schlaeger

Innovation, partnership and efficiency: a success story for overmolded mechatronic assemblies

08.03.-10.03.2023 - Arburg Technology Days

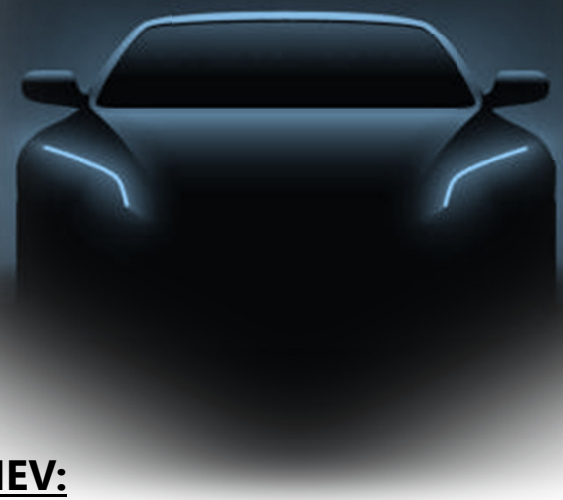
motion
FOR MAN AND MACHINE

www.schlaeger.com

Schlaeger M-Tech – what we do …

ICE:
- Coils fuel injectors
- Turbo charger actuator
- Camshaft actuator
- SCR dosing systems



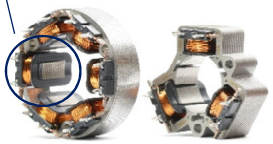
BEV:
- Temperature sensors
- Stator/rotor thermo-management
- High voltage battery actuators







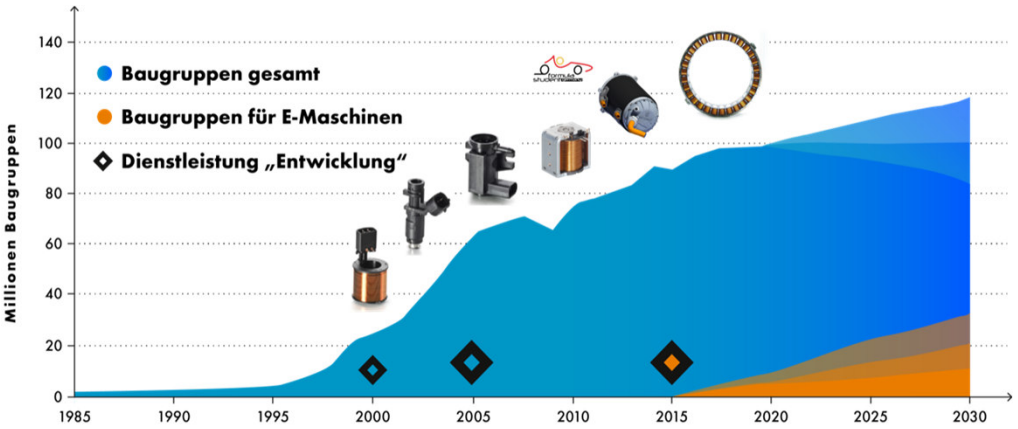


Consumer / gaming:
12mm mouse wheel stator!

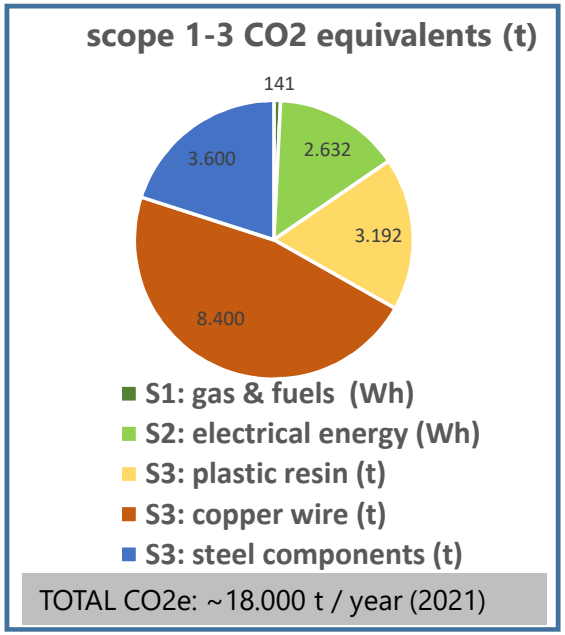
HEV:
- Stator segments (600V / 120 kW traction)
- Integrated temperature sensors
- Actuator coils & drives for cooling valve

Schlaeger M-Tech 2021 in numbers ....



Resources

- 6,1 GWh electrical power
- 0,6 GWh gas & fuels
- 940 t plastic resin
- 2.000 t Copper
- 1.200 t steel
- 2.000 m³ water



Business

- EUR ~ 90 Mio. turnover
- ~ 90 Mio. mechatronic products
- 450 employees / 20 R&D
- < 0,02 PPM field quality

Production equipment

- 100 thermoplastic molders
- > 350 winding spindles
- > 300 automized units
- > 80 welding units (res. & laser)

Innovation & projects:

- Overmolding with high functional integration
- toolshop (x 50 tools / year)
- High volume production < 1,2 sec / part
- Industrialization with own engineering team

Automation projects (Turnkey) „insert molding“ - MILESTONES

schlaeger

>30 projects in 20 years

Improved inter-action between molding tool, gripper system, machine size

Growth & Standardization (e.g. only electric ARBURG A & H types)

Focus on Best Practice

sensitive PPA / PPS material

-30% % cycle times
-80% % specific energy

2001 2011 2021 2023

14 sec. cycle time
13 kWh/ kg nylon

<10 sec. cycle time
<2 kWh / kg nylon

First automation (turnkey) project 2001:

Product
- Insert molded bobbin
- Manufacturing step 1 of 5 to finished injector PWG
- 8-cavity hot runner tooling
- 150 Mio. pieces produced (18,8 Mio shots / 20 years)

Machine / Automation / Parameters
- ARBURG 320 C
- Linear handling
- (feeding systems supplied by schlaeger)

Resources / CO2e
- Sprueless / nylon PA 66 GF35
- Ca. 13 kWh / kg nylon
- Ca. 4,6 Wh / piece,

1. Insert Moding | 2. E-Assembly | 3. M-Assembly | 4. Overmoding | 5. EOL Testing

Current automation (turnkey) project (2021):

1. Insert Molding → 2. E-Assembly → 3. M-Assembly → 4. Over-modling → 5. M-Assembly → 6. EOL

Product
- Insert molded bobbin PPA GF35
- Manucturing step 1 of 6 to finished actuator coil
- 4-cavity hot runner tooling
- SOP 2021 / 4 variants

Machine / Automation / Parameters
- ARBURG 370 H „gestica“
- Linear handling
- Turnkey with feeding, packaging
- Cleanliness level 200 microns

Resources / CO2e
- Sprueless PPA GF35
- Ca. 1,7 kWh / kg PPA
- Ca. 10,0 Wh / piece

Partnership & Innovation – how we made progress together

In-line horizontal molding machines

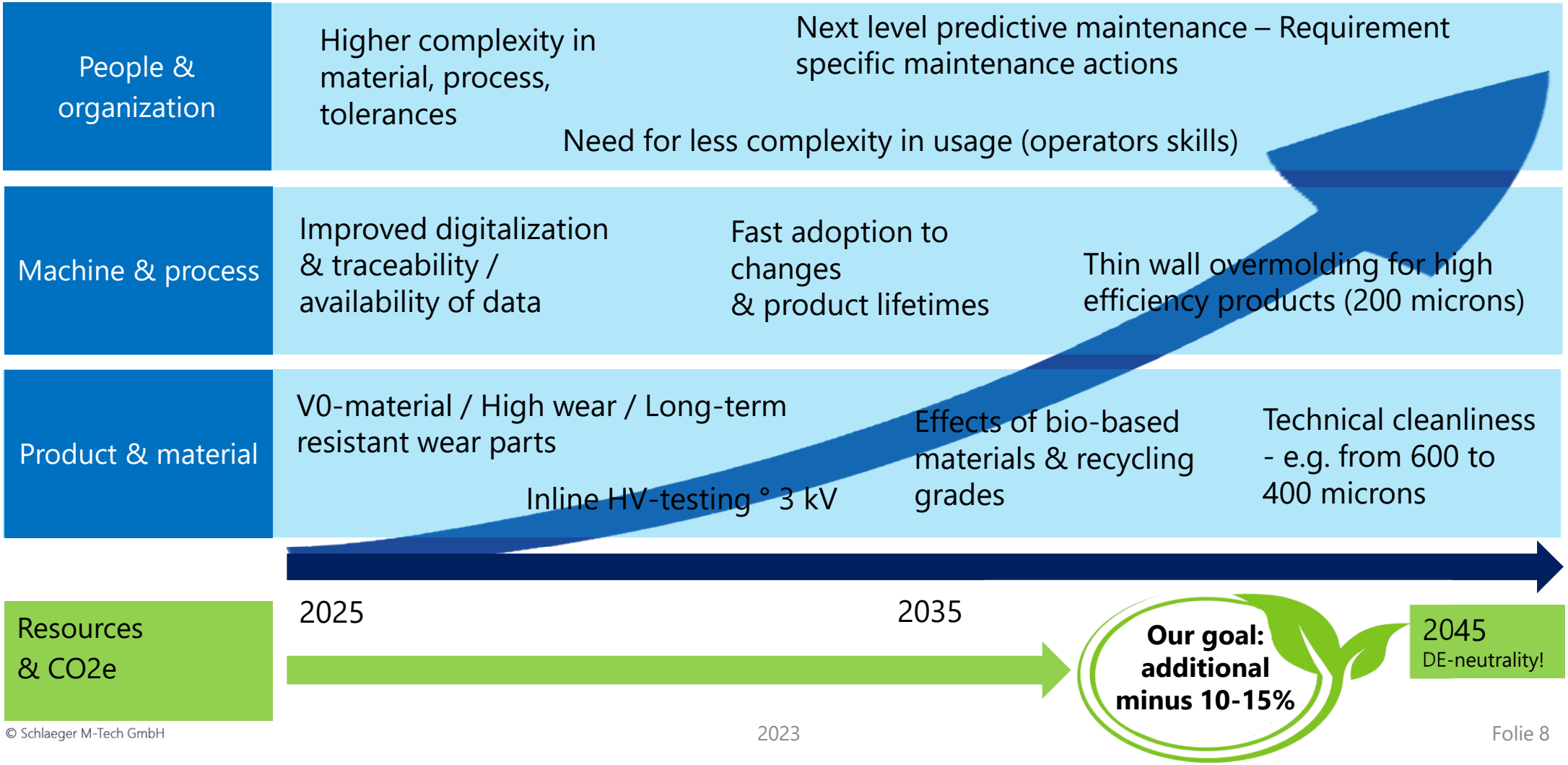
- Special programming for machine behaviour acc. to complete line status – line / machine communication
- Agile automized scrap routines
- Joint development of set-up mode „Zustimmbetrieb“

In-line rotary table molding machines

- Speed & communication optimization
- Operator accessability / protection & safety switches
- Auxillary hydraulics with parallel movements

1. Bobbin | 2. M-Assembly | 3. E-Assembly | 4. M-Assembly | 5. Overmodling | 6. M-Assembly | 7. M-Assembly | 8. EOL

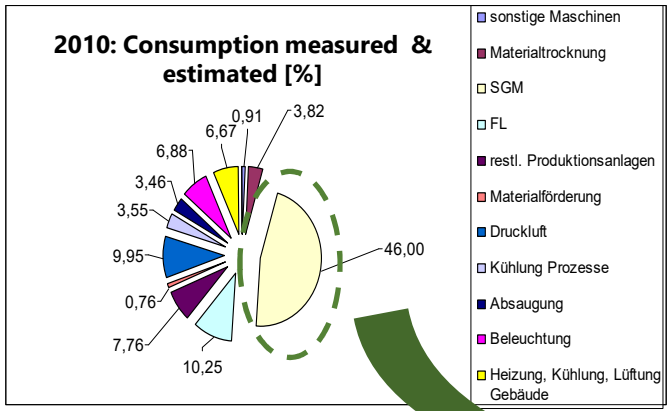
Automation projects (turnkey) – 5 Years OUTLOOK

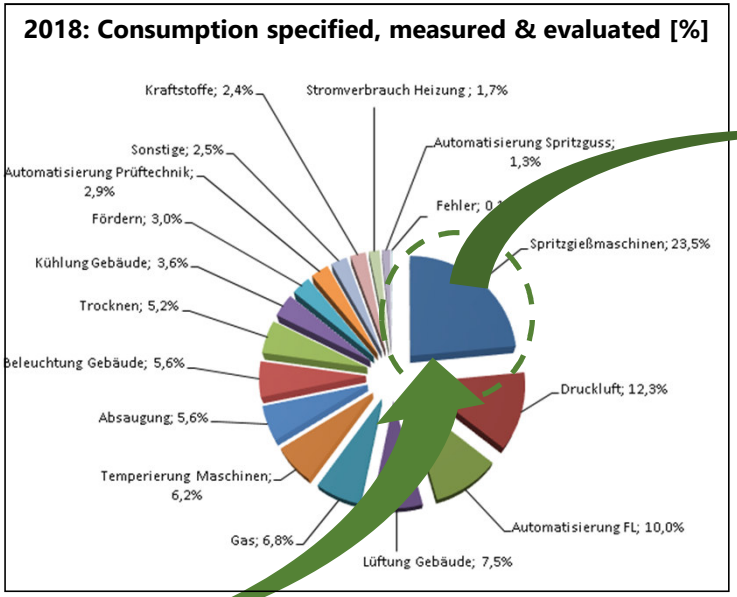


How to work in energy efficiency categories …

Consumption categories

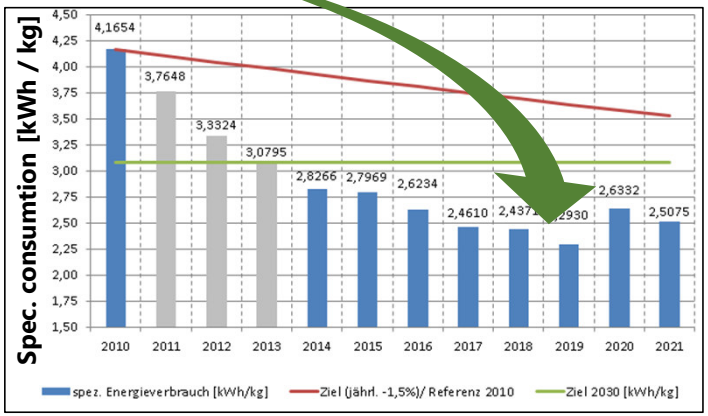
- Audits & estimates in 2010
- 16 categories monitored 2018 ff





Plastic processing

- Strongest category improvement



Actions „Infrastructure“:

- Accept ROI > 5 years
- Central energy levels downsized: system pressure, cooling levels
- Heat recovery where possible

Actions „assembly units“

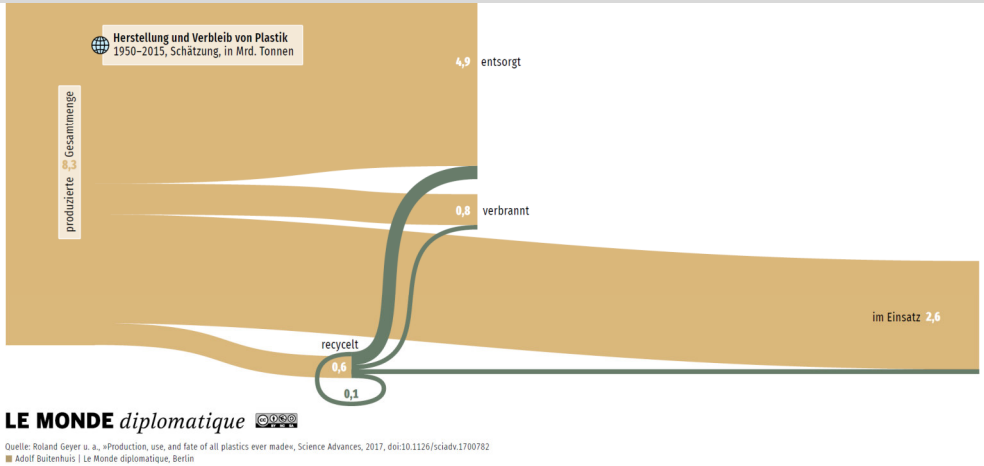
- Avoid air as energy source
- Central electric drives
- Strong focus on equipment specs
- Ask always „what else can be done?“

Actions „Plastic processing“:

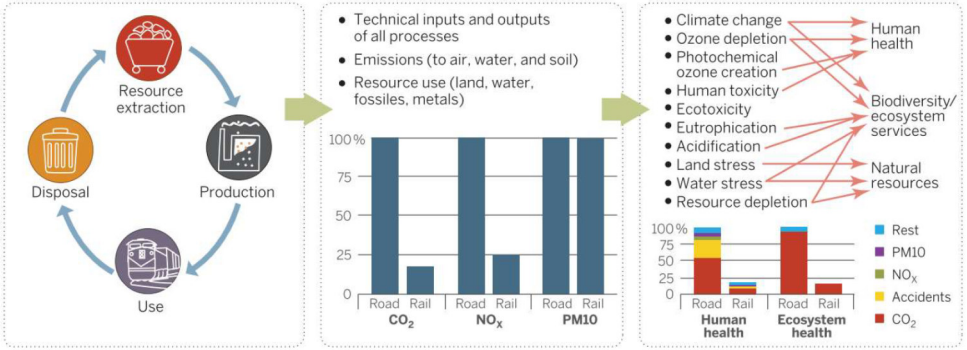
- Best operation point focused
- electric machines /re-cuperation axis
- Cycle times down
- Special tooling technologies

Material ressources: where we are and where we have to go

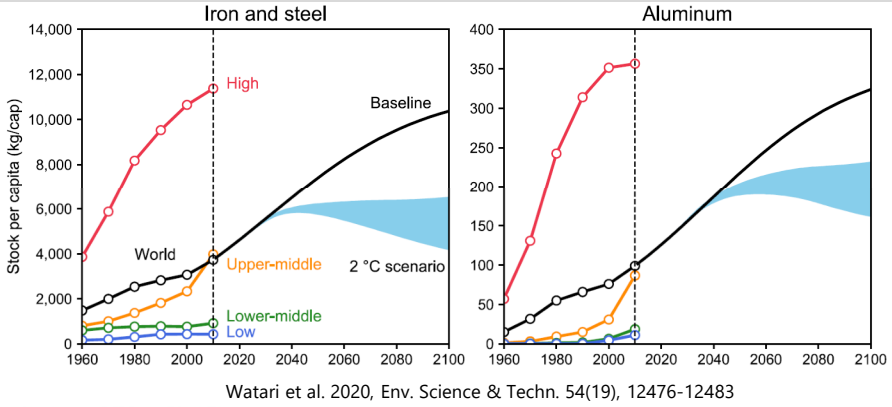
1. How we define the real value of plastic products?



Need for life cycle assessments (LCI / LCIA)

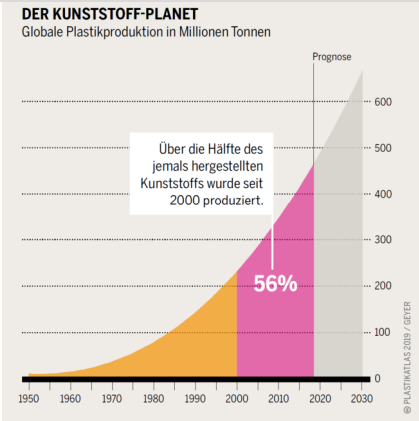


2. Change in growth for all materials on the horizon?



Watari et al. 2020, Env. Science & Techn. 54(19), 12476-12483

How will plastic & products react?



Solutions through:
Non-fossil content / bio-based
Mass-balanced
Full material recycling & circularity

70 Years of mechatronic – where will we be in 2035

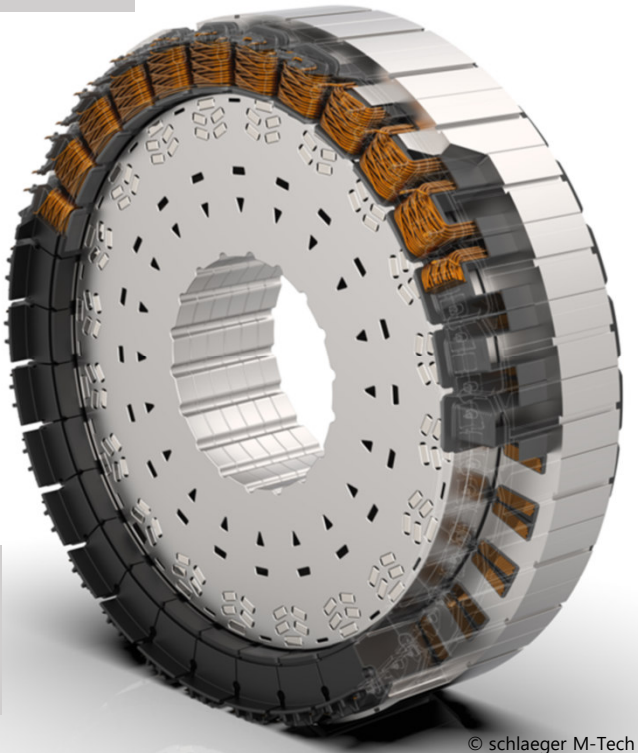
1965

100% CO2-neutral plastic resin purchased

High material efficiency assessed by high-level LCA-calculation

2035

minimal material usage with high functional integration & hybrid metal-plastic-assembly



100% renewable energy / 50% own local production (scope 1 & 2)

recycling concepts for production & end-of-life = full circulatity

schlaeger

THANK YOU VERY MUCH FOR YOUR ATTENTION

A milestone for our plant in Bayreuth: CO^2 neutrality since 2019