.

In the trial, Campanella’s team will work with six people out of a cohort of 30 new hires, using the VR headset to practice driving the vehicle, and locating, scanning and picking orders in the digital version of the factory. The group will still complete the same safety training and co-working with an expert operator inside the site itself, with the VR training on top. Their performance in the first weeks of the job will then be measured and compared with those who didn’t do the VR sessions.

“Their travel very high up and they have to lean over to reach the shelf. Some people feel too sick with vertigo to do it”, says Claudia Campanella, Manager of Ergonomics, Human-machine Interface, Virtual Reality and Augmented Reality for CNH Industrial’s technology and innovation department. Her team is trying out virtual-reality sessions inside a “digital twin” of the San Matteo depot, as part of the initial staff training — a first for the Company.

The spare parts center hires seasonal staff each year to be ready for the big increase in orders from agricultural equipment customers every spring. Initially, these staff are slower and more prone to making errors than experienced employees who work there year-round. Each incorrect order costs the Company time and money to put right.

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“When they start, we expect they will be faster at learning the operations and that they will be more precise”, says Campanella. It is the Company’s intention to start using VR in training more widely, and it expects safety and efficiency improvements, which will also contribute toward a better working environment.”

ABOVE: CLAUDIA CAMPANELLA AND GENNARO MONACELLI OF THE ADVANCED TECHNOLOGIES & INNOVATIONS TEAM TESTING VR HEADSETS IN SAN MATTEO. RIGHT: SHELVES IN THE DEPOT REACH NINE METRES INTO THE AIR AND CAN CAUSE NEW STAFF TO SUFFER FROM VERTIGO.
India’s National Safety Council was set up in 1966 to reduce industrial accidents and raise safety levels in factories. Every year since 1972, it has held a Safety Week from March 4–10, focusing on different aspects of workplace health and safety.

In 2021, Safety Week’s theme was “learn from disaster and prepare for a safe future”. CNH Industrial’s three plants in India have a strong focus on safety year-round, but Safety Week is an opportunity to double down on the message, with training and awareness-raising for all staff.

At its Greater Noida plant in the state of Uttar Pradesh, where some 4,500 employees make New Holland tractors, CNH Industrial organized training for bus and forklift truck drivers. Other activities included eye tests, training in firefighting and the correct use of personal protective equipment (PPE) such as safety helmets, explains Sanjai Misra, CNH Industrial’s Environment, Health and Safety Lead for India, who is based at the plant.

Misra’s team also got the families of staff involved to recognize that “safety starts at home”, asking employees’ children to make posters and come up with slogans about road and home safety.

In the Pune plant, in the state of Maharashtra, where CNH Industrial has 550 staff making sugar-cane and combine harvesters, employees took part in mock disaster and fire drills, learning about different types of incident and the right response for each.

Health and Safety Manager Sudhakar Patil invited trainers from the National Disaster Management Authority to deliver the courses at the plant.

At the Pithampur plant in the district of Dhar, Madhya Pradesh, CNH Industrial makes loader backhoes, compactors and excavators, and employs around 1,400 people. Health and Safety Lead Manoj Paliwal focused the plant’s Safety Week training around preventing and responding to risks from materials handling and chemicals, including propane and LPG (liquefied petroleum gas), used at the site. Part of that training was raising awareness of the importance of using the right PPE, including head and respiratory protection.

The activities were carried out in a concerted and coordinated way across all sites in India despite the difficulties imposed by the pandemic and Safety Week turned out to be an extremely well-organized event.

“CNH Industrial has always had a very strong safety culture”, says Paliwal. “We start daily communication meetings with plant managers and functional heads at the plant by checking if there have been any incidents or safety issues”. The benefit of spending a week focusing on the subject is that it gives his team the chance to recognize the staff’s continual hard work in this area, and the care they take to keep standards high, he adds.
SNAPSHOTS

SUSTAINABLE COMMUTING
CNH Industrial is continuously analyzing and improving its employees’ journeys to and from work in order to promote sustainable mobility. These initiatives reduce environmental impact, commuting time, cost and stress, while supporting the wellbeing of staff and encouraging socialization between colleagues.

For employees at plants in Turin and San Matteo in Italy, the Company launched the innovative MyShuttle! Service, which uses a fleet of IVECO minibuses powered by natural gas. A specially designed mobile app developed by VIA Technologies allows staff to book a ride in advance or at the last minute. Additional shuttle services have been set up at strategic points near to plants in Piracicaba (Brazil); Harbin (China); Annonay and Croix (France); and Greater Noida, Pithampur and Pune (India).

Cycling to work is increasingly encouraged. Employees in Belgium have benefitted from bike leasing programs, with over 100 bikes hired by staff at plants in Zedelgem and Antwerp, where the Company also held a road safety course for cyclists. During European Mobility Week in September 2021, CNH Industrial was main sponsor — for the seventh year running — of the annual Giretto d’Italia cycling event and around 900 employees from sites across the country took part.

During the Company’s own Bike Race initiative between May and October, staff registered and certified their commutes by bike via a special app. Over 5,000 journeys were recorded, clocking up more than 33,000 kilometers and saving 43 tonnes of CO2 emissions. In the USA, employees and their families took part in the ninth annual Pedal the Parks community event in Burr Ridge, Illinois, which was sponsored by the Company.

CNH Industrial also collaborates closely with public transport systems and local authorities. In Modena and San Matteo (Italy) and Lugano (Switzerland), public transport is subsidized for employees. In another Italian town, Jesi, the Company has even invested in infrastructure by financing a cycle lane to encourage staff to commute to its plant by bike.

SOCIAL INCLUSION
New Holland Construction supports charities like the Mano Down Institute, in the state of Minas Gerais (Brazil), which helps people of all ages with Down’s syndrome with health-care issues, social assistance, education, cultural and sports activities, and work opportunities. In all some 500 families benefit. In 2021, New Holland partnered with the institute for a second year, sponsoring a new space for the expanding service, as well as three specific projects. Avante Mano Down is creating an ecosystem for social inclusion, Mano a Mano promotes cultural diversity through artistic and musical performances, and the charity set up a Christmas event for the Mano Down choir, which performed in a sled pulled by a New Holland L330 mini loader. New Holland also promoted a lecture at a dealers’ meeting to raise awareness of the treatments needed by people with Down’s syndrome. “The Mano Down partnership develops artistic skills that stimulate sensitivity, cultural knowledge, training, discipline and other socio-educational skills”, says Erika Michalick, CNH Industrial’s Sustainability Manager for Latin America.

SUSTAINABLE TOURISM
CNH Industrial is working with the Brands4Sustainability initiative, which actively supports the UN Sustainable Development Goals (SDGs), on a project called Capri Circolare — A Sustainable Tourism Model. An in-depth analysis of the Mediterranean island will position it as a green destination by creating a framework with set themes, actions and objectives to champion a circular economy and implement best practice to protect local culture, resources and biodiversity. The result will be known as the ‘Capri Model’ and can then be rolled out to other small islands.

FOOD HAMPERS AND TRAINING SCHEMES
Pakistan was hit hard by the COVID-19 pandemic, particularly in the financial and economic capital Karachi, which now has more than 600 slum areas. CNH Industrial teamed up with social welfare organization Taqweem-e-Pakistan to purchase 500 food hampers from small local vendors and distribute them to the city’s most vulnerable communities — widows, orphans, the disabled and minorities, including the transgender community. An additional initiative also offered long-term support for people who had lost jobs during the pandemic. Twenty men were offered a year’s training to obtain a Diploma in ICU and Anesthesia.
VOCATIONAL TRAINING AND FOOD DISTRIBUTION

Working with the Sa Kaeo College of Agriculture and Technology in Thailand, CNH Industrial launched a new youth technical training program in 2021. After completing four weeks of practical training working with New Holland tractors, students participated in an initiative for the We Care We Share outreach program. 1,200 bags of high-quality jasmine rice were purchased, labelled with the company logo in an hour, and distributed along with canned foods and instant noodles to four communities across the country that were hit hard by the COVID-19 pandemic. The Poh Teck Tung Foundation in Bangkok, which supports victims of road accidents, received 630 bags of rice. The Foundation for Slum Child Care, also in the capital, was given rice as well as hygiene products and milk powder. The Bang Pla community in the province of Samut Prakan near Bangkok was given enough to feed 200 people and the Baan Eua Arthorn community in the province of Nakhon Nayok in the center of the country was given 250 portions of rice and also canned food.

REDUCING WASTE

To secure a sustainable future, the agriculture sector must eliminate waste, and Case IH’s Patriot® 50 series sprayers offer farmers an effective solution. The three new models — the Patriot 3250, 4350 and 4450 — will come to market from fall 2022 and have already won awards from the American Society of Agricultural and Biological Engineers (ASABE) for outstanding agricultural innovation. The sprayers help farmers get into fields sooner with less compaction and offer enhanced connectivity and integrated Raven technology (see page 28). They provide consistent, accurate applications every season, reducing excessive use of precious resources including pesticides and fertilizers. “Today’s growers and ag retailers are looking for complete vehicle control and dependable features to enhance their productivity”, says Mark Burns, Case IH Application Equipment Marketing Manager. “That’s why we completely redesigned every detail of the Patriot 50 series sprayer to deliver next-level efficiency along with an unmatched day-to-day operator experience”.