ON THE ROAD TO THE CIRCULAR CAR

How car component suppliers can become future-proof by applying circular economy principles

CIRCLE ECONOMY | ABN·AMRO

THE DUTCH AUTOMOTIVE INDUSTRY, CHARACTERISED BY A DYNAMIC AND INNOVATIVE MIX OF PART AND COMPONENT SUPPLIERS, IS WELL-POSITIONED TO PLAY A LEADING ROLE IN THE TRANSITION TO A CIRCULAR ECONOMY.

These opportunities are arising at a moment in time when the automotive industry is reinventing itself. This is driven, for example, by changing consumer demands, including digital connectivity and new mobility services such as 'car as a service' concepts.

At the same time, the industry is responding to a policy push that focuses on safety and increasing fuel efficiency, both driving material innovation. The ever-stronger consumer demand for emerging technologies and new business models requires radical innovation in terms of car design, use, and end-of-use strategies. Existing manufacturers face the challenge of a fast and fundamentally changing market where newcomers to the market have the potential to outperform traditional manufacturers through innovation.

At first sight, the need to embrace circularity appears to be rather limited. In the Netherlands, it seems to be a good sign that over two hundred thousand cars are 95% recycled on an annual basis. However, this figure is based almost entirely on the weight of recycled steel. The remaining fraction, consisting of plastics and composites used for e.g. dashboards and floor mats, is mostly downcycled and often 'thermally' recycled - in other words, burned. What is more, a large amount of cars is exported and thus escapes the high-value cycling of components and materials. Innovation aimed at improved recycling (upcycling) and circularity is therefore a necessity for the automotive industry in order to create positive impacts on both consumers and the environment.

To drive successful innovation, the automotive industry needs to collaborate across the entire value chain. And this is where bottom-up, circular innovation from parts and components suppliers will play a crucial role.

This report showcases examples of leading circular innovators and provides recommendations on how to future-proof the Dutch automotive industry with circular business strategies.

CONTENTS

1

THE URGENCY TO BECOME CIRCULAR

Consumer demands are driving change in the automotive supply chain

The emergence of digital technology and social media has given the consumer more power than ever before. With smart devices connecting every aspect of consumers' lives, they are increasingly controlling how and where they engage with companies. As a result, consumers have come to expect more, making it harder for businesses to keep up.

With this rise in access to information, transactions are shifting more and more to real time. Greater trust, convenience, and a sense of community are pushing the adoption of the sharing economy forward. New service models are shifting consumer demands for the products and services they consume and how they consume them. Lower barriers to entry for technology are resulting in rapid innovation and this is expected to get even faster in the future.

These trends are having a significant impact on the automotive industry. The growing role of consumers is already transforming the role and function of the traditional automobile with cars becoming smarter, more connected devices. The shorter product and service development cycles and increasing technological complexity of smarter cars requires a complete restructuring of the automotive supply chain. As a result, car manufacturers are increasingly pursuing new differentiation strategies and engaging with their supply chains in order to meet these new consumer demands.

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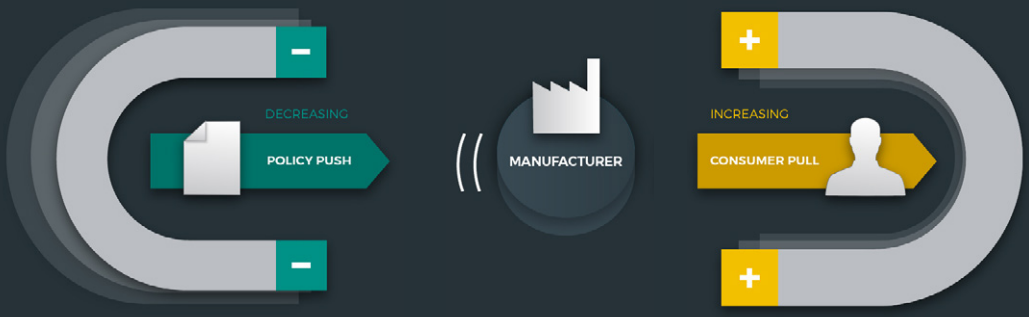
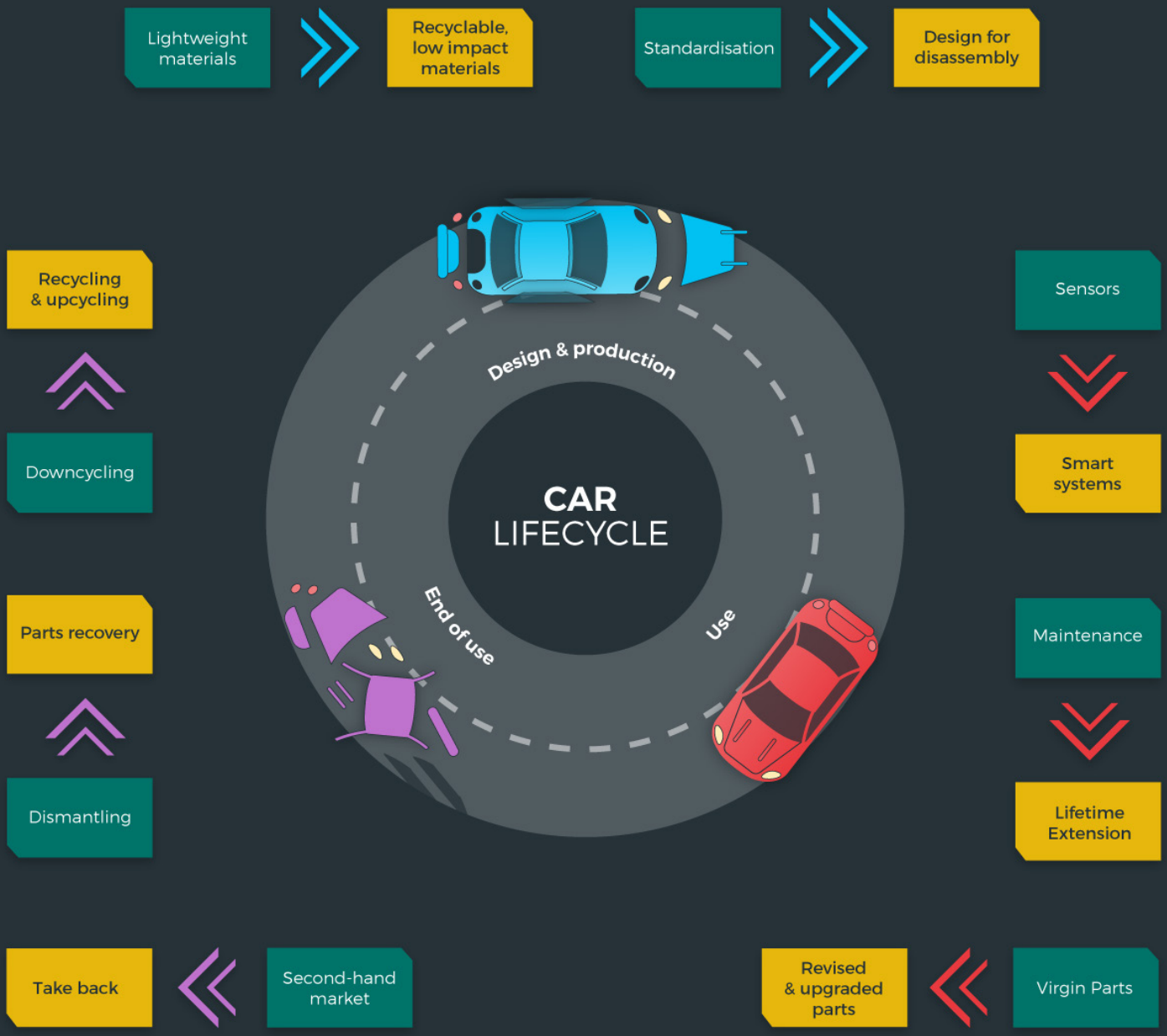


Digital consumer trends are creating new mobility demands that require radical innovation in terms of car design, use, and end-of-use strategies. Innovation in cars is currently driven by a powerful policy push; yet a shift is taking place as these consumer demands are creating an ever-stronger pull.

Policy-driven innovation is primarily focused on safety (warning systems, sensors) and reducing emissions (fuel economy, lightweighting). Consumers create a pull force for a 'smartphone on wheels'. They want connectivity and more services and features in their vehicles.

Consumer demands for new mobility business models such as sharing and leasing will increase the utilisation of the car and result in shorter lifetimes for vehicles.



The consumer demand for greater innovation, the need for new mobility models, and the resulting shorter lifecycles of cars are forcing automakers to take action towards a more circular economy. To meet these demands, automakers will have to focus on developing recyclable, low impact materials, design for disassembly, smart systems, lifetime extension services, revised and upgraded parts, take back programmes, parts recovery, and material upcycling.

Established suppliers within the automotive supply chain currently respond to the policy push. These suppliers are most at risk to the new consumer pull faced by the automotive industry.

Proactive suppliers - the innovators - recognise and leverage the consumer pull trends affecting the automotive industry. These companies utilise circular economy principles to create value for manufacturers.

Established supplier

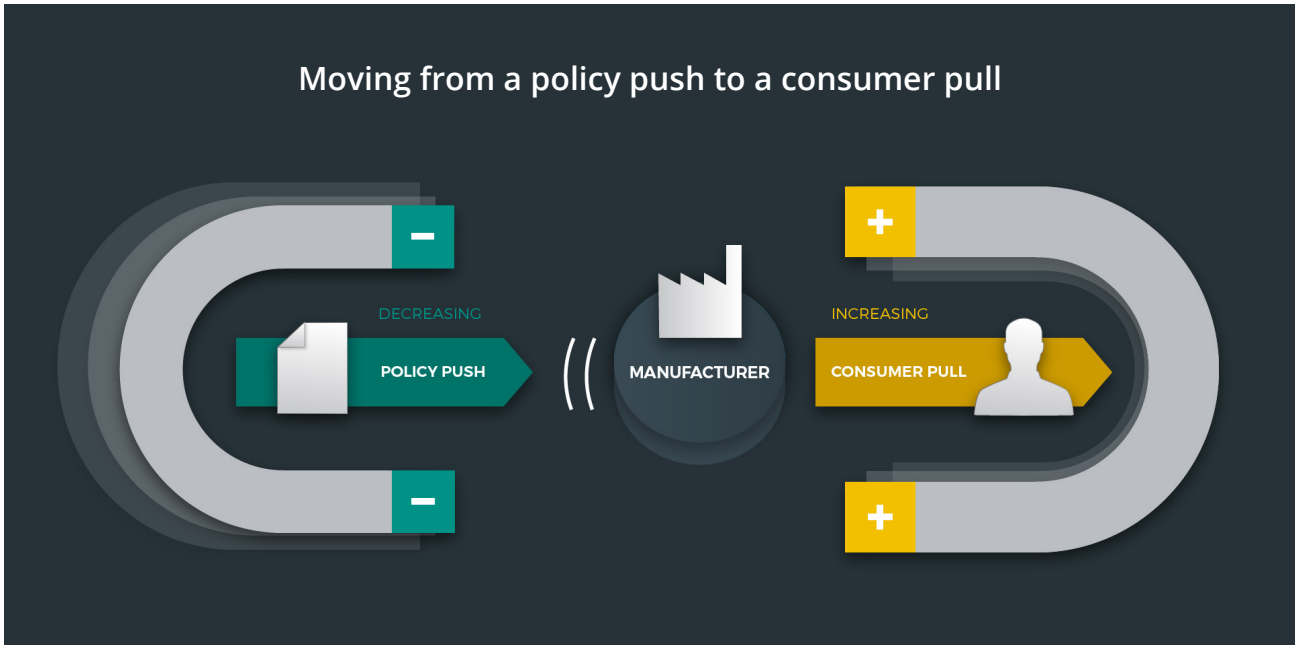
Innovator

CIRCLE ECONOMY

Beyond policy push: a fast growing consumer pull

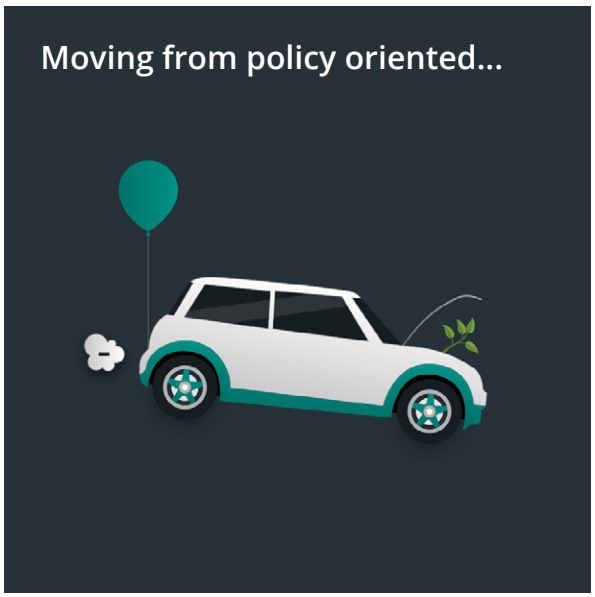
The two key drivers of change within the automotive industry are policies and consumers. Policy has always influenced the automotive industry, creating a push towards increasing environmental and safety considerations. Traditionally, policies focused on safety and environmental considerations have influenced the physical design and innovation of cars.

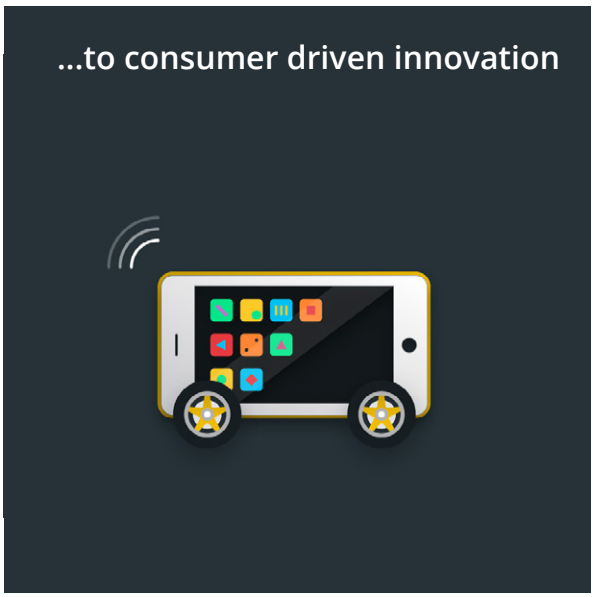
While the push of policy remains a strong influence, the pull of consumers is increasingly becoming the stronger driving force. Digital consumer trends are creating new mobility demands that require and enable radical innovation in terms of car design, use, and end-of-use strategies. This shift from a traditional, policy-guided industry to a consumer-driven one has major repercussions throughout the automotive value chain.



Consumers drive innovation

Consumers are demanding more and more services and features in their vehicles, leading to cars becoming 'smartphones on wheels'. Safety, autonomous driving and infotainment are starting to influence purchasing behaviour more than brand image, engine size, and reliability, as consumers are willing to pay more for these connectivity features. For example, in their 2014 report on consumer car purchasing behaviour, Deloitte found that the top trigger for consumers when purchasing another car is the availability of new technology. Similarly, a 2014 survey by Accenture showed that 39% of respondents indicated their primary consideration for choosing a new vehicle was in-car technology. And just one year later, a survey by Autotrader found that 77% of respondents said that a vehicle with all of the technology features they desired was more important than its colour, and 65% said they would switch vehicle brands to have all of the technology features they wanted.





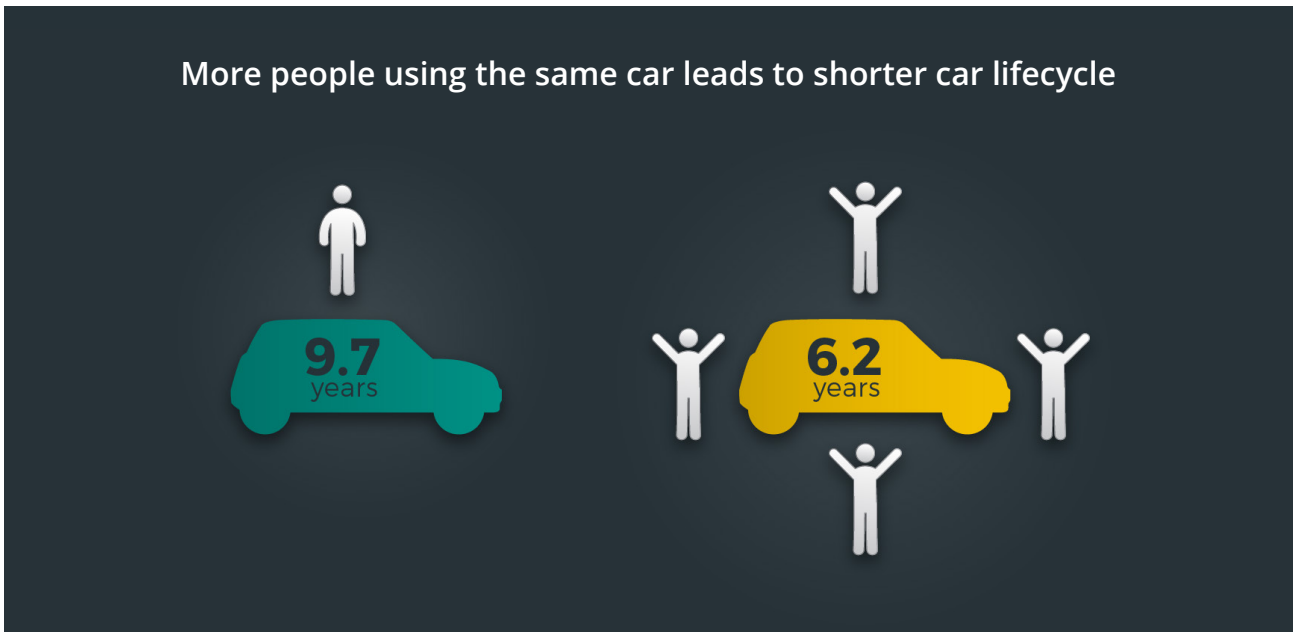
Manufacturers are already responding to these demands. Approximately 90% of automotive innovations in 2012 featured electronics and software. The number of networked cars will rise by 30% a year for the next several years; some experts believe that all cars will be connectivity enabled by 2025. BMW's Vision Next 100 highlights how the company is thinking about new innovations to meet these needs. In addition, new players - Dyson, Faraday Future, Future Mobility Corp., Nvidia, etc. - are emerging with more innovative solutions.

Consumers drive new business models

The demand for new mobility solutions is also growing. Car-as-a-service, the sharing and leasing models that promote performance over ownership, are causing manufacturers to rethink how value is created and lost across the lifecycle of a car. For example, car owners between 18-35 years of age are concerned about the rising costs of owning a car and are 40% more likely than other age categories to abandon their vehicles if costs increase. Instead, these consumers are starting to 'lease cars like they sign a smartphone subscription'.

Consumer demands for car connectivity

Source: Business Insider, 2015



As a result, in 2014, the number of shared cars in Europe nearly tripled compared to 2012 as over 2.2 million members joined car-sharing platforms like Greenwheels (partly owned by PON), Car2Go, SnappCar (partly owned by AutoBinck and partner with Athlon Car Lease), MyWheels, Blablacar and Mobility Mixx (owned by LeasePlan).

When looking at car sales in the Netherlands, two things stand out. Firstly, sales of new cars to consumers are declining. In 2015, about 450,000 new cars were sold: only a third of which were sold to consumers. Secondly, private leasing to consumers is rising rapidly. In 2015, the estimated total number of private lease contracts was 36,000, more than twice as many as in 2014. The terms and conditions of these private-lease contracts are becoming less restrictive, making them more like subscriptions than lease-contracts. We expect the number of private lease contracts to triple by 2020.

New business models will have long-reaching impacts across the automotive supply chain. According to ACEA estimates, privately owned cars currently in use have an average age of 9.7 years in Europe but are idle over 95% of the time, largely left parked. However with car sharing, cars are in use nearly 34% of the time. This increases the intensity of the car's use and results in shorter lifetimes. Given an average rental time of 8 hours a day and an average of 11 km driven per hour for rental cars, shared cars have an estimated age of 6.2 years. This figure will likely decrease as car sharing is increasingly adopted.

> **Consumer needs require new business models that radically alter the traditional automotive chain. We have to redesign the car completely and reorganise the chain.**
>
> **- Jan-Paul Kimmel, CLAUT**

Established manufacturers are already responding to these changes. For example, BMW's 'ReachNow' programme offers car sharing services. General Motors, Daimler and Ford are also exploring the sharing and leasing concepts with pilot programmes like Maven, Car2Go and Ford CreditLink.

Consumer trends are driving circularity in the industry

Consumer demands for greater innovation and new mobility models are driving automakers towards a more circular economy. The circular economy rethinks the traditional models for industry and the way we organise our society and businesses.

The principles of a circular economy stress greater innovation through improved design and new business models that support longer lifetimes of products and services. It also aims to reduce environmental impacts and generate less waste. The circular economy is estimated to generate up to 1.8 trillion euros a year and 3 million jobs within Europe by 2030.

Demand for new business models is causing a shift to better-integrated, value-generating models that transition ownership from consumers to manufacturers, leasing companies, or service providers and influencing greater collaboration across the whole automotive chain.

In order to respond to these demands and trends, the following **circular strategies and principles** will be important for the industry.

CIRCULAR STRATEGIES & PRINCIPLES

- **Recyclable, low impact materials** - developing innovative materials that deliver safety and lightweighting while also ensuring recyclability and minimal environmental impact.
- **Design for disassembly** - designing for modularity to enable easier disassembly and recovery at the end of use.
- **Smart systems** - creating intelligent and connected systems that enable greater monitoring and tracking.
- **Lifetime extension** - providing maintenance, repair, and upgrade services at appropriate intervals to ensure continued functionality and long lifetime.
- **Revised & upgraded parts** - enabling a steady supply of revised and upgraded replacement parts to support continued functionality.
- **Take back** - capturing the second-hand value of end-of-use car parts.
- **Parts recovery** - harvesting reusable parts and components for further use in the industry after end of use.
- **Recycling & upcycling** - maximising material reuse within the industry and recycling for new innovative purposes.

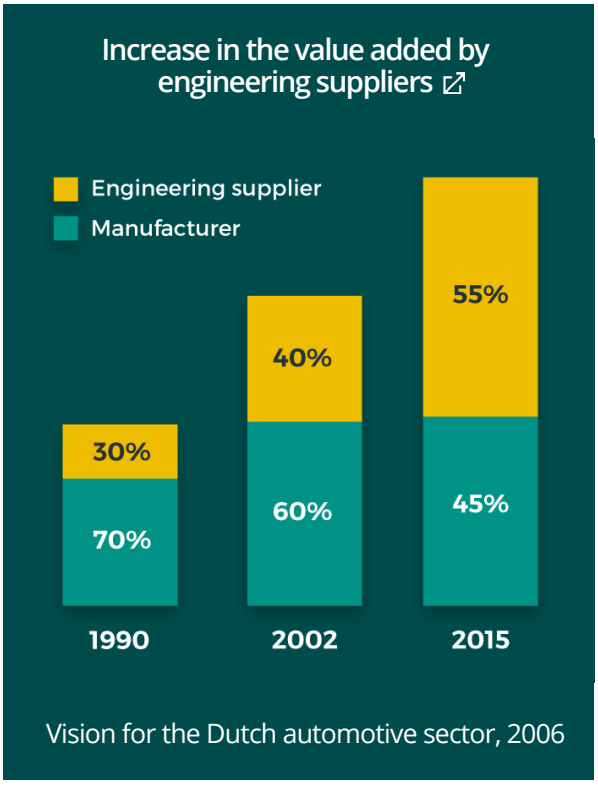
Impact on automotive suppliers' role

The principles of the circular economy that are relevant to the automotive industry will also impact automotive suppliers and the entire value chain. To keep up with this transition and avoid fierce competition from disruptive players taking over their market, car manufacturers will have to adapt. In addition, rising production and warranty costs are already putting pressure on car manufacturers to increase production efficiency and reduce costs. For example, Volkswagen aims to reduce its costs by about five billion euros in 2018. In its 'Back in the Race' plans, PSA has also targeted cost reductions of 1,100 euros per vehicle produced in 2018. As auto manufacturers are not able to cope with all these challenges alone, innovation needs will increasingly be passed on to supply chains to ensure continuous access to technology, R&D know-how, and engineering capabilities.

A need for diversification and specialisation to deliver the required innovation presents a significant opportunity for suppliers to provide added value. Suppliers currently develop and assemble 65% of the average value of a vehicle and this share is expected to increase to almost 80% over the next decade. In this context, suppliers will need to work closely together and establish strong relationships with car manufacturers and other players in the value chain.

Following circular economy principles can guide suppliers to collaborate more effectively with manufacturers, create significant value in the transitioning automotive industry, and future-proof their operations. Within the current landscape of the automotive value chain, there is a mix of established suppliers - the adapters, and proactive suppliers - the innovators.

> **At this moment, the car of the future is only becoming less circular! The quest for lightweighting is detrimental for circularity. New reinforced plastic composite materials and increased usage of glue for fixation create new barriers for recycling, repair and disassembly.**
>
> **- Wim Simons, Timmerije**



Vision for the Dutch automotive sector, 2006

Established suppliers respond to the policy push

Established suppliers typically respond to car manufacturers' requests for parts and components, primarily as a result of a policy push. These suppliers are most at risk to the new consumer pull faced by the automotive industry. If these suppliers do not reorganise their production systems around new materials and processes using circular principles, and engage in greater co-creation and collaboration with car manufacturers, they face the risk of being left behind by the new model because they are not developing solutions that meet market needs.

Innovators create value for the consumer pull

Proactive suppliers - the innovators - recognise and leverage the consumer pull trends affecting the automotive industry. These companies already utilise circular economy principles to collaborate with, and create value for, car manufacturers. Innovators are typically new entrants or players from other industries that are carving out spaces in the industry. These suppliers should continue to build upon existing circular economy principles and integrate more with the automotive supply chain to create a more circular automotive sector that is able to meet consumer needs.

CLAUT: AN EXAMPLE OF A PROACTIVE BOTTOM-UP INITIATIVE DRIVING CHANGE

CLAUT is a Circular Automotive platform launched in the summer of 2015 in Limburg by Polyscope, and has now grown to include a number of companies. Using funding from an innovation fund and subsidies from the Province of Limburg, the platform enables cooperation between suppliers, car manufacturers and leasing companies. It organises a car sharing programme with 250-500 cars that enables 2nd and 3rd lifetimes for the vehicles and also ensures proper end-of-use treatment.

CLAUT focuses on material innovation and modular manufacturing during the design phase, new business models during the use phase, and remanufacturing and proper material recycling of the car when it reaches end of use.

The initiative was a result of the complexity of the current automotive supply chain which is highly regulated and also dominated by top-down car manufacturer specifications.

CLAUT is exploring partnerships with education institutions and Open Labs to spread knowledge. It is looking to include leading companies that bridge the entire value chain from the chemical industry to automotive industry to leasing/sharing programmes. In the future, CLAUT also aims to expand from the Limburg region to the greater Meuse–Rhine region and beyond.

2

CIRCULAR OPPORTUNITIES FOR THE DUTCH AUTOMOTIVE INDUSTRY

The principal strength of the Dutch automotive industry lies in the manufacture of automotive parts and components. The Netherlands has about 300 automotive suppliers employing over 30,000 people. Dutch companies have key strengths in material and process innovation, new mobility propositions, and emerging technology solutions across the three key phases of a car's lifecycle: **design and production, use,** and **end of use**. Below, we show some examples across these three critical stages.

DESIGN & PRODUCTION

The design and production process of a car is an important aspect with huge implications for the broader supply chain. The key elements of this process are the choice of material for the parts and components and the design of the car required to integrate these parts and components together.

Recyclable, low impact materials

Weight reduction is constantly on the agenda for the automotive industry. Policy pressure to reduce emissions is causing a consistent vehicle lightweighting trend, which has considerable material implications. **Established suppliers** are responding by pushing forward with materials such as aluminium alloys and carbon fibre. However, this presents a challenge to circularity as it results in greater complexity, lower recyclability, and greater long-term environmental costs. **Innovators** within the Dutch automotive industry such as TenCate, DSM, Corbion, CLAUT, IAC Group, NPSP and TNO are actively looking into new circular polymers and mate-

Composite mixtures of current materials and parts cannot be recycled; however, there are easy solutions. There is an endemic habit to require virgin materials, but this is often unnecessary: quality and performance should be the leading drivers of material choice and design.

- Jan-Paul Kimmel, CLAUT

rials that enable recycling and reduce environmental impact. International examples of such innovative companies include Heinz, DuPont and Solvay Specialty Polymers.

Design for disassembly

Safety regulations significantly influence the design of vehicles. Even today, many **established suppliers** are reacting to new policies and aiming to reduce costs by developing more standardised platforms for their cars. However, new mobility models will require cars that are easy to upgrade, repair and maintain, as well as to disassemble at the end of use in order to recover valuable parts and materials. Many **innovator** initiatives, like the TU/Ecomotive Nova, use innovative circular solutions that focus on improved modularity and reconfigurable parts and components that can be easily exchanged and adjusted with minimal effort. International examples include OSVehicle, Altran eMOC and Strati EV.

USE & MAINTENANCE

To ensure that a car continuously delivers significant value to customers throughout its lifecycle and across new business models, automakers are increasingly requiring suppliers to provide smart systems, lifetime extension solutions, and upgraded car parts.

Smart systems

Nearly 75% of the emissions footprint of the automobile is in the use phase. Policy pressure to reduce this impact has led to **established suppliers** providing a variety of sensors and computing technology to optimise vehicle operations. Furthermore, consumer-driven trends for greater connectivity, comfort, and safety for automobiles are leading many **innovators** such as NXP, TomTom, Sioux and Mind to develop circular solutions that meet these needs. Innovations like advanced sensors, intelligent navigation systems, and

A remanufactured part requires up to 85% less raw material and 80% less energy compared with a newly made product. We are therefore now using screws instead of glue or welded joints.

- Gunnar Magnusson, head of remanufacturing Volvo in ReMaTecNews May 2015

Recyclable, low impact materials

TenCate, DSM, Corbion, Claut, IAC Group, NPSP, TNO

Heinz, DuPont, Solvay Specialty Polymers

Recycling & upcycling

ARN, Black Bear Carbon, Refil, Carglass

Umicore, Geo-Tech Polymers, GDE Recycling

Parts recovery

VEGE Benelux, Denso, Suez ReCharge

Ford, Autocraft Material Recovery, Linder's Inc

Take back

Tesla, Volvo and Renault

Design for disassembly

- TU/Ecomotive Nova, BMW Mini
- OSVehicle, Altran eMOC and Strati EV

Smart Systems

- NXP, TomTom, Sioux, Mind
- Google, Apple, Intel, NVidia, TE Connectivity

Lifetime extension

- Business Lease Group, ProDrive, Neways, TomTom
- BMW, Bosch, IBM, Denso

Revised & upgraded parts

- ACTronics, Rebbl, Perfect Green/No Risk Parts

CIRCLE ECONOMY

self-driving capabilities dramatically improve vehicle resource use and support improved vehicle maintenance and safety. International tech companies such as Google, Intel, NVidia and TE Connectivity are also now in the automotive space.

Lifetime extension

Cars typically age due to the wear and tear of parts and components and regulations require that vehicles have regular checks to ensure they are still roadworthy and safe. The **established suppliers** carry out these checks based on maintenance costs and the economic lifetime of a car.

> **3D-printing is today's trendiest industrial revolution. We aim to make it a sustainable one as well and so we have introduced our ABS filament made from car dashboards.**
>
> **- Refil website**

However, as new service models will increase the utilisation of cars, vehicles will need to be maintained and upgraded at appropriate intervals to extend their (economic) lifetime. **Innovators** in the Netherlands, such as Business Lease Group, provide all-in-one service offerings, that help manage costs, decrease the size of the car fleet and increase intensity of car use. Companies like ProDrive and TomTom provide telematics solutions to help fleet owners manage the costs, lifetime and utilisation rate of their fleet. Neways in the Netherlands and international companies such as BMW, Bosch, IBM and Denso are using big data analytics and the internet of things to enable sensor technologies to perform predictive maintenance in cars, thus preventing problems before they even happen.

Revised & upgraded parts

Policy pressures for safety are causing many car manufacturers to be very specific about their requirements for car parts. **Established suppliers** who respond to these specifications produce these parts using mostly virgin materials. With new mobility models that decrease vehicle lifetimes and increase the intensity of use, there will be a greater need for revised and upgraded car parts. **Innovators** such as ACTronics and Perfect Green (No Risk Parts) are now actively working with manufacturers and the automotive chain to supply green car parts that are remanufactured and/or upgraded for reuse, thus easing the burden on the virgin resources required to manufacture these parts. Others innovators, like Rebbl, upgrade entire cars by making them electric.

END OF USE

Consumer-driven trends for new mobility services and technology innovations will require new systems to be in place at the end of use of a car.

Take back

At the end of use, vehicles have a lot of second-hand value and takeback programmes need to be established to allow this value to be recovered. **Established suppliers** have set up takeback programmes for vehicles and components by providing online marketplaces that enable used cars and components to be sold and traded. **Innovators** in the automotive supply chain, such as Tesla, Volvo and Renault, already have buyback schemes.

Parts Recovery

Policy requirements in the Netherlands encourage the recycling of vehicles by charging consumers a fixed fee ('verwijderingsbijdrage'). Parts recovery has always been the domain of the dismantling companies and is already well developed in the Netherlands. **Established suppliers** in the automotive end-of-use chain harvest car parts, provided they have sufficient value in second-hand markets.

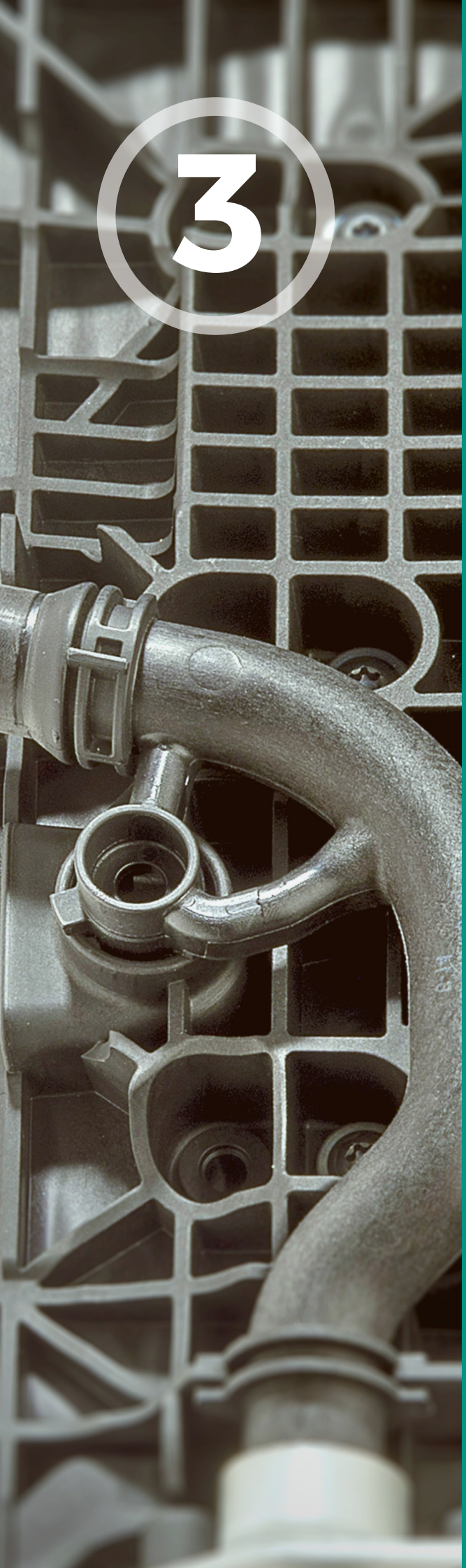
However, with increasing technology in cars, faster cycling through new mobility models, and improved modular design of vehicles, suppliers need to work together with recyclers to enable a more circular model to be devised to recover and remanufacture car parts. **Innovators** such as VEGE Benelux, Denso, Suez ReCharge, have exchange and recovery programmes for car parts which they disassemble and remanufacture into spare automobile parts. International companies doing this include Ford, Autocraft Material Recovery and Linder's Inc.

Recycling & upcycling

As part of the end-of-use recycling process, processes are in place to ensure that cars are shredded to recover metals and other materials. **Established suppliers** purchase end-of-use vehicles to recover iron, copper, and aluminium and sell them for scrap metal.

However, with new innovation towards new circular polymers and materials in the automotive industry, there will be an increasing need to work more closely with the automotive supply chain to recover such materials from cars. **Innovators** such as ARN, Black Bear Carbon, Refil and Carglass recover materials from cars for new innovative uses and conduct research into new recycling opportunities to extract the maximum value from the materials in the vehicles. International examples include Umicore, Geo-Tech Polymers and GDE Recycling.

> **For every car part we need to find ways to retain its value, be it through reuse, remanufacturing or high-value recycling. This requires bold, new strategies.**
>
> **- Martijn Lopes Cardozo, Black Bear Carbon**



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Ralph Ramaekers
Marketing Director
Automotive at DSM
Engineering Plastics

PERSPECTIVES FROM THE DUTCH AUTOMOTIVE SUPPLY CHAIN

DSM is a Dutch multi-national company active in health, nutrition and materials. The company works closely with the automotive industry to design sustainable materials for component production. DSM's automotive solutions are focused on plastics compounds that make cars more environmentally friendly.

What does your company do?

'We have worked with the automotive industry for more than 25 years to design better, smarter, safer, lighter – and increasingly greener components. Our automotive solutions are based on a simple, three-pronged principle of serving people, planet and profit. In the automotive market – where carbon emissions and energy efficiency increasingly dominate the landscape - we now offer a range of "Eco+" solutions, including bio-based plastics.'

Where do you see the automotive supply chain in the future?

'There are some 82 million cars produced per year worldwide and the number continues to rise. Projections for 2030 state that they will rise and peak somewhere around 120-125 million cars per year. Original equipment manufacturers (OEMs) like VW and BMW are investing heavily in electric vehicles - the lion share of R&D investments at these companies is being used for electric driving. But the internal combustion engine will not disappear anytime soon. 95% of cars will likely still have combustion engines in

10-15 years' time, although significantly downsized with hybrid capabilities to meet emissions standards.

There is a shift from car ownership to mobility access that is transforming the market. There is a host of new disruptive players like Google, NVidia and Faraday Future which are entering the automotive space and making OEMs nervous. The biggest fear of OEMs is to become a hardware supplier and lose direct interface with the consumer. Automakers want to provide a car that offers more services and engage in more car sharing to raise its utility. We will be able to do more with fewer cars, which means fewer cars are produced. However, there are still many opportunities for suppliers in this declining market. For example, for us, the amount of plastics used in each car is projected to grow.

On the materials front, manufacturers focus on technical specifications and rely on suppliers to choose the optimal way to meet the specifications. As they do not specifically ask for virgin materials, it presents a significant opportunity to use recycled materials. Manufacturers like Ford have ongoing programmes focusing on using alternative materials. DSM also have solutions that contain a high percentage of renewable material building blocks. But system cost remains an important factor. Everything is cost driven.'

How will this impact automotive suppliers?

'The amount of plastic components in vehicles is continuously growing, primarily driven by lightweighting and requirements to reduce emissions. Plastic producers like DSM will have an increasing role to play to push innovations for lighter and more circular materials. Tier 1 suppliers are increasingly becoming system specialists and important drivers of innovation.

Lightweight components are now often made with carbon fibre thermoset composite materials that are expensive and difficult to recycle. However, we have innovations focusing on thermoplastic polyamides, which bring similar performance but are easier to recycle. As the amount of electronics within automobiles increases rapidly, heat management becomes an important topic. DSM are also innovating a lot in this area to develop thermal conducive solutions that can be used instead of metal.'

What is the role of innovative companies who are entering the automotive space?

'Newcomers like Tesla will have circularity higher on the agenda. Traditional players are less likely to rapidly change their mindset. All the disruptive players - Google, Microsoft, Uber - are coming up with new business models related to big data. Our role as material suppliers will likely remain the same. DSM will continue to look into new material solutions for new, innovative cars to address the needs of the OEMs.'

What are your tips for current suppliers within the automotive chain?

'In the next few years, the automotive industry will change more rapidly and more extensively than in the preceding decades. However, environmentally friendly mobility remains the key topic for the automotive industry. Suppliers need to be able to adapt to these changes quickly in order to stay relevant and avoid becoming the 'Kodak' of the automotive industry.' ■

Thijs Jasink
COO ACtronics Group

ACTRONICS' PERSPECTIVES - THIJS JASINK

ACtronics is a Dutch automotive supplier located across Europe with its headquarters located in Almelo, the Netherlands. The company is already a market leader in over 23 European countries offering self-developed innovative technology solutions to provide the automotive chain with remanufactured and upgraded electronic computers. The improved products are sold on the aftermarket.

What does your company do?

'The remanufacture of electronic engine computers represents the core business of the company, and ACtronics works with garages and dealerships across Europe to provide high-quality, remanufactured components and spare parts for maintenance and repair. The success of ACtronics lies in its thorough understanding of and continuous learning about all the various car models and their different electronic computers, making ACtronics a specialist in the remanufacture of these components.

The company's remanufacture process ensures that each product is inspected for common faults as well as future problem areas. These are corrected and, as a result, each of the products that is remanufactured by ACtronics is expected to work and look like new, with a lifetime equal to, if not beyond, the original manufacturer specifications. Thus, the company is able to offer their remanufactured products for a fraction of the cost of a new product, along with a two-year warranty.'

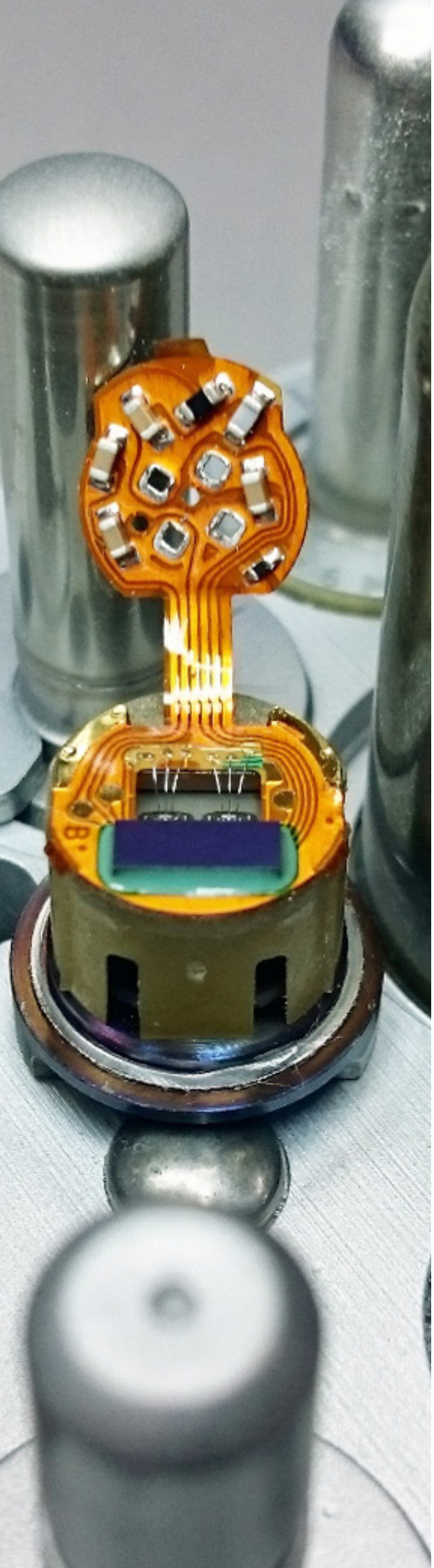
Where do you see the automotive supply chain in the future?

'Private ownership of cars will disappear - though not completely - and cars will be owned by the manufacturer in the next 10-15 years. This will result in fewer cars, due to the fact that cars will be more heavily utilised through sharing. Moreover, car rental companies will become obsolete. Car manufacturers like Mercedes, GM, Ford, etc. are already trying to make the car less of a symbol of a privately owned asset and more of a service.

The impact on the automotive chain is that manufacturers will sell less cars, but will have greater involvement in the after-market services. The cooperation between supply chain partners and manufacturers will significantly increase. Branded dealerships and global dealerships will still exist, but third party garages and independently run garages will close in the future if they are not working closely with the manufacturer as specialists.'

How will this impact automotive suppliers?

'At the moment, supply chain companies largely listen to rules of the manufacturer, but this will need to shift towards more collaboration with manufacturers to co-develop and co-innovate new solutions.



You can already see that new innovative suppliers in the automotive space are inherently closer to the manufacturer than the current suppliers. Because of this, manufacturers are increasingly requesting their current suppliers for new requirements and new innovations. To still be relevant in the future, suppliers will need to become more specialised in order to survive. They will have to be unique and have expertise and provide specific innovations and solutions like many of the more innovative suppliers are doing today.'

What is the role of innovative companies who are entering the automotive space?

'Consumer electronics companies like Samsung and Sony, and telecommunications companies like Vodafone and T-Mobile, already provide new connectivity services in cars. This trend is being extended with companies like Google and Apple and others who make revolutionary products that are starting to literally change the automotive market. These companies have ownership of internet and telematics infrastructure, navigation, etc. and they are working on innovations within the automotive industry. They want to sell their knowledge to manufacturers and, as a result, are transforming the industry and maybe will eventually make or develop their own car.

The future direction of the car is heading towards a smart office on wheels. There is increasing connectivity, media, internet services and infrastructure to communicate to the outside world.'

What are your tips for current suppliers within the automotive chain?

'Strive to become future-proof. Continue to specialise, continue to innovate, and most importantly, make sure you get closer to manufacturers. Be more proactive rather than reactive.' ■

Jasper IJsenbrandt
ARN Business Sales Developer

Pieter Kuiper
ARN Senior Project Manager

Alzira Schaap
ARN Consultant

Hector Timmers
ARN Senior Project Manager

ARN'S PERSPECTIVES - JASPER IJSENBRANDT, PIETER KUIPER, ALZIRA SCHAAP, HECTOR TIMMERS

ARN was founded in 1995 by the Dutch automobile sector represented by RAI Vereniging, BOVAG, FOCWA Schadeherstel and STIBA. The objective was the (optimal) recovery and recycling of parts and materials of end-of-use vehicles. As the demand for mobility solutions grows, ARN plays an increasingly important role in the themes of 'material recovery' and 'sustainable enterprise'.

What does your company do?

'As part of a network of nearly three hundred chain partners, ARN handles the environmental processing of end-of-use cars. The legal objective for vehicle recycling and recovery was set at 95%, starting from 2015. This objective has been met and continues to be met through the collaboration of ARN and its chain partners. In 2011, ARN took a major step in the right direction by opening the PST plant, where shredder waste from cars is processed into reusable materials.

ARN also ensures streamlined collection and processing of waste flows for garages. Examples of this are used oil and coolant, tyres and old batteries. ARN's know-how from its long experience is available for others through ARN's consultancy services on technology and chain management in the recycling-and mobility sector. The Institute for Sustainable Mobility was founded by BOVAG and RAI Vereniging in 2008 and merged with ARN in 2013.'

Where do you see the automotive supply chain in the future?

'The material composition of cars will change by 2025. It is likely that there will be less of a reliance on steel and more on lighter materials like aluminium and plastics. The policy push for CO2 and lightweighting will continue to make it difficult for other material innovations to take place. Cars will also take less time to get to market - going from eight to only a few years and including a variety of electronic components. Designing for recycling is something the car designers would like to increase, but most of the time design choices need to be made on the basis of safety, weight and appearance.'

How will this impact automotive suppliers?

'There are still opportunities to increase the number of streams of parts and

components that are reused. For example, in France it is now mandatory for maintenance shops to actively offer used parts for replacement in used cars.

A lot of the R&D happens with brands that are not located in the Netherlands. But there is a need to do more R&D in the Netherlands. There is a big opportunity for suppliers to take more leadership in the automotive industry and to work more closely with OEMs that currently do not do R&D in the Netherlands.

The second hand market for vehicles is changing. With the rise of composites and more advanced electronics in cars, dismantling companies are afraid that they will not have the technological knowledge in the future to support reuse as they do now. They need to have access to more information on the possibilities for reuse.

More specialised service companies are therefore likely to emerge, even some with OEM branding. These suppliers will handle specific tasks such as being responsible for battery recycling after end of use.'

What are your suggestions for current suppliers within the automotive chain?

'We see a need for more collaboration between suppliers and the rest of the chain, from the beginning to the end. Closer cooperation is needed in order to capture the value of products and materials at the recycling stage. This is why we aim at exchanging more knowledge on recycling and second life applications. Our recent decision to join the Automotive Campus in Helmond represents a good example of this ambition. Ideally, more and more suppliers will use recycled materials in car parts and components.' ■

4

CONCLUSIONS

The Dutch automotive industry, characterised by a dynamic mix of innovative part and component suppliers, is well-positioned to play a leading role in the transition to a circular economy. This report illustrates this by showcasing examples of leading circular innovators like ACtronics who remanufacture electronic engine computers or DSM who work on material innovation. These opportunities arise against a backdrop of changing consumer demand including digital connectivity and new mobility services such as 'car as a service' concepts. At the same time the industry is responding to a policy push that focuses on safety and increasing fuel efficiency which drives material innovation. The ever-stronger consumer demand for emerging technologies and new business models requires radical innovation in terms of car design, use and end-of-use strategies. Existing manufacturers face the challenge of a fast and fundamentally changing market where newcomers to the market have the potential to outperform traditional manufacturers with their innovation power. To drive successful innovation, the automotive industry needs to collaborate across the entire value chain where bottom-up, circular innovation from parts and component suppliers will play a crucial role.

Consumers drive car circularity

We see that consumers increasingly ask for mobility solutions instead of car ownership. The popularity and fast growth of Car2Go, Snappcar and Greenwheels show the sheer interest of many consumers in innovative 'car as a service' models. Ownership is shifting at a growing pace from consumers to manufacturers, leasing companies or services providers. The new 'car as a service' models also lead to a higher utilisation degree of cars and shortened product lifecycles. As a result, car manufacturers need to rethink their business models.

This creates an important shift in innovation strategies and require the automotive industry

FINANCING NEW OWNERSHIP MODELS AND THE CIRCULAR ECONOMY

The transition from ownership to access demands a new approach to financing. ROI periods and residual values will probably change, and the shift in ownership will also present legal challenges. At present, banks are financing on the basis of expected cash flows or the provision of some form of security and collateral in return.

New circular business models are accompanied by a growing demand for pre-financing, changing cash flows and raw materials that are being put up as security. With a lease or subscription model, for example, production costs will have to be financed in advance. Since the product is not being sold outright, the proceeds will not be earned at the time of sale, but will be paid out in instalments over a longer period. At ABN AMRO, we are studying the financing needs that are implied by these models and looking for a suitable solution. When the residual value of products increases in closed chains, this expands the basis for financing. This development therefore affects the entire automotive chain, from spare parts production to new solutions for the end-of-life phase.

Finally, it makes it necessary for financiers, such as ABN AMRO, to gain more insight into the business model applied by the players in the supply chain, and the financial performance of its customers. Policies on sustainability and the circular economy must also be taken into consideration. Research by Deutsche Bank (2012) ⧉ and Eccles, Ioannou and G. Serafeim (Harvard Business School, 2014 ⧉), has shown that companies that implement an active policy regarding sustainability also score better than their peers in terms of profitability. This supports our vision that it is important for automotive suppliers to consider the possibilities for a circular car.

In the coming years, regulations will also be the dominant force in the automotive field, although the demand on the part of consumers for a mobility solution that replaces car ownership is gaining increasingly more traction, and will, in the medium-term, lead to a more circular car. This is due to the simple fact that it is ultimately less expensive.

to move towards more circularity. Automakers will have to adopt strategies that focus on developing innovative materials, modular design, intelligent systems, repair and upgrade services, green parts, parts recovery, and material recycling to meet the new demands.

Suppliers need to adapt and think circular

As auto manufacturers are not able to cope with all these challenges alone, innovation needs will increasingly be passed on to supply chains to ensure continuous access to technology, R&D know-how, and engineering capabilities. A need for diversification and specialisation to deliver the required innovation presents a significant opportunity for suppliers to provide value. Following circular economy principles can guide proactive suppliers - the innovators - to more effectively collaborate with manufacturers, create significant value in the transitioning automotive industry and futureproof their operations.

Dutch automotive industry well-positioned to lead the transition

As the examples show, a variety of innovators is already taking the first bold steps. They show that it makes business sense to adopt circular strategies for the design, use and end-of-use phase of cars. To further drive successful innovation, the Dutch automotive industry needs to collaborate across the entire value chain where bottom-up innovation from parts and equipment suppliers will play a crucial role.

HOW TO BECOME FUTURE-PROOF?

Being a frontrunner requires a proactive stance and the adoption of circular strategies and business models to establish a competitive edge. Innovators in the Dutch automotive industry tell us that, in order to become future-proof, suppliers should:

1. Lead: Be proactive and prevent newcomers with new, circular business models that stimulate circularity from taking over.

2. Innovate: Invest in research, development and innovation. Increase the value added to cars by applying circular strategies for design, use and end of use.

3. Specialise: Be the best at making specific car parts or materials that are developed taking into consideration circular principles. Become the preferred supplier of one or more brands.

4. Collaborate: Establish closer cooperation with car manufacturers and other players in the value chain. Move towards co-development and co-creation.

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About Circle Economy

A social enterprise, we accelerate the transition to circularity through the development of practical and scalable solutions. Our tools and programs are designed to facilitate decision making and action plans for businesses and governments in a wide range of sectors.

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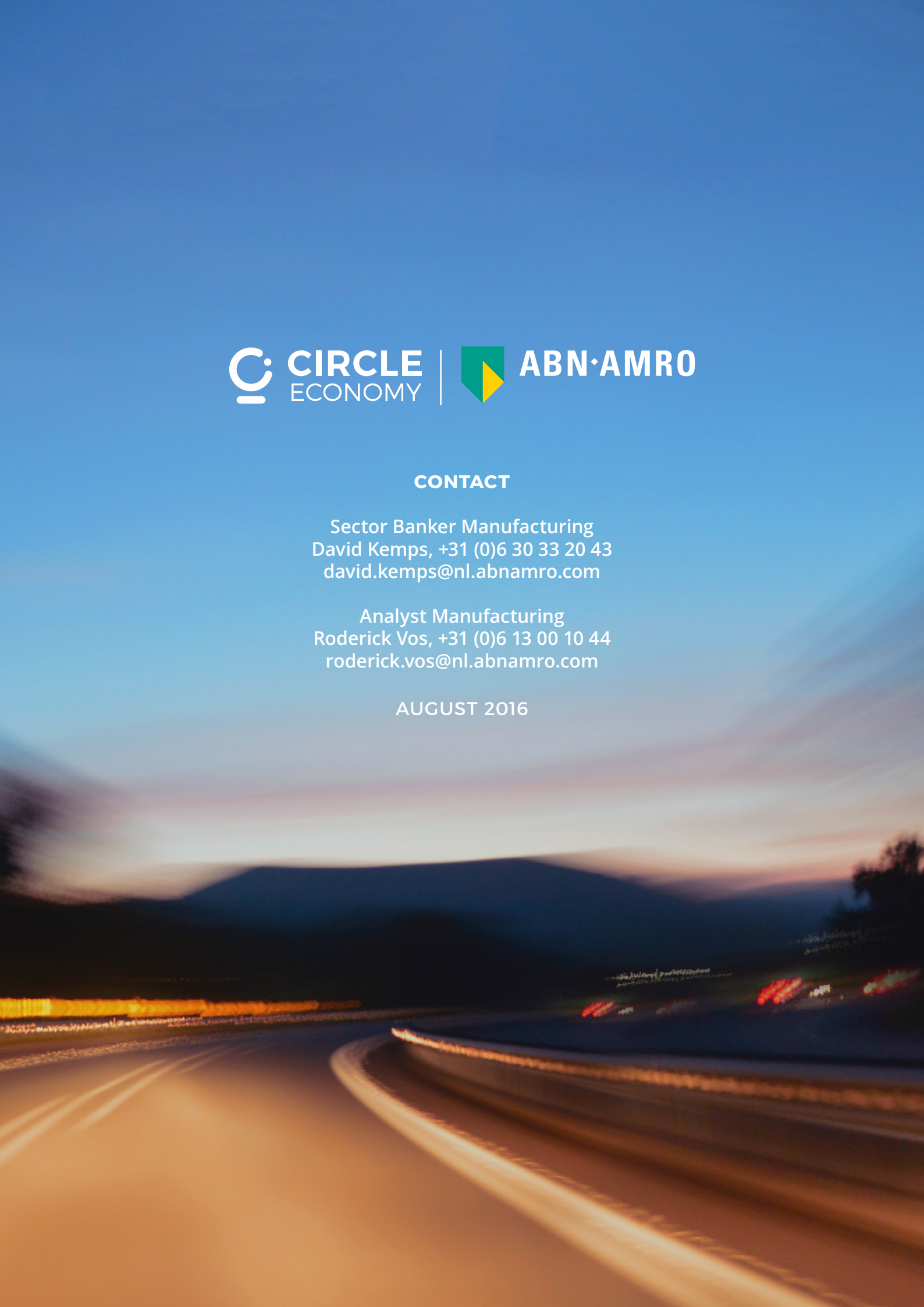

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