Automotive – Focus on innovation

Horst Binnig, CEO Rheinmetall Automotive
Capital Markets Day 2018, 29 November, Berlin

Look back to CMD 2017 in Bremen
Last Chart 2017: Rheinmetall Automotive is still on track

MARKETS AND CUSTOMERS
Markets in better shape than anticipated, global LV production will grow by >2%
Our global production and technology footprint will follow local needs
Rheinmetall Automotive intends to continue outperforming markets in the future, too

PERFORMANCE AND GROWTH
Sales growth at Mechatronics will follow the high demand for fuel-optimization products
Hardparts will continue to optimize its global footprint, with the focus on generating cash
Aftermarket: back on track with a new strategy, now set to return to former profitability

INNOVATION AND PRODUCTS
Trend toward greater efficiency and emission reduction promises higher content per car
Electrification brings additional business and sales growth
Product pipelines are still full of innovations for every type of power train
2018 A “disruptive” year?

1. China
2. Diesel
3. Legislation
4. E-Mobility

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1. China
Greater market share and more content per car

MARKETS AND CUSTOMERS

2018:
Market -1%

2019:
Market outlook looks gloomier than expected

BUT:
- New customers
- New segments
- Growing truck business
- Growing aftermarket business

PERFORMANCE AND GROWTH

2018:
~6% growth for Rheinmetall Automotive expected (in local currency)

2019:
We expect CAGR in our own companies to be 3 times higher than in our joint ventures

WHY do we grow?
- More content per car and truck
- New plant
- Local customers for NEV-Cars
- Product portfolio towards NEV (battery tray, e-motor...)

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Innovation Roadmap Rheinmetall Automotive

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INNOVATION AND PRODUCTS
2. Diesel

Future of the passenger car diesel engine

- Diesel market in Europe still under pressure
- WLTP-related backlog will be reduced by the end of the year
- Small diesel engines (< 1.5 l) will come under price pressure

Diesel engines are “clean” with the right technologies
- Share of pure diesel-related products is further reduced in our plan 2019ff
- Our content per diesel engine will also grow in the future

New products, esp. for HD-applications, are in the pipeline

Global map for Diesel bans
3. Legislation
The growth drivers of Rheinmetall Automotive

Efficiency
(CO₂ Reduction)

Emission
(Reudction)

Plus:
Electrification

3.1 Legislation / Efficiency
CO₂ Reduction = Reduction of consumption = Efficiency
3.1 Legislation / Efficiency

Innovation Roadmap Rheinmetall Automotive

Global Trend #2: Emissions down

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3.2 Legislation / Emission
Innovation Roadmap Rheinmetall Automotive

4. Electrification
E-Mobility@Rheinmetall Automotive
4. Electrification
Innovation Roadmap Rheinmetall Automotive

4. Electrification
Share of BEV sales increased again in 2018

€ ~800 m
Lifetime Order Value
€ ~250 m BEV, € ~550 m Hybrid
And now to something additional...

Sales by segment (2017)

Non-LV Business

34% Non-LV Business

Trucks, large-bore pistons, continuous casting, marine, industrial, recreational

LV Business

Gasoline

Diesel
Focus on our Truck Business

Truck
Our current product portfolio
First driver for growth and performance

Global transport volume will continue to expand, tripling by 2050.

Freight transport volumes
(Billion ton-kilometers)

- International
- Non-OECD
- OECD

Source: OECD, International Transport Forum, January 2017

Second driver for growth and performance

Legislation for emissions

Source: IHS Markit; Status: February 2018
North America

has already introduced **EURO VI** emission limits and is introducing new CO₂ targets in 2020 (GHG2).

Europe

Already applies **EURO VI** and is heading for the next stage in 2019 plus additional CO₂ targets (planned).
China and India are going to introduce **EURO VI** by 2020

First came the Emissions Law, now additional new fuel consumption guidelines for trucks (CO₂)!

Third driver for growth and performance

**Legislation for consumption (CO₂)**

Source: IHS Markit; Status: February 2018
Legislation will boost content per truck around the globe.

For the foreseeable future, the diesel engine will remain the dominant drive technology for commercial vehicles!

Focus China & India
Dynamic growth in Asian markets for our truck components

CAGR ~ 50%

after 2020

Source: OECD, International Transport Forum, January 2017
Truck

Potentials for CO₂ reduction

Fields for possible CO₂ reductions

- Low-rolling resistance tyres
- Side & underbody panels of truck chassis
- Improved turbocharging and EGR
- Down-speeding with optimised map
- Predictive cruise control
- Reduced losses (lubricants, design)
- Air compressor
- Improved water & oil pumps (less friction)
- Cooling fan
- Closable front grille
- Ture pressure monitoring
- Aerodynamic mud flaps
- Improved SCR & optimised SCR heating
- Improved lubricants

Source: ACEA

Innovation Roadmap

Truck & Offroad

Products stable in production (EU-VI)

- 2018
- TM Gen-I
- HD BPV EC-Driven K&S body
- Stahl Pistons
- RV Gen-I
- HD EGR
- HD EGR Twinflap

Products for MY 2021 updates

- 2019
- TM Gen-II
- HD BPV EC-Driven PG body
- EGR FlexVent
- RV Gen-II
- EGR Twinflap

Products for EU-VII regulation

- 2020
- HD BPV SS body
- Hot BPV
- HP-P-EGR Gen 1 tbd.
- BPV EC Gen-2
- EGR EC Gen-2

- 2021
- Lead-free Bearings for Truck Brakes
- Castings
- RV Hight Flow
- RV EC Gen-2

- 2022
- HD BPV EC-Driven PG body
- BPV EC Gen-2

- 2023
- TM Gen-II
- HD BPV EC-Driven PG body
- EGR EC Gen-2
- EGR Twinflap EC Gen-2
Rheinmetall Automotive

**Innovation Roadmap is fully packed**

- **E³**
  - **Efficiency** (CO₂ Reduction)
  - **Emission** (Reduction)
  - **Electrification**
CMD 2018
Summary

MARKETS AND CUSTOMERS
Markets are becoming more uncertain, BUT
1. Our portfolio includes customers in high-growth regions of the world
2. We have new customers for industrial applications

PERFORMANCE AND GROWTH
Our global presence in LV plus our NonLV business gives us the chance to grow faster than the market for LVs
- Legislation is enforcing the use of our products and solutions
  - Content per car is increasing to meet high-tech requirements
  - Higher margin products due to innovative designs

INNOVATION AND PRODUCTS
Rheinmetall Automotive’s Innovation Roadmap is full of products geared to current megatrends:
- Emission & CO₂ reduction and E-mobility
- Extended product portfolio for hybrids
E-mobility and hybrid are undergoing massive expansion; our current order volume is approx. € 800 million and continues to rise (+ € 300 million just in 2018).

MOBILITY. SECURITY. PASSION.
### Appendix

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<th>Englisch</th>
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<td>ETC</td>
<td>Elektrische Drosselklappe</td>
<td>Electric Throttle Control</td>
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<tr>
<td>EOP</td>
<td>Elektrische Ölpumpe</td>
<td>Electric Oil Pump</td>
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<tr>
<td>E-CAM Phaser</td>
<td>Elektrischer Nockenwellenversteller</td>
<td>Electric Cam Phaser</td>
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<td>EGR Flex Vent</td>
<td>Abgasrückführungsventil „Flex Vent“</td>
<td>Exhaust Gas Recirculation Valve „Flex Vent“</td>
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<td>Stoßdämpferaufnahme</td>
<td>ShockTower</td>
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<td>Fahrwerksteile – wie z.B. Hinterachsfrärschemel</td>
<td>Chassis Parts</td>
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<td>E-Motor Housing</td>
<td>Elektromotorgehäuse</td>
<td>E-Motor Housing</td>
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<td>Battery Tray</td>
<td>Batteriegehäuse</td>
<td>Battery Tray</td>
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<td>VOP</td>
<td>Variable Ölpumpe (mechanisch)</td>
<td>Variable Oil Pump (mechanical driven)</td>
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<td>EAM</td>
<td>Elektrisches Antriebsmodul (Aktuator)</td>
<td>Electric drive module (actuator)</td>
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<td>RV</td>
<td>Membranventil</td>
<td>Reed Valve</td>
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<td>EVP</td>
<td>Elektrische Vakuum Pumpe</td>
<td>Electric vacuum pump</td>
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<td>Gearbox Housing</td>
<td>Getriebegehäuse</td>
<td>Gearbox Housing</td>
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<td>CSV</td>
<td>Kühlmittelumschaltventil</td>
<td>Coolant switching valve</td>
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<tr>
<td>EGR Module</td>
<td>Abgasrückführungsmodul</td>
<td>Exhaust gas recirculation module</td>
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<td>HD EGR TWINFLAP</td>
<td>Hochdruck Abgasrückführungs-Doppelklappen-Ventil</td>
<td>High Pressure Exhaust gas recirculation Twin-flap valve</td>
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<td>OGV</td>
<td>Öl-/Hydraulik Umschaltventil</td>
<td>Oil switching Valve</td>
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<td>Exhaust Flap</td>
<td>Abgasklappe</td>
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<td>VVT</td>
<td>Variabler Ventiltrieb</td>
<td>Variable Valve Train</td>
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<td>VAP</td>
<td>Elektrische Kraftstoffdampf-Abgaszugsrumpfe</td>
<td>Electric Vapor Pump</td>
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<td>Electric coolant pump / electric water pump with 35W (auxiliary circuits)</td>
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<td>Swirl flap</td>
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<td>Delta pressure valve</td>
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<td>Inline CSV</td>
<td>ab – Kühlmittel Umschaltventil</td>
<td>Inline coolant switching valve</td>
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<td>Heavy Duty variable Oil Pump (mechanical)</td>
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<td>OSV Piston Cooling</td>
<td>Öl Umschaltventil für abschaltbare Kolbenkühlung</td>
<td>Oil switching valve for piston cooling</td>
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<td>ORV</td>
<td>Öl Regelventil</td>
<td>Oil regulating valve</td>
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<td>CRV</td>
<td>intelligentes Kühlmittelregelventil</td>
<td>Intelligent coolant regulating valve</td>
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<td>Turbo Recirculating valve / electrical bypass valve</td>
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<td>Variable waterpump/coolant pump (mechanical driven)</td>
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<td>Kolbenschmidt Hauptlager</td>
<td>Kolbenschmidt Main bearing (3 layer, R=radialbearing, 55=layer material, Q= polymer layer)</td>
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<td>3-Schichtlager (Alu Polymer)</td>
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<td>LiteKS 4</td>
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<td>Wasserstoffrecikulationsgebläse</td>
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