RONALGROUP

AFTERMARKET WHEEL
RONAL R70-BLUE.

PLANBLUE

Customer expectations, legal regulations and society's understanding and perception of the issue of climate change are leading to changing expectations and demands. The matter of components in the automotive sector requiring as little carbon as possible is increasingly coming into focus. With the R70-blue, the RONAL GROUP shows that it is possible to produce aluminum wheels with a small Product Carbon Footprint (PCF). The greenhouse gas emissions of the aluminum and in production were reduced significantly, and the emissions that cannot be reduced are offset entirely with climate certificates: with the Gold Standard verified climate protection project "Utsil Naj – healthy homes for all in Mexico."

1. OBJECTIVE AND SCOPE

The report on the R70-blue focuses on the "cradle to gate" approach, from raw material production to production in Landau (Germany) to our logistics warehouse in Forst (Germany). The environmental impact category assessed was the climate impact (global warming potential) for a reference period of 100 years. The impact assessment is based on the CML-2001 method[1].

The basis of calculation:

R70-blue wheel

- 40 % primary aluminum – produced with renewable energies (CFP: 4 kg CO_2eq./kg Al)
- 60 % secondary aluminum – 30% pre-consumer and 30% post-consumer material
- Electricity: renewable electricity – produced with 100% hydropower in Europe
- Gas: offset – purchased CO_2eq.-neutral through offsets from the energy supplier

Standard alloy wheel, produced in Europe

- 60 % primary aluminum – carbon footprint European average
- 40 % secondary aluminum – pre-consumer (today's usual share of aluminum waste from production)
- Energies: EU mix – calculated with common European average factor for CO_2eq.; emissions from gas consumption are not offset.

In this analysis, we have followed the method of DIN EN ISO 14067:2019 and the standards DIN EN ISO 14040:2009, DIN EN ISO 14044:2006. The environmental impact category considered was the climate impact. This means that all greenhouse gas emissions in the production of an alloy wheel are assessed and the emissions are presented as equivalents of the gas carbon dioxide. The unit is [kg CO_2eq. per wheel].

To model the life cycle of the R70-blue, the LCA software Umberto[2] is used. The underlying database is Ecoinvent version 3.7.

[1] The CML method is a multidimensional approach to life cycle assessment with the aim of quantitatively mapping all direct material and energy-related environmental impacts. The development of the method goes back to the Centrum voor Milieukunde (CML) of Leiden University.

[2] LCA = Life Cycle Assessment. It is a systematic analysis of the environmental impacts of products, processes or services along their entire life cycle. The life cycle assessment method is used as a tool for environmental decision-making.

1.1 ENVIRONMENTAL IMPACT CATEGORY

Climate impact
Climate change deals with the effects of anthropogenic emissions on the radiative forcing of the atmosphere. Greenhouse gas emissions increase radiative forcing, which leads to an increase in the Earth's temperature. The characterization factors applied here are based on the Global Warming Potential (GWP) category indicator for a timeframe of 100 years [IPCC 2013]. The reference substance for the global warming potential is CO_2eq. to which all other effective substances (e. g. CH_4, S_2O, SF_6, VOC) are set in relation.

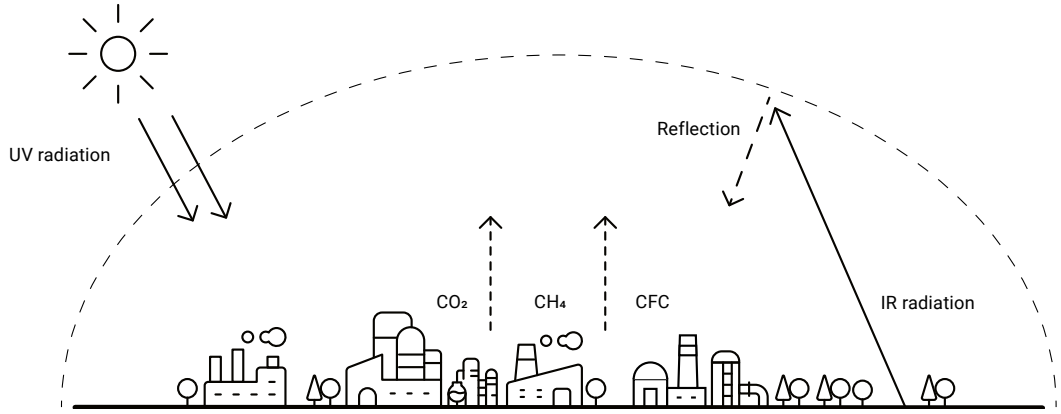


Figure 1: Graphical representation of the impact category greenhouse gas potential

2. LIFE CYCLE INVENTORY AND IMPACT ASSESSMENT

All data on processes and consumption used for the report come from our production location in Landau, Germany.

All input and output data are data from the production facility and direct data from the suppliers. Aluminum weights and energy consumption are measured data. The consumption of resources (paints, cooling lubricants, chemicals, water) and other production aids as well as the waste quantities are data of procurement and waste disposal (purchasing/waste management). These annual consumptions were broken down to the $WAiO_3$ wheels produced.

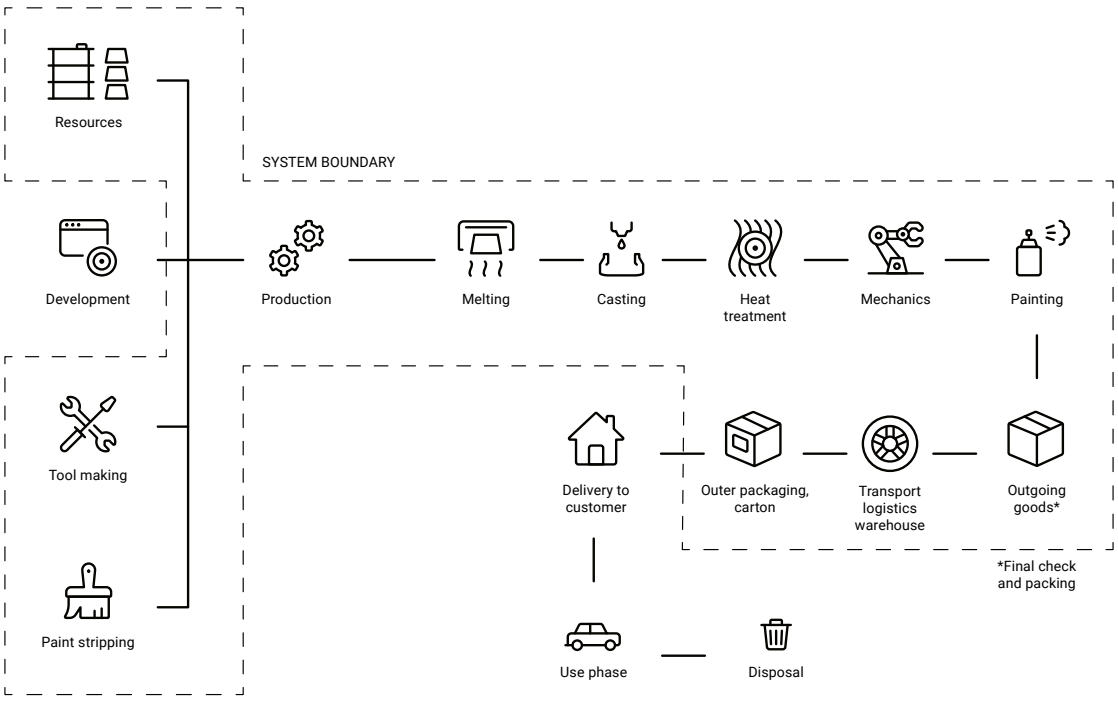


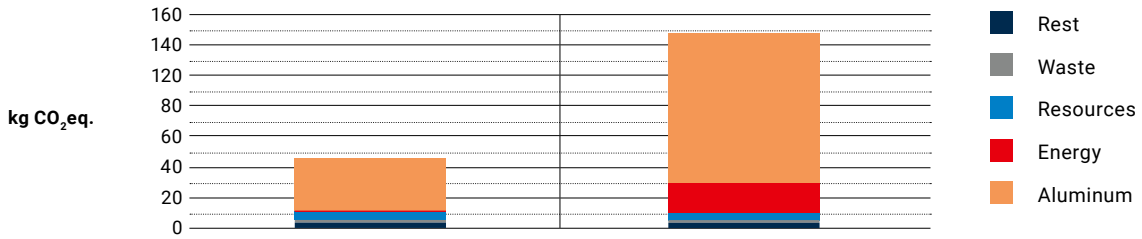
Figure 2: Production flow of the R70-blue with the system boundary of the report – cradle to gate.

[3] Goods issue OK = wheel ready for sale

2.1 CLIMATE IMPACT OF THE WHEELS CONSIDERED

R70-blue wheel and standard alloy wheel, produced in Europe

Figure 3 shows the results of the R70-blue compared to the wheel made with today's standard aluminum and energy mix. The R70-blue has a CO_2eq. footprint of 49.6 kg CO_2eq. per wheel. In comparison, the footprint of a wheel of the same weight, but without any CO_2eq. reductions implemented in the process and materials, is 149.9 kg CO_2eq. per wheel.



	R70-blue wheel	Standard
Rest	3.7	3.7
Waste	2.8	2.8
Resources	5.0	5.0
Energy	1.5	19.5
Aluminum	36.6	118.8
TOTAL	49.6	149.9

Figure 3: Comparison of the different scenarios: CO_2eq. of the different materials

Aluminum production has the greatest influence on CO_2eq. emissions, followed by the energy used in the production process.

If the conventional EU mix and natural gas are chosen for energy without offsetting them, this results in CO_2eq. emissions of 19.5 kg per wheel. With green electricity and offsetting the natural gas, this can be reduced by 18 kg. With a conventional energy and aluminum mix, the wheel has a three times higher CO_2eq. footprint.

Resources, waste and the rest total 11.5 kg CO_2eq. per wheel. In the production process, resources include paints, chemicals, cooling lubricants and other auxiliary materials. The term "rest" includes all packaging, transport, accessories (screws and lids) as well as the production of the mold (ingot mold).

2.2 CONCLUSIONS

The R70-blue reduces CO_2eq. emissions by more than 60% during production compared to a standard wheel. By offsetting the remaining 49.6 kg CO_2eq. per wheel, the R70-blue can be called a CO_2eq. neutral wheel.

This CO_2eq. reduction is achieved, among other things:

- Through the use of a primary aluminum with a reduced CO_2eq. footprint and the use of secondary material (pre- and post-consumer aluminum). This results in a reduction of 82 kg CO_2eq.
- In the production process, a reduction in greenhouse gas emissions can primarily be achieved through the use of 100% green electricity and by offsetting natural gas combustion emissions. This once again results in a reduction of 18 kg of CO_2eq.

Overall, the footprint of the R70-blue was reduced by 100 kg CO_2eq. compared to a standard wheel produced in Europe.