



# Automotive: An exciting outlook

Pascal Wagner

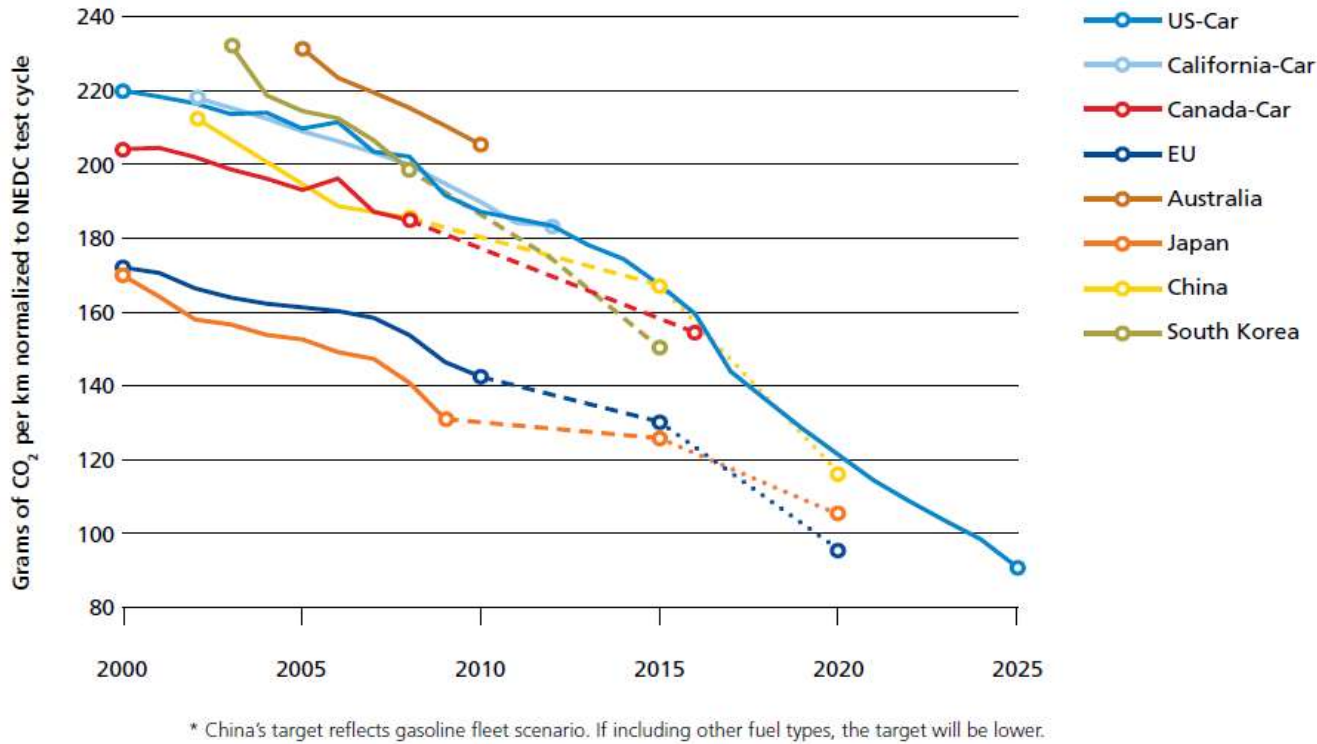


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- A silver Mercedes-Benz car is parked in front of a rustic building with a large circular overlay containing a list. The car is a sleek, modern sedan with a prominent grille and alloy wheels. The building has a weathered, stone-like facade with large windows and pipes. The circular overlay is white and contains a list of four items, each with a number in a grey circle.
- 1 Aluminium in Automotive
  - 2 Market Outlook
  - 3 Rolled Products and Automotive
  - 4 Hydro inside



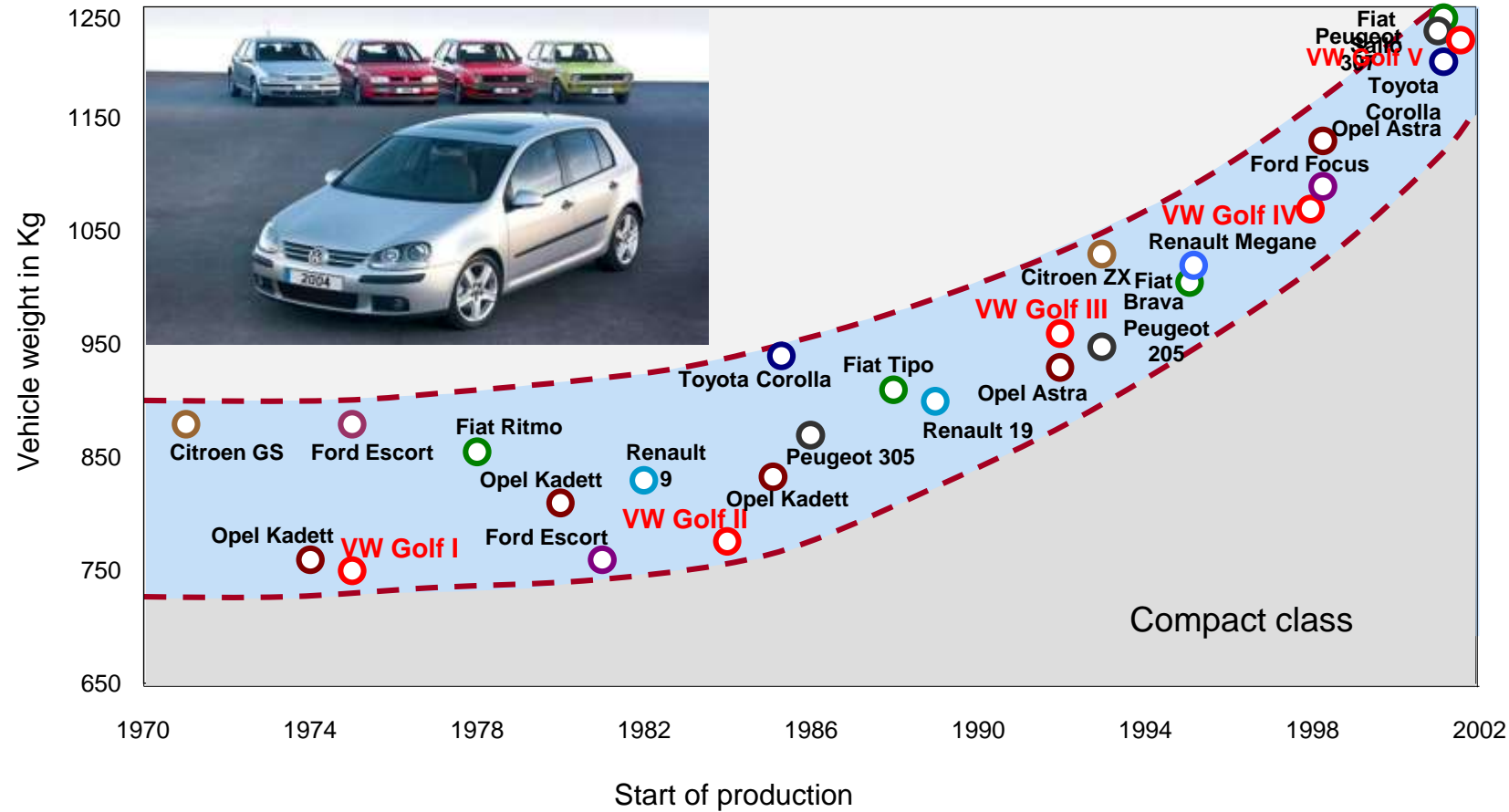
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- A silver Audi SUV is parked on a dark asphalt road in a desert landscape. In the background, there are large, layered red rock formations under a clear blue sky with a few wispy clouds. A large, semi-transparent white circle is overlaid on the left side of the image, containing a numbered list.
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# Climate change and continuous reduction of emission targets



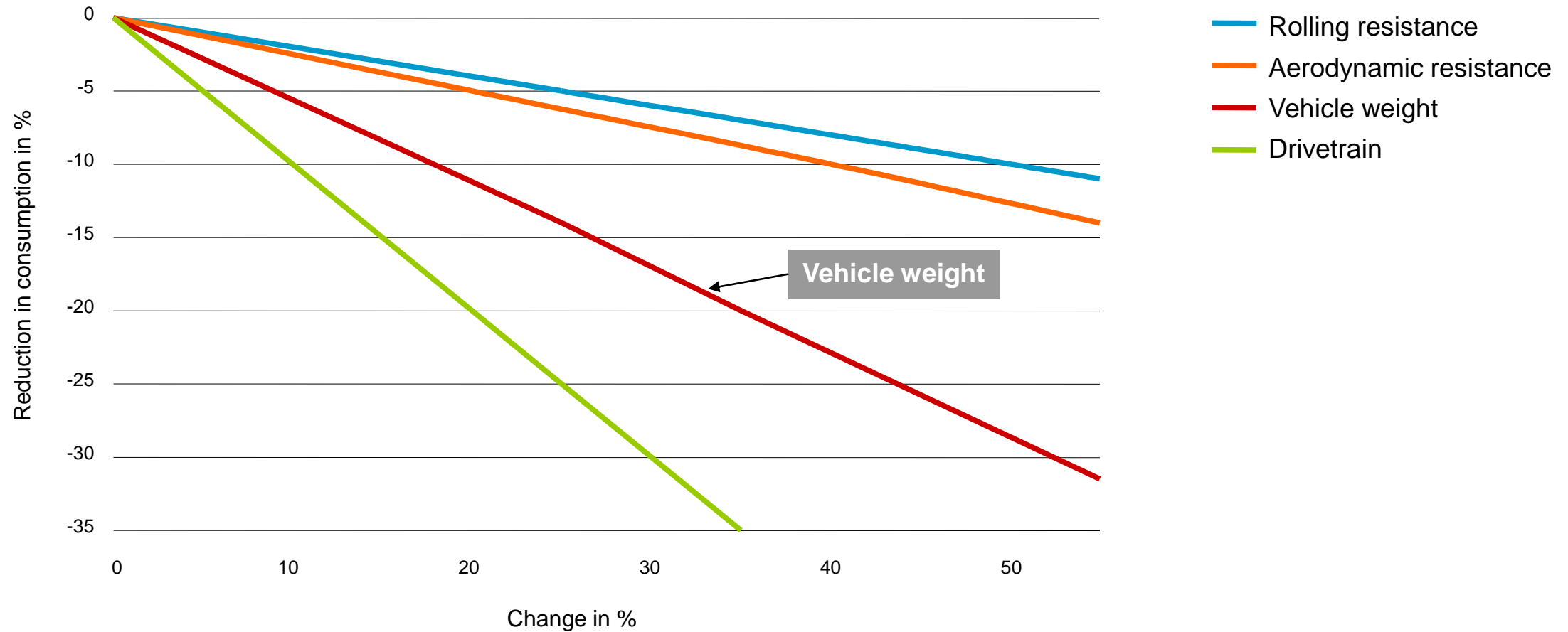
Source: [www.theicct.org](http://www.theicct.org)

# Vehicle weight increase and it's origins



- Safety
- Legislation
- Driving performance
- Comfort
- Quality

# Light weighting is 2<sup>nd</sup> best measure for emission reduction

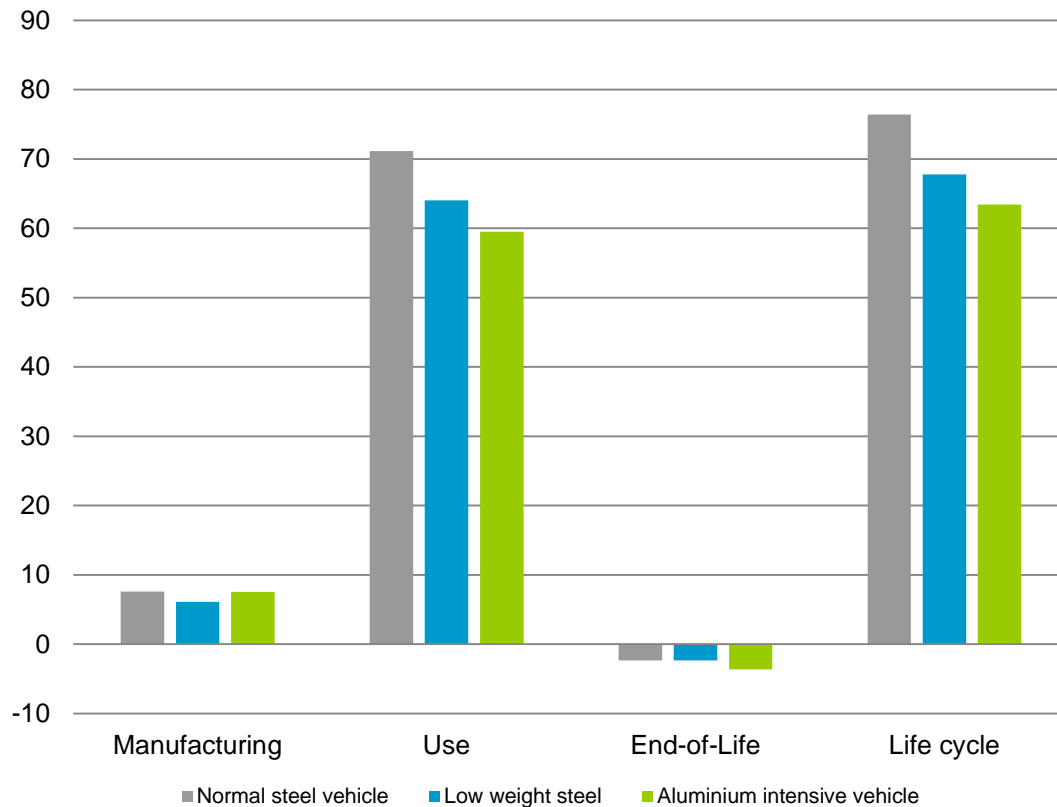


Source: Dr. W. Ruch, "Die Strategische Bedeutung der Al-Technologie im Karosserieleichtbau bei AUDI",  
2<sup>nd</sup> European Al-Automobile Conference, November 7-8, 2002, Bad Nauheim



# Greener through reduced emissions and recycling

Life Cycle CO<sub>2</sub>e Emissions (Kg)



- Every kg aluminium substituted for traditional steel saves up to 15 kg CO<sub>2</sub> over the life cycle of a car<sup>1)</sup>
- Recycling of aluminium saves 95% of the greenhouse gas emissions associated with primary aluminium production, and requires only 5% of the energy
- Nearly 90 % of automotive aluminium is recovered and recycled
- Aluminium is infinitely recyclable without degradation to the material

Source: [www.drivealuminium.org](http://www.drivealuminium.org), Life Cycle Assessment – Energy and CO<sub>2</sub> Emissions of Aluminium-Intensive Vehicles conducted by the United States Department of Energy's Oak Ridge National Laboratory

1) Source: S. Faßbender, "Einsatzmöglichkeiten von Aluminium im Automobilbau", Einführung in die Technologie des Aluminiums, March 20-23, 2012, Aachen

# Reduced fuel consumption

## Mercedes Benz SL



125 kg lighter vs. predecessor

- 100 kg weight savings
- Reduce fuel consumption by ~0,3 l/100 km or 600 l over life cycle of 200,000 km
- This equates to ~1.4 tons less CO<sub>2</sub> emissions

Source: S. Faßbender, "Einsatzmöglichkeiten von Aluminium im Automobilbau", Einführung in die Technologie des Aluminiums, March 20-23, 2012, Aachen



# Built to last with unmatched performance




- Corrosion resistant, aluminium reduces need for rust repair and increases vehicles lifespan
- Aluminium components are typically 40% to 50 % lighter, but provide more structural stiffness than heavier components they replace
- Higher rigidity of structures improves drivers feeling for the road and allows faster and more and precise control

Source: [www.drivealuminium.org](http://www.drivealuminium.org)

# Safety first!

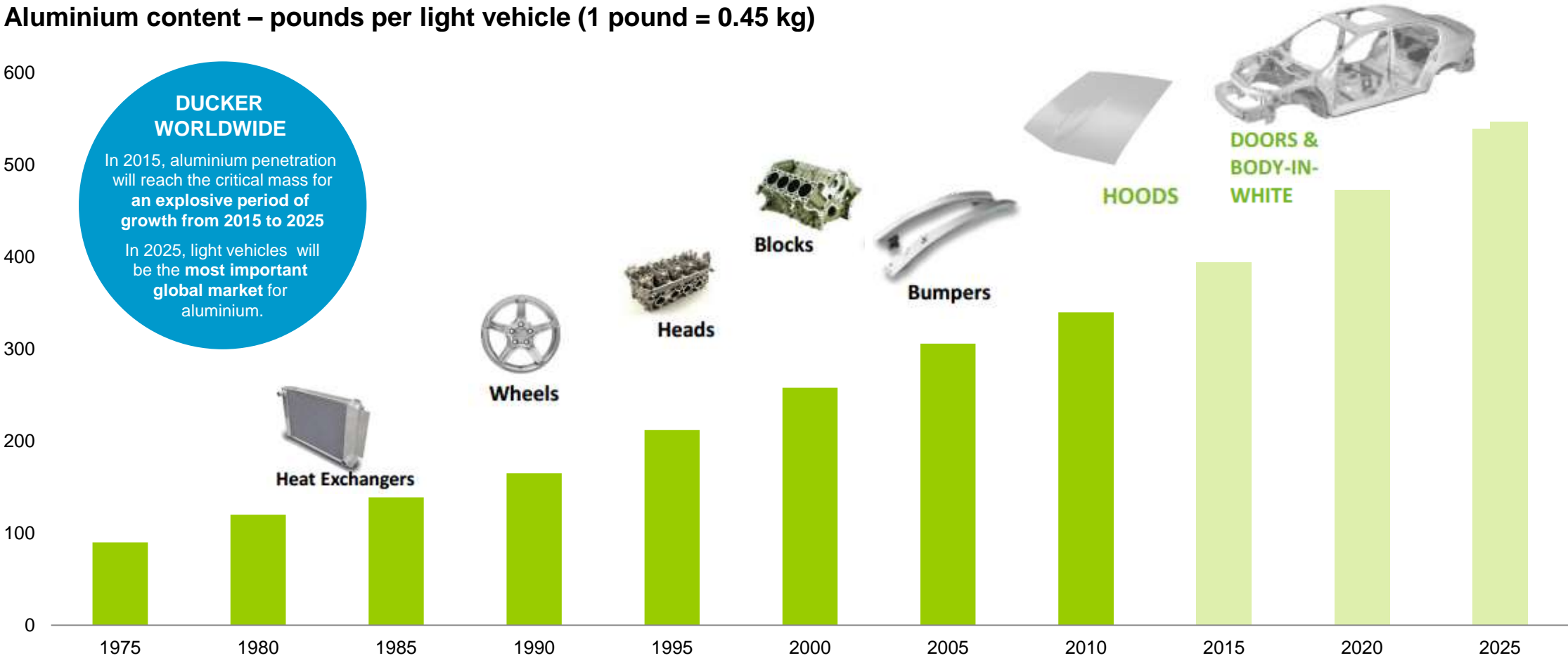


- Absorbs twice as much crash energy as steel
- Allows increased size and energy absorption capacity without increasing overall weight
- Folds predictably during crash, allowing vehicle to absorb crash energy and therewith to protect occupants
- Allows shorter stopping distances

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# 40 years of uninterrupted automotive aluminium growth

Aluminium content – pounds per light vehicle (1 pound = 0.45 kg)

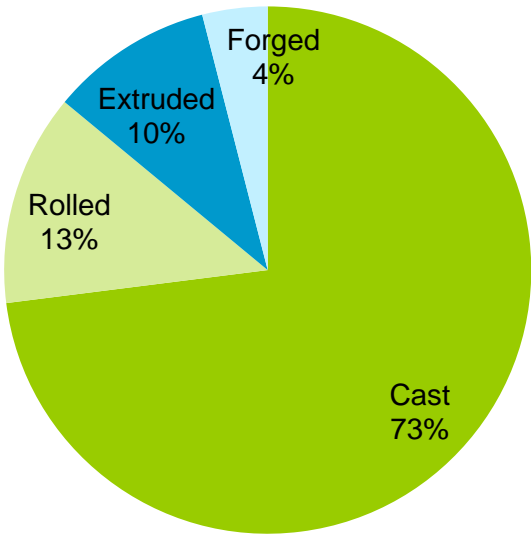
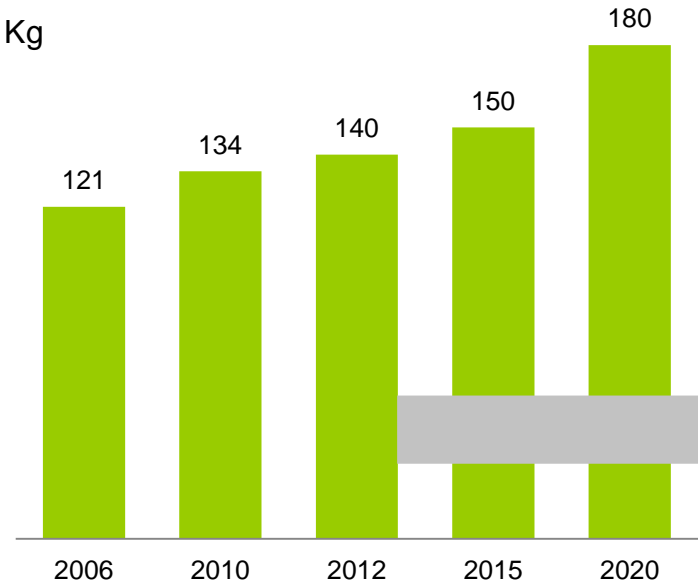


Source: Ducker Worldwide, '2015 North American Light Vehicle Aluminum Content Study', CRU, Hydro

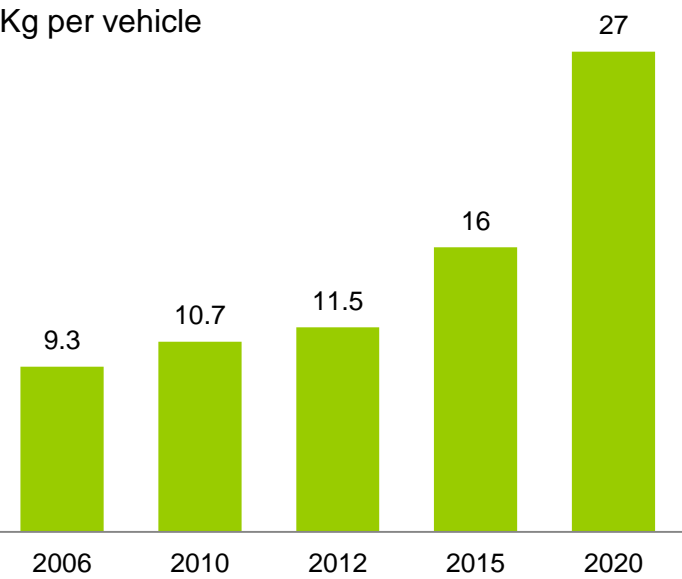


# Increasing Al content in European light vehicles driven by rolled, automotive body sheet

Al-content per car (EU27)



Body, bumpers, IP and closures



Source: Ducker Worldwide 2012

# Aluminium: “Stronger, tougher and more fuel efficient”

The car industry embraces aluminium



## AUDI

«Audi believes aluminium still offers abundant potential, especially in the shape of the new, higher-strength alloys»



## BMW

«Aluminium plays a major role in lightweight construction at the BMW Group»



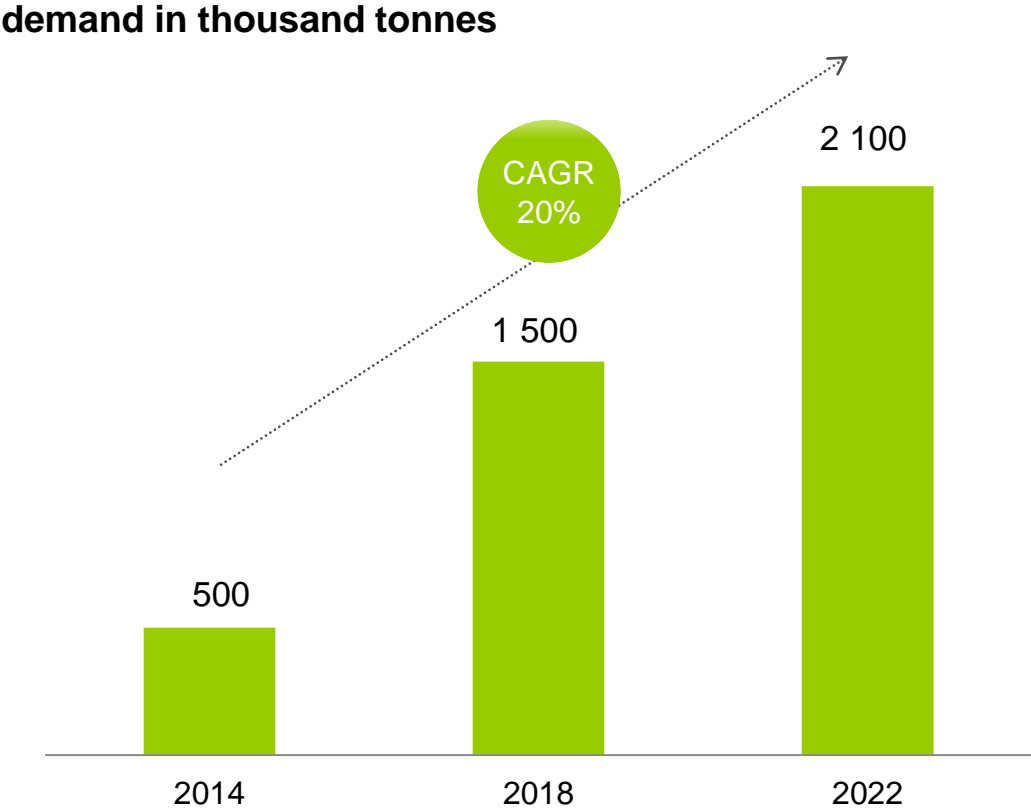
## JAGUAR LAND ROVER

«Lightweight construction is a core element of Jaguar's DNA and Jaguar is at the cutting-edge of aluminium technology in the automotive industry»

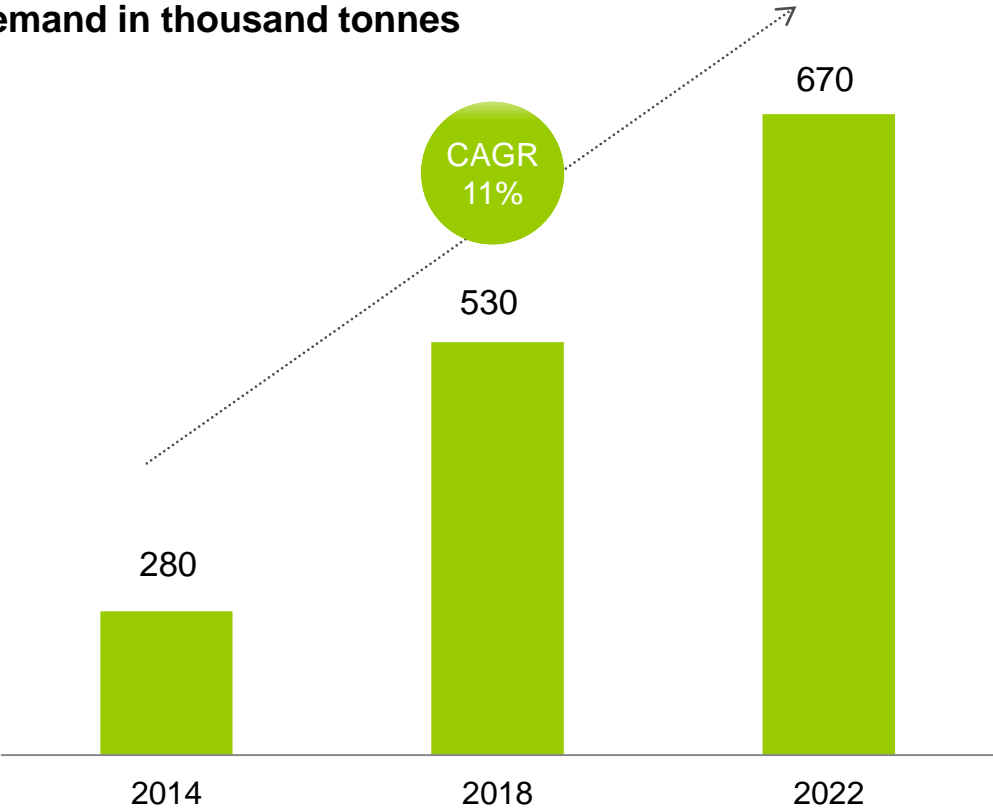
# Positive development in main growth driving segment


Automotive Body-In-White

World Body-in-White  
demand in thousand tonnes



Europe Body-in-White  
demand in thousand tonnes



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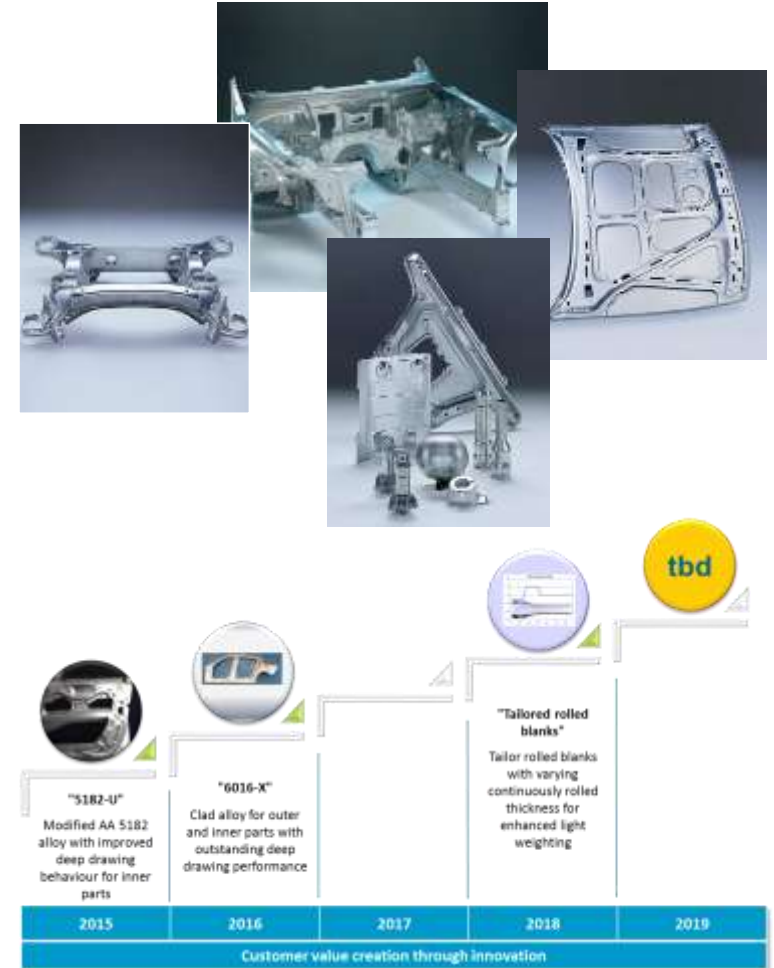
# Automotive

## Position

- No. 2 in Europe with 25% market share, No. 4 in BIW
- Supplying full portfolio with coils, strips and sheets for chassis, structural components and BIW, partly with special surface treatment
- Preferred supplier through differentiation

## Success factors

- Innovation
- Full R&D and technical support
- Material models and simulation know-how
- Product properties
  - optimum surface, especially for outer body sheets
  - exact flatness
  - Variety of mechanical properties, depending on application



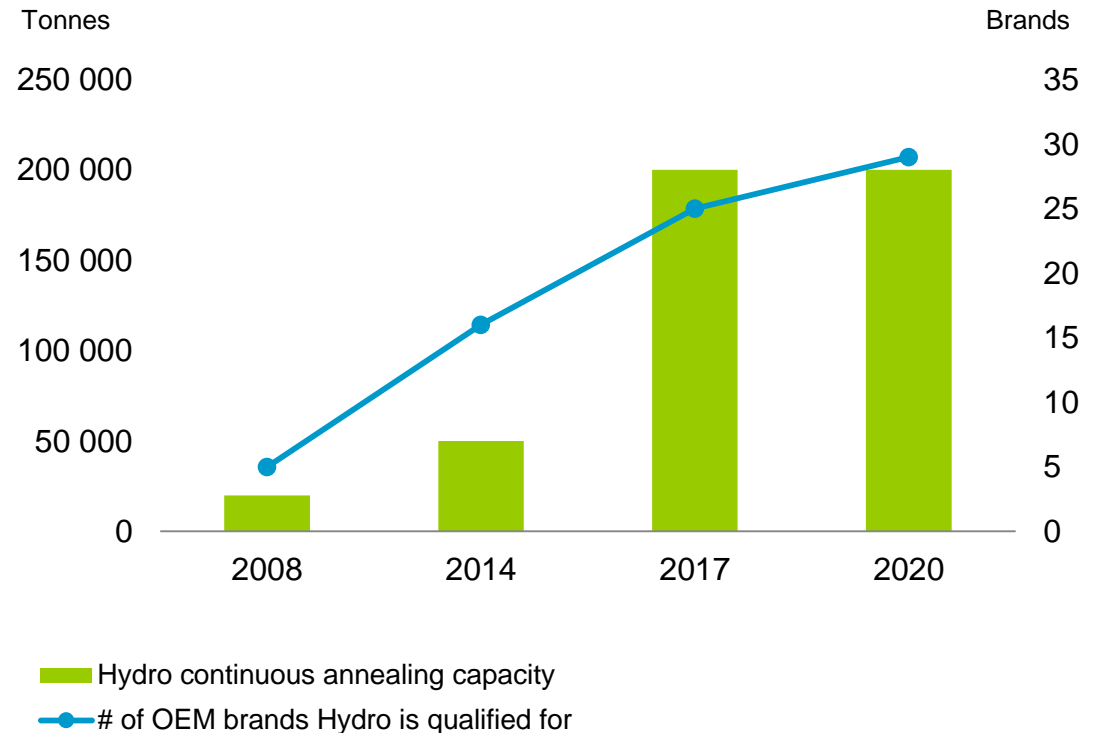
# Pursuing attractive growth opportunities



## Major step in automotive Body-in-White (BiW) market

- Installation of automotive line 3 (AL3) lifting capacity to 200 thousand tonnes per year
- ~130 M€ invest
- Step change in BiW production process
- Production start second half 2016

## Hydro BiW development

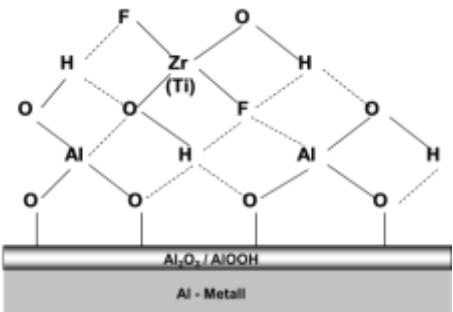


# Oxsilan® coil passivation

High strength structural joints by adhesive bonding



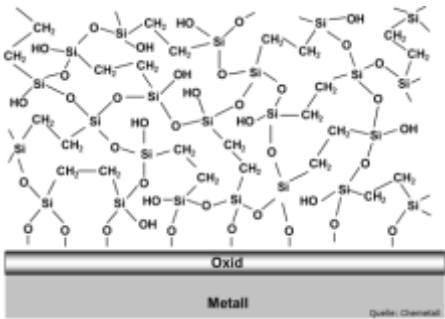
Reference: **Ti/Zr** based



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Failure mode in lap shear test

New: **Oxsilan®** based

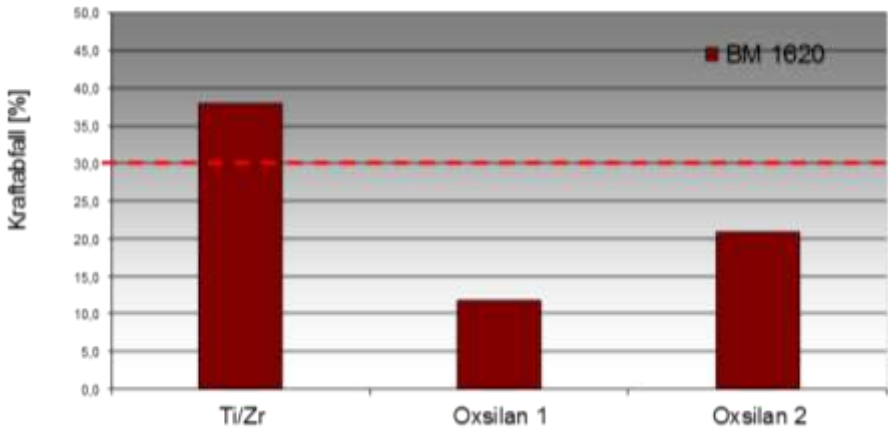


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Better adhesive bonding performance

- achieving preferred failure mode
- improved durability through lower strength loss after weathering

Strength loss after weathering (durability)



# Forming optimized AA5182 variant




- High formability and high corrosion resistance due to optimized specification
- Strategic supplier to major European OEM's
- Based on leading R&D competence



# Single-part side panel




- Forming limits represent the main challenge in automotive applications
- Clad alloy HA 6016-X allows for strongly improved formability
- Customers need less joining operations to produce one functional group
- Cost advantages over multi-piece solutions
- Compatible alloys with no downgrading of existing recycling concepts

A silver Mercedes-AMG GT sports car is parked on a wet, reflective street in an industrial setting. In the background, there are industrial buildings, a tall utility pole with yellow transformers, and a distant city skyline under a cloudy sky. The car's license plate is 'W 69579'.

Men of steel drive cars of aluminium.

## **Ambition in automotive**

- No. 2 in European BIW market
- Technology leader through differentiation in innovation, technical support, quality and service

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- A silver Peugeot car is parked on a paved surface in front of a modern building. The building features a large circular cutout that frames a view of a cloudy sky. The car is positioned on the right side of the frame, facing slightly towards the left. The license plate on the car reads "VH-080-AM".
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# BMW 7 series

## Alloys

- 6xxx-Outer
- 5xxx-Inner

## Car parts

- Hood
- Doors
- Trunk lid
- Roof
- Side panel





# Mercedes C Class T



## Alloys

- 5xxx-Inner

## Car parts

- Hood
- Doors



# Audi A6

## Alloys

- 6xxx-Inner

## Car parts

- Inner door parts





# Audi Q7

## Alloys

- 6xxx-Outer

## Car parts

- Hood
- Doors
- Tailgate



# Porsche Macan

## Alloys

- 6xxx-Outer
- 6xxx-Inner

## Car parts

- Fenders
- Tailgate





# Porsche 911



## Alloys

- 6xxx-Outer
- 5xxx-Inner

## Car parts

- Front lid
- Fenders
- Doors



# Peugeot 308

## Alloys

- 6xxx-Outer
- 5xxx-Inner

## Car parts

- Hood
- Fenders



