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AUTOMOTIVE & INDUSTRIAL

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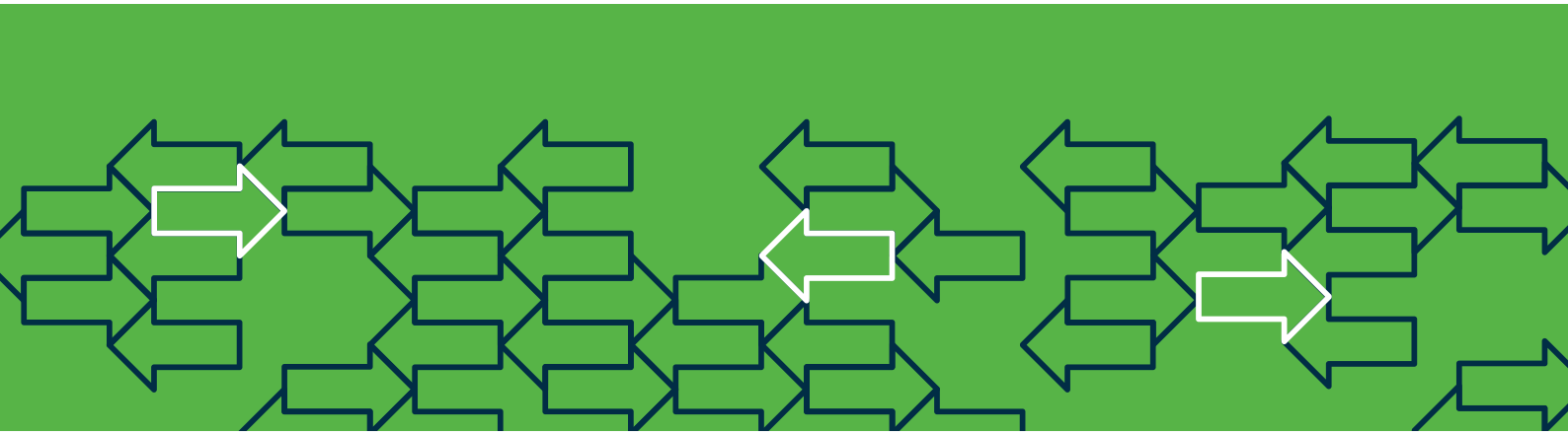
A watershed moment for the automotive industry



In the next 15 years, electric and hybrid cars will capture more than half of the market. Connected and autonomous driving will open up new earnings potential. Digitization will enable double-digit cost reductions. Is the automotive industry facing its biggest challenge of the past hundred years?

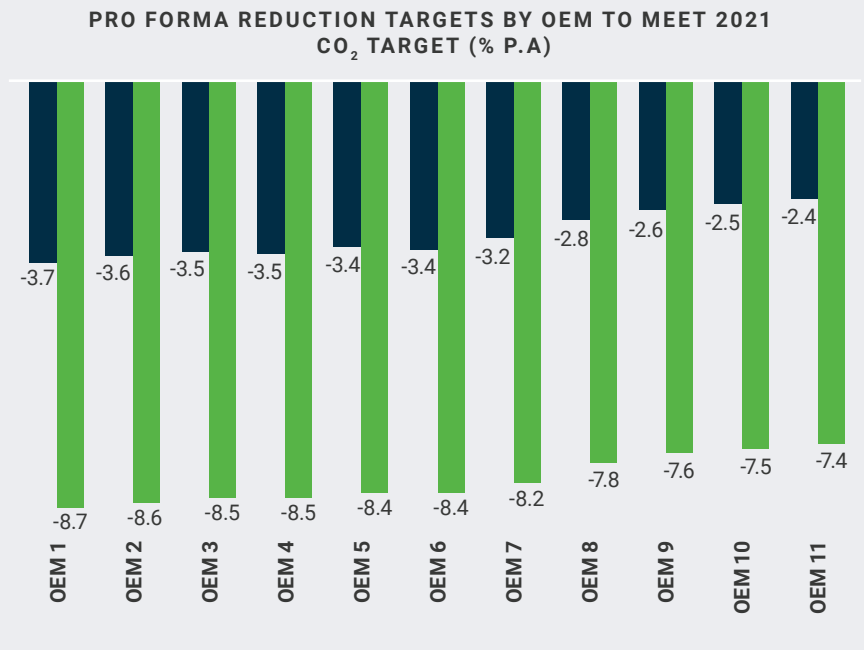
The global car market continues to grow, with new sales expected to rise at an annual average of 2.8% from 2015 to 2023. Taking advantage of that growth will mean mastering the greatest change that the industry has experienced in the past hundred years.

That change is being triggered, on one hand, by ever-more-stringent emission regulations, which can no longer be escaped, following the recent high-profile emissions scandals. On the other hand, it's coming from technological developments and challenges by connectivity, autonomous driving, and digitization of the value chain.

In the coming years, the automotive industry will face its biggest upheaval since before Henry Ford. Such are the findings of the study *A Watershed Moment for the Automotive Industry: The AlixPartners Global Automotive Outlook 2016.*

In 2030, half of all cars are expected to have an electric or hybrid powertrain, and almost all cars will be connected. To achieve that, the automotive supply chain will undergo large-scale changes, and systematic digitization will reduce the structural costs by a quarter. Online services will heavily influence

FIGURE 1: TO ACHIEVE 2021 TARGETS UNDER NEW WLTP[1] CONDITIONS, OEMS WOULD HAVE TO MORE THAN DOUBLE THE ANNUAL REDUCTION ACTIVITY



Unclear impact of WLTP

- WLTP will partially close the distance between real world emission test results and current NEDC.
- Assuming effective 20% lower gap to real world would translate into 5% higher reduction target per OEM to meet 2021.
- Details on WLTP not fully defined yet, so effective impact on target achievement is also still open.
- Real world CO_2 likely 40% to 50% higher than type approval today. WLTP likely to be 20% to 25% higher.

Introduction of WLTP is currently discussed along the lines of modifying/ compromising the 2021 targets on CO_2.

■ 2014 to 2021 Average annual CO_2 reduction activity – NEDC ■ 2014 to 2021 Average annual CO_2 reduction activity – WLTP

Source: AlixPartners
Note: [1] WLTP: Worldwide harmonized light vehicles test procedure

the driving experience and offer crucial new revenue opportunities. In cities, individual mobility through free-float car sharing will continue to grow. And only organizations that integrate that new world into their strategies will be able to compete and stay relevant in this rapidly evolving industry.

CHINA REMAINS THE LOCOMOTIVE OF AUTOMOTIVE GROWTH

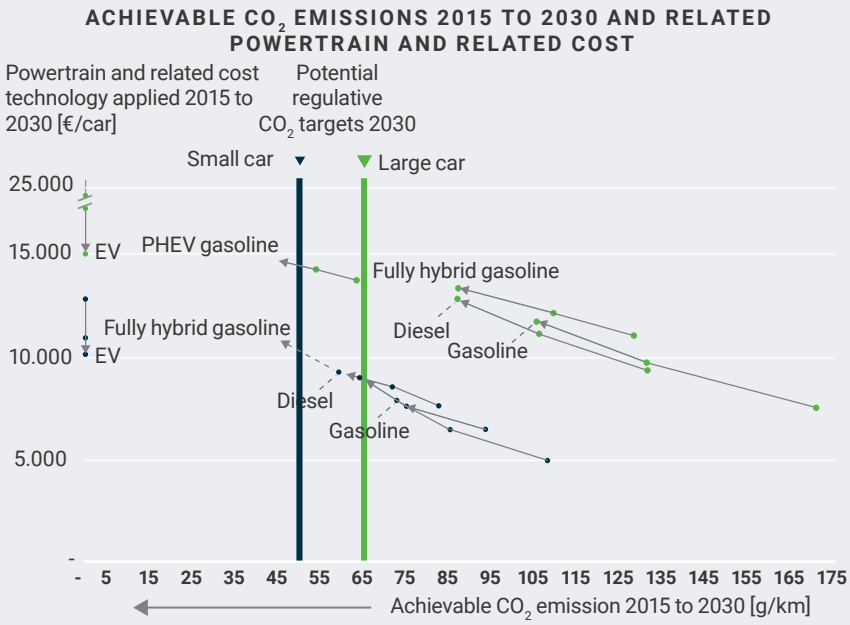
AlixPartners predicts global sales of 110 million cars per year by 2023—an increase of 22 million per year from today—which represents an average annual increase of 2.8%, slightly slower than forecast global economic growth. More than 60% of that growth is expected to come from China, whose automotive market continues growing by 6% per year.

India and the Middle East are also expected to see significant growth—in particular, with the opening of the Iranian market. The US automotive market, however, is expected to stagnate from 2018 to 2020, after which it will slowly recover towards 17 million units per year by 2022. In Europe, car sales are expected to be boosted by growth in eastern Europe and pent-up demand in southern Europe. The larger, Western markets had been predicted to remain broadly flat, until the UK vote to leave the European Union. Whereas the Southeast Asian market should grow at 3.8% annually, aging populations in Japan and South Korea will see auto sales decline by an average of 1.5% per year.

YIELD AND UTILIZATION IN THE SECTOR HAVE RISEN

The year 2015 saw a return to precrisis level profitability in the industry, with European, Japanese, and South Korean manufacturers and suppliers having become more profitable than before the financial crisis. In Europe, factories' average utilization levels are now at the top end of the 75 to 80% break-even band, which has driven some of that profitability growth. And even though Chinese factories are seeing an increase in utilization—driven by an increasing proportion of sales coming from domestic players—they still remain below 70% in terms of capacity utilization.

FIGURE 2: IMPROVING CONVENTIONAL POWERTRAINS IS THE MOST COST EFFICIENT WAY OF REDUCING EMISSIONS, BUT WILL NOT ALLOW OEMS TO MEET EXPECTED TARGETS



- From a TCO perspective, over the next ten years, optimizing conventional powertrains will be more cost efficient than moving to electrified vehicles.
- However, potential regulatory CO_2 targets for 2030 (approximately 50g/km small cars; approximately 65g/km large cars) can only be achieved by a significant share of EVs for small cars and PHEVs and EVs for large cars.
- We expect insufficient customer demand for diesel alternative powertrain vehicles (APV) due to TCO increase versus gasoline versions.
- Insufficient market demand for PHEVs for small cars due to limited range requirements.

- Small car* Example engine small car 2015: Gasoline: 4Cyl 1.2 l, Diesel: 4Cyl 1.5 l, full hybrid: 4Cyl 1.2 l
- Large car* Example engine large car 2015: Gasoline: 4Cyl 2.8 l, Diesel: 6Cyl 2.5 l, full hybrid: 4Cyl 2.8 l

2015 2020 2030

Source: ika, AlixPartners model of TCO development for small and large car powertrains
Note: * Small car: segments A: 29%, B: 71%; large car: segments E: 75%, F: 12.5%, S: 12.5%

THE RISE OF ELECTRIC POWERTRAIN IS UNSTOPPABLE

"Dieselgate" has led to a series of emissions scares across the globe. Multiple recent studies have revealed that most of today's cars, when tested under real driving conditions, exceed regulatory emissions limits in both carbon dioxide and nitrogen oxide by factors of five to nine.[1] Future emissions tests are expected to be changed to reflect real-world driving conditions, and that will have an enormous impact on the industry (figure 1). Although cars can meet near-future emissions standards by way of diesel and petrol engines, the cost of emissions reduction technologies will increase significantly. By 2030, if the same purchasing incentives exist, consumers will not see any noticeable differences between the price of a traditionally powered vehicle and a fully electric one.

AUTOMAKERS MUST ADJUST MODEL RANGE AND PRODUCTION

During the next 15 years, the study predicts a progressively increasing proportion of battery-powered electric vehicles, plug-in hybrids, and mild hybrids with 48-volt technology. Such vehicles are predicted to represent 35 to 40% of all new car sales by 2025, increasing to more than 65% in 2030. Those gains will be at the detriment of the diesel engine, which is expected to completely lose its cost advantages in smaller vehicles and hence market share by 2030 (figures 2 and 3).

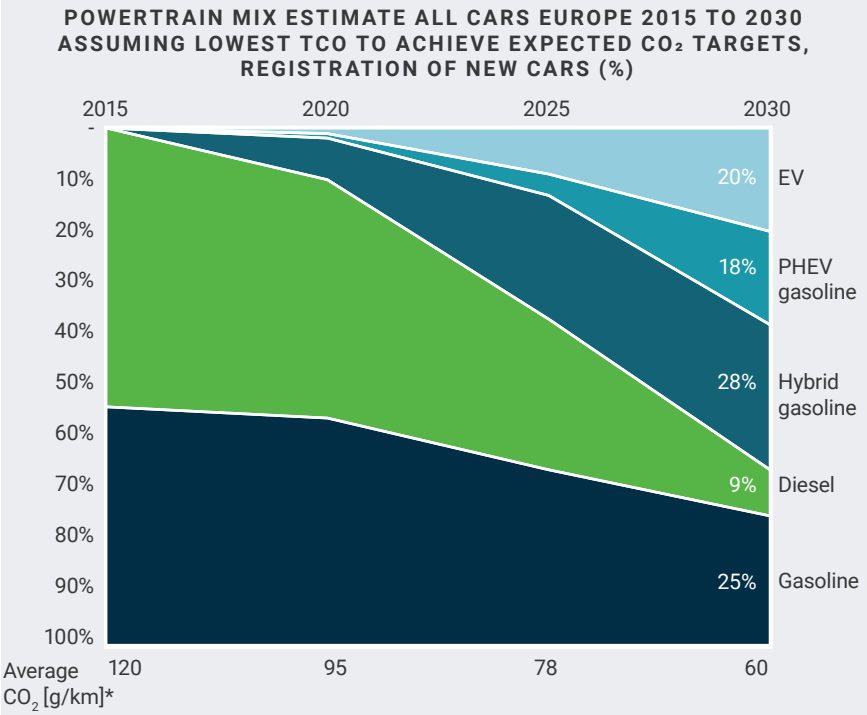
To meet the growing demand for electric vehicles, many manufacturers are expected to be forced to undergo structural change in their manufacturing footprints. Each new electric vehicle will mean declining utilization of existing engine production for carmakers. Industry players will have to fight to capture their shares of the value added and component development if they are to avoid dependencies on suppliers in those important technologies. VW Group has already announced such a strategy, and more will follow.

CHARGING INFRASTRUCTURE REQUIRES HUGE INVESTMENTS

As battery-powered electric vehicles grow in prominence, focus will shift to improving the global charging infrastructure. In such cities as London,

[1] http://www.theicct.org/sites/default/files/publications/ICCT_LaboratoryToRoad_2015_Report_English.pdf; Kraftfahrt Bundesamt (KBA) research.

FIGURE 3: OVERALL SHIFT TO ELECTRIFIED VEHICLES BY 2030 REPLACING DIESEL WHICH IS EXPECTED TO HAVE A SMALL SHARE OF ADDITIONAL SALES POST 2030



Key model findings

- By 2030, alternative powertrains will significantly substitute conventional powertrains.
- Diesel will lose high share to alternative powertrains from 2020 – not cheap enough to compete with gasoline and not clean enough to compete with APVs.
- Hybrids will gain significant share from 2020, PHEVs and EVs from 2025 as battery cell costs fall and charging infrastructure rolls out.

Source: AlixPartners
Note: * Based on 2016 testing procedure

for example, around 75% of households do not have off-street parking, and a robust public charging infrastructure will be critical. The study calculates by 2030 a global demand for more than 300 million charging stations in the 488 cities around the world with populations of more than one million, which represents an investment of €3.7 trillion.

DIGITIZATION REDUCES STRUCTURAL COSTS BY A QUARTER

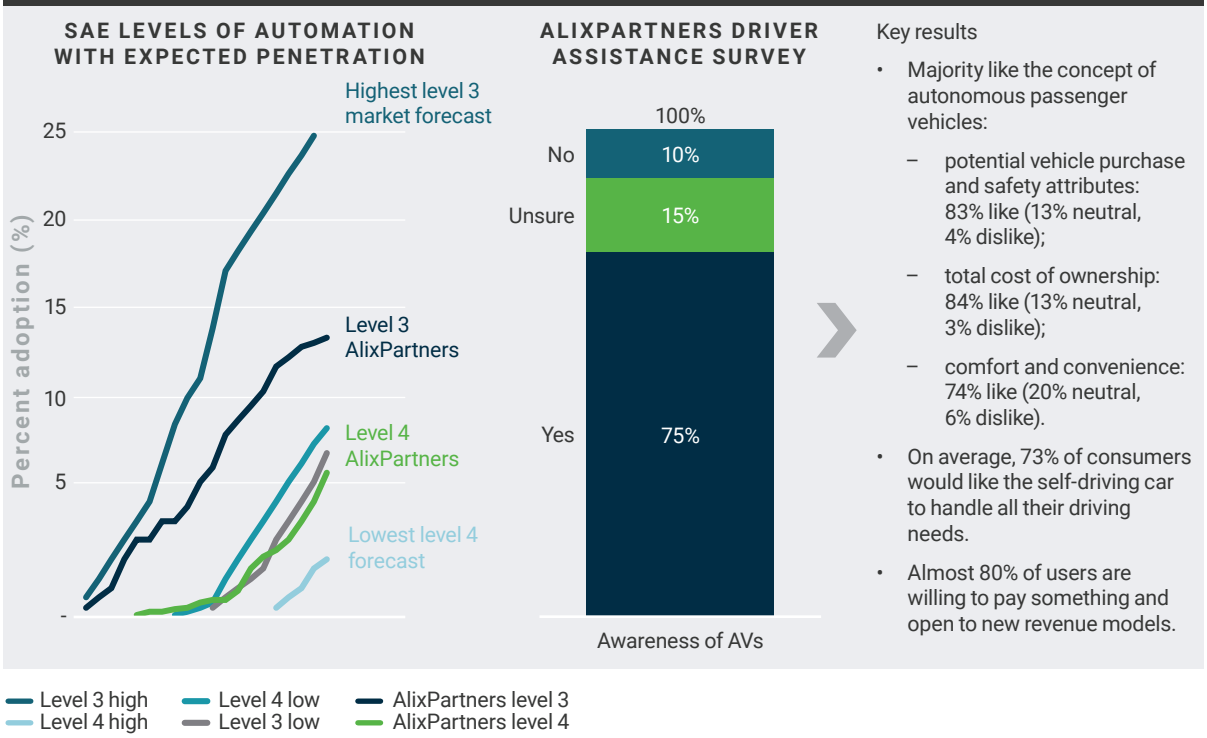
Systematically exploiting the benefits of digitization is a basic requirement for remaining competitive and can lend itself to huge cost and operations efficiency improvements. Overall, the study anticipates large-scale benefits such as production cost reductions of 5 to 25% driven by smart robots, reduced downtime, and scheduling optimization. Inventory costs will be reduced by 20 to 35%, and better predictive and conditional planning along with reduced spare parts usage will lead to 20 to 35% reductions in maintenance costs. Furthermore, companies can expect to see declines in the cost of quality by 8 to 20% as well as reductions of 15 to 25% in costs of logistics. Finally—and important for the automotive industry—customer analytics, product visibility, and real-time understanding of profitability could see the cost of complexity plummet by two-thirds.

CONNECTED CARS AND AUTONOMOUS DRIVING OPEN UP ENORMOUS EARNINGS POTENTIAL

The growing acceptance of connected- and autonomous-driving technology can lead to new revenue opportunities of €160 per year per car in such areas as component services, apps, content, and advertising. The study further predicts that motorists will be prepared to pay for those services because they will benefit from savings such as location-driven fuel price optimization, parking space reservations, reduced wear and tear, and discounts on insurance.

As the autonomous-driving industry continues to evolve, consumers' desires to drive and own autonomous vehicles are becoming increasingly positive, supported by the continued evolution of legal frameworks. Still, autonomous driving is at an early

FIGURE 4: OUR ANALYSIS SUGGESTS LEVEL 3* AUTOPILOTS WILL BE QUICKLY ADOPTED, BUT NO FULLY DRIVERLESS VEHICLES WILL BE ON THE ROAD BEFORE 2020



Source: Moody's, IHS', other published forecasts from BCG/McKinsey/CBInsight/IHS, AlixPartners Driver Assistance Survey of US Consumers 2016, AlixPartners analysis
Note: * Level 3 refers to mainly autonomous driving with human responses when requested to intervene. Level 4 refers to systems when human responses are not needed

stage, and the cost of the technology is still higher than consumer willingness to pay. Whereas 80% of US consumers say they're prepared to pay extra for an autonomous-driving system, only 10% are willing to spend $5,000 on it.

Manufacturers therefore have a balance to strike. On one hand, they need an exclusive offer from customers who are already prepared to pay today, and on the other, they need to aim at the wider market to get the economies of scale of mass production (figure 4). Furthermore, it is becoming clear that the benefits for the customer and the profit potential for the industry are large. The AlixPartners study calculated that for the US, autonomous driving could enable savings of up to 325 billion dollars for the industry, society, and consumers, as a result of accident avoidance, productivity gains, fuel savings, and congestion savings.

ABOUT THE STUDY

The study *A Watershed Moment for the Automotive Industry: The AlixPartners Global Automotive Outlook 2016* is based on expert interviews and financial analysis of more than 300 global suppliers and global automakers. A

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