

ULTRA-EFFICIENCY OR DIGITAL DISRUPTION?



PLANNING FOR THE
FUTURE OF FLEETS



Foreword: ultra-efficiency or disruption?

The retail, entertainment and travel sectors have undergone radical disruption due to new technology, with new players like Amazon, Netflix and Expedia shaking up traditional industries.

Until very recently, the commercial fleet sector has — except for incremental advances — remained relatively unchanged. Not for much longer. A convergence of new technologies, services and greater connectivity is set to reshape the sector, requiring new skills as well as creating new industry players and business models.

By 2040, the fleet industry could transform almost beyond recognition. Virtually all smaller vehicles are likely to be electric. Larger long-haul transport will transition to renewable and low-emission fuels. Many vehicles will be self-driving, with routine maintenance via software download and artificial intelligence enabling individual fleet vehicles to take themselves to an optimal location for refuelling and overnight parking — ready for their allotted tasks the following day.

We could see ‘vehicle-less’ fleets, with companies using the logistics equivalent of ride-hailing apps to manage networks of independent vehicles to share loads efficiently, manage deliveries on demand and remove the capital and operational cost of owning vehicles themselves.

Exponential growth in the volume of data will ensure that fleets are as efficient as possible, leading to financial and environmental gains as well as making planning and journeys easier for both managers and drivers.

With their operating environment in constant flux, nearly half of fleet managers find it challenging to stay informed, with a need to gain support internally from business leaders and fleet drivers for new initiatives. As many as 40% say they struggle to stay informed, and 1 in 4 feel their bosses are resisting new technologies.

Based on extensive interviews with 750 fleet managers in the UK, Germany, Netherlands and Poland, this report is a guide to the trends that are shaping the fleet landscape and will continue to transform it for years to come. It contains the information you need to master the changes that are coming and maximise the opportunities they’ll bring with them.

Katya Atanasova,
Vice President, Shell Fleet Solutions



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Evolution meets revolution

News of the rapid and far-reaching changes transforming the commercial fleet industry is hard to escape. In twenty years' time, the commercial fleet is going to be almost completely unrecognisable to anyone working in the industry today.



The need to transition to new fuels will create challenges and opportunities for fleet managers that are very different to those faced by the domestic vehicles industry. With batteries able to power large vehicles for long distance still in development, fleet managers will have to find the right mix of alternative fuels for their organisation's needs.

New vehicle types — including those running on new fuels as well as autonomous and semi-autonomous vehicles — will fundamentally change the mix of skills required of fleet managers and their teams. Disruptive technologies such as automated vehicles, ride-sharing, load sharing and over-the-air software and maintenance will also fundamentally alter the way we work.

In such a revolutionary environment, it can be tempting to simply assume that change is too complex for any one person to predict and plan: a wave to be ridden rather than a force to be mastered.

But this is not the case. Some of the factors driving this change — the creation of an always-connected, data-rich environment, for example — are providing the tools to augment existing ways of working, not simply overhaul them.

From how they manage, monitor and control their fleets, to how they improve the performance of drivers, fleet managers will soon be able to achieve new levels of efficiency while delivering tangible cost savings and commercial value to their organisations.

In other words, this is revolution and evolution alike

Rising to the energy challenge

The US Energy Information Administration predicts a 28% rise in global energy demand by 2040⁽¹⁾.

By 2025, almost half a billion citizens in emerging markets will have risen from poverty to become middle class⁽²⁾. And with rising prosperity, comes rising consumption. That means greater demand for consumer goods, more technology in homes and businesses drawing power and more vehicles on the road. According to research cited by the World Economic Forum, the number of cars on the road worldwide will double to two billion by 2040⁽³⁾.

But at the same time as demand is rising, businesses are under increasing pressure to diversify their energy sources and transition to cleaner fuels. The UK and France have both passed laws banning the sale of petrol and diesel cars by 2040. The United Nations Paris Agreement on climate change seeks to limit global warming to well below 2 degrees Celsius by managing climate and environmental pressures while ensuring economic development.

What does this mean for fleets?

As the market shifts away from traditional fuels, no one can afford to stand still. Leave it too late to transition to new fuels and vehicle types, and you may find yourself burdened with the cost and disruption of an unnecessarily rapid whole-fleet transition.

Equally, a wholesale transition to a single type of alternative fuel is unlikely to be a good option for most company fleets. A range of new and innovative fuel types exists or is in development, each of which is best suited to different types of vehicles and use cases.

Only by creating greater fuel efficiency and adopting a mix of cleaner fuels can we, as a society, hope to decarbonise our increasingly energy hungry economies. By the same token, only with a range of fuels can fleet managers meet the needs of all users, from shorthop urban delivery drivers to long-haul heavy-goods hauliers.

The number of cars on the road worldwide will double to two billion by 2040



⁽¹⁾ International Energy Outlook 2017, 14 September 2017, US Energy Information Administration. ⁽²⁾ Emerging market insights: The coming emerging market demand shock, September 2017, Deloitte. ⁽³⁾ The number of cars worldwide is set to double by 2040, 22 April 2016, Matthew Nitch Smith, World Economic Forum.

A 5-year countdown

Research by analysts Frost & Sullivan found that commercial vehicles in Europe are responsible for 20% of all vehicle-related greenhouse-gas emissions, despite only being 5% of the vehicles on the road⁽¹⁾. Fleet vehicles are also much more likely to have a diesel engine than passenger cars are. This leaves commercial fleets particularly exposed to the growing unease about particulates in diesel exhaust. Increasingly, these pressures and concerns are driving change.

Shell's Future of Fleet survey found that 53% of fleet managers expect to adopt new fuel types within the next five years⁽²⁾. Asked which fuel types they would choose for their fleet if they had an entirely free hand, 64% fleet managers chose either electric or hybrid not only over other types of alternative fuel, but also in preference to diesel and petrol⁽³⁾.

Eclectic not (just) electric

Extensive publicity and high-profile announcements from automotive manufacturers has meant that the electric car has grabbed public attention. But unless your use-case is extremely limited, the chances are you will need a wider range of vehicle types in your fleet than just electric. A recent study in the American Chemical Society's journal Energy Letters calculated that a battery capable of providing a US class 8 truck — with a gross vehicle weight rating (GVWR) of over 14,969 kg — with enough power for a 600-mile journey would weigh over 16,000 kg, more than the payload capacity of the vehicle⁽³⁾.

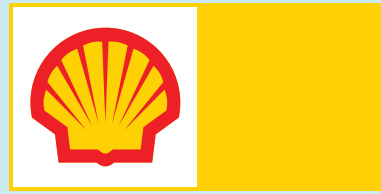
So what type of vehicles are available or will be soon?

Electric Vehicles	Fuel-cell Electric Vehicles	Gas-to-liquids Vehicles
Cars and vans that run on mains electricity drawn from a charging point installed at your business or a participating service station.	Vehicles powered by a fuel-cell that converts compressed hydrogen into electricity to power the vehicle.	Suitable for use in normal diesel engines, GTL is natural gas — the cleanest-burning fossil fuel — which has been converted to a liquid.
Biofuel Vehicles	Hybrid Vehicles	Liquefied Petroleum Gas Vehicles
Made from renewable sources such as sugarcane, biofuels can be used by themselves or blended with petrol and diesel.	Powered by a mix of electricity and internal combustion, usually petrol or diesel, hybrid vehicles lower fuel emissions but deliver power and range.	LPG burns cleaner than traditional fuels, producing lower emissions but engines must be modified before they can run on it.
Liquid Natural Gas (LNG)		Compressed Natural Gas (CNG)
A natural gas that has been converted to a liquid, LNG is a low-emission high-density fuel. This makes it particularly suitable for long distance haulage.		Methane stored at high pressure, CNG can be used in specially designed engines or in standard petrol and diesel engines that have been slightly modified.

The exact mix of engine types you need for your fleet will depend on your specific requirements. The good news is that there is a technology for every use case, from light local deliveries to long-haul freight haulage. For more information on alternative fuels, see 11.

(1) Electric trucks and vans cut pollution faster than cars, 28 July 2017, Chris Baraniuk, BBC News. **(2)** Shell survey of fleet managers in Europe, October 2017. **(3)** Performance Metrics Required of Next-Generation Batteries to Make a Practical Electric Semi Truck, Professor Venkat Viswanathan, ACS Energy Letters 2017, 2, 1669-1673.

PLANNING FOR THE FUTURE OF FLEETS



NEW MATERIALS:

aluminium, graphene and carbon-fibre composites will improve aerodynamics and fuel efficiency. Self-healing materials, 3D printing and swarms of small robots will reduce maintenance costs and extend the life of vehicles.

IMPROVING ENVIRONMENTAL IMPACT

better data enables journeys and loads to be optimised, improving fuel efficiency, reducing waiting time and congestion.



VIRTUAL FLEETS:

fleet managers will use ride-hailing and sharing services to call vehicles 'on-demand' removing the cost of owning and maintaining cars and vans.



LOAD-SHARING:

apps will match drivers with companies that need deliveries so that they can pool logistics costs and deliveries.

BIOFUELS

such as used coffee beans mean that by-products previously seen as waste become productive alternative fuels.

A MOSAIC OF FUELS:

most fleets will use a mix of fuels to suit the type, task and range of vehicles. Better data will mean all vehicles are more fuel efficient and fraud is reduced.

REMOTE MAINTENANCE:

servicing and repair will be delivered 'over-the-air' as software downloads.

ELECTRIC AVENUES:

embedded wireless chargers and 'powered' roads recharge electric vehicles as they drive. Photovoltaic cells in the road surface generate solar power for national grids.

DRONE DELIVERY:

freight vehicles will arrive with their own team of drones to rapidly make multiple deliveries in a nearby area.

SMARTER ROADS:

temperature-sensitive, photo-luminising paint will create changing road patterns to remind drivers of weather conditions and safety information.

SMARTER FUELLING:

mobile refuelling will enable customers to order fuel deliveries on-demand to a home or office.

PROGRAMMATIC INFRASTRUCTURE

smart vehicles will automatically identify the best price and location for refuelling and drive themselves to this destination, so they are ready for their next job.

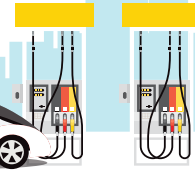


THE ROAD TO CHANGE: A TIMELINE TO 2040



2025

Mixed fleets are commonplace, with different fuel types for long or short-haul usage



1.25 billion

cars on the roads¹

10%

of all cars globally are EVs (vs 1% today)¹

Connected technologies make vehicle maintenance easier



Batteries for electric vehicles will cost \$80 per kilowatt-hour, compared with about \$150 today and more than \$650 in 2010⁸



Load sharing apps mean fewer empty journeys

2030

Fleet Managers are now mobility managers coordinating more vehicle and journey types



100%

of new car sales are EVs in US, China and EU⁴

Fossil fuel use starts to decline sharply⁴

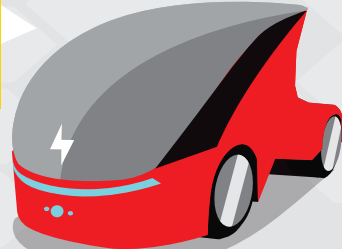
EU cities including Paris ban all non-electric cars from its streets³

City centre deliveries are almost all in self-driving vehicles

1 in 10

new cars sold are shared, not privately owned⁵

2040



Almost all taxis and shared cars are self-driving

Car maintenance is entirely automated

25%

of all cars on the road will be electric⁷

2 billion

cars on the roads¹

Global energy demand up
+30%
from today⁶



1. Shell Scenarios presentation, September 2017
2. Bloomberg New Energy Finance Electric Vehicle Outlook 2017
3. Paris to ban non-electric vehicles altogether, 18 October 2017, Manta Kotkar, Automotive Electronics
4. Shell Scenarios 'Sky'
5. Automotive Revolution – Perspective Towards 2030, January 2016, McKinsey & Company
6. International Energy Agency's (IEA) main scenario
7. The Car You Will Be Driving in 2040: Top 10 Predictions, 6 March 2018, Credit Suisse
8. Study predicts slow, steady rise of electric vehicles to 2030, 2 November 2017, Paul Lienert, Reuters

The impact of digital disruption

By 2030, many cars will be fully autonomous under favourable conditions and, thereafter, fully autonomous under all conditions⁽¹⁾. This opens a range of interesting possibilities for fleet managers. Autonomous or semi-autonomous vehicles could be programmed to drive in platoons, with only the lead truck under direct human control. Given that platooning has been shown to improve fuel efficiency by around 4%⁽²⁾, if applied globally, it will have huge financial and environmental benefits.

Software-over-the-air technologies and improved telematics, will also allow the monitoring and maintenance of vehicles on the go, with repairs and servicing delivered via download or mobile service team, changing current models for management, maintenance and reliability of fleets.

Platooning has been shown to improve fuel efficiency by around 4%

Meanwhile, adapting the concept of ride-hailing services like Uber and Didi Chuxing could dramatically change the commercial sector. Companies could operate with 'vehicle-less' fleets, using technology to call for deliveries on-demand and combine loads with other businesses for greater efficiency. This 'asset-light' model will remove many of the capital and operational costs of purchasing and maintaining vehicles.

Next generation fleets

These changes present both opportunities and challenges. As with any disruption, successful early adopters will enjoy a competitive advantage. The potential for improving fuel efficiency and for reducing downtime is huge, given the greater visibility and control the development of intelligent vehicles will offer.

For organisations and for fleet managers, they represent a Darwinian pressure that will drive the evolution of fleets. Ultimately, the sector will emerge stronger, more efficient and more agile. But as with any process of evolution, there will be winners and losers. The key to being among the winners, is to start preparing now.



(1) Driverless Cars: Time for Insurers to Shift Gears. **(2)** Platooning Trucks to Cut Cost and Improve Efficiency, 5 February 2018, Office of Energy Efficiency & Renewable Energy.

Are fleet managers ready?

A recent Shell survey of fleet managers asked what challenges were uppermost in their minds and how well prepared they felt to face them. The answers were illuminating.

Almost four out of every 10 fleet managers in Europe expect just staying competitive to be a challenge soon. The three big changes respondents see coming are the adoption of new fuel types (53%), the introduction of new technologies (48%) and the advent of new vehicle types (47%).

This is entirely consistent with other independent research and with the broader industry view. But surprisingly, over half of fleet managers say that they have experienced resistance to change either from drivers or from senior management.

This suggests an environment in which fleet managers often don't get the support they need to make the best decisions for their organisations. This is entirely regrettable, as it's ultimately those organisations with inertia that will suffer from most.

This makes it even more vital that fleet managers have the data and the evidence they need to make the business case for change now. To prepare themselves and their fleets for the challenges ahead, fleet managers need the institutional support necessary to shape and adapt their organisations to the new normal. Failure to do so, is preparing to fail.

Almost four out of every 10 Fleet Managers in Europe expect just staying competitive to be a challenge soon

New era, new fuels

Most fleet managers recognise the need to adapt to the energy challenge, reduce the environmental impact of their operations and adopt new, environmentally friendly fuels. In fact, Shell's survey of fleet managers found that 28% would introduce electric vehicles to their fleets today if cost was no option. A further 26% would adopt vehicles powered by other alternative fuels.

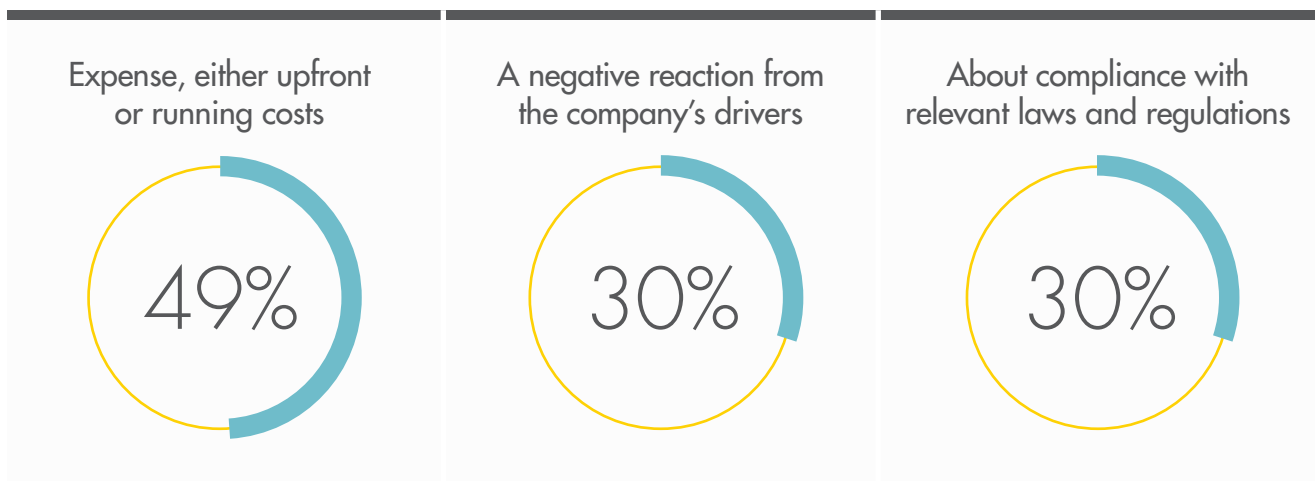
What managers may not appreciate, is that cost is already not the issue they imagine it to be. A 2017 study by UBS found that the total cost of ownership for an electric vehicle in Europe would be no more

than for a standard petrol or diesel vehicle by 2018. China will reach cost parity by 2023 and the USA by 2025⁽¹⁾. Research by Bloomberg indicates that electric vehicles will even be cheaper to buy within seven years or less⁽²⁾.

Unsurprisingly, given such figures, 36% of fleet managers believe the move to alternative fuels is vital if their operations are to stay competitive. 36% say that they would like to introduce electric vehicles to the fleet while 28% would opt for hybrid. The preference for these two fuel types is attributed to its low environmental impact.

Yet despite this relatively high level of consideration for alternative fuels, uptake remains slow. 35% of fleet managers say they anticipate challenges in integrating new fuel types into the fleet.

Their concerns are:



Perhaps most revealing is that 30% of fleet managers feel preparing their organisations for the broader use of alternative fuels will be one of the biggest struggles of the next five years.

⁽¹⁾ Electric car costs forecast to hit parity with petrol vehicles, 19 May 2017, Peter Campbell, The Financial Times. ⁽²⁾ Pretty Soon Electric Cars Will Cost Less Than Gasoline, 26 May 2017, Jess Shankleman, Bloomberg.

How is the industry reacting to new technologies?

As well as adapting to new fuel types and meeting environmental goals, fleet managers are also concerned to get the best possible competitive advantage from new technologies.

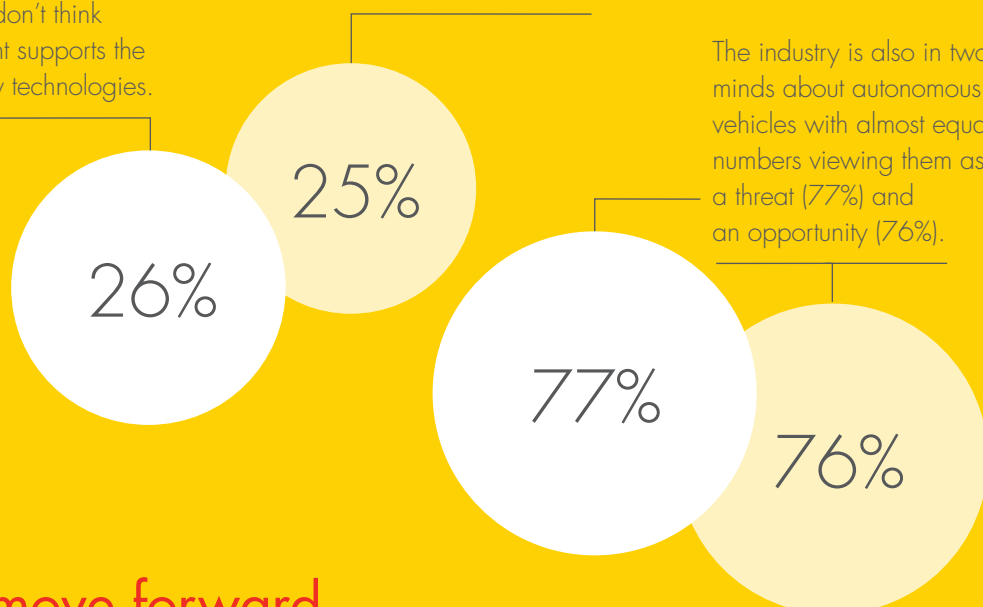
More than half (58%) say they are excited about the role new technologies will play in the evolution of the industry. Respondents singled out business technology – to streamline back-office operations (40%), to demonstrate business value and to enable wireless fleet monitoring – as having the greatest potential to transform operations.

What are the roadblocks?

While they may be enthusiastic about the potential of new technologies, a quarter (26%) of fleet managers don't think senior management supports the introduction of new technologies.

A further 25% say they will face resistance from drivers.

The industry is also in two minds about autonomous vehicles with almost equal numbers viewing them as a threat (77%) and an opportunity (76%).



How to move forward

Everyone in this equation knows that change is inevitable. What prevents many organisations that run commercial fleets from beginning the transition process, is the feeling that change is both far off and that we don't know for sure what form it will take.

Both assumptions are incorrect. And the longer any organisation clings to them, the more of a disadvantage it puts itself at. Fleet managers, who have the most to gain and lose from this process, are also best placed to be advocates for change.

But to drive the evolution, they need the full support of the organisations they represent.

What next?

With almost two thirds of fleets keeping their vehicles for less than three years, and only 7% keeping them for more than five years, it's important that fleet managers understand new vehicle technologies and how to implement and manage them in their fleets if they are to remain competitive.

However, a Shell survey of European fleet managers reveals a gap between optimism about their changing industry and their readiness to maximise their company's potential in this new world. To bridge this gap between awareness and readiness, organisations urgently need to empower fleet managers to begin the process of evaluating and procuring tomorrow's technologies. If necessary, fleet managers should consider bringing in outside expertise to achieve this goal.

The businesses that start future-proofing their fleets now will be able to integrate new technologies faster than their rivals. They will also be able to do so from a stronger position of organisational competence and readiness, rather than finding themselves forced to rush through changes at the last minute in response to the advantages gained by their better-prepared competitors.



Preparing to win

Business Car magazine recently reported that UK fleet managers spend 32 hours a month just on routine administration, often working without the tools or specialist support they feel they need ⁽¹⁾. Given the workload many fleet managers already labour under, it's hardly surprising that they often don't have the time to do extra-curricular and in-depth testing of new technologies.

It's also telling that respondents said they often don't have the tools or specialist support they need. This chimes with our research, which found 60% of fleet managers saying they didn't have the expertise internally to keep up with the pace of change in the industry.

It's difficult for any single organisation to invest the time and budget required to develop in-depth expertise in new vehicle types. For most organisations, doing so would divert attention and resources from the core mission. For this reason, external experts and consultants have a crucial, enabling role to play in the process of fleet transition.

According to Shell research, 34% of Fleet Managers would find external support and advice helpful in the transition to new technologies and vehicles types. The right external advice and support could help ensure they're better equipped to navigate the 'new normal' and, importantly, more able to convince their bosses and employees of why the time for change is now.

34% of Fleet Managers would find external support and advice helpful in the transition to new technologies and vehicles types

(1) SME Fleet Managers spend 32 hours a month on fleet admin, says Allstar, 2 August 2017, Daniel Puddicombe, Business Car.

Q&A with Parminder Kohli

Global General Manager Business Development, Marketing and Operations, Shell Fleet Solutions



Where do you think the industry will see the biggest changes?

Looking at the long-haul sector, we'll see the aggregation of a range of fleet services like freight optimisation and the growth of demand-matching. I'm thinking of organisations like the Truck Alliance in China. These systems have the potential to organise a fragmented market, to the benefit of hauliers and their customers. They could even allow their members to aggregate a range of fleet services, from fuel discounts and route planning to road toll services. The potential benefits are huge. Meanwhile, in the last-mile sector, we know that global logistics providers are looking at the role of intelligent systems in optimising order allocation and the placement of vehicles and drivers. Using Artificial Intelligence to predict behaviour so we can perfectly balance supply and demand, could reduce costs by up to 20%. Fleets may even be able to dispense with the need to own their own vehicles, instead simply predicting demand and dynamically buying in supply from vehicle aggregators to match. There is also the additional challenge of coping of energy transition and a mix of fuel types of LNG, CNG, Electric mobility, Hydrogen and deciding your optimum fleet mix given the mosaic of fuel types.

Do you see new types of partnership and collaborations changing the industry?

Yes. Look at things like the IONITY venture between Auto OEMs and Shell to bring high speed charging to Europe, a venture between Daimler, T-Systems and DKV to develop a single service for handling all the different road toll requirements also across Europe etc. I also expect big logistics players to start taking stakes in, and working closely with, telematics and navigation startups. We'll see investment in intelligent systems and Blockchain. Automotive component manufacturers are using the latter to optimise supply and stock-management systems and Blockchain is also set to be a big factor in industry responses to ride-sharing and dynamic electrical-vehicle charging.

What skills do you think fleet managers will need in future?

I think fleet managers need to change the way they think about data. Your average fleet produces a lot of data that could be made to yield a financial return, for instance, by making it possible to save fleet-wide on insurance. This is going to be a challenge but also a source of huge opportunity. If I were a fleet manager, I'd also start thinking about whether my company genuinely needs to own fleet assets or if it can operate with a virtual, aggregator model. I also think fleet managers will find themselves increasingly pushed to show how they play an active role in reducing their organisation's carbon emissions. The most effective way to do this, will be through a combination of fuel efficiency; a mix of alternative fuels; reducing wastage and inefficiency as well as through offsetting.

How should fleet managers support drivers?

Whilst drivers may be concerned about the impact of new technologies, there are positive points about how technology can make their lives easier, safer and less stressful. For example, smarter route planning and warehousing could lead to shorter, less intense periods of driving. This could also enable planned changeover between drivers at scheduled points to minimise the length of drives. Wearables could monitor stress and tiredness amongst drivers to relieve them sooner.

Is there a role for common standards?

Yes. By developing consistent standards for new technologies and for things such as road tolls, government and industry bodies can help accelerate and depoliticise necessary change. Legislation such as the GDPR (the EU's new data protection legislation, the General Data Protection Regulation) will also give the industry a framework within which to monetise fleet data. Common standards will help us reduce duplication and wastage as we develop the infrastructure we need to switch to alternative fuels.

Welcoming new technologies

Technologies such as advanced telematics — the collection and long-distance transmission of operating data — and data analytics have the potential to transform fleet management. They enable real-time fault detection and, in many cases, remote repair. Through predictive analysis, they also have the potential to reduce rates of failure and optimise fleet efficiency.

Automated or partially automated vehicles will transform the way fleets operate. Already today, in-vehicle monitoring systems (IVMS) provide Fleet Managers with data on vehicle and driver behaviour that can help improve driver comfort, efficiency and safety. By helping drivers improve their road habits, it can also cut fuel consumption.

Pre-pay and automated payment systems cut the rates of fuel fraud. Through artificial intelligence, we will be able to predict peaks in demand for specific areas and customers (internal or external), allowing us to optimise the number of vehicles and drivers available at any time for maximum efficiency and cost effectiveness — and for the best possible customer experience.



A process of prioritisation

Faced with all these possibilities, it's both tempting to want to implement them all but at the same time difficult to know when to start. In reality — unless you're faced with establishing a brand-new fleet — this is not practical.

Organisations that begin preparing for the transition to new technologies now can gain a complete and detailed understanding of their needs, allowing them to integrate exactly the right mix of technologies and to maximise the benefit those technologies bring to their operations. These companies will enjoy a competitive advantage as the industry goes into the next stage of its evolution.

The key is to identify priority areas for your business: areas in which fleet renewal and the integration of new technologies can help your organisation achieve core business goals. Then map out a strategy that adds the necessary technologies incrementally, with each renewal of expansion of part of the fleet. Ideally, every new acquisition should fit within this strategy in way that deepens and broadens the capabilities being added to the fleet.

New technologies in action

Exciting new ideas have real potential to deliver greater value and sustainability for commercial fleets. Here is a selection of some of the most interesting:

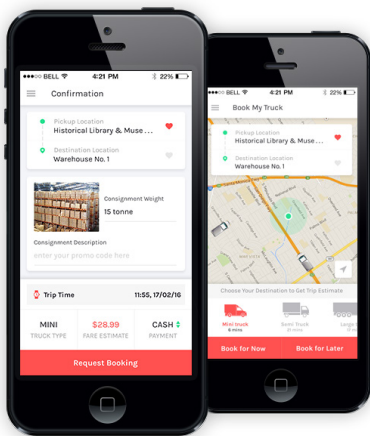
NEW MATERIALS

Aluminium, carbon-fibre composites and other new materials are being used to improve aerodynamics and reduce the weight of vehicles, leading to greater fuel economy. Companies like Samsung are exploring the applications in battery technology. Its ‘graphene ball’ has the potential to extend the storage capacity and life of lithium-ion batteries.

Looking further ahead, new materials could lower maintenance costs and improve the durability of commercial vehicles. For example, Harvard University has developed a self-healing material for use in vehicle tyres.



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LOAD-SHARING

Uber Freight and the Truckers Alliance Group offer free apps that match drivers with companies that need deliveries. This provides flexibility for drivers, upfront pricing and faster payments which could revolutionise logistics business models. It could lead to more freelance drivers and greater collaboration between companies to pool logistics costs and deliveries.

There is scope to aggregate many other services for commercial vehicles, for example adding fuel payment and loyalty programmes, automated transactions for road tolls, and discounts on new vehicles, tyres and mobile phone costs.

ADDITIVE MANUFACTURING AND ROBOTICS

Techniques such as 3D printing, could make vehicle maintenance cheaper, as parts can be produced on-demand, on-site, reducing the cost of shipping and storing spares. Stratasys has developed an additive manufacturing platform being used by Volvo, Daihatsu, Jaguar and McLaren to 3D print prototypes, components and test models.

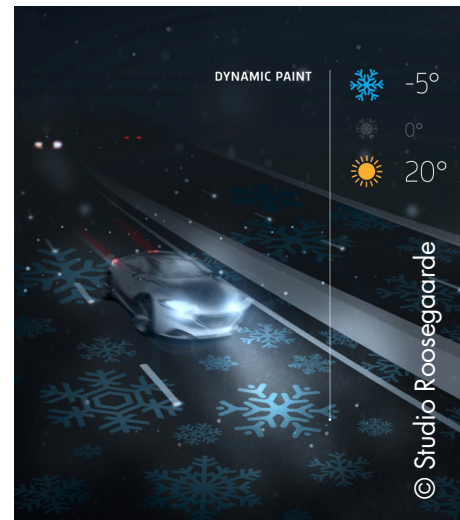
Intelligent robotics will improve maintenance, with smarter, smaller robots able to conduct quicker, more regular inspections of vehicles to identify potential issues earlier. Academics are also researching the behaviour of insects such as ants and bees, to develop swarm robotics, which will enable small, individual robots to work collectively to make repairs to both vehicles, roads and traffic infrastructure.



SMARTER ROADS

A range of innovative ideas have been proposed which will aid fleet drivers and increase road safety. A trial has taken place in the Netherlands of photo-luminising powder for road markings, which charge during the day and glow at night. Another idea is the use of temperature-sensitive paint to create changing road patterns to remind drivers of weather conditions.

A 1.2-mile-long stretch of electrified road has opened just outside Stockholm, Sweden. Created by eRoadArlanda, the road recharges the batteries of electric vehicles as they drive. An alternative approach is Qualcomm’s HalolPT system, which embeds wireless induction chargers in the tarmac to increase the range of electric vehicles.



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SMART DISPLAYS

Buses, vans and other commercial vehicles could be equipped with external, transparent LCD displays, which can display information such as adverts, route plans, tourist information and weather reports. This could drive new business models and partnerships between content providers and operators of commercial fleet vehicles.

The rise of autonomous vehicles also frees up productive time, with smart screens able to display company applications for professionals using company cars or personalised in-seat information and entertainment for passengers on public transport.

SUPPORTING DRIVERS

While there is caution amongst some fleet drivers about the impact of technology, there are new developments which will make their lives easier, safer and less stressful.

For example, smarter route planning and warehousing could lead to shorter, less intense periods of driving. This could also enable planned changeover between drivers at scheduled points to minimise the length of drives.

The European Institute of Innovation and Technology has trialled wearable technology to help truckers and other fleet drivers keep measure their alertness, stress levels, health and wellbeing.

Intelligent virtual assistants, or ‘concierge’ services, will also help smaller fleet operators and individual drivers to take advantage of new digital services.



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The fleet sector must innovate to survive

Q&A with Stuart Blyde,
Shell Retail Marketing
Innovations Manager



Stuart Blyde is the head of Shell's Connected Car and Innovations programme. We caught up with him to find out what he thinks the evolution of the fleet will look like.

What do you see as the most exciting opportunities for the fleet industry in the next 5 years?

The opportunity for customisation is particularly exciting. For instance, when automotive brands sell in bulk to a fleet company, they'll look much more closely at what technology needs to be integrated with those vehicles. This could help fleet professionals accelerate the adoption of new services to support drivers, provide accurate data or support the adoption of new fuel type by negotiating this into new contracts. We recently worked with a leading manufacturer that was very interested in bundling Shell on-site charging and other next-generation services with the work we were already doing for them.

If we were to step 10 years into the future, what do you think would be the biggest changes we will see in the fleet industry?

I think by then, we'll have some fully autonomous vehicles and that gets really interesting. You've heard of programmatic advertising; when advertisers dynamically bid on ad spots as a webpage loads, with the winner getting the banner or the video slot? Well, imagine fleets in which every vehicle is dynamically programmed to know how much to bid for power, depending on factors such as how many charge points are left within a vicinity, how far it still has to go, how much charge it has left and so on. I call this programmatic infrastructure. The opportunities for efficiency are immense.

What do you think are the first, most important, steps that Fleet Managers need to take to prepare for the future?

I think Fleet Manager's will be highly involved in monitoring, analysing and responding to incoming data. This could be both immediate needs — for example does a particular vehicle need to be cleaned or serviced — and about maintaining the service levels in the fleet as a whole. I think that's what we as an industry should be thinking about.

How can Shell help?

Shell Fleet Solutions is a specialist division of the Shell, with the aim of providing Fleet Managers with the products, services and expertise they need to succeed. Our specialists are industry-leading experts who also have the broadest range of connections in the automotive sector. We can help Fleet Managers understand how to integrate exactly the right mix of new fuels and technologies into their operations for the optimum outcome.

Embracing new fuels

In the last two decades, the range of fuels available to power our vehicles has expanded rapidly. Navigating the in-depth and sometimes conflicting information about the costs and benefits of different fuel options can be complicated and time-consuming.

And as alternative fuel types become available, the challenge will only become greater; leaving 32% of Fleet Managers to tell Shell researchers that they would benefit from advice on the merits and drawbacks of different fuel and vehicle types.

Shell has decades of experience in fuels innovation and this goes far beyond petrol and diesel. Around the world, Shell is working with vehicle and equipment manufacturers to push the boundaries of technology, with industry bodies to expand new energy infrastructures and with start-ups to bring clean energy innovations to life.

By embracing alternative fuels, you give your organisation a head-start on its competitors, make it more attractive to increasingly environmentally motivated investors, customers and legislators, and reap the benefits of these increasingly cost-efficient energy sources. But to realise these benefits, it's important to start the transition now.



Training for tomorrow, today

Education and training is critical in preparing for the future of fleets. Nearly two-thirds (63%) of Fleet Managers in our survey are seeking additional training to keep up-to-date with industry evolution and 44% expect their role to become less about managing vehicles and more about managing people. Investing in driver training is also seen as key to competitiveness, with 35% viewing this as a priority.

In terms of professional development, areas to consider include:



Fuel-efficiency

Encouraging more fuel-efficient driving is one of the immediate priorities with 35% of Fleet Managers focusing on this area. Every extra 45kg you carry reduces fuel efficiency by up to 2%, so training on load management can make a difference. Using high quality motor oils, lubricants, replacing dirty or worn components and ensuring optimal tyre pressure can all lead to fuel-efficiency gains.



Virtual and augmented reality training

With the emergence of autonomous and semi-autonomous vehicles and new concepts such as platooning, using virtual and augmented reality simulations can be a good way to introduce these new approaches to drivers, gain their support and enhance their driving skills.



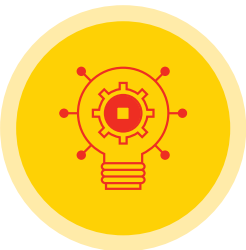
Personal wellbeing

A combination of wearables, telematics data and concierge tools can provide drivers with valuable information about their health, stress and driving performance as well as automating basic tasks to free up time. Ensuring everyone in the fleet understands how to use these tools can improve safety, wellbeing and efficiency.



Understanding software and data analytics

Improving awareness of the available tools, how systems connect and how information can be used helps familiarise managers, drivers and senior executives with what is possible while also generating data to demonstrate the value of new fleet investments.

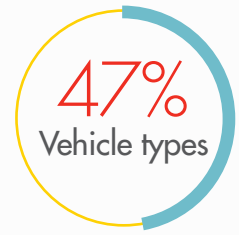
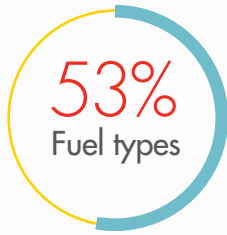


Predictive modelling

Sophisticated tools are emerging that simulate and predict how large numbers of vehicles will behave in different scenarios. This can be used to plan routes, optimise fuel and loads, pre-empt maintenance needs and test the hypothetical impact of new vehicle types or fuels.

FLEET MANAGERS ENVISION TOMORROW

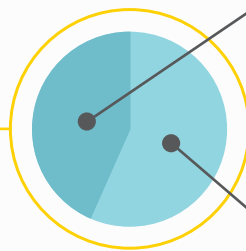
WHAT CHANGES WILL SHAPE FLEETS IN THE NEXT FIVE YEARS?



TECHNOLOGY: OPINIONS, OPTIMISM, AND OBSTACLES

Opinions on new technologies are divided

58% are excited about how technology will shape the industry



But 40%

admit keeping up with the latest technology is a challenge

And 60%

want additional training to keep up

Which technologies will boost fleet competitiveness?

58%

wireless vehicle maintenance

36%

alternative fuels

40%

technologies to streamline business operations

What are the obstacles to new technologies?

1 in 4

lack support from senior managers and drivers

30%

admit they lack knowledge around new technologies and/or their benefits

NEW FUELS: ARE FLEETS READY?

What is the fleet manager's first choice new fuel?



ELECTRIC

- Low environmental impact
- Health and safety
- Low cost

HYBRID

- Low environmental impact
- Infrastructure available
- Low re-fuelling frequency

The reality is more challenging

Only 28%

would introduce electric vehicles

Only 26%

would introduce alternative fuels

30%

feel readiness for alternative fuels will be one of the biggest challenges of the next 5 years

To find out more, visit www.shell.com/fleetsolutions

The future starts now

To win in tomorrow's market, you need to start preparing for the future today. That means acting now to assess and understand the current and future requirements of your organisation, and thereby give you the time to build a business case for change.

Some areas to consider:



Learning together

This paper outlines some of the most interesting innovations in our sector but the pace of change makes it hard for even the largest players to guarantee what will come next. As a result, we are seeing many new collaborations between organisations seeking to share advice and develop common standards. Looking for partners outside your immediate sector – such as technology, energy infrastructure or consulting – can help test ideas and identify best practice.



Reviewing assets

Whether you actually need to own fleet vehicles and infrastructure is a major financial consideration. A combination of technology and commercial models means that it may be possible to operate 'virtual fleets' as well as share vehicles, maintenance, fuelling infrastructure and loads.



Rethinking contracts

One way of progressing alternative fuel types and technology can be to renegotiate what is provided as part of a fleet contract. For example, can new vehicles be provided with specific technology included or with an agreement around providing supporting infrastructure such as charging points?



The power of aggregation

New models are emerging which aggregate a range of fleet services – from offering on-demand delivery through to fuel card services, discounts on replacement parts and servicing and wider business tools such as invoicing and payments. Choose partners with the scale and reach to negotiate better deals and take a holistic view across your operations.



Commercialising great ideas

Many start-ups and newcomers have great solutions for our sector but need a means of funding, testing, distributing and scaling their innovations. At Shell, we are providing investment, advice and access to our existing network of 43,000 service stations, our relationships with automotive manufacturers and our insights into driver behaviour to accelerate new ideas and fresh thinking.

If you do not have the full range of expertise and resources within your organisation, there are external experts to whom you can turn – Shell Fleet Solutions among them. With the right partner, you can take the necessary steps now to ensure that your business and your fleet remain competitive long into the future.

For more information visit www.shell.com/fleetsolutions

Cautionary note

The companies in which Royal Dutch Shell plc directly and indirectly owns investments are separate legal entities. In this report “Shell”, “Shell group” and “Royal Dutch Shell” are sometimes used for convenience where references are made to Royal Dutch Shell plc and its subsidiaries in general. Likewise, the words “we”, “us” and “our” are also used to refer to Royal Dutch Shell plc and subsidiaries in general or to those who work for them. These terms are also used where no useful purpose is served by identifying the particular entity or entities. “Subsidiaries”, “Shell subsidiaries” and “Shell companies” as used in this report refer to entities over which Royal Dutch Shell plc either directly or indirectly has control. Entities and unincorporated arrangements over which Shell has joint control are generally referred to as “joint ventures” and “joint operations”, respectively. Entities over which Shell has significant influence but neither control nor joint control are referred to as “associates”. The term “Shell interest” is used for convenience to indicate the direct and/or indirect ownership interest held by Shell in an entity or unincorporated joint arrangement, after exclusion of all third-party interest.

This report contains forward-looking statements (within the meaning of the U.S. Private Securities Litigation Reform Act of 1995) concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management’s current expectations and assumptions and involve

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