

AUTOMOBIL INDUSTRIE

SPECIAL



DEKRA CRASH TEST CENTER NEUMÜNSTER

30 Years of Certified Safety

CRASH TESTS

**Representing the
diversity of mobility**

ACCIDENT RESEARCH

**How crash tests
are turned into data**

OUTLOOK

**How will we
test in the future?**

Safety for people

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The Crash Test Center
celebrates its anniversary!

Your reliable partner for 30 years. We support you
with customised solutions for crash tests and thus ensure
safety and efficiency. Contact us at

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OUR MISSION: SAFETY THROUGH TECHNICAL EXPERTISE

For almost 100 years, the name DEKRA has been synonymous with safety. The “Deutscher Kraftfahrzeug-Überwachungsverein e. V.” was founded in 1925 in Berlin because of the need to make the increasing motorized mobility safer through the work of technical experts. In the beginning, the company’s core business was regular technical inspections of vehicles, and this continues to be an important core activity for DEKRA, with around 27 million vehicle inspections each year in more than 20 countries throughout the world, today we are by far the number one in this field. But our “safety” mission goes much further than this: Today, DEKRA sees itself as a global partner for a safe and sustainable world.

“We support everyone who wants to make mobility safer.”

With regard to our core focus on road safety, this means: DEKRA contributes its expertise – for vehicles and mobility forms of all kinds, from development support, through homologation, to regular vehicle inspection across the entire life cycle. Our laboratories and testing facilities offer an extensive service portfolio for vehicle manufacturers, suppliers and engineering-service providers, regardless of whether the focus is on analog or digital technology.

For 30 years, we have been supporting everyone who wants to make vehicles – and mobility as a whole – safer, including in our DEKRA Crash Test Center (CTC). Although our DEKRA accident researchers had already been carrying out initial crash tests previously, the establishment of a separate site placed this work on a completely different foundation. Through ongoing development and investment, we have continually raised the CTC to a new level in accordance with customer requirements. In our anniversary year, we are delighted to be able to offer our customers the highest standard of service with our ultramodern facilities. And one thing is clear: This will continue to be our aim in the future.

In this special issue for its 30th anniversary, you can find out how the DEKRA Crash Test Center came into being, what it is today, and for which future challenges the team in Neumünster are currently preparing.

We wish you an enjoyable read!

Photos: Thomas Küppers



Guido Kutschera







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30 YEARS OF THE DEKRA CRASH TEST CENTER IN NEUMÜNSTER



Not everything was better in the old days: Back in 2007, this car was completely destroyed by the pole impact in the CTC.



Anniversary: 2012 saw the 2,222nd crash test at the CTC.



Ouch: Truck liftgates can pose a deadly threat to other road users.



Day-to-day testing: A front-end collision with heavy side rotation is one of the standard tests carried out at the CTC.



Deadly: The impact of a truck traveling at 43 km/h can be fatal for car passengers at the end of a line of traffic.



Flying bottles! Cargo safety is a very important issue for DEKRA.



Test setup: Technicians in the CTC get an Electric Motorcycle ready for a crash test.



Diverse destruction

“Mobility and all of the fun that goes along with it should be safe.” This is how Thilo Wackenroder sums up the core focus of DEKRA’s work. And all of those things that “go along with” mobility are also very diverse in the Crash Test Center.

- BY THOMAS GÜNNEL -

Ssssssst: Crash! These two, well, sounds sum up very simply and concisely the work of Thilo Wackenroder and his team. Wackenroder is the Director of the DEKRA Crash Test Center in Neumünster.

The core focus of the Center’s work is testing on behalf of automobile manufacturers for the approval of their vehicles, and development tests for vehicles at different levels of maturity. “For the most part, development now takes place virtually,” explains the site director, “although certain data points require a ‘hard’ test result, from which the subsequent development steps

can be derived”. The small number of prototypes that are available are extremely valuable and expensive. “This means that, during the tests, we have to work to the highest standard in order to ensure that the valuable object is destroyed expertly, appropriately and systematically,” says Thilo Wackenroder.

The nondisclosure requirements are often also extreme. One of the reasons for this is that the vehicles being tested are development prototypes. The testing organization has therefore created options in Neumünster that enable automobile manufacturers to deliver and prepare their test vehicles

away from public eyes. “We currently have eight rooms for preparing prototypes. They are all ‘prototype safe’, with controlled access and separate temperature-controlled areas,” explains Wackenroder. The tests are carried out at temperatures of between 19 and 23 degrees Celsius, depending on the test specifications.

There can be no doubt about the validity of the data that are obtained: DEKRA is officially accredited by DAkkS, the German accreditation body and national accreditation authority of the Federal Republic of Germany. “We work to certified standards,” says Thilo Wackenroder.



Head-on collision into the wall with unsecured passengers: A typical crash scenario in the test center.

Photo: Thomas Küppers

CRASH TESTS AND ACCIDENT RECONSTRUCTION

The classic crash tests for passenger safety are still carried out today; DEKRA covers all international standards with its facilities at the site in Neumünster. These include the UN-ECE, FMVSS, TRIAS, ISO and GTR. Specialized tests can also be carried out, such as crash tests for insurance companies (AZT, RCAR), which use the results to determine the type classes of the vehicles, or reconstructed accidents to assist accident investigation.

“The spectrum extends from e-scooters to heavy-duty trucks, at all standard speeds – and under reproducible conditions,” says Wackenroder. “Within the realm of modern micromobility solutions, we reconstruct accidents with e-scooters, for example, and conduct biomechanical studies in order to examine the effectiveness of the framework conditions, such as potentially making the wearing of helmets compulsory. We also assist in the development of standards.”

The options on offer in Neumünster cover virtually every possible scenario:

- Truck and bus tests with vehicles up to an approved gross weight of 40 metric tons
- Guardrail tests in accordance with DIN EN 1317, DIN IVA 14 and PAS 68; road infrastructure tests
- Tests within the context of motorsport, such as for evaluation and accreditation for the FIA and DMSB (German Motorsport Federation)
- Accreditation tests for vehicle approval in certain markets
- Intersection accidents with various impact angles
- Collisions between vehicles and obstacles
- Tests involving two or more vehicles moving simultaneously
- High-speed accidents
- Testing and certification of mobile anti-terror infrastructure in line with international requirements
- Motorcycle crash tests in accordance with ISO 13232

Further individual tests are also possible if required. For instance, DEKRA tests in detail the accident safety of trucks and trailers, and the so-called “compatibility” of trucks, cars, buses and trailers in an accident. “Truck against concrete wall”, “truck against car”, “side impact on a truck or bus” and “structural misuse”, such as overloading, are just four possible scenarios. The Neumünster center can also test alternative drive



Photo: Thomas Küppers

It's going to be all right: DEKRA uses six different types of dummy in total.

concepts in terms of their accident safety – specifically from the point of view of the respective drive type: Fuel-cell vehicles with an active fuel cell, hybrid vehicles, battery-electric vehicles with a voltage in the high-voltage system of up to 1,000 volts, gasoline-driven vehicles, or just the tank systems.

DEKRA has been providing testing for electric vehicles since 1992: “But back then, the drives were generally still prototypes; today we see them on the road, production ready,” says Wackenroder. The Neumünster site has the complete infrastructure for the preparation and follow-up of the tests: This infrastructure includes charging facilities for adapting the state of charge to the test specifications, measuring technology for logging the temperature of the battery packs following testing, and storage for short-term vehicle quarantine of high-voltage vehicles, with temperature, smoke and fire detectors. DEKRA also evaluates the transportability of batteries following test-

ing, and monitors them in accordance with dangerous-goods requirements. “We have also developed rescue procedures for people and the crash facility in the event that a test doesn't go according to plan,” says the site director.

Tests on electric vehicles now account for over 80 percent of all tests. DEKRA is therefore investing in its teams and infrastructure. Fast-charging DC columns should be installed by 2023, for example. “The systems also require new capabilities in terms of the measuring technology and how it should be used,” explains Wackenroder.

3D-DATA FOR CAD AND CAE

The options for measuring technology are already extensive: DEKRA documents the full-scale geometric parameters of the test object and test facility before and after the crash test. These include the positions of dummies and components, the deformation of batteries and of deformation elements in relation to the level of maturity of the vehicle structures during and at the end of development. The organization also provides support with so-called “reverse engineering”.

This is based on a virtual coordinate system and the spherical determination of surface positions using the TRITOP/ATOS systems by the optical instrumentation company GOM. At <0.1 mm, the accuracies are suitable for overlaying with simulation results for validation and development. The systems can be used for test setups indoors and outdoors. DEKRA provides the results obtained as 3D data in STP and other exchange formats; developers can integrate



Photo: Thomas Küppers

Extreme electric car crash: Total loss without battery fire.



Photo: Thomas Kueppers

Motorcycle accident on a bend: What danger do the road signs present?



Photo: Thomas Kueppers

A watch is put to the test: Will it still work after a collision at 64 km/h?



Photo: Thomas Kueppers

Cargo safety put to the test: Can the trailer tarpaulin withstand the impact of the cargo?

them into all standard CAD and CAE environments.

WORKSHOP ON THE TEST SITE

In the on-site workshop, the testing experts can prepare vehicles and components for the tests, or test updated settings. It is possible, for example, to replace components such as windshields, or to carry out welding work – always in accordance with the automobile manufacturers' requirements. Concept and prototype parts can also be produced and installed on-site, and control units can be flashed. The engineers check the assembly of the reworked areas using 3D measurement and scanning systems.

EXAMINING THE DAMAGE CAUSED BY ACCIDENTS

The experts can also simulate the possible effects of an accident on the material on-site, using flammability and combustibility tests, for example, especially in vehicles with alternative drive systems. This includes developing strategies that first responders can deploy to rescue people at the scene of an accident. "How can the effects of accidents be minimized once the accident has happened?" asks Wackenroder, referring to one of the organization's main areas of activity: rescue and recovery.

"We want to expand this topic in Neumünster." According to the site director, many volunteer fire departments are very interested in obtaining information on new vehicles, for example. "New materials, different types of steel and optimized crash structures can be extremely challenging for the first responders after an accident. For example, conventional implements cannot cut through an A-pillar made of ultra-high-strength steel in two minutes, or perhaps even at all. The classic rescue methods are

no longer adequate," explains Thilo Wackenroder. "For the first responders, this can lead to psychological stress at the scene of the accident when they can't get to the people trapped inside the vehicle." Moreover, the financial resources available for training within fire departments are often severely limited, and materials are also lacking: namely, vehicles with modern, high-performance equipment. "That is why we are developing rescue concepts that we want to offer in training courses," says Wackenroder. "The aim here is not to compete with other providers, but to support the fire departments."

SAFETY AWARENESS

Fundamentally, DEKRA's aim is to generate awareness of accident-related issues and consider them from every angle – even seemingly mundane things, such as chevron signs at curves, road signs, poles and guard-rail systems – as well as less mundane

things, such as anti-terror barriers. A standard was introduced in 2021 for this "mobile road infrastructure". "We certify these barriers for local governing authorities – municipalities, cities and so on – and this is another area where we want to protect human life," says Wackenroder. "It requires a great deal of expertise to design a barrier that has a truly protective effect."

In addition to solid concrete blocks, there were also crash tests involving much smaller objects: watches. The manufacturer submitted two models to stress testing, whereby the watches were strapped to the dummy's wrist and subjected to an impact at 64 km/h. Marketing-related considerations are likely to have outweighed safety-related ones in this instance.

Nevertheless, this highlights the many facets of DEKRA's testing activities. "We are the unbiased referee," says Wackenroder. "Not for nothing did we sponsor the referees in the Bundesliga for 18 years."



Photo: Thomas Kueppers

Collisions with an agricultural vehicle are rarer scenarios, though these are nevertheless reconstructed.



Photo: Thomas Küppers

What injuries do cyclists sustain when they collide with cars? And how can the severity of those injuries be reduced?



Photo: Thomas Küppers

A van collides with a trailer – a scenario particularly likely during the vacation period.



Photo: DEKRA

Testing of electrical vehicles is part of the portfolio, as is the handling of vehicles.

Talking of sport: DEKRA has been active in motorsport for decades, as a technical partner for the DTM and also as a sponsor. The CTC has conducted numerous crash tests for the FIA Institute for Motor Sport Safety.

The “Tecpro” barriers that are used on many racetracks were also developed in collaboration with the FIA – including with crash tests.

A new motorsport venture is the HYRAZE League, a competition with hydrogen race cars, which is due to launch in 2023. Crash tests are also carried out on karts, for example: “We test the drive technology in e-karts: Do the electrics switch off after an accident? Can the vehicle be driven without risk?” explains Thilo Wackenroder.

For this purpose, DEKRA runs an FIA-accredited laboratory for a wide range of vehicle classes and categories. “Mobility and all of the fun that goes along with it should be safe,” says Wackenroder.

ACCIDENT RESEARCH AND ROAD SAFETY

In order to ensure that all of those things that “go along with” mobility are safe, DEKRA also examines “soft” issues, such as statistical relationships, and questions them. “There were fewer road fatalities in 2020. Have our roads become safer? Or were there just fewer people using them?” asks Wackenroder. Another focus is on the types of accidents that are occurring. New mobility concepts result in different types of accidents due to speed limits or different mobility behavior, for example.

And that creates volatility: “There have been a great deal more SUVs on the roads for some years now, and more mobile homes at least since last year, so the likelihood of them being involved in accidents is also increasing,” explains Wackenroder. “It is also increasingly often older people who are driving these vehicles, and many drivers cannot judge the driving dynamics of these types of

cars.” Tests and studies in the CTC also inform the internal accident research and analysis; the findings are incorporated into the expert organization’s annual road-safety report, among others.

Back to the beginning: “Ssssssst: Crash!” The first sound is produced by an approximately 240-meter-long, 16-millimeter-thick steel cable as it runs across its guide rollers. The vehicles being crashed are accelerated by the cable. At the other end there is an engine from a Leopard 1 armoured tank. With around 37 liters of displacement and 10 cylinders, it generates approximately 700 kilowatts of power – enough to bring even heavy vehicles up to the necessary speed. The second sound hardly requires an explanation. The crashed vehicles always take one of two routes following the tests: Either the manufacturer collects it for further analysis, or they are scrapped in the conventional way by a certified recycling company. Thilo Wackenroder remarks dryly: “We are usually the end users”. <



Photo: Thomas Küppers

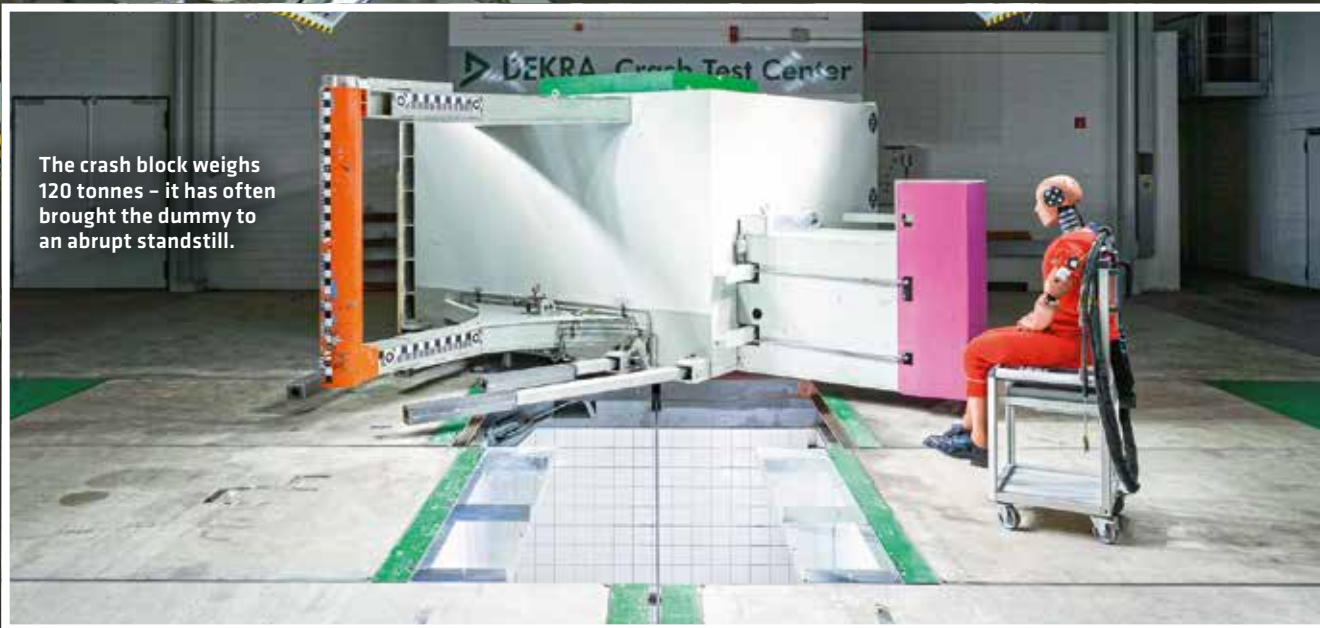
The control room of the outdoor crash facility in Neumünster. It is from here that the test engineers observe the tests.



Photo: Thomas Küppers

New types of mobility are part of day-to-day testing: electric scooters and mobile airbags.

The crash block weighs 120 tonnes – it has often brought the dummy to an abrupt standstill.



Certified secure

The safety of vehicles, traffic-management systems and barriers need to be verifiable, and extensive approvals are needed for these certifications to be valid from a legal standpoint. DEKRA has all bases covered.

- BY THOMAS GÜNNEL -



Around 30 years ago, car magazines featured two particularly interesting sections: Vehicle endurance tests and crash tests. The latter was particularly eye-catching, as it was generally accompanied by a generous number of images – where else could such detailed insights into passive vehicle safety be found?

These classic crash tests are still used today, in all manner of variants and with more standards than before. Accordingly, testing institutions are required to have all manner of testing equipment available. At its Neumünster site, DEKRA has all international standards covered – and then some. <

→ Outdoor crash facility

The outdoor facilities are primarily used for testing large vehicles, such as trucks or buses, or for scenarios involving several vehicles.

- Variable impact directions and angles
- Several vehicles can be steered from different directions towards one accident point
- Length: 107 m to the crash block
- Crash block weight: 500 tonnes (4 × 4 × 5 m)
- Drive: Drive train with special PLC (programmable logic controller, updated in early 2021), 700 kW diesel engine
- Speeds: 5.0 up to 100 km/h (28m/s), 40 tonnes at up to 44 km/h
- Accuracy: ± 0.5 percent
- Film pit: 6 × 0.9 × 3 m plus two pits along the test track

→ Indoor crash facility

The indoor facility is primarily used for homologation and development-support tests. In detail this means:

- Length: 102 meters
- Drive: hydrostatic, PLC controlled
- Torque: 5.1 kilonewton meters
- Speeds: 4.0 to 80 km/h at up to 3.5 tonnes gross vehicle weight (90 km/h at up to 2.5 tonnes)
- Accuracy: ± 0.2 percent at up to 80 km/h
- Film pit: 16 × 2.5 × 3.5 m (variable width and can be divided into sections)
- Crash block weight: 120 tonnes (3 × 3 × 2 m), rotatable through 360°
- Four preset, adaptable crash scenarios
- 0° fixed barrier with deformable elements as required
- 0° offset barrier with deformable elements as required
- 30° barrier, left/right
- Pole impact with variable positioning

→ What standards does DEKRA meet?

Accreditation in accordance with DIN ISO 17025 by Germany's national accreditation body (DAkkS). DEKRA is a notified body designated by national and other international approval authorities to perform European and international type approvals.

- Germany – KBA (Federal Motor Transport Authority)
- Netherlands – RDW (National Highway Administration)
- Bulgaria – Ministry of Transport
- Ireland – NSAI (National Standards Authority of Ireland)
- Taiwan – MOTC (Ministry of Transport and Communications)
- Austria – BMVIT (Federal Ministry of Transport, Innovation and Technology) (ECE regulations only)
- Sweden (Swedish Transport Agency)
- Lithuania – CSDD (Road Safety Directorate).

Legal requirements for the EU:
ECE-R 33, 34, 94, 95, 100, 135, 137
1996/027/EC – Protection of motor-vehicle occupants in the event of a side impact

1996/079/EC – Protection of motor-vehicle occupants in the event of a frontal impact

Legal requirements for the USA:
FMVSS 201, 204, 208, 212, 214, 219, 301, 303, 305

Legal requirements for Canada:
CMVSS 208, 216, 301, 301.1, 301.2, 305

Legal requirements for Australia:
ADR 69, 72, 73

Legal requirements for China:
GB11551-2003 Frontal impact, GB/T 20913- 2007 Offset frontal impact, GB20071-2006 Side impact, GB20072-2006 Rear impact.

Legal requirements for Japan:
TRIAS 15, 17, 18

Customer satisfaction NCAP programs:
EuroNCAP, US-NCAP, ANCAP, JNCAP, KNCAP, C-NCAP, Latin NCAP, ASEAN NCAP

Consumer rating USA: IIHS Front Moderate Overlap, Front Small Overlap, Side Impact, Bumper Test, RCAR.





Bad example: This crash from DEKRA Accident Research illustrates the need for underride protection on truck trailers.



Photo: Thomas Küppers

Digging for digital gold

The crash tests at the CTC can be something of a production spectacle. Behind the scenes, however, accident analysts and researchers are quietly mining the real gold from the mountains of data: Information and knowledge for more traffic safety and legal certainty.

– BY HARTMUT HAMMER –

Today, around 95 per cent of the crash tests performed at the CTC are commissioned by vehicle manufacturers. These tests are predominantly standardized, so the vast majority of crash parameters are already predefined.

The crash tests commissioned by DEKRA Accident Research and Accident Analysis are much more varied. These two branches of the company commission the CTC to recreate accident scenarios. First, to verify the result of the reconstruction by re-enacting the sequence of events of the accident. This is up to the accident analysts at DEKRA, who are mostly tasked with pre-

paring expert accident reports on behalf of the police, courts and public prosecutors.

Second, road safety learnings are derived from sequences of both the actual accident and those recreated in the CTC – as deduced by DEKRA's accident researchers. Among other things, they analyze crash data and filter out new phenomena in the accident sequence that need to be analyzed more closely in future.

ADDED VALUE FOR ALL

“DEKRA has traditionally focused on providing accident-analysis services to ensure legal certainty, as well as conducting research to benefit road safety in Germany

and beyond,” explains Peter Rucker, Head of DEKRA Accident Research/Accident Analysis. “DEKRA Accident Research has been around since 1978, and was an important driving force behind the founding of the CTC.” This is because detailed recordings and analyses of crash tests can give DEKRA experts insights into important behavioral patterns and the basic principles of accidents. Peter Rucker: “With the specialist knowledge gained from these experiments under laboratory conditions, they are able to better interpret the evidence left behind in a real accident – such as the deformation of the car body subject to a certain impact energy – and from this

they can then piece together the course of the accident in more detail.” For example, the speed of a car hitting a tree can be determined relatively well with the help of data and damage patterns from previous accidents or crash tests.

If the expert still has questions left unanswered by the reconstruction of the accident, then it can also be re-enacted in the CTC. Here, the course of the accident is reproduced using all valid parameters, thus confirming or correcting the previously assumed version of events. Particularly in cases involving insurance claims, such as compensation for pain and suffering or pension payments, the CTC re-enactment of the accident is highly regarded as a reliable source of information. But also cases that could result in the driver losing their license, such as an alleged hit-and-run after bumping another car while parking, can be clarified if an expert is able determine the force with which the driver may have (possibly) unknowingly impacted with the other vehicle, based on the damage pattern on the vehicles.

TURNING DATA INTO KNOWLEDGE

Access to accident analysis reports prepared by DEKRA's accident experts enables accident research to grow to form extensive accident databases. They record real-life accidents in Germany and also provide vehicle-specific information. For example, there are separate databases for bus acci-



Photo: Thomas Küppers

The CTC also carries out crash tests for accident research on behalf of customers.

dents and motorbike accidents. In all, the database comprises several thousands of accidents' worth of information. More than 400 parameters for each accident event are available. Together with the tests in the CTC, this therefore allows for a detailed, customer-specific evaluation of the accident. In addition, there is information from research projects to which the CTC and accident-research experts have contributed. For example, there have been projects on tank-truck safety, fire protection in coaches, the danger posed to pedestrians and cyclists by trucks turning corners and improving the active and passive safety of motorbikes.

DEKRA's accident researchers can use a rich database pool to filter out patterns and developments that will need to be considered more closely in future when it comes to vehicle development, road infrastructure planning, traffic regulation and rescue services. “Our clients for analyses such as these include vehicle manufacturers and suppliers, as well as authorities and associations,” explains Peter Rucker. “Vehicle manufacturers, for example, are interested in accident data in order to optimize the active and passive safety of their products.” Rescue services, on the other hand, want to know how they can best rescue a person from a destroyed vehicle or fight a vehicle fire.

DEKRA also uses the data for its own publications. For example, DEKRA includes findings from accident analysis and acci-

dent research in its annual road-safety report. This publication considers one road-safety concern at a time, broken down into vehicle technology, infrastructure and the human factor. Areas of interest over the past years have included, for example, senior citizens, two-wheelers, children, freight transport and country roads. The report provides food for thought and specific recommendations for action for politicians, traffic experts, manufacturers, scientific institutions and associations.

DIGITAL DETECTIVES

Digitalization will have a major influence on accident analysis and accident research in the coming years. Today, the data for various vehicles is already stored in different control units. Reading this data and interpreting it in a meaningful way presents a challenge for experts. However, there is still much debate surrounding access rights and the legality of utilizing this data. Peter Rucker: “DEKRA would like to see clear regulations implemented here, allowing digital forensics to further improve legal certainty and road safety.”

Disclosure of codes that relate to driving decisions made in automated driving will most likely present a similar conundrum. For example, for automated driving systems at Level 3 or 4, this move could allow impartial bodies to unequivocally clarify whether the driver or the system was in control of the vehicle at the time of the accident. <



Photo: DEKRA

Unusual real-life accidents are also recreated at the CTC.



Passionate about the big bang

DEKRA has been putting the pedal to the metal in Neumünster for over three decades. What started out as a site for basic crash tests for tank trucks has evolved into a technically sophisticated and versatile test center.

- BY HARTMUT HAMMER -

DEKRA's crash testing history goes back 30 years and much beyond. As early as the late 1970s, DEKRA's Accident Reconstruction Department and Swiss insurance group Winterthur organized for unmanned vehicles to collide in order to study their motion sequences and collision dynamics. To this day, DEKRA and Winterthur's successor, Axa, conduct a number of tests annually with alternating themes on location in Switzerland.

They were also accompanied by crash tests involving trucks, the first of which

having been carried out in Altensteig in Württemberg in 1985. Following a devastating tanker explosion in Spain, the Deutsche Verband Flüssiggas [German Liquefied Petroleum Gas Association] wanted to demonstrate the safety of the LPG tank trucks used in Germany. Two years later, tank-truck manufacturer Ellinghaus sought to cooperate with DEKRA in response to the gasoline truck accident in Herborn. The first crash tests using Ellinghaus tank trucks were carried out in 1987 in Neumünster, Schleswig-Holstein, and are considered to

be the origin of the DEKRA Crash Test Center (CTC). The choice of location was instigated by the head of the DEKRA Academy working on site at the time, who sought to create a road-safety center with a training ground for truck-crash tests. The DEKRA team in Neumünster had also gathered much experience in dealing with trucks in the previous years.

"Following the first series of crash tests and associated national and international expert lectures, DEKRA Accident Research had become an esteemed point of contact,"



Photo: DEKRA

On the brink: DEKRA carried out various truck crash tests in the early 1990s as part of the large-scale research project THESEUS.



Guard rails and crash barriers can save lives, but not prevent the damage caused by accidents.

recalls Alexander Berg, Head of DEKRA Accident Research and the CTC from 1996 to 2006. So it was not surprising that DEKRA played a leading role in the major research project THESEUS (Eng.: Tank vehicles with the highest achievable safety through experimental accident simulations) from 1988 on. Alexander Berg: "This project was dedicated to investigating accident sequences as well as conducting tipping and crash tests involving tank vehicles."

INNOVATION AND IMPROVISATION

With 36 crash tests performed between 1989 and 1995, THESEUS called for the crash facilities to be further upgraded. The tried-and-tested mobile testing equipment from other test series that accumulated in Neumünster as a consequence of events was to be replaced with a permanent crash facility for trucks. It was inaugurated in the summer of 1991, and the DEKRA Crash Test Center was born.

The site's way of working also changed. In the early days of the CTC, tests were carried out during the summer months, with most of the test personnel involved making the trip from Stuttgart. On site in Neumünster, staff from the nearby DEKRA Academy assisted with the tests. In 1992, Guido Folster, who was responsible for measurement technology, became the first permanent employee to be hired for the CTC. He was joined by Ulrich Krüglstein a year later, who

heads up the CTC's film and photo technology division to this day. Currently, the CTC employs around 30 people.

"In the beginning, we practically had to develop all the crash technology and measuring equipment ourselves, as there were only a few standards and ready-made products," recalls Guido Folster, who headed the CTC from 2006 to 2018 and is currently responsible for special assignments. His colleague Ulrich Krüglstein adds: "By today's standards, however, we also had much more creative leeway and could implement all manner of ideas. In those earlier crashes for accident research, for example, we were sometimes able to experiment with new camera positions in order to further develop the testing technology."

RESEARCH & DEVELOPMENT

The THESEUS tests earned the CTC a reputation as Germany's leading truck-crash test institute. This led Mercedes-Benz AG to commission the CTC to perform the crash tests for the development of the new Actros truck series in 1994. Later, MAN and Iveco also entrusted the CTC with their crash tests, as did manufacturers of cars and motorbikes. As a result, the remit changed: In the early years of the CTC, DEKRA mainly had vehicles crash into other vehicles or roll over for accident research and analysis purposes. As the number of orders accompanying the vehicle-development processes

of major manufacturers grew, standardized tests based on fixed parameters soon took a front seat. Today, they account for more than 90 per cent of the 150 or so crash tests carried out in Neumünster every year.

With industrial orders on the horizon, it wasn't long before a covered crash track was called for in order to offer discrete test conditions all year round. This new indoor crash test facility at the CTC was inaugurated in July 2004 and was part of a comprehensive progressive design. It provides for destructive crash tests with vehicles at the CTC in Neumünster. The DEKRA Technology Center at the Lausitzring in Klettwitz opened in 2003, and offers mechanical load-testing services for vehicle components, as well as non-destructive tests – driving dynamics tests, for example – and homologation and certification services.

SPECIALISTS FOR SPECIAL CASES

What truly sets the CTC apart is the versatility of its outdoor crash facility. "We can accelerate vehicles up to 100 km/h on site, we can drive them into the obstacle on a versatile track by remote control, we can reproduce rollover tests or even the oblique impact against avenue trees or crash barriers, for example," says Guido Folster. "And we can do all this using cars, trucks, caravans, bicycles, Segways, quads, pedestrian dummies and, if required, as a mass crash. It is unlikely that any other crash facility can offer such a broad range of testing capabilities."

But the CTC's professionalism when it comes to standardized OEM-development crash tests has also steadily increased. The technicians work intensively to perfect test procedures and technology applications. "We cannot have a single camera or measuring system fail during the crash due to a lack of power supply, for example," explains Ulrich Krüglstein. "The shot must be right first time."

Last but not least, over the past three decades, the CTC has proven to be a reliable input supplier to the specialist community. For about 15 years DEKRA has been in charge of organizing the two annually alternating 'Safety of Commercial Vehicles' and 'Load Securing' symposia, which give center stage to the latest CTC test findings. This, in turn, gave birth to the DEKRA Future Congress for Commercial Vehicles, which will be held for the fourth time in Berlin in early December 2021. <



Built for tomorrow

30 years of CTC mean 30 years of investment in new infrastructure and technology. In the future, DEKRA will continue to expand and modernize its Neumünster site to be best equipped for the crash tests and requirements of tomorrow.

- BY HARTMUT HAMMER -



Photo: Thomas Küppers

The battery box of an e-vehicle is still relatively unharmed after the pole impact.

Outdoor crash facility since 1990; indoor facility since 2004. New developments at the CTC have always centered around these two pillars of the company.

For example, the CTC carried out its first concept tests using electric vehicles in 2000, with crash tests for development approvals following from 2016 onwards. Initially, the electrified vehicles mainly relied on hybrid drives, but later there were joined by more and more battery-

powered vehicles. Since then, hybrid and battery-powered vehicles have clearly outnumbered test specimens with combustion engines in the annual number of crash tests.

DEKRA responded to this trend, resulting in the recent comprehensive modernization of the CTC in 2020 and 2021, equipping the site for crash tests involving battery-powered vans and trucks. The modernization work included, for example, upgrades to the crash facilities, and

increasing upstream and downstream workshop capacities to accommodate high-voltage drives of up to 1,000 volts, including staff training. Fuel-cell electric drives can now also be crashed at the CTC, while the urgent issue of battery management has also been addressed. A comprehensive safety concept covers, for example, the professional and proper handling of any damaged batteries after the crash, their classification and storage, transport, and even disposal.

Last but not least, the fire-fighting and rescue concepts were adapted to the new drives. In total, a seven-figure sum has been invested in expanding the CTC for electromobility since 2015.

SPOTLIGHT ON ENERGY SUPPLY

“In the near future, we want to move to become self-sufficient in our use of eco-friendly electricity,” reveals the head of the CTC, Thilo Wackenroder. “We are considering installing a photovoltaic system on the roofs of our building, along with a larger battery storage unit to supply the necessary electricity for operating the system or for charging the electric vehicles. This also includes setting up the appropriate charging infrastructure.”

The CTC is planning to gradually establish a comprehensive test infrastructure for this drive technology in order to be able to test not only fuel-cell-powered cars, but also vans and large trucks. It will encompass instrumentation, safety concepts and the necessary safety technology for crash tests from cars to large trucks, for example, and will comply with current standards and requirements. This will also involve the introduction of a refueling and defueling infrastructure, as for the battery-powered drive.

Thilo Wackenroder: “We expect that long-haul trucks will mainly be powered by combustion engines and hydrogen combustion.



Photo: Thomas Küppers

Micromobility devices pose new dangers, as seen here, when an e-scooter hits the kerb.

Battery-powered distribution trucks could possibly be recharged with small fuel cells, thus gaining additional range. But we see battery-powered – and thus locally emission-free – drives as having the brightest future in short-haul distribution transport settings.” In any case, the CTC is expecting more hydrogen-powered vehicles to be tested on the crash tracks in the future.

This also includes the racing vehicles of the HYRAZE League, a racing series with fuel-cell drives set to launch in 2023. DEKRA is involved in the creation of this

racing format and has taken on the responsibility of developing a crash-safety concept that will optimally protect the hydrogen tanks.

Over the next few years, DEKRA will continue to invest in the expansion of the battery and fuel-cell infrastructure in Neumünster. Improved temperature management has already been installed in the crash hall. Because in times of climate change, constant ambient conditions are more than ever a prerequisite for reproducible tests.

FOCUS ON URBAN TRAFFIC

DEKRA must also create suitable conditions for infrastructure tests. An external site previously used for this purpose will soon no longer be available. For this reason, in the future, the crash tracks at the CTC will be equipped with bollards, metal crash barriers, mobile concrete crash barriers, warning beacons and the foundations and masts for gantries.

Terror barriers to protect against deliberate vehicle-ramming attacks have been added as a new testing service in recent years. With the help of crash tests, DEKRA helped to develop the DIN specification for these installations. To make up for the long start-up times sometimes involved in infrastructure tests, the drive technology for the crash vehicles is being further developed.

In addition to these infrastructure investments, Thilo Wackenroder sees other future tasks on the horizon: “In future, we will find ourselves dedicating more time to micromobility, load securing and occupant protection for motor homes, as well as training courses for rescue forces – for example, on how to handle high-voltage drives.”

In the field of micromobility, in particular, an increasing and differentiated number of accidents is to be expected. At the CTC, basic tests will be conducted to investigate the key accident risks and physical conflict points. These findings will then be translated into specific recommendations for micromobility users, other road users, planners and authorities.

To this end, the first crash tests with e-scooters and pedelecs were already carried out in 2020. “The CTC will continue to identify new mobility and safety topics in cooperation with DEKRA’s Accident Research and Accident Analysis teams and address them with suitable tests and measurement technology,” promises Thilo Wackenroder. <



Photo: Thomas Küppers

Stop! In the test, anti-terror barriers have to safely stop trucks weighing several tonnes.



Heather violet

Nothing is left to chance when it comes to crash tests. And the same goes for the color of the tools used. In Neumünster you can't miss them.

- BY THOMAS GÜNNEL -



Simulated collision with a trailer; painted in RAL 4003.



The violet element here symbolizes a pole, which is hit by a vehicle.

RAL 4003, Heather violet: This color takes on a special meaning at DEKRA in Neumünster. All technical tools used during crash tests are painted in this particular hue. And there are historical reasons for this: "Originally, 16-millimeter cameras were used during crash tests. However, the lighting presented a unique challenge", says Thilo Wackenroder, Head of the Crash Test Center. "At the time, cars

were painted in certain colors as monochrome film was still sometimes being used - but the contrasts needed to work for later analysis," he explains. So all crash test centers chose a color. "We're also a little proud to have such a pretty shade", jokes Wackenroder. The bright violet has the added advantage "that industry employees in the know can even identify the service provider, simply based on the color." <



E-car crash extreme: side impact of the electrically powered Nissan Leaf.



The violet sidewalk mimics the actual danger in day-to-day life.



Load securing: can the tarpaulin withstand the load?



Side impact with deformable barrier.

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