June NEWSLETTER

www.rcar.org

From the Secretary General

Hello RCAR members.

Despite the continued challenges in working during the Covid crisis, I am very pleased to see that we have contributions from 13 RCAR research centres to this newsletter.

In this edition, the topics range from ADAS and driverless vehicles to e-scooters and hail damage. Note also that AZT is celebrating its 50th anniversary as a research centre. Congratulations. As usual, my contact for any feedback or questions is rmcdonald@rcar.org Stay safe.

INDEX

50 Years Allianz Center for Technology – Driving Tomorrow

The Allianz Center for Technology was founded in 1971 and for 50 years now, AZT is well known for expertise in automotive technology and road safety. Whether seat belts, low speed crash performance, electronic immobilizers, driver assistance systems or repair methods: Working closely with the automotive and claims community AZT has made significant contributions in establishing standards and systems in vehicles that are nowadays taken for granted. Thus it has had a positive impact on insurance costs as well as traffic safety. A central approach of AZT's work has always been to identify future-oriented topics at an early stage and to address them with research methods.

Only one year after AZT was created, it became one of the founding members of RCAR. The increasingly international collaboration within RCAR has had important advantages in exchanging state of the art know how and establishing global standards.

On the occasion of AZT's 50th anniversary, we thought about how we could make the combination of historically grown expertise and future-oriented research in the automotive field, as well as our international way of working, tangible. One result is our new claim "50 Years Research - Driving Tomorrow“.

New AZT Claim

Over the anniversary year there will be various communication activities on the history and future of AZT. In a short film Dr. Christoph Lauterwasser, Managing Director of AZT, presents the most important areas of work of the AZT over the past 5 decades as well as for the future. The film can be viewed via the following link: 50 Years AZT - YouTube

Intro of the new AZT film

Practical tests according to defined standards on various safety topics have always been a central element of AZT's work. The following trailer gives an impressive overview: Trailer 50 Jahre AZT - YouTube

For further information to 50 years AZT and other topics please refer to our website:
Allianz Center for Technology - Allianz Zentrum für Technik (azt-automotive.com)

New jointly accepted documents on painting and bodywork-to-paint handover conditions

When repairing vehicles that have been involved in an accident, it is desirable for all those involved to work together in the interests of the common customer in order to achieve the best possible result in the required time to everyone's satisfaction. To this end, constructive dialog between experts, bodyshop, paint shop and insurance company is indispensable, requiring a common understanding of the challenges from all those involved in the claims process.

Over the last year, therefore, the AZT has worked together with representatives of vehicle manufacturers, bodywork and paint associations, experts and insurance companies in two working groups to draw up jointly supported documents on the handover condition of bodywork to paint and the state of the art in vehicle refinishing. These documents have been agreed at the end of March as a follow-up to the annual meeting of the German Commission for Paint and Bodywork Repair, which was held virtually on March 2, 2021.

The first document is on the significance of the handover condition after completion of a bodywork repair and thus the starting point for subsequent painting. Since two trades should ideally work hand in hand here, this document provides the parties involved with support for their arguments.

In addition, a comprehensive paint data sheet has been compiled that covers the current state of the art in the refinishing of road vehicles. Besides purely technical aspects, the document also discusses the procedure for defining the scope of repairs and the cooperation between the paint shop and the expert or insurance company.

Both documents are available in German and English and can be downloaded free of charge from the AZT website: Downloads - Allianz Zentrum für Technik (azt-automotive.com)

Example of a vehicle with repaired fender and refinish painting with color matching of the adjacent component in the same level (driver's door).

Audits of roads, commercial vehicles, and both workshops of the oil and mining industry

Two leading industrial companies have contacted Cesvi to carry out an audit in 2 specific areas, Tehcnical and Road Safety. The objective is to imrpove Road Safety in their commercial vehicles fleet.

The work was divided in 3 types of audits:

1- Road Audit

The evaluation and analysis were made through HAZID Method focusing on characteristics and risks of the road where they transport their resources and goods for its usual functioning.

This road was a two way one and one lane each, with a surface of gravel of 155 km.

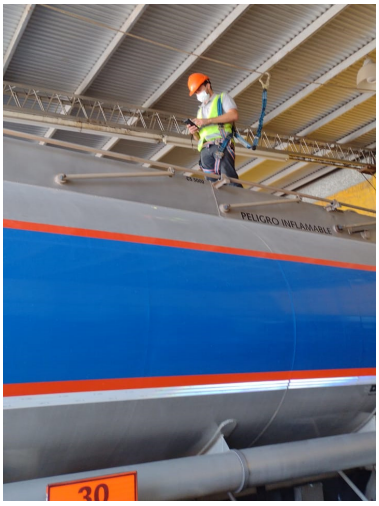
After the audit, a technical report with details of the findings was sent. Some improvements of the road were suggested.

2- Vehicles Audit

The fleet has 33 vehicles and the audit consists of the evaluation of the main systems of them

The first step was the inspection of the tract unit which veryfied the kinematic chain, brake systems, tires and the general condition of the cabin. Then the tank was verified in its different types of systems, such as fuel dispatch, lighting, brakes, and running gear components (tires, suspension, among other systems).

In addition, the verification of all the legal and necessary documentation was carried out to be able to circulate, as well as the regulatory advertising



Tract-tank audit

The findings detected in the audit allowed to implement a corrective and preventive maintenance plan for the entire fleet.

3- Workshop audits

As the third pillar of the plan, ten workshops that serve the fleets of audited vehicles were evaluated, applying a specific protocol depending on each service discipline.

Workshop Audit

Among these workshops we can find official dealers of the automotive terminal, workshops for the maintenance of brake systems, tank repair workshops and engine rectification workshops.

Also,each of the workshops was evaluated for the following items: infrastructure, training, equipment and management, among others.

Finally, a technical report was made detailing the findings with a proposal for suggestions for improvements.

The team of auditors of CESVI ARGENTINA made a presentation of the results obtained to the Operations Managers of the mining and oil companies, in order to implement the necessary action plans that allow them to improve the Road Safety of their services.

CESVIMAP conducts pioneering research into driverless cars

Using a normal, 100% electric car as a starting point, CESVIMAP, alongside the Carlos III and the Technical Universities of Madrid, has installed cameras, radar and LIDAR sensors on this Mitsubishi i-MiEV model, making its steering, acceleration and brakes automatic in order to achieve a totally autonomous vehicle.

This technology is still not completely developed - society is facing, among other factors, cybernetic risks with regard to driverless driving, as well as doubts over who would be held responsible in the event of an accident: the vehicle manufacturer, the sensor manufacturer, the software developer, etc. But it is into a mid-term future that CESVIMAP wishes to research, while also determining the repercussion that such technology would have on an insurance company such as MAPFRE.

After various off-road tests and the scheduling of the first decisions, a phase which was carried out in 2020, it is now that CESVIMAP has been trying out its driverless car in a controlled but real setting: Ávila.

For various days, the daily traffic was cut off in a specific area of this Spanish city. Students and faculty members from the Universities, together with members from our company of the human team involved in this project, all carried out experiments on how the vehicle functioned in relation to urban features: lamp posts, kerbs, roundabouts, litter bins, passers-by... Various actions and problems over which the vehicle had to "decide" and interpret reality correctly.

In this way, the researchers determined the sensorial fusion of the vehicle, or the way to combine the stimuli perceived separately from the sensors - camera, LIDAR sensors and radars. Moreover, they determined the vehicle's image processing, as well as possible implications concerning road safety - in the event there were mistakes in these - in order to foresee our driverless car's degree of success in the perception of its environment.

CESVIMAP wants to ascertain first hand the advance in this driverless technology which will leave the decision sometimes to the vehicle and sometimes to the driver. It wants to learn about the opinion of the autonomous car's future client: does the client like it, does it frighten the client, etc., to pool the possible limits of autonomous driving from the insurance company's angle. The vehicle regulations must include safety standards to deal with possible errors of perception, meaning that the insurance policy will activate certain new kinds of cover, in principle. When the inclusion of autonomous vehicles becomes more widespread on our roads, this will be the moment when a revolutionary change will take place in the paradigm of the insurance policy, although before this, cybernetic risks or driving responsibility will have to be resolved.

CESVIMAP develops a test system for AEB: AEB Block Tester

Since 2015, CESVIMAP has been conducting research in order to evaluate various ADAS systems mounted on the vehicles: Autonomous Emergency Braking (AEB), Lane Departure Warning (LDW), Lane Keeping System (LKS), Blind Spot Warning (BSW), etc. This has been in order to determine how they work and when they might not work. The principal aim is to judge the capacity of the vehicle to avoid accidents - and the personal injury and material damage these would cause - with the direct influence this has on road safety. Likewise, the mounting of sensors from these ADAS systems on zones with major exposure to accidents can influence the vehicle's repair costs, with the consequent repercussion on the insurance company's and the end client's budget.

Among the tests performed, more exhaustive AEB tests have been defined with objects which get in the way of target perception or disrupt it, in such a way that more realistic conditions are reproduced. CESVIMAP also experiments with offset tests and with different types of vehicle target. As a result, it has developed a test system for AEB which can be perceived by all the vehicle sensors and which is multipurpose; the system is called ABT or AEB Block Tester. It was very important for this purpose to design and build specific adapted targets.

In 2016, CESVIMAP registered its ABT patent internationally. It has 1:1 proportions and an RCS (radar cross section) similar to the vehicle which its image represents. The ABT has capacity to design and build targets which are detectable by LIDAR, camera and radar, and it ismanufactured in a foam with additive particles from a material which simulates the echo the radar produces on it, as if it were a real vehicle. The external material does not cause damage to the vehicle, in the event of a malfunction of the AEB system.

ABT can test if the vehicle is travelling along a narrow road, with obstacles at each side, and see if it activates these systems by mistake or not. It also detects a pedestrian crossing at a normal pace, both in an open area and when appearing from behind obstacles. The aim is to reproduce, for the purpose of perception of the vehicle's sensors, the rear of a car. The overlap vehicle detection test (where 100% of the rear of the vehicle is not detected) produces a range of errors in various manufacturers, since it is not provided for by any other laboratory's test system. Furthermore, in large cities there is a high likelihood that rear-ending will involve crashing into a motorcycle, which is why it also detects this type of vehicle.

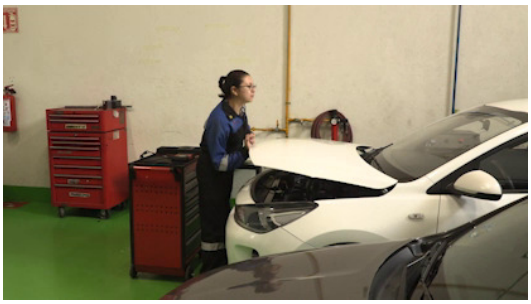
CESVIMAP uses these blocks in its own tests, as well as selling them to provide brands and dealerships with a method which shows clients the advantages of the system, and the consequent reduction in accidents. In addition, this enables various research centres to evaluate vehicle sensors in order to improve the autonomous emergency braking systems. ABT is used by various entities in Europe, Asia and America, for the development of sensors and equipment tests.

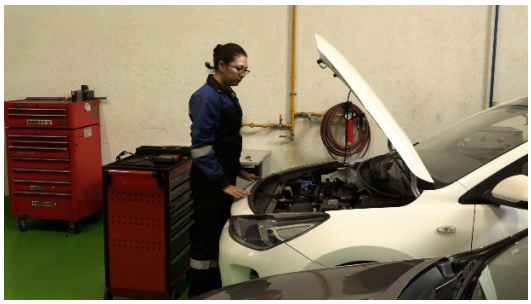
AMAVe and Cesvi certify more than 500 service providers

AMAVe (Mexican association of vehicle lessees) commonly with Cesvi México created the ¨Certification program for maintenance providers¨, a program in response to the needs of AMAVe partners and in which the most important service centers of the leasing ecosystem were identified and a value to each quantitative and qualitative criterion that was necessary for the evaluation.

This certification in its first stage (2018 - 2019) supported more than 500 maintenance providers, which were recognized as the best in the sector due to Cesvi's evaluations, and that represents solid support for the operation and growth of the companies. business sales of tenant association partners.

To build solid relationships, the second stage continues, where expansion is sought and more service centers join, since this inevitably requires a strong commitment and effort from both parties to improve the sector.





Cesvi establishes a training alliance with Axalta

Cesvi México was chosen by Axalta as a training partner to strengthen its supply with the Nissan dealer network throughout the Mexican Republic.

This business strategy is because Cesvi has been Nissan's approved bodywork training provider for more than 20 years. Thanks to this experience and the infrastructure developed for the delivery of face-to-face and distance courses, Cesvi turns out to be the ideal partner for the development of this project.

In the first stage, 40 courses will be taught during the rest of the fiscal year 2021, planning to train around 200 technicians.

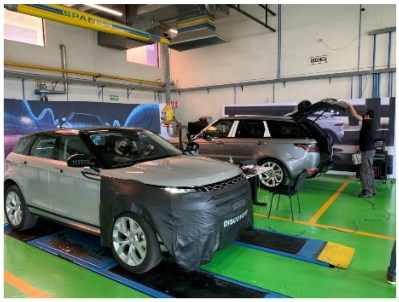
Jaguar Land Rover Mexico takes advantage of Cesvi's facilities

In another win-win relationship, Land Rover Mexico has chosen Cesvi as its national location for teaching courses related to mechanics.

Thus, the British brand makes use of the training rooms and the car workshop, places where theoretical knowledge is transmitted and practices are carried out in the firm's vehicles.

In the first stage, Land Rover has trained 45 technicians from the cities of Mexico, Guadalajara, Monterrey, and others. In the second stage that begins in this month of June, it is expected that the same number of people will be updated.

It should be added that Land Rover promotes the development of its mechanical technicians with a series of competitions in which the best mechanic of the year is recognized.

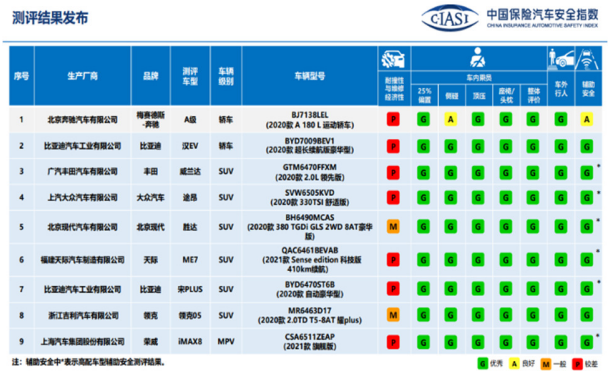


Report of 2020 C-IASI Test Results

Under the guidance of Chinese Insurance Association,

CIRI was hold a press conference to release the C-IASI evaluation results report in Jun 2021.

C-IASI has finished 23 vehicles models tests, including 14 SUVs, 8 Cars, 1 MPV. Tested models can cover 9.89% of the total sales in China market, and Chinese brand account for 43.5%. the results of Chinese brand vehicles acquired 100% GOOD at passenger protection and pedestrian protection.


测评结果发布

CIASI 中国保险汽车安全指数

序号	生产厂商	品牌	测评车型	车辆级别	车辆型号	耐撞性与维修经济性	车内乘员				车外行人	辅助安全
							25%偏置	侧碰	顶压	座椅/头枕	整体评价		
1	北京奔驰汽车有限公司	梅赛德斯-奔驰	A级	轿车	BJ7138LEL (2020款 A 180 L 运动轿车)	P	G	A	G	G	G	G	A
2	比亚迪汽车工业有限公司	比亚迪	汉EV	轿车	BYD7009BEV1 (2020款 超长续航版豪华型)	P	G	G	G	G	G	G	G
3	广汽丰田汽车有限公司	丰田	威兰达	SUV	GTM6470FFXM (2020款 2.0L 领先版)	P	G	G	G	G	G	G	G*
4	上汽大众汽车有限公司	大众汽车	途昂	SUV	SVW6505KVD (2020款 330TSI 舒适版)	P	G	G	G	G	G	G	G*
5	北京现代汽车有限公司	北京现代	胜达	SUV	BH6490MCAS (2020款 380 TGDI GLS 2WD 8AT豪华版)	M	G	G	G	G	G	G	G*
6	福建天际汽车制造有限公司	天际	ME7	SUV	QAC6461BEVAB (2021款 Sense edition 科技版 410km续航)	P	G	G	G	G	G	G	G*
7	比亚迪汽车工业有限公司	比亚迪	宋PLUS	SUV	BYD6470ST6B (2020款 自动豪华型)	P	G	G	G	G	G	G	G*
8	浙江吉利汽车有限公司	领克	领克05	SUV	MR6463D17 (2020款 2.0TD T5-8AT 耀plus)	M	G	G	G	G	G	G	G
9	上海汽车集团股份有限公司	荣威	iMAX8	MPV	CSA6511ZEAP (2021款 旗舰版)	P	G	G	G	G	G	G	G*

注：辅助安全中*表示高配车型辅助安全测评结果。

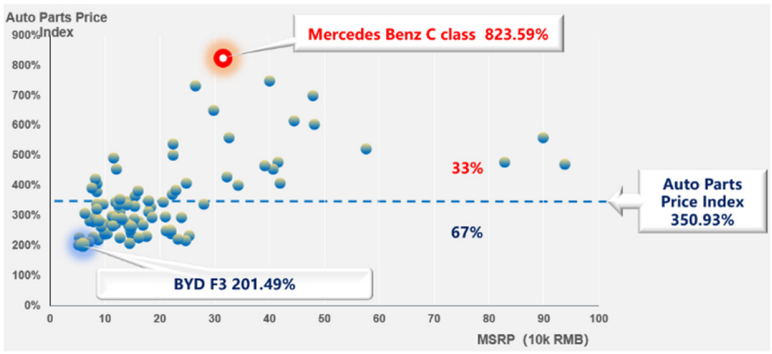
G 优秀 A 良好 M 一般 P 较差

On the Damageability and Repairability tests, the airbags explosion rate is 17%, which is 9% lower than that in 2019. On the passenger protection, the front and side airbags explosion rate are 100%. 87% of tested vehicles equip side airbags, which is 28% higher than 2019. In addition, on the pedestrian protection, 90% vehicles acquire GOOD. On the P-safe, 39% vehicles equip AEB system, higher than 19% comparing with 2019.

C-IASI will always be based on serving consumers and improve the traffic safety in the future. Using the advantage to develop the national economy and assist the national supply side reform.

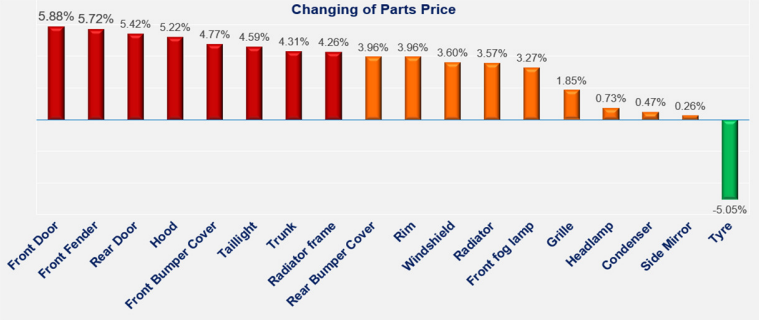
Auto Parts Price Index in China

In June 2021, CIRI relaeased the 12th vehicle parts price index. There are 100 vehicle models in the index. The Auto Parts Price Index and Frequently-used Parts Index has significant increased. The Auto Parts Price increase 13.96% comparing with 2019. And the Frequently-used Parts Price in 1.15. For example, the Ratio of Parts Price to manufacturer's suggested retail price (MSRP) of Mercedes Benz C class is 823.59%.



According to CIRI research, there are 17 of the 18 frequently-used parts price higher than 2019, especially front door, front fender, and rear door. The most expensive headlamp is Audi, accounting for 10.56% of the total vehicle price. In additon, The price of vehicles with expensive parts ranges from 300000 RMB to 500000 RMB.

Auto Parts Price Index reflects the cost. consumers and insurance companies auto CIRI will combine the advantages in the Index tech, and release new Auto Parts Price in the future.



RAC3D, 3D printing technology in car repair

RAC3D project was born from the collaboration between the AUTOMOTIVE CLUSTER ASSOCIATION OF ARAGÓN, the AITIIP FOUNDATION Technology Center and CENTRO ZARAGOZA. The general objective of the project was the use of 3D technologies for the manufacture and adaptation of spare parts for the transport and agricultural sector, as well as their subsequent certification and validation through a scheme developed for this purpose. It was co-financed by the Ministry of Industry, Commerce and Tourism within the support program for Innovative Business Groups.

The project began with the analysis of different printing technologies, according to the material used and the printing process, and the identification of the main advantages: freedom of design, reduction of times in redesign and prototypes, "in situ" and "tailored" manufacturing, manufacturing multi-material products, reduction of material and waste, reduction of emissions from transport, reduction of stocks, reduction of costs logistics, weight reduction, possibility of manufacturing parts of geometric complexity or geometry or greater speed to deal with changes, especially small changes in the final product. Among the main limitations were the lower production speed, the limitation in the size of the parts, the legal protection on 3D designs, the price of the printing equipment, the lack of qualified personnel, the availability and cost of the material, the surface finish problems, the chemical resistance of the manufactured parts, the necessary mechanical resistance and the difficulty of product quality control and process repeatability.

A survey was carried out among the identified stake holders: manufacturers, distributors, workshops and insurers. Most of them answered that traditional and additive technologies will coexist and even be combined in the future. Likewise, they considered that the verification of the quality should be carried out by an organization that certifies both the manufactured part and the manufacturing process. Parking sensor brackets, moldings and mirror housings were the parts considered as the most interesting for manufacturing using 3D printing.

A study of the impact of 3D printing technology was carried out, considering the parking sensor bracket, a part without structural responsibility, one of the parts that would best fit this technology. In addition, it was decided to analyze parts with a certain responsibility in a crash, evaluating a bumper bracket.

CAD digital files were used on the selected parts. Models were made by 3D printing with Polyjet technology, in which the material used is a photopolymerizing resin, with low mechanical performance but higher quality. In this case, the resin used was translucent. For the study of the bumper bracket, two different materials were used: polyamide with 40% carbon fiber (PA40CF), very high resistance but with high rigidity, and an acrylonitrile styrene acrylate (ASA), a material with medium mechanical performance and greater flexibility. Parameterization studies and tests were carried out to achieve optimal results in each type of part. The parts were printed with the selected technologies, according to the previously identified parameters.

A test plan was developed for quality verification in accordance with previously determined criteria. The tests were carried out on the parts manufactured by 3D printing. The requirements to be verified in one of the 3D printed parts were defined, as well as the work procedures, developing a test plan to verify the quality of the 3D printed part. It was decided to focus the verifications on the tests on the 3D printed part, without considering the evaluation of the production process and the quality control of the 3D printing center.

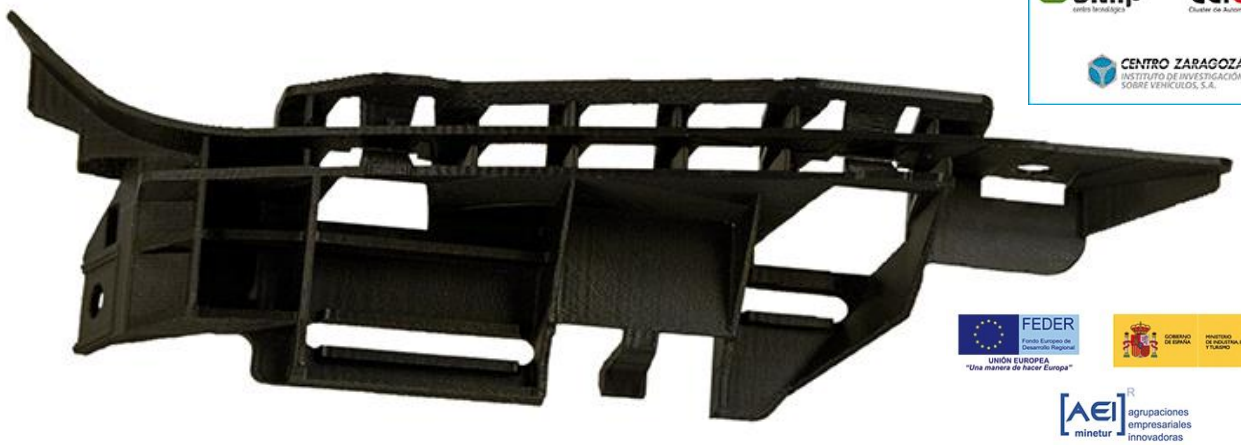
Regarding the bumper bracket, it was analyzed the quality of the plastic (resistance to heat, resistance to impact at low temperature, resistance to impact at room temperature and resistance to fuels) and thickness and mass of the part; part appearance, identification, geometry and shape; adaptability, work process and positioning of the part. It was carried out an impact test at low speed. To check the behavior of the 3D-printed bumper support compared to the OEM part, the vehicle was subjected to an oblique impact at the end of the bumper where the bracket is placed, and to another frontal impact on the bumper. Regarding the parking sensor bracket, the analysis of its functionality allowed to determine that the tests to be carried out on this part were like those presented previously for the bumper bracket, excluding the crash test.

From the study, it was determined that 3D printing technology could be used for the manufacturing of this type of parts by applying a series of corrective measures, such as replacing ASA with another material more resistant chemically and mechanically or the improvement of the surface finish, at least of the part that will remain visible after fitting.

Therefore, by carrying out the necessary adjustments, mainly in relation to the material, 3D printing technology could be an alternative in the manufacture of spare parts, although it would be necessary to carry out a verification to ensure that the part has a proven quality.

An analysis was also carried out with the aim of evaluating the economic and environmental impact of manufacturing using 3D printing technology, being compared to traditional processes. Three scenarios were evaluated: traditional replacement, repair with 3D printed part and a hybrid scenario where partial printing was carried out with the aim of repairing the part. Costs, environmental impact (carbon footprint generated) and waste generated were analyzed, including the transport, the preparation of the machine and the printing. For the last scenario, the additional costs and operations to carry out the reconstruction of the original part with 3D printing elements were considered. 3D printing reached favorable values in terms of repair costs for large print volumes that allowed the amortization and maintenance costs. The traditional option (purchase of the part) was the most favorable in terms of environmental impact. Partial replacement is the one that generated the least waste, because the original material is partially reused and only the necessary material is produced.

A web was created: http://rac3d.com/, which remains active at the end of the project.



3D printed bumper bracket

Testing of Vehicle Hail Protection Covers

IAG information suggest that 2/3 of all vehicles are damaged by hail while stationary when outside, exposed to the weather. One of the possible ways to mitigate hail damage is to protect a vehicle using a whole-vehicle cover.

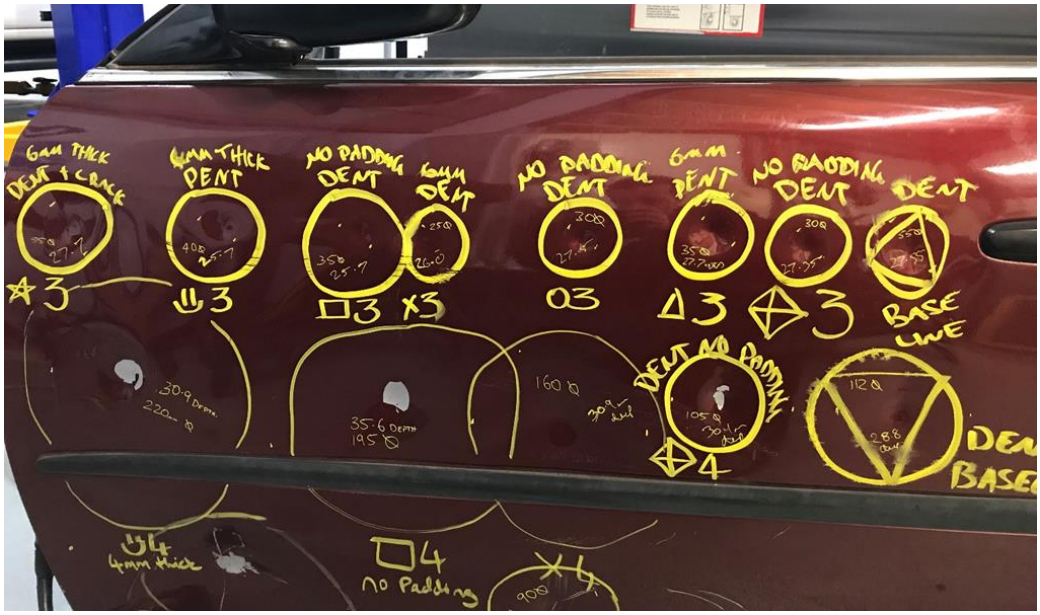
Vehicle Cover on Car

Whole vehicle covers are rather large, making them difficult to fit and may require two people to put them on a vehicle. Severe weather events accompanied by high winds increase difficulty in fitting a vehicle cover rising the chance the cover is blown away potentially creating a safety hazard for the person fitting it.

In a controlled environment, using a hail cannon replicating hailstones of various sizes, we have tested seven vehicle covers available in the Australian market to determine what level of protection they provide against the risk of hail damage to vehicle panels.

IAG Hail Cannon

The test results demonstrated that overall, the vehicle covers provide only very little to no additional protection against hail damage. However, the level of protection is inconsistent for all sizes of hailstones.



Test Result

In the cases where the diameter or depth of damage was reduced, the impact reduction is not significant enough to result in a reduction in the level of repair needed or cost of claims. When investigating the damage caused by the smaller hail stones, generally this can be repaired using paint-less dent removal techniques. For the larger hailstones however, the use of the vehicle covers is likely to lead to increased repair cost as the use of these covers appeared to exaggerate the damage area or impact the paint coat due to increased friction levels between fabric and panel. In these cases, more traditional methods of repair and re-painting are required or a replacement of the panel entirely.

Overall, based on the test results, the vehicle covers tested do not provide effective protection against the risk of hail damage caused by hailstones likely to be encountered in a hailstorm.
Combining this test outcome with an increased risk of physical injury to a person during a hailstorm, we cannot recommend promoting use of the vehicle covers by general public.

Contact:
CRIS SURACE
Consultant, Engineering Research
IAG Research Centre
Phone: +61 2 9292 6862
Email: cristopher.surace@iag.com.au

Modern headlamp technology and its impact on cost of repairs in Australia leaves many questions to be answered by automotive insurance research

By Petr Zuzanek, John Farrugia, George Elazzi and Christopher Emerson

The headlamp technology and associated cost has evolved significantly since the automobile was invented.

However, replacement frequency of a headlamp in a collision has probably not changed that much in the last 135 years.

One in three vehicle collision insurance repairs usually include replacement of a headlamp.

Today, improved visibility during day or night and vehicle appearance are often traded for a higher replacement cost.

The replacement cost of headlamps available in Australian car market has risen steeply in the last 10 years.

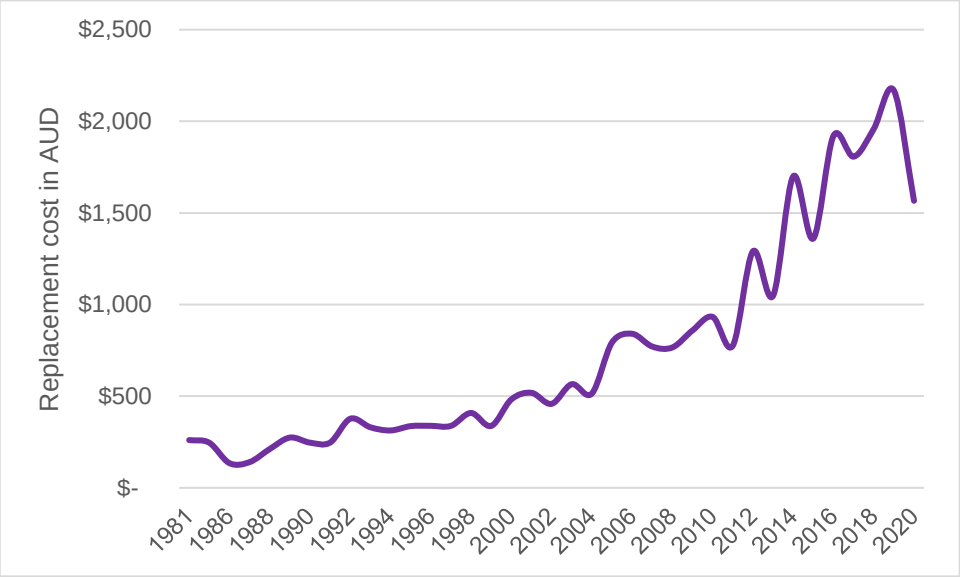


Figure 1: Average price of headlamp (Right Hand side) in Australia (March 2021) by vehicle model production start year

Source: IAG Research Centre

Advanced headlamp technology trickles down to lower vehicle categories and is no longer a domain of high-end vehicles.

The impact on insurance is even more pronounced when the headlamp replacement cost is related to purchase price or residual value of the insured vehicle.

This has the potential to increase the cost of claims even more as it increases probability of economical write-off an total loss for older vehicles.

Headlamps are in the first line when it comes to vehicle collision.

Today, headlamps are not only a necessity providing visibility and safety to the driver during both day and night, but also an element of modern vehicle design, fully integrated in the vehicle body shape and styling.

Not all body shapes are created equal when it comes to damageability of headlamps.

Figure 2: Headlamp damageability is influenced by vehicle styling

Source: https://www.couriermail.com.au/news/queensland/sunshine-coast/testing-40-years-of-the-mazda-323-and-mazda3in-the-wet/news-story/f14ae8b6daacc33a244778fbd62ab7b7; https://www.lundgrenhondaofauburn.com/used/BMW/1987-BMW-M6-cce54e950a0d0cc747661f10d9606cf2.htm; https://www.carsdirect.com/2021/bmw/8-series/pictures

The expense does not stop with the cost of replacement part and labour.

Almost all headlamps today (not just the latest smart matrix LED) have some element of automation and ADAS (such as automatic high beam or active, corner following function) and therefore rely on a number of sensors (camera, radar or other) to operate as designed.

This means that they may also require re-calibration upon replacement, which further increases the cost of repair.

The modern headlamp technology raises few questions:

1. Do the increased functional benefits outweigh the increased cost for customers, repairers and insurers?
    a. Do the modern headlamps provide a significant safety customer benefit at nigh time?
    b. Are cars mostly driven (and have collisions) mainly during daytime?
    c. What more can be done to influence the modern vehicle design to reduce headlamp exposure?
2. Are the modern headlamps genuinely more expensive to develop and manufacture to warrant the higher cost?
    a. Does modern headlamp development, design and production costs warrant a per unit price of $2,000 or more?
    b. Does the high cost mean that a modern headlamp will become a target of thieves as it could be removed from the vehicle relatively quickly without gaining access to the inside of the vehicle?
    c. How many of the modern OEM headlamps do have a reliable and high quality Tier1 parallel production or after-market alternative?
3. What can be done to increase repairability and re-use of modern headlamps involved in a collision?
    a. How many OEMs do provide headlamp repair kits to reduce the cost of repair by enabling replacement of damaged headlamp unit brackets should that be the only damaged part of the headlamp?
    b. Is there any way modern vehicle headlamps could be disassembled and repaired, re-using some of its components, instead of a complete headlamp replacement?
    c. If the headlamps are repaired, could it impact safety of vehicles and customers who drive them?

Do you know more?

Contact:

PETR ZUZANEK

Manager, Engineering Research

IAG Research Centre

Phone: +61 0411 011 951

Email: petr.zuzanek@iag.com.au

New research highlights limitations of automated systems

Speeding habits and roadway curves could limit the safety benefits of adaptive cruise control (ACC) and partial automation, two recent studies from the Insurance Institute for Highway Safety (IIHS) show.

The studies drew on data collected by the Advanced Vehicle Technology Consortium at the Massachusetts Institute of Technology. The data came from vehicles used by 40 drivers for their regular driving over four weeks in the Boston metro area. The volunteers were provided either with a 2016 Land Rover Range Rover Evoque with ACC or a 2017 Volvo S90 equipped with ACC and Pilot Assist, a partial automation system combining ACC and lane centering.

In the first study, IIHS researchers found that drivers were substantially more likely to speed when using the technologies than without them.

ACC and partial automation systems on the market today don't restrict drivers from setting speeds that are higher than the legal limit. When selecting a speed to "set and forget," many drivers choose one over the limit.

Today's automated systems also aren't capable of handling certain road features, a constraint that was the focus of the second study.

In that study, the researchers found the systems were less likely to be activated as curves became sharper, either because the driver switched the system off or because it deactivated automatically.

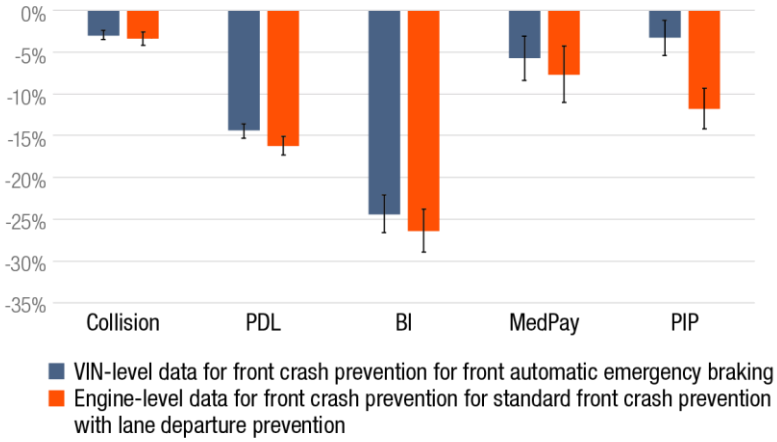
That is an especially important limitation for partial automation systems, since the types of crashes lane centering could help prevent are more likely to occur on curves than on straightaways.

HLDI uses engine-level data to analyze benefits of safety features

The Highway Loss Data Institute (HLDI) has retooled its vehicle information database to collect information at the trim and engine level instead of only by model — a change that allows it to more easily produce timely analyses of the effects of safety technologies.

HLDI, an IIHS affiliate, uses insurance data to analyze the effects of various features. To do so, HLDI analysts need to know which vehicles are equipped with a particular feature. When features are optional, HLDI has traditionally relied on manufacturers to provide a list of vehicle identification numbers (VINs) for the equipped vehicles.

Change in claim frequencies for front crash prevention using VIN- and engine-level data

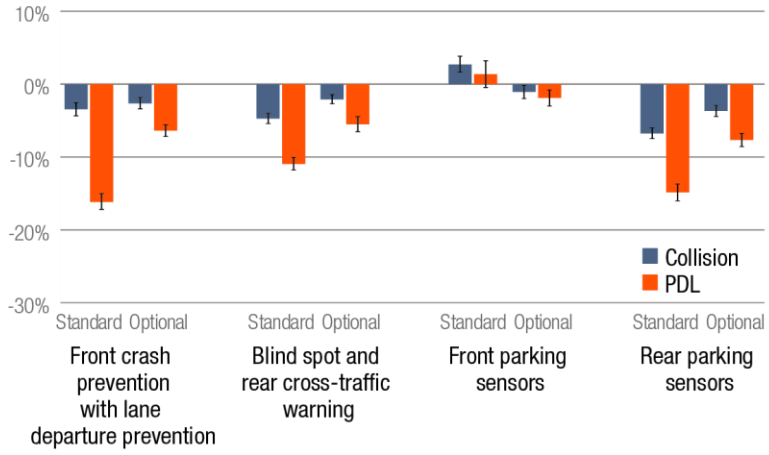


The findings on the effect of front crash prevention using engine-level data are in line with other HLDI analyses that rely on VIN-level data.

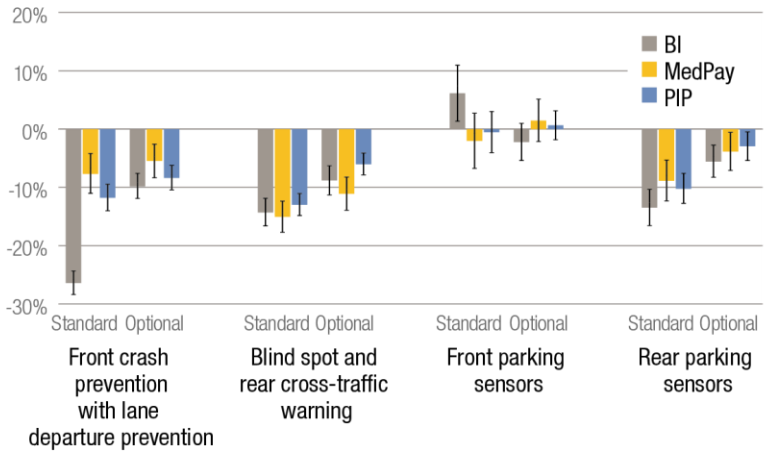
Getting that information from manufacturers can be difficult, so beginning with the 2018 model year, HLDI began incorporating information on the features included with specific trims and engine types into its database. Automakers always encode the engine type in each VIN, in accordance with federal regulations, and sometimes also encode the trim level. HLDI has since expanded this detailed data collection to include model year 2017-20 vehicles.

Findings on driver assistance technologies using engine-level data, 2017-20 model years

Change in physical damage claim frequencies associated with driver assistance technologies



Change in injury claim frequencies associated with driver assistance technologies



Many features that are optional for a given model are standard for a particular trim and/or engine type. The inclusion of these more granular data in the HLDI vehicle database allows HLDI to analyze the effect of certain features on insurance losses without asking manufacturers for a list of specific VINs.

Several studies by HLDI have validated this approach. When driver assistance technologies are analyzed this way, the results are in line with HLDI's findings based on manufacturer-provided VIN-level data.

For example, in the most recent such study of engine-level data, published in April, HLDI found that vehicles with front crash prevention and lane departure warning had claim frequencies under bodily injury liability coverage that were 26 percent lower than vehicles without the features. That's similar to the 24 percent reduction found for front crash prevention using VIN-level data.

Vehicle choice, crash differences help explain greater injury risks for women

Women are much more likely than men to suffer a serious injury when they are in a crash, but much of the heightened risk is related to the vehicles women drive and the circumstances of their crashes, rather than physical differences, new IIHS research shows.

"Our study shows that today's crash testing programs have helped women as much as men," says Jessica Jermakian, IIHS vice president of vehicle research and one of the study's authors. "That said, we found that women are substantially more likely to suffer leg injuries, which is something that will require more investigation."

Though men are involved in more fatal crashes than women, on a per-crash basis women are 20-28 percent more likely than men to be killed and 37-73 percent more likely to be seriously injured after adjusting for speed and other factors.

Recently, the discrepancy in injury risk for men and women has prompted calls for new crash test dummies that better reflect how women's bodies react to the forces of collisions and other changes to crash-testing programs. With this new study, IIHS sought to shed more light on the issue.

The researchers analyzed injuries of men and women in police-reported tow-away front and side crashes from 1998-2015.

In front crashes, women were 3 times as likely to experience a moderate injury such as a broken bone or concussion and twice as likely to suffer a serious one like a collapsed lung or traumatic brain injury. In side crashes, the odds of a moderate injury were about equal, while women were about 50 percent more likely to be seriously injured, but those results weren't statistically significant.

To determine how much of the discrepancy was due to physical differences between men and women, the researchers repeated the analysis with only single-vehicle crashes and two-vehicle crashes in which the vehicles were a similar size or weight. Only crashes with a front airbag deployment were included.

Limiting the analysis to comparable front impacts flattened the disparity considerably, though women were still twice as likely to be moderately injured and a bit more likely to be seriously hurt.

One explanation of the higher injury rates for women could be vehicle choice. Men and women crashed in minivans and SUVs in about equal proportions. However, around 70 percent of women crashed in cars, compared with about 60 percent of men. More than 20 percent of men crashed in pickups, compared with less than 5 percent of women. Within vehicle classes, men also tended to crash in heavier vehicles.

For more information, visit https://www.iihs.org/news.

Study on dynamic calibration

There are two main types of calibration for the advanced driver-assistance system (ADAS), static and dynamic.
The static calibration is to make the sensors recognize some particular targets put at predetermined positions around the car. The dynamic calibration is to make the sensors learn the required information for ADAS calibration while someone is driving the car.

The static calibration has been a major way to set the ADAS sensors for Japanese domestic cars.
Japanese car manufacturers, however, have recently started launching new model vehicles whose sensors could be calibrated in either way.
JKC has calibrated ADAS sensors over 100 vehicles in the static way. Recently, JKC started conducting dynamic ADAS calibration to study its features and we would like to share the results.

We conducted dynamic calibration for millimeter-wave sensors and front cameras on the tested vehicle. To study how driving situations would affect the results of calibration, we actually drove the test vehicle and calibrated its ADAS sensors under the following nine different course patterns.

Test Location: (A) City area (B) Suburban area (C) Highway
Starting Time: (X) 10:00 (Y) 13:15 (Z) 15:15

Please see Figure 1 for the results we obtained under the course pattern (A) and (X) (i.e.: Starting the calibration at 15:15 in the city area). It shows the relation among the progress rates of calibration,car speeds,
and the driving distances.

The repair manual for this test vehicle stated that vehicle needed to be driven straight for about 5 to 15 minutes at a speed of more than 40km/h in order to initialize the dynamic calibration. During our test, the distance that we were able to drive over 40km/h was limited due to the congested traffic. We noticed, however, that the progress rate of calibration steadily proceeded even at the speed of less than 40km/h as shown in Figure 1.

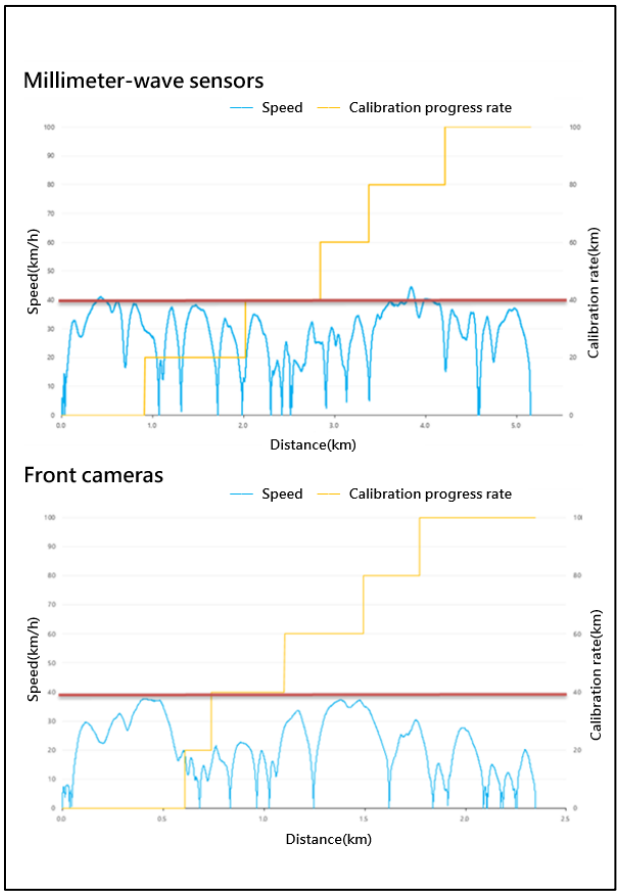


Figure 1

Please see Figure 2 below for the relation between the progress rates and the driving distance required for completing the calibration in each course pattern and the starting time.

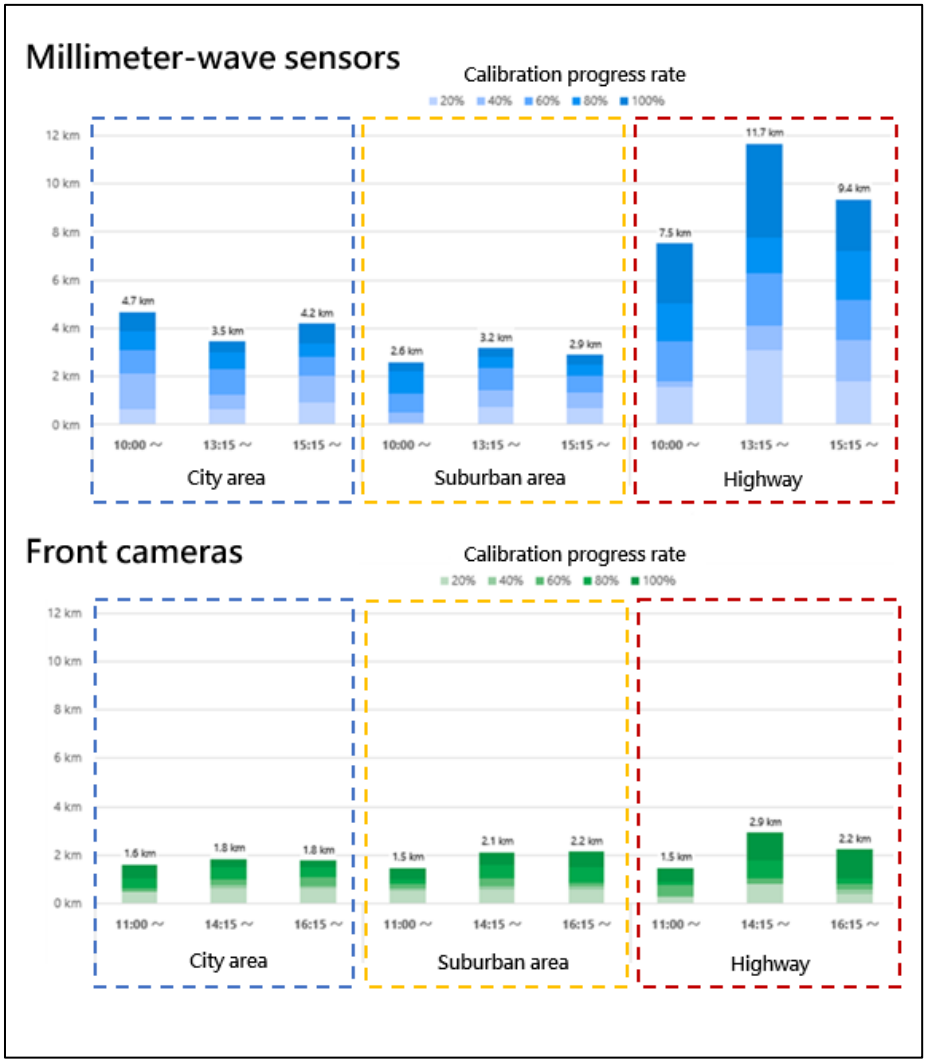


Figure 2

The required driving distance for calibration depends on the traffic conditions.
As shown in Figure 2, the millimeter-wave sensors were more affected by traffic conditions than the front cameras.

In the static calibration, it can be conducted by setting up particular targets precisely on the appointed positions around the vehicle. Dynamic calibration does not require detailed settings.
On the other hand, dynamic calibration needs to drive the vehicle on public roads, and therefore, we need to be fully aware of traffic accident risks.
To decide which way to take, it is important to understand the differences in features of each type of calibration. Working environments and available tools of repair shops should also be considered as necesarry conditions.

JKC will continue conducting research for both types of calibration in order to collect useful information on improving work efficiency of ADAS calibration.

A study on claim processing of high-voltage batteries in electric vehicles

As of April 2021, the number of registered electric vehicles in Korea was 151,911 units, accounting for 0.62% of total registered vehicles. Although the number of electric vehicles is still insignificant, it is rapidly increasing, so it is necessary to establish a reasonable compensation process before incorrect repair practices are prevailed in the market. The biggest problem in electric vehicle accidents is an accident accompanied by minor damage to the high-voltage battery, which increases the possibility of total loss of the vehicle. This is because the price of high-voltage batteries accounts for about 40% of vehicles. Although it varies by manufacturer, the price of a high-voltage battery for Hyundai Kona, currently the most sold electric vehicle in Korea, exceeds $18,800. If the high-voltage battery is damaged, whether the vehicle is in total loss or not, the replacement cost of the high-voltage battery is too high, so it is necessary to prepare a way to lower the claim cost for the high-voltage battery.

The table below compares the accident rate and loss ratio by auto insurance coverage between electric vehicles and all registered vehicles as of 2020. The accident rate was higher in the case of collision coverage, but lower in the case of property damage liability. Overall, there was no significant difference in the accident rate. However, the loss ratio was higher in all coverages for electric vehicles. Currently, the proportion of electric vehicles is low, so there is no big problem, but it is necessary to draw up an improvement plan as soon as possible for the future.

Coverage	Collision		Property Damage Liability		Bodily Injury Liability		Medical Payment	
Vehicle	EV	Total	EV	Total	EV	Total	EV	Total
Accident rate (%)	12.2	9.9	12.2	13.4	5.5	5.5	0.8	0.7
Loss ratio (%)	84.4	76.7	77.3	73.8	93.0	80.6	90.5	63.9

<Source: KIDI Automobile Insurance Statistics, 2020>

First of all, KIDI/KART is jointly measuring the detaching/attaching labor time to replace or repair the high-voltage battery with a battery remanufacturer. To this end, we were provided with warranty repair times for high-voltage batteries from Hyundai Motors and Kia Motors, and referred to them. For high-voltage batteries from other manufacturers, we plan to set the labor time for detaching/attaching pack assembly and parts repair. Also, we are working with car manufacturers to create an environment where refurbished batteries can be used. In addition, a diagnostic method study to determine whether a scratched high-voltage battery can be used as it is will conducted. It is also planning to conduct research on depreciation and residual value with battery manufacturers.

In this high-voltage battery damage case, the lower case was damaged by a certain object, and $18,800 was paid to replace it for a new one, and $3,110 was reversed through the sale of the battery after replacement.

Advanced Driver Assistance System (ADAS) Awareness Program by MRC Malaysia

In March 2021, MRC Malaysia has organised two courses on Advanced Driver Assistance Systems (ADAS) Awareness Program.

Due to the Covid-19 pandemic, Malaysian government has announced the Conditional Movement Control Order (CMCO) to control the spread of Covid-19 and to bring down the number of positive cases in Malaysia. Aligned with this announcement, MRC Malaysia has modified its training program into online activities. As a start, a one-day Zoom online webinar on the introduction to Advanced Driver Assistance System (ADAS) Awareness Program to the Malaysian industry has been organised by MRC Malaysia on March 3, 2021.

Webinar of the introduction to Advanced Driver Assistance System (ADAS) with speakers and participants on March 3, 2021.

Despite the ever-increasing introduction of ADAS which is now a common feature on all new cars, there has been a lack of clear information on how to approach the repair of these safety-critical systems. The need to understand the calibration before, during and after repair is sometimes overlooked or misunderstood.

The objective of the program is to understand and identify the importance of ADAS and the need of calibration post repair. This webinar has been attended by 340 participants from various sectors from the industry, i.e. insurers, repairers, loss adjusters, college and university lecturers, government agencies, etc.

The webinar has been presented by Steve Miller, the CEO of MRC Malaysia and KY Cheng from Autel Asia Pacific, a company specializes in research and development, production, sales and service of automotive intelligent diagnostics, detection and analysis systems and automotive electronic components. Later, Daryl Yap from Unipac Engineering, an engineering company with enormously diversified business portfolio including instrumentation and automotive equipment, also presented.

Later in March 2021, as the government of Malaysia has relaxed certain restrictions of CMCO and has allowed training program to be conducted at the training centre by following the strict Standard Operating Procedure (SOP) issued by the Ministry of Health, MRC Malaysia has taken the opportunity to conducted a two-days training on ADAS awareness program from March 30, 2021 to March 31, 2021 at MRC Malaysia training academy.

The title for this ADAS awareness program is ADAS Calibration Training. There were 16 participants from the industry i.e. insurers, repairers and loss adjusters. The training modules consist of both theory and hands-on training.

Left: ADAS Calibration training with participants and presenter. Right: During the training, participants has been exposed to use the ADAS calibration tools and equipment.

The objective of this program is to create awareness on different types of ADAS, ADAS calibration tools and equipment in the market. In addition, this program can educate the importance of ADAS calibration and reset process. Also, it exposes the participants to the ADAS features in the vehicle's manual and they will be able to identify calibration requirements, OEM information and understand how ADAS calibration works through the program.

Driver Monitoring Systems

Driver inattention is a serious issue on the roads with increasing sources of distraction such as mobile devices and control screens entering the vehicle, allied with drowsiness, (micro) sleep and sudden illness. Almost 27% of police reported fatal accidents on UK roads had a contributary factor of the driver being impaired or distracted, and 29% of HGV drivers admitted to falling asleep at the wheel in a confidential survey.

Driver monitoring systems (DMS) use sensors and vehicle data to determine the level of attentiveness and alertness of the driver. They can provide a safety benefit by advising drivers of fatigue and warning in case they are excessively distracted from the driving task or exhibiting sleepiness. The performance of active safety systems can also be adapted acknowledging the driver state.

Subaru Forester Distraction Warning

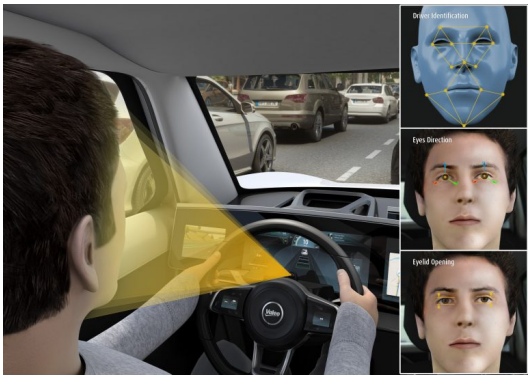
DMS will also be a key component of future assisted and automated driving systems where the driver is relieved of the driving workload. The systems will allow the vehicle to determine the driver's attentiveness when assistance systems are active (e.g. Cadillac SuperCruise), and monitor and maintain them in a state able to take over during automated driving.

There are two types of driver monitoring systems; direct and indirect.

Indirect monitoring collects data from the drivers inputs and lane position. Over time this is used to assess the level of and any changes to the level of driver fatigue and attention. These systems are commonly available and tend only to warn of driver fatigue with a reccomendation to take a break.

Direct driver monitoring uses an interior camera to continously measure the driver's attention to the driving task through facial and/or eye tracking (e.g. Subaru Driver Monitoring System, Mazda Driver Attention Alert). Direct monitoring systems are able to determine driver attentiveness in real time and differentiate between momentary driver distraction and drowsiness. This allows the system to provide more relevant alerts to the driver and adapt active safety systems appropriately. Direct monitoring systems are also able to quickly determine driver sudden sickness and initiate a minimum risk manoeuvre.

Thatcham Research are undertaking testing of currently available systems; working towards developing a test procedure which will drive the appropriate performance of sytems and provide a means of assessing their effectiveness in a repeatable and reliable manner.



Valeo driver monitoring system

Assessing e-scooter Risk to Motor Insurers

The use of e-scooters as a mode of transport has increased in popularity in the UK through both private sales to the public and sanctioned rental trials permitting use in major cities globally. In 2019 the Government published the 'Future of Mobility: Urban Strategy' which outlines the investment in accelerated trials of e-scooters in various cities and towns throughout the country.

e-scooters are classified as a powered but unregistered means of transportation. UK insurers have concerns regarding their introduction pertaining to whom will be liable for and recompense the costs of collisions and personal injury on the public road.

Thatcham Research set out to provide an understanding of the potential risk and motor insurer liability associated with the public use of e-scooters by:

- Conducting an insight analysis based on existing e-scooter (or e-scooter proxy vehicle) accident data.
- Investigating the e-scooter accident risk mitigation potential of passenger car Autonomous Emergency Braking (AEB) via practical track testing.

e-scooter testing

For the insight analysis, 2019 UK and French collision data involving e-scooters and/or bicycles (e-scooter proxy vehicle) were analysed. French data was used for comparison becase micro-mobility personal vehicles are specifically categorised in the French data. It was found that for collisions involving two vehicles, 80% of micro-mobility personal vehicle collisions occurred with a car. A cluster analysis was also carried out to identify the accident scenarios typically related to micro-mobility collisions in the UK and France. The two predominant e-scooter scenarios identified were crossing collisions at junctions (more severe) and side/side door opening impacts (less severe).

The AEB testing provided an understanding of e-scooter collision avoidance capabilities of two modern vehicles, a 2020 Tesla Model 3 and a 2018 Ford Focus, representing state of the art high performance and typical modern vehicle Advanced Driver Assistance Systems (ADAS) respectively. A test procedure based on Euro NCAP AEB Vulnerable Road User (VRU) cyclist test protocol was used, including both crossing and longitudinal ahead collision scenarios.

For both vehicles, the collision avoidance capability reduced for the e-scooter target compared to the cyclist target, marginally for the Tesla and notably for the Ford. Though the Tesla performed well with an e-scooter crossing speed of 15km/h, performance dropped significantly when the e-scooter speed increased to 20km/h. It performed well for longitudinal scenarios regardless of speed. The Ford performance dropped significantly for both crossing and longitudinal scenarios when the e-scooter was travelling at speeds greater than 10km/h.

There are clear risks associated with e-scooter usage in the road environment, where there is the potential for collisions with motor vehicles and other road users. Without legal e-scooter requirements, there will be risk and liability associated with the e-scooter riders and other motorists.

	Car-to-e-scooter Nearside Adult (CENA)											
	Vehicle Speed (km/h)											
Model	Target Speed	10	15	20	25	30	35	40	45	50	55	60
Tesla	15km/h											
	15km/h											
	20km/h											
Ford	15km/h											
	15km/h											
	20km/h											
	10km/h											

	Car-to-e-scooter Longitudinal Adult (CELA)								
	Vehicle Speed (km/h)								
Model	Target Speed	25	30	35	40	45	50	55	60
Tesla	15km/h								
	15km/h								
	20km/h								
Ford	15km/h								
	15km/h								
	20km/h								

No Braking		Vehicle does not respond to the e-scooter
Some Braking		Vehicle responds to the e-scooter but fails to completely avoid a collision
Avoid		Vehicle responds to the e-scooter and completely avoids a collision

Vehicle technology revolution and future claims landscape

Thatcham Research has undertaken a modelling exercise to project the effects of vehicle technology as they reshape the UK car parc and translate to motor insurance losses over the coming 15 years. A report outlining our projections and key influencing factors will be published to UK Insurer members in July 2021. While it's main focus is passenger car risk performance, inherent technology developments and strategic automotive direction have wider reverberations throughout the wider vehicle sector.

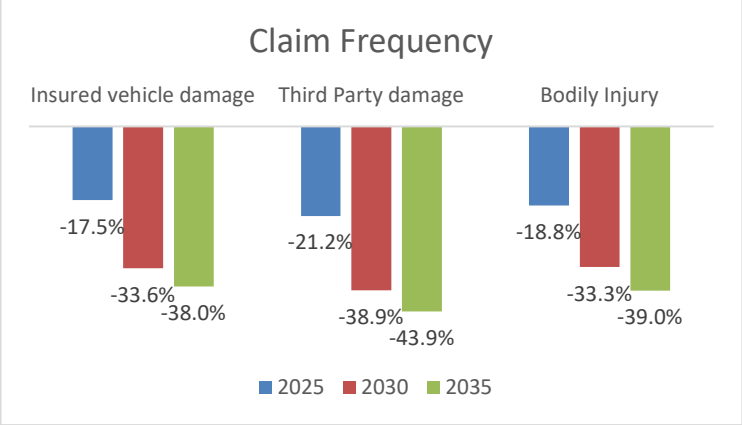
In the context of increased focus and strategic push towards electrification, as well as continued steps towards vehicle automation and autonomy, we updated and recalibrated our insurer loss model. Key components include accident classification and mapping, technology fitment and effectiveness and propensity by type of loss across the three main insurance categories: damage to the vehicle insured, damage to third party property and bodily injury.

Main vehicle trends explored include: collision avoidance and mitigation: ADAS fitment, electrification, automation and connectivity. We are observing increased ADAS fitment, driven by the efforts of vehicle safety organisations such as RCAR members; evolving vehicle testing roadmaps, such as EuroNCAP's 2030 roadmap which reviews testing emphasis on ADAS performance; changing regulation with the introduction of the revised General Safety Regulation as well as proven effectiveness of collision mitigation technology. Introduction of first Level 3 (ALKS) and Level 4 (Highway pilot and driverless parking) are also explored, through the lens of technology and capability as well as regulatory and legal requirements.

In electrification, we observe the changing automotive manufacturer strategies over the coming period. Increase in BEV models, improvements in battery performance, vehicle design and platform revolution as well as increased technology fitment and capability, nudged by WLTP, green global strategies, as well as UK specific Government drives.

As a result, we're projecting an increased take up of electrified passenger cars in the UK, as our Government revised new ICE sales band is brought forward to 2030. This would result in a 40% electrified UK car parc by 2030 and near 100% by 2050.

In terms of losses, we are projecting a decrease in frequency and severity of crashes across all three categories, as per figure above, with additions of new loss types and increases in repair costs and complexity that will increase in the short to medium term.



Electromobility: the importance of the opportunity of battery repair

High-voltage batteries leave the biggest CO2 footprint within the production of electric cars. Repair solutions for batteries are therefore not only mandatory in the future. The KTI is currently analyzing the battery repair options for the 20 most popular models in the german market.

Sustainability Electromobility: Battery repair has a key role to play

The sustainability is becoming increasingly important for car manufacturers. The maxim within production is CO2 neutrality - and electromobility plays a key role here. International studies confirmed that electric vehicles have a better overall CO2 balance compared to vehicle with an combustion engine.

However, accident damage can have an extremely negative impact on the CO2 balance within the life cycle and mean that the vehicle would ultimately be more sustainable with an internal combustion engine. A decisive factor here is the battery and the possibility of repairing it in the event of damage.

Figure 1: Damaged battery housing

Access to manufacturer information is particularly important

According to the damage process, the focus is on damage assessment, repair options and the availability of spare parts. Especially in the case of damaged high-voltage batteries, damage assessment is particularly important. Access to criteria as well as the diagnostic options for classifying battery damage is imperative. Here, there would still be potential for development among manufacturers.

It is also important that specific manufacturer guidelines are available and, for example, that repair instructions are available in which the disassembly of the battery housing is described in a comprehensible way. A further difficulty would also arise from the availability of the individual battery components in the spare parts sector. If, for example, only the lower battery housing is damaged, it is currently not guaranteed by every manufacturer that this component is also available as a spare part.

CO2 balance of the electric vehicle after battery replacement worse than for diesel

This means that even in the case of relatively minor damage to the housing, the battery must be completely replaced by many manufacturers. The KTI has used official information to show what this means for the environmental balance sheet: Measured by production and a driving performance of 200,000 km, an example vehicle from the compact class produces 36.7 tonnes of CO2 as a petrol model, 31.3 tonnes as a diesel model, while the comparable electric vehicle produces only 27 tonnes of CO2. If we now assume an accident with battery damage during this mileage, then the currently necessary replacement of the battery in this model adds 4.7 tonnes of CO2 - in other models it can even be significantly more.

In this case, the BEV would have a worse CO2 footprint than the car with a diesel engine. According to the calculations of the KTI, a battery repair would only cause 0.9 tons of CO2 and thus preserve the advantage of e-mobility in the CO2 balance.

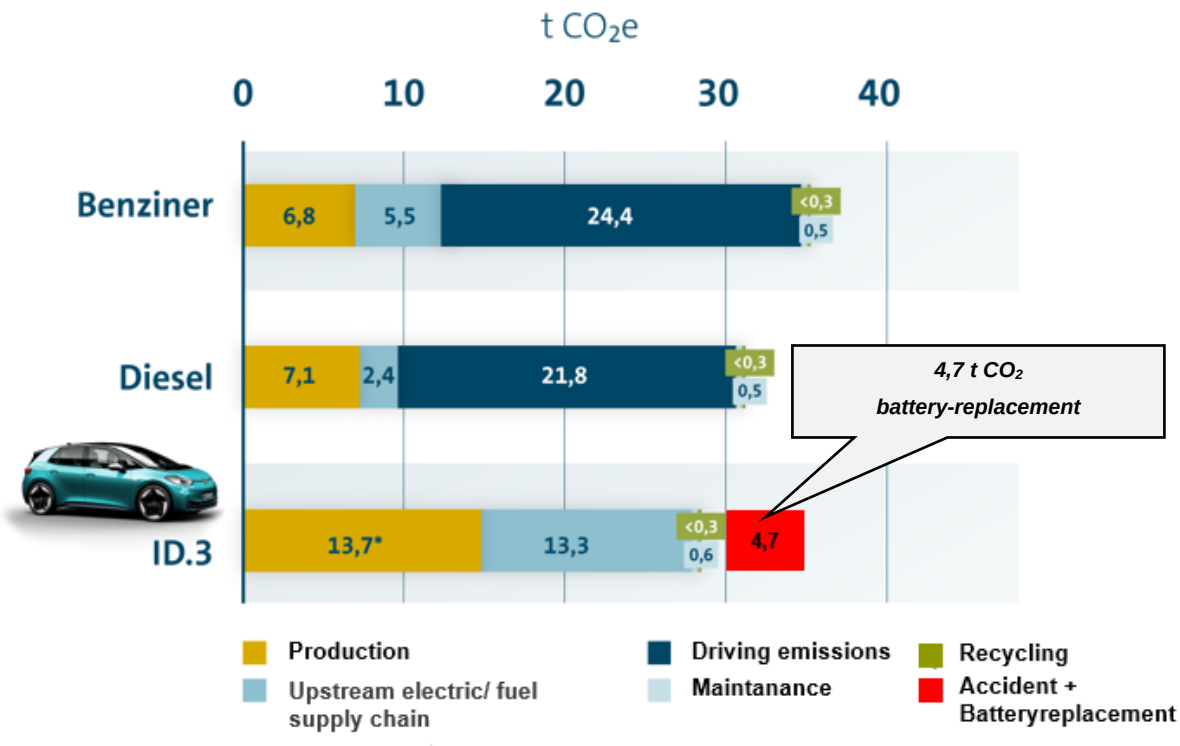


Figure 2: CO-2 Footprint life cycle including batteryreplacement

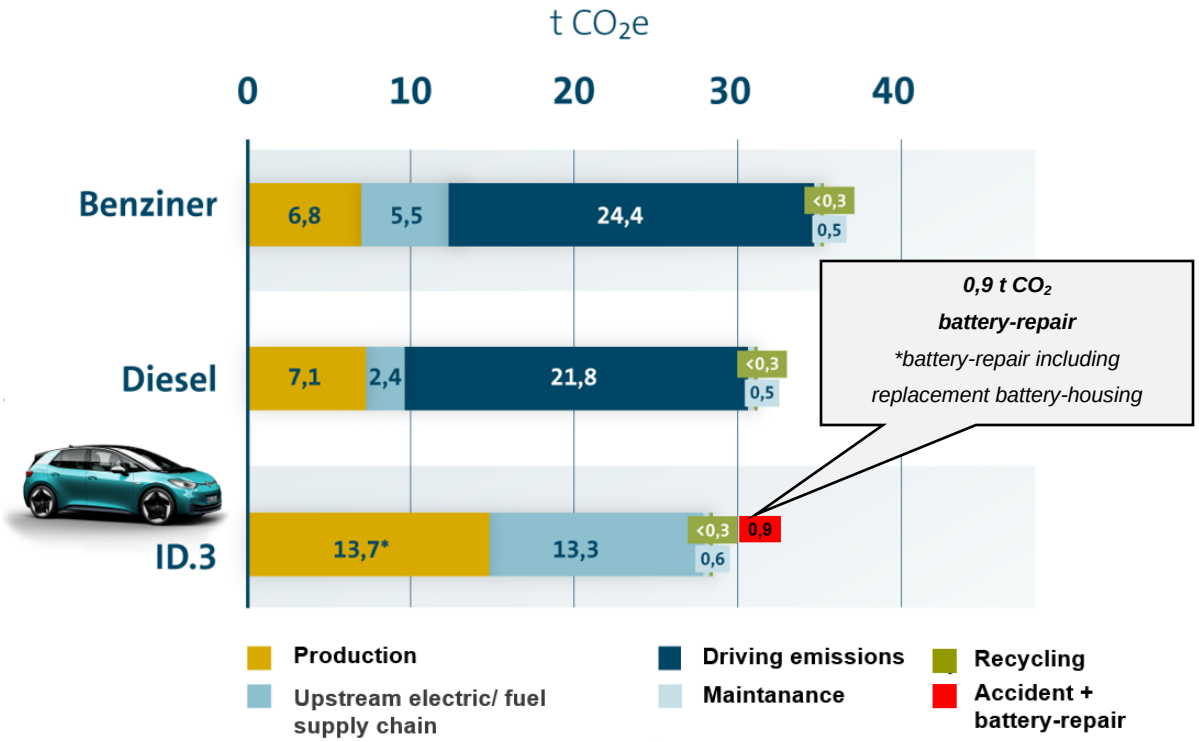


Figure 3: CO-2 Footprint life cycle including battereyrepair

Dialogue with the car manufacturers

The KTI therefore emphasises: It must be ensured that manufacturers make underfloor damage or marginal external damage to the battery housing repairable. To this end, the KTI is in dialogue with various manufacturers to steer the focus towards battery repair.

Positive examples already include the BMW i3, the Audi e-tron and the Renault Zoé, among other manufacturers.

Contact

KTI GmbH & Co. KG
Kraftfahrzeugtechnisches Institut
Waldauer Weg 90a
34253 Lohfelden

Phone: +49 561 51081 0
Email: info@k-t-i.de
URL: www.k-t-i.de