

Our world is sorting itself out in many ways. The automotive industry is looking to rely less on specific countries such as Russia, China and even Taiwan. Automakers are finding new sources of critical components such as semiconductors and making sure they have enough batteries as their vehicles transition from internal combustion engines to batteryelectric power. Startups are looking more questionable and the experience that comes with being a legacy player has its benefits. It's an industry on the move in a time of uncertainty. And that uncertainty is just starting.



NEWS BY SAM FIORANT

Autonomous vehicles delayed

The automotive industry is finally realizing that the technology for autonomous vehicles is not as close as they initially believed. For years, every major vehicle manufacturer around the world has been investing in the technology that could take over full control of passenger vehicles on public roads.

After investments of billions of dollars, many early adopters are moving their money elsewhere. Argo AI, the six-year-old technology startup with Ford and Volkswagen as main stakeholders, was valued at as much as US\$7 billion just four years ago but is expected to shut down before the end of 2022. Expect more downsizing of this field, pushing mainstream autonomy out past 2030.

More companies leave Russia

Although production has been halted since early 2022, Kia has an assembly plant in St. Petersburg, Russia. With the ongoing war in Ukraine, Kia is expected to focus on servicing current customers while abandoning the factory. Mercedes-Benz is selling its Russian assets to a local company and shuttering operations in the country. Mazda, which assembled vehicles with local partner Sollers, is also leaving the market and selling its shares in the joint venture. Additionally, Mitsubishi will not resume production in Russia.

GAC Fiat to go bankrupt

After Stellantis decided to stop production of Jeep models in China, the future of its joint venture



with state-owned GAC was placed in doubt. In late October, the JV was expected to file for bankruptcy as it reportedly owed more than 8.0 billion RMB (US\$1.1 billion). Guangzhou-based GAC will continue to operate and will be largely unaffected by the demise of the JV.

New rules in China do not require foreign firms to establish joint ventures with local companies to produce for the Chinese market and sales of locally produced Jeeps slid dramatically in recent years, compounding the desire to dissolve the local partnership.

London Taxi cuts workforce

Formerly known as London Taxi, LEVC is owned by Geely of China and produces vehicles at its UK-based plant, but economic conditions are hitting the automaker. The small company had



fewer than 600 employees at the beginning of the year and will cut as many as one-quarter of its staff. Switching from the traditional black cabs to the modern electric taxis and commercial vehicles, LEVC was expected to make money at this point in its turnaround. However, it lost £118 million (US\$136 million) last year and is not expected to turn a profit in 2022.

Volkswagen planning EVs in Mexico

Volkswagen started making the Beetle at its Puebla plant in Mexico in 1967 and the plant still produces more than 300,000 vehicles annually. With an investment of US\$763 million, Puebla will be prepared for its first electric vehicle starting in 2025. The new EV model will be produced alongside a range of ICE-powered models, including the new Tayron crossover starting in 2024.

Arrival downsizing

Among the wave of commercial vehicle producers looking to join the current EV push, Arrival has relatively modest plans. Employing its assetlight structure, Arrival developed a fully electric

'ARRIVAL LOST
US\$310 MILLION
DURING THE
THIRD QUARTER
OF THIS YEAR'





van and expected to produce it in conservative volumes in the UK and the US. After announcing its own financial troubles, the startup pushed back production plans in the UK to focus on assembly in the US, which can take advantage of recently enacted EV incentives.

Even though the truck maker has orders for 10,000 vans for United Parcel Service, Arrival lost US\$310 million in the third quarter of 2022 and claims to have only US\$330 million in reserves. Additional funding sources are being sought to keep the company afloat.

Stellantis to double capacity in Morocco

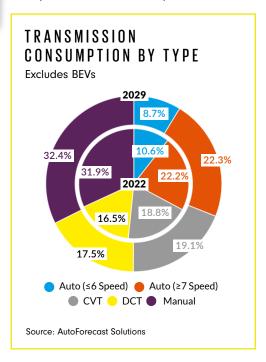
Located in Kenitra, Stellantis's Moroccan plant launched production of small cars and quadracycles in 2019. Aside from the Peugeot

208, the factory manufactures the tiny Citroën Ami and related Opel Rocks-e. Demand has grown and the automaker will invest US\$300 million to double the plant's capacity and add another 2,000 workers.

BMW expands in Hungary

Planned to open in 2025, BMW's new plant in Hungary is getting more investment. The German automaker announced it will invest €2 billion (US\$2.1 billion) into the Debrecen plant, double its earlier plans.

The extra funding will add another 500 jobs and increase the size of its battery assembly plant. Production of the all-electric BMW iX3 is expected to begin in August 2025, followed by the BMW iX4 a year later. Capacity for the new plant should initially hit 150,000 units annually.





GLOBAL ELECTRIC VEHICLE INITIATIVES

BY CONRAD LAYSON

The Renaulution continues

The Renault Group took major steps to reorganize its business as part of the Renaulution plan unveiled in January 2021. First, Renault formed a joint venture with Chinese OEM Geely to make and distribute internal combustion engines (ICEs) and hybrid technology to brands owned by each OEM as well as outside customers. Pending final agreement, each OEM will hold 50% of the new venture, employing 19,000 people at 17 powertrain and three R&D facilities at launch in 2023. The new entity, based in London, UK, will be able to supply five million engines and hybrid systems to all brands, including Renault partners Mitsubishi and Nissan in Japan.

Renault's carve-out of "Horse", the ICE component of the Renaulution plan, leaves the automaker to focus on "Ampere", Renault's electric vehicle division, which is expected to make Renault compliant with the 2035 ICE sales ban in Europe. Complicating the deal are Nissan's concerns with sharing intellectual property with open.

Next, Renault CEO Luca de Meo presented a plan to increase profitability by splitting Renault into five separate operating companies, each led by its own CEO with profit and loss responsibilities. The component divisions are: the JV with Geely (Horse); the electric vehicle division, which will be listed in the second half of 2023 (Ampere);

sports cars; recycling and mobility; and financing. The last three divisions will be open to investment by firms such as Qualcomm, Google and other partner companies. The plan is reminiscent of the Asian business practice of cross-investment and analysts have complained about its complexity and potential for failure should one division not be properly capitalized. Nissan has yet to comment on the new plan.

Our Next Energy powers Bollinger

CEO de Meo is dividina

Renault into five

operating companies

Our Next Energy (ONE) announced the selection of Van Buren Township, Michigan, as the site of its US\$1.6 billion battery cell production facility back in October. Already the recipient of an investment through BMW i Ventures, ONE named its first client outside of BMW, Michigan-based fleet EV startup Bollinger Motors.

ONE's Aries modular LFP battery pack will

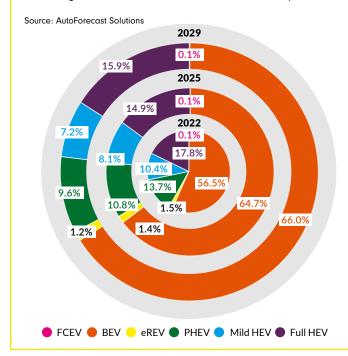
replace Bollinger's in-house battery development effort, which in turn will allow Bollinger to move up its first fleet customer delivery date to late 2023. ONE's Aries battery pack will first be installed into Bollinger's

Class 4 chassis cab. Customers can specify one or two battery packs wired in series or parallel, depending on range, payload and duty cycle requirements.

The ONE Aries battery
pack will use cell-to-pack
technology, where 108 prismatic
LFP cells make up a pack with

GLOBAL LIGHT VEHICLE ELECTRIFICATION

Percentages based on electrified vehicle market only



79kWh capacity, using a 400V architecture.

Mounted in the vehicle's centerline, the pack's structure will be supported and protected by Bollinger's frame rails. ONE's Van Buren cell-making and pack facility will be built with a co-located raw materials and minerals refinement facility and cathode manufacturing, to support battery cell production.

Finished cells will also be packed on site, prior to shipment to Bollinger for installation. ONE's Van Buren facility will open in time to meet Bollinger's Q4, 2023 vehicle assembly SOP. ONE's plant will scale up battery cell production within five years to achieve a 20GWh annual output, enough to build 200,000 EVs per year.

Volkswagen reconsiders Trinity

Volkswagen Group CEO Oliver Blume and brand boss Thomas Schäfer indicated in a letter to employees that all projects were undergoing re-evaluation. But it became very clear that the construction of a new all-EV plant in Wolfsburg-Warmenau, just north of the existing Wolfsburg facility, and Trinity, the halo car that was to be built in the new factory beginning in 2026, were the focus of the corporate rethink.

At issue are the systems and software that were to go into the new platform

underpinning Trinity. Launched as part of the Neue Auto strategy in July 2021, the Scalable Systems Platform (SSP) was to be the group's first software-defined platform, enabling Level 4 autonomous operation. The physical architecture was scalable to accommodate A-, B-, C-, and D-segment vehicle top hats and was to replace the current MEB and PPE platforms across all Volkswagen Group brand passenger vehicles.

The SSP's group-wide operating system and electronic architecture were to be developed by in-house software company CARIAD SE. Since its inception as the Car.Software organization in 2019, the legacy automotive group's inability to adapt to and integrate with new software development



practices left CARIAD unable to operate effectively. CARIAD SE now oversees outside software providers using the old OEM-supplier framework, resulting in the same ineffective patchwork of code that the company was formed to replace.

Current ID.3 and ID.4 models still cannot be updated over the air. Porsche and Audi will not use CARIAD's updated OS E3 1.2. Production of MEB-based vehicles will be extended. The E3 2.0 OS release has moved from 2026 to 2029, along with Trinity's debut to 2030. The delays have put the new factory in Wolfsburg-Warmenau in doubt.

GLOBAL LIGHT VEHICLE PRODUCTION OUTLOOK

BY SAM FIORANI

AS THE END OF the year nears, the total losses due to the semiconductor shortage are coming into focus. Dramatically better than 2021, the chip shortage in 2022 represents a big improvement, partially offset by the lower expectations for demand this year. An anticipated soft market next year will also provide a lower starting point for the production outlook. Fortunately, the waning demand for advanced chips following the COVID shutdowns has eased the need for

'IT SHOWS HOW QUICKLY STOCKHOLDERS NEEDED THE SHIFT TO EVS' semiconductors in many markets outside of automotive. Moving some of the production capacity to automotive chips could ease the tight supply and might shorten the production bottlenecks, possibly by the middle or late in the new year.

The shift to electric vehicles has been more about changing the image of legacy automakers than cleaning up the environment. Companies like Volkswagen had a tarnished image to fix and the wide-ranging push into electrics shows how quickly stockholders needed the change.

For some companies, such as General Motors, the shift is to change the mind of the stock market to view these century-old combustion-engine makers as modern tech companies.

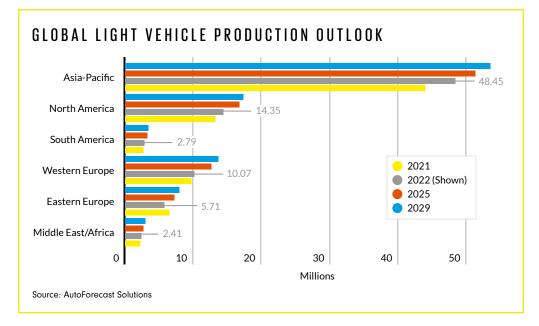
Billions of dollars are being fed into this move to make the shift as quickly as the market will handle. But General Motors is tailoring its plans to its own revised vision of that market acceptance.

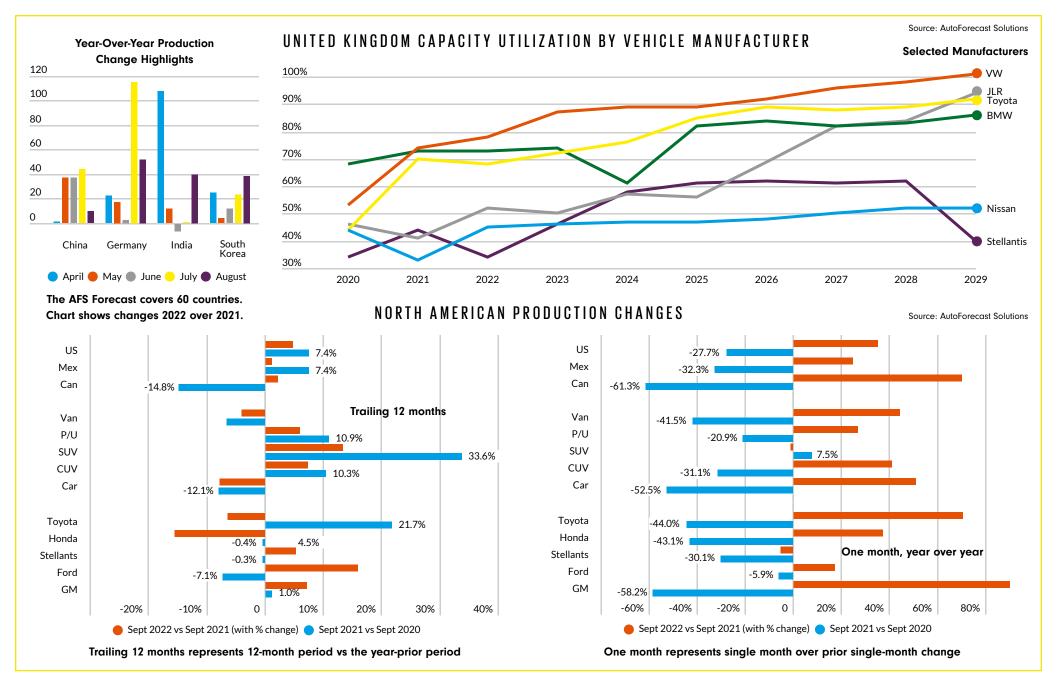
CEO Mary Barra told stakeholders that GM's coming electric vehicles will be delayed. The original plan targeted 400,000 electric vehicles by the end of 2023 and now that goal is in the summer of 2024.

The slowing of the ramp-up can be seen immediately. Just a month or so ago, more than 10,000 of Cadillac's much-anticipated Lyriq crossover were planned to roll out of the Spring Hill factory this year. The revised plan now expects fewer than 1,500 to be produced this year. A similar change has hit the very expensive GMC Hummer EV.

The prediction from GM's notoriously optimistic crystal ball has been revised downward, with half as many Lyriqs and Hummer EVs expected to be produced next year, and similar cuts to all other North American EVs on the schedule for 2023.









GLOBAL LIGHT VEHICLE SALES OUTLOOK

BY SAM FIORAN

DESPITE THE ONGOING threats of global recessions, many of the markets around the world are starting to pick up. Countries in Europe, North America, South America and Asia have shown signs of life, but it must be noted that sales a year ago were down considerably, giving lots of room for growth. Improving on 2021's poor showing is not necessarily leading markets forward. This is, however, providing hope that the market is not ready to suddenly turn down.

Recent upticks in the EU add to that hope. Sales in October marked the third straight month beating prior year numbers. October light vehicle sales were up about 9% over the same period in 2021, with the continued expectations that November and December will report slight improvements as well.

Despite these positive numbers, losses in the first half of the year mean 2022 will end considerably lower than 2021 and should mark the trough of around 9.1 million units. Sales are expected to pick up 3.5% in 2023.

Light vehicle sales in the UK also performed better in the last three months than in the same period the year prior. October sales were up 26.9%, besting the single-digit improvements in September and August. As in the EU, big losses in the first half will hold back this year's totals for the UK and the year is expected to finish down 1.2% compared with 2021. Nearing 1.7 million units of sales next year will be a 3.0% improvement over this year, but this will still be a far cry from the two-plus million units reported annually before the pandemic year of 2020.

North America grew in October by 7.5% although year-to-date (YTD) is still behind last year by 10.2%. Mexico was in the black through

October, but the US and Canada still have a way to go to recover early 2022 losses.

Last October, sales in the US dropped to just over one million units, but early year sales pushed the YTD total to over 12.7 million. Even with the 9.6% improvement this October, sales for the year are still 11.1% and 1.4 million units behind 2021. With just two months left in the year, the 12-month total for 2022 will be 8% shy of the 2021 numbers. This year will be the worst tally in more than a decade. Expectations for next year point to turning a corner, with a 5.6% improvement over this year. However, as interest rates continually increase in an effort to mitigate inflation, consumers may be more hesitant to purchase large-ticket items

THIS YEAR WILL BE THE WORST SALES TALLY IN THE US IN MORE THAN A DECADE

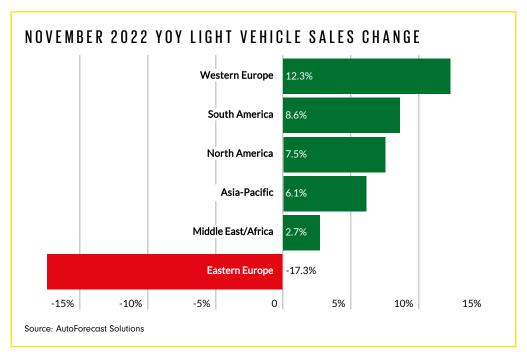
like houses and vehicles in the coming year, regardless of high pent-up demand.

Mexico already reported better numbers this year than last year. October's 8.5% improvement means that YTD sales are up 1.1%. Again, with just two months left in 2022, there isn't much room for the market to bloom but Mexico will move 1.6% more vehicles this year than last when the

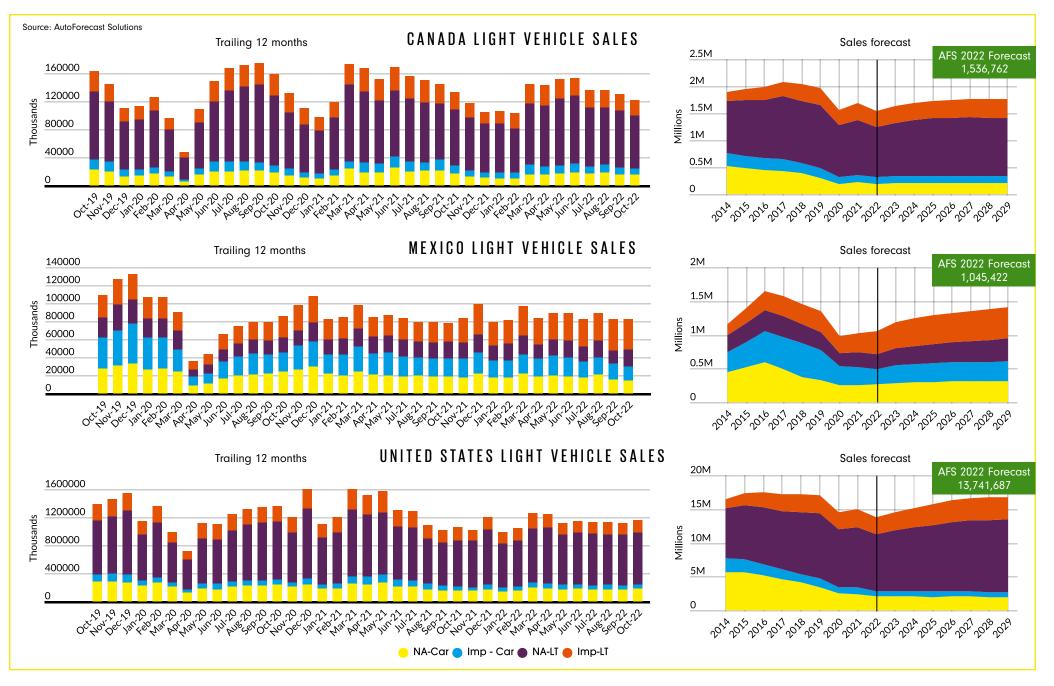
December counting is complete before the market really bounces back with a 13% increase in 2023.

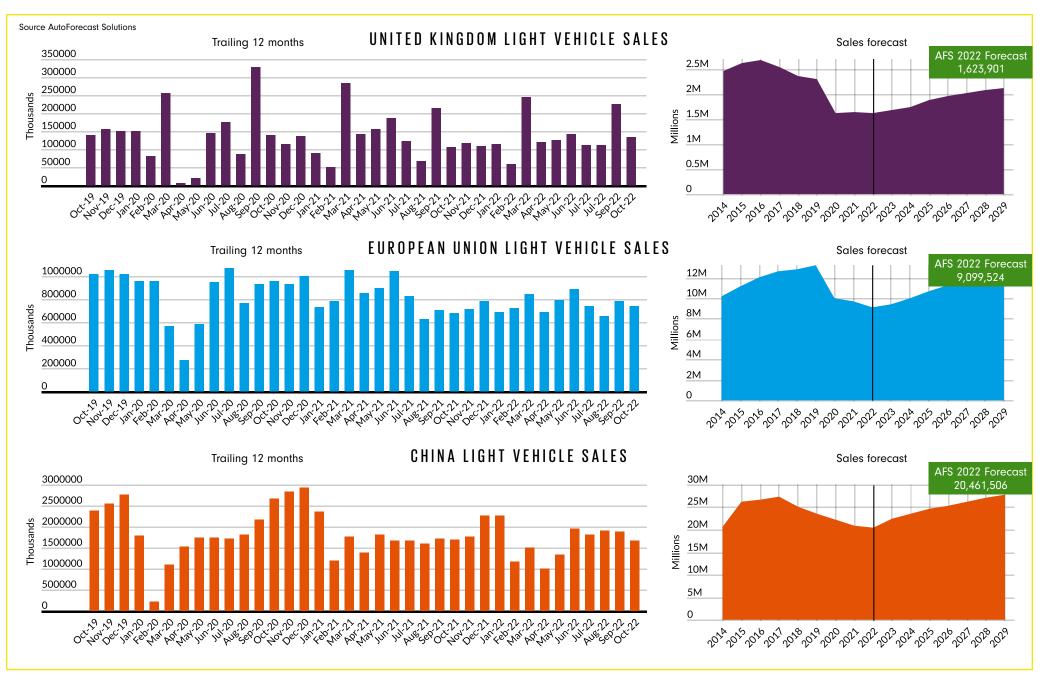
Light vehicle sales in Canada are still trying to get back to even 2020's pandemic-lowered total. Driven by the continuing supply chain issues, low inventory levels are slowing sales as buyers cannot find or cannot afford a new vehicle. Losses have extended to their ninth straight month and are expected to continue through the rest of the year and into 2023. A sales recovery in 2023 should bring total vehicles sold above 2022 levels, but not quite to 2021's 1.68 million units.

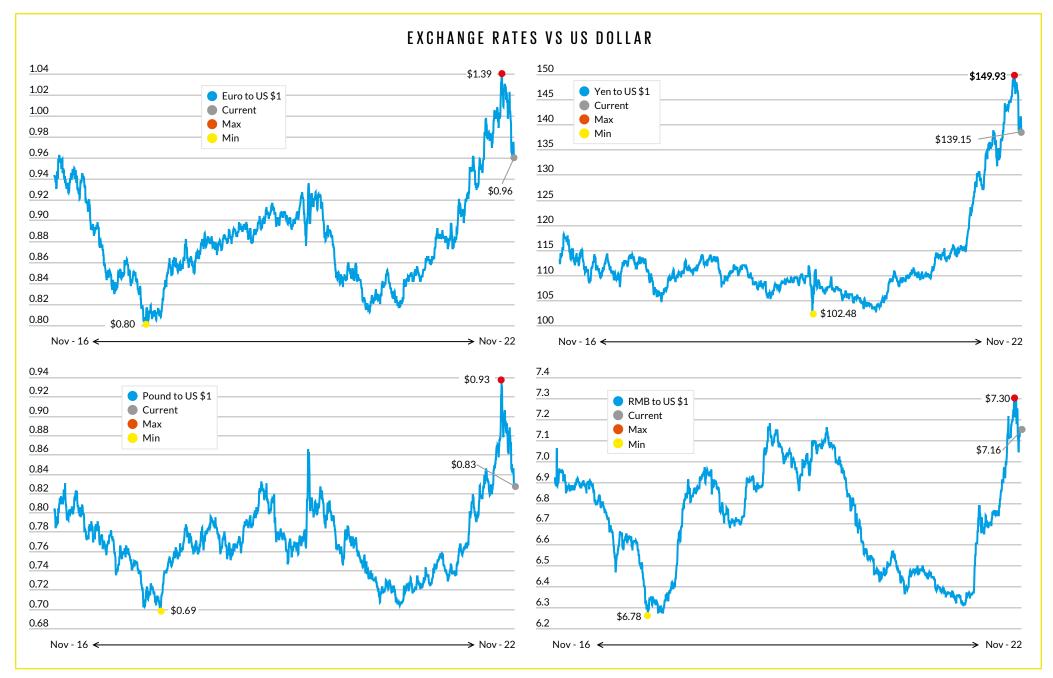
Consumer confidence in China is slipping and recent Singles Day sales reflect this. While consumer sales improved by about 5% on the November 11 informal holiday, this demonstrates a slowdown compared with last year's relatively modest 13% improvement over 2020. October sales lagged slightly behind last year's numbers.

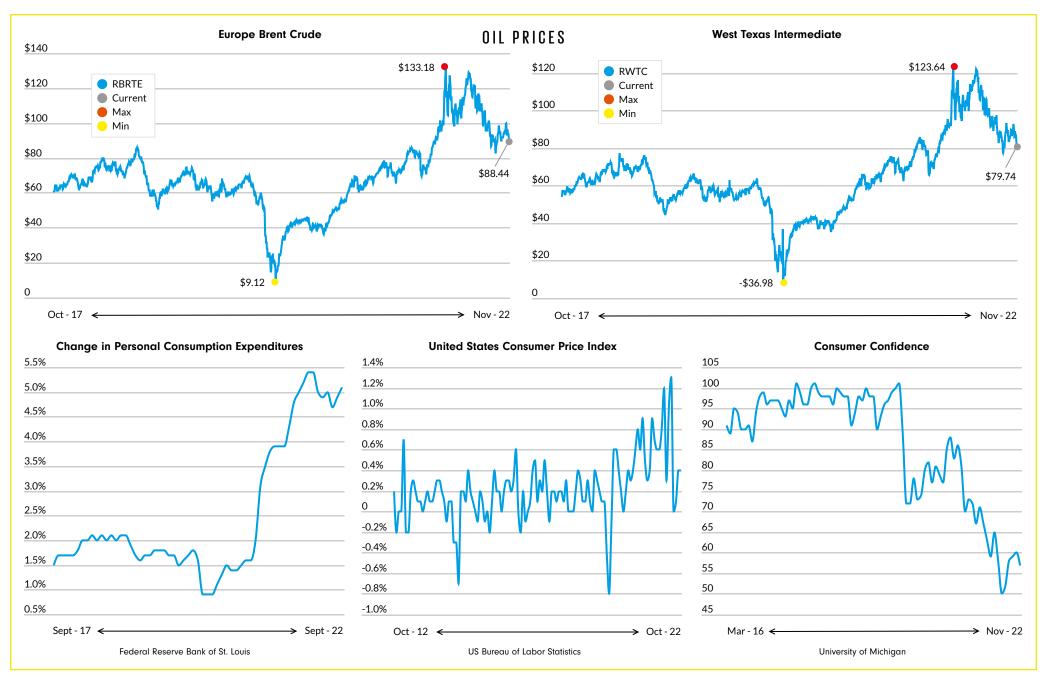












SPECIAL REPORT

BY SAM FIORAN

Foxconn goes automotive



HON HAI PRECISION was founded in 1974 to make components for other manufacturers. The company slowly progressed from plastic pieces to electronic cables and connectors in the 1980s. Although still relatively small, the company opened a complex in Shenzhen, known as Foxconn City, in 1988 and started expanding its reach. After a deal was made with Dell computers in the mid-1990s, growth of Hon Hai took off. By 2004, the company was manufacturing computers and servers for some of the world's largest brands. Additional contracts for mobile phones and video game consoles kept the growth going.

Acquisitions of Chi Mei Optoelectronics and Japan's Sharp Electronics filled out the company's technological résumé, ensuring its place among computer equipment suppliers. Over the past two decades, Hon Hai has supplied key products to Nokia, Sony, BlackBerry, and, of course, Apple.

Today, the company, commonly referred to as Foxconn, is the largest employer on mainland China, with over one million workers. According to its own information, it has facilities in Brazil, Czech Republic, Hungary, India, Mexico, Slovakia, the US and Vietnam, in addition to Taiwan and China.

In recent years, Foxconn branched out into other

industries. Extensive experience in electronics made the move into modern electric vehicles an obvious next step. This became public in October 2020 with the announcement of an EV platform.

FOXTRON

minim

Labeled MIH ("Mobility in Harmony"), the architecture is described as an open source software and hardware platform for EVs. This has been designed to work on EVs just as Android works with smartphones, the company has said. A growing consortium of companies joined to use the technology for upcoming production vehicles.

Foxconn joined forces with Taiwanese automaker Yulon to form the joint venture Foxtron in March 2021. Under the new JV, production of EVs is planned for Taiwan.

The company has rolled out a number of prototypes to demonstrate what is possible with the MIH architecture.

Joining the growing field of electric crossovers, the Foxtron Model C made its debut in October 2021. Stretching 4,640mm long and riding on a 2,860mm wheelbase, the Model C seats up to seven across three rows. Its all-wheel-drive powertrain harnesses 300kW of power and 700Nm of torque to launch the CUV to 100km/h (62mph) in 3.8 seconds. Plans for production to begin in Taiwan in early 2023 followed the expected opening of order banks late this year.

Alongside the Model C was the debut of the Model E. Ford Motor Company already had an issue with Tesla using this name and obviously won't allow Foxconn at it either, but the sedan looks primed to take on the Tesla Model S. The company's flagship sedan features 560kW of power, a 0-100km/h time of 2.8 seconds and a range of up to 750km (466 miles) on a charge.

The third model in Foxconn's EV debut was the Model T. Again, Ford will not like the name. However, this vehicle has very little in common with Henry's "Tin Lizzy." An intercity bus, the Model T would look right at home on the streets of any major American city, which is probably the point. With a top speed of 120km/h (75mph), the Model T will travel up to 400km (249 miles) on a charge.

Troubled Lordstown Motors became the latest company to provide fodder for Foxconn's growth. In May 2022, Foxconn purchased the physical assets of the budding electric truck maker, primarily its factory in Lordstown, Ohio. With an initial infusion of US\$230 million, Lordstown could continue development of its pickup truck while

'ITS EXPERIENCE IN ELECTRONICS MADE MODERN EVS AN OBVIOUS NEXT STEP'

Foxconn acquired an automotive factory and would, under contract, assemble the upcoming Lordstown Endurance EV. With a factory of its own, Foxconn's march toward an EV brand could continue full strength.

In October 2022, the company followed up its initial wave of vehicles with more products. The smaller Model B sports a Pininfarina-designed four-door hatchback body. Looking like a direct competitor to the Tesla Model Y, the Model B is smaller. The nearly production-ready concept has a 2,800mm wheelbase with a 4,300mm compact body, about 350mm shorter than the Tesla. Its range is 450km (280 miles) on a charge.

On the stage next to the Model B was the Model V, an all-wheel-drive pickup with a five-passenger, four-door cab. With its payload capacity of "up to one ton" and towing capacity of "three tons," the Model V would intrique pickup-hungry Americans. Few concrete details were provided about production plans for any Foxtron models. However, the Model V has been earmarked for assembly plants in Taiwan and the US.

A solid-state battery is under development. Foxconn expects to have the new battery ready for production by 2024.

Foxconn is making moves to reach a targeted 5% share of the global EV market by 2025. In early November, it invested another US\$170 million for a 18.3% stake in Lordstown, becoming the startup's largest shareholder. After reporting a loss of more than US\$154 million in the third quarter, Lordstown is looking to revise its future product plans and will rely on Foxconn's MIH platform for the next generation of vehicles it develops.

Launching the Foxtron brand introduces a potential problem for the company's other businesses. A new EV brand will be competing with potential clients for Foxconn's assembly and engineering services. Established global automotive suppliers have viewed this problem in the past and found it to be detrimental to their core business of supplying parts and services to OEMs. Foxconn, however, believes it can do both and, so far, potential partners see no issue there.

A joint venture with state-owned PTT has been created to develop and produce EVs for Thailand. The PTT energy group started working with Foxconn in 2021 to harness the MIH architecture and create a supplier base in the country to support local production.

With the chip shortage slowing production of vehicles around the world, Foxconn's experience in semiconductors will be beneficial in the near term for automotive production. After a deal

between Foxconn and Stellantis, announced in late 2021, the two companies are developing "flexible semiconductors" dedicated to automotive use. Stellantis is developing the "STLA Brain" architecture as a base for its upcoming vehicle platforms and these new chips will play a key role in the strength of this new design. The first STLA Brain vehicles will begin production in 2024 with the hope that this new dedicated supply will ensure a steady stream of chips.

Announced in early 2022, Foxconn's Lordstown plant will produce vehicles for Fisker. Sharing the MIH platform, the Fisker PEAR follows the Austrianbuilt Ocean as the brand's second EV model. With a target starting price below US\$30,000, the

automatically move to its biggest client: Apple. Independently, Foxconn and Apple opened automotive divisions to take advantage of the new EV market. Apple outsources much of its production of iPhones to Foxconn, which makes the natural connection that Foxconn would also be on the shortlist to assembly an EV developed by the California tech company. Nothing has been officially released about the two companies working together on vehicles, but Apple has been very quiet about its vehicle development so far.

And Foxconn is working on a smaller vehicle under the Project X joint venture. To be unveiled next year, Project X takes the MIH architecture and downsizes it for use in a sub-compact model. Press releases promise "battery systems combined with fixed charging and battery swapping technology" and other advanced developments.

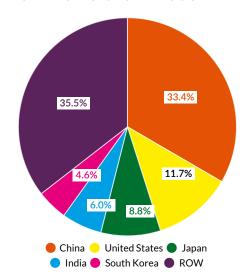
Evolving from ICE vehicles to battery-electric vehicles is an expensive endeavor in developing new platforms and building dedicated factories. Startup companies have the same expenses here that legacy automakers have in this transition, but companies such as Foxconn are providing a helping hand by lowering the cost of entry. With Foxconn's own MIH platform, a potential startup could develop a body and image on top of the pre-developed architecture. Additionally, Foxconn's factory makes a new entry "asset light" by taking away the billion-dollar cost of a greenfield factory.

Foxconn is filling voids in engineering and production that quickly appeared over the past few years. Harnessing its new technology could potentially introduce the new Foxtron brand around the world as global territories increasingly try to push ICE vehicles out of the market. There are a number of potential pitfalls for the company. However, Foxconn has seen amazing growth over the past half century in a number of industries and automotive could very well be the next.





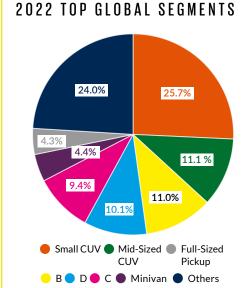
2022 TOP 5 GLOBAL COUNTRIES



TOP 5 BRAND OWNERS **Brand Owner** 2022 Production Brand Owner 2029 Production Toyota Motor 10,342,213 Toyota Motor 11,048,519 Volkswagen 8.239.036 Volkswagen 9,129,941 6,990,257 Stellantis Hyundai Motor 8,808,039 Renault-Nissan-Mitsubishi 6,892,961 Hvundai Motor 8.034.038 Stellantis Renault-Nissan-Mitsubishi 7.683,968 6.649.334

37.1% 31.7% 12.4% 5.7% 7.7% India Germany ROW

2029 TOP 5 GLOBAL COUNTRIES





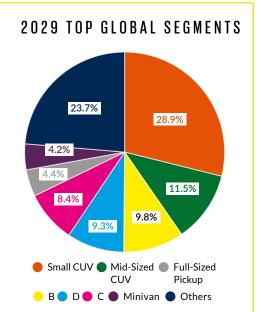
TOP 5 GLOBAL PLATFORMS

Renault-Nissan-Mitsubishi (CMF-B HS), Toyota Motor (NGA-C, NGA-K-SUV, NGA-C), Tesla (Gen III), Volkswagen (MQB A1), Hyundai Motor (KP2, N)

TOP 5 GLOBAL ASSEMBLY PLANTS



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