



SUSTAINABLE WHEEL STRATEGIES FOR CO2 SAVINGS

September 2023

SUSTAINABLE WHEELS MATTER

A partner for affordable, sustainable mobility

As we transition towards carbon neutrality, there's a growing need to address materials strategies. To make mobility sustainable, suppliers and OEMs must jointly address CO2 emissions. Maxion Wheels is ready to partner in this process.

ROADMAP ZERO, our strategy to achieve carbon neutrality by 2040, is already driving improvements in the energy efficiency of our processes and equipment – and the sourcing of renewable energy – positioning us well to develop more affordable sustainable solutions.

And we are working with customers and new partners on ways to move towards circularity. Our vision for a circular economy is one that protects and preserves resources, reuses valuable materials multiple times, and eliminates waste.

Partnership is essential. Real circularity requires investment, innovation, and agility. Maxion Wheels is continuously exploring new methods and processes that will give end-of-life wheels new life. We are taking responsibility and making this central to our strategic direction.

This white paper provides some insights into our latest work. I hope it will also foster further dialogue.



PIETER KLINDERS
CEO, Maxion Wheels

WHEELS MATTER

Up to 4% of a vehicle's cradle-to-gate CO2 equivalent footprint can be attributed to the wheel. Its production is energy-intensive, and the raw materials pose challenges. Increasing the share of sustainable and recycled materials in wheels by 2030 is a key circular economy ambition for Maxion Wheels.

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From sustainable options
to a circular economy

First of a new generation of
secondary aluminum wheels

Green steel fast-tracks
carbon reductions

Materials key to carbon
neutral wheels

SUSTAINABLE WHEELS MATTER

From sustainable options to a circular economy

Vehicle manufacturers and suppliers recognize their responsibility to act on climate change, reduce emissions across their entire value chain, and develop circularity in their sourcing models.

Wheels are a priority for action. Their production is energy-intensive, and the raw materials pose challenges. Significantly increasing the share of sustainable and recycled materials in wheels by 2030 is a key ambition for Maxion Wheels.

The transition towards a circular economy requires Maxion Wheels to optimize the use of primary raw materials, eliminate waste, and keep suitable automotive-grade wheel materials in circulation for wheel applications for longer.

“It will take many wins – large and small – to achieve carbon neutrality. Maxion Wheels is pursuing every possible gram of CO2 from our production processes, products, and purchases. The introduction of circular economy models is an essential part of our company’s future.”

PIETER KLINKERS, CEO, Maxion Wheels

UN GLOBAL COMPACT

Committed to real progress and transparent reporting, Maxion Wheels’ parent company, Iochpe-Maxion, is a signatory of the United Nations Global Compact, accounting for its environment, labor, human rights, and anti-corruption practices to recognized international standards.

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DATA DRIVING CHANGE

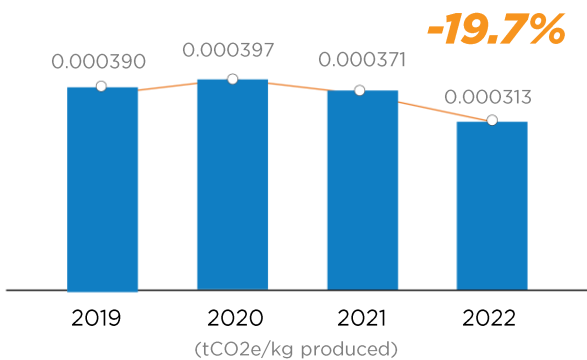
As the world's largest wheel supplier, Mxion Wheels is leading the process to reduce its CO2 equivalent footprint for this essential component. ROADMAP ZERO is our commitment and strategy to achieve carbon neutrality by 2040. By 2030, we will achieve a 70% reduction in Scope 1 and 2 CO2 emissions.

ROADMAP ZERO drives continuous improvements in the energy efficiency of our processes and equipment – and the sourcing of renewable energy. In 2022, through global investment in renewable energy supplies and energy efficiency advances, we recorded a reduction of 19.7 percent in our Scope 1 and 2 CO2 emissions intensity from our global operations against a 2019 baseline.

The sustainability of every wheel we produce is improving year on year. With life cycle analysis for every plant and soon to be part number, our CO2 data drives our journey towards carbon neutrality.

ROADMAP ZERO PROGRESS

In 2022, Iochepe-Mxion reduced Scope 1 and 2 emissions by 19.7 percent vs the 2019 baseline.



Source: Iochepe-Mxion 2022 Sustainability Report. Scope 1 and 2 data audited by Deloitte.

LEADERSHIP COMMITMENT

ROADMAP ZERO is our strategy to become the industry's first carbon neutral wheel supplier. This commitment is backed by \$400 million of sustainability-linked bonds issued by Iochepe-Mxion.



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DEMAND GROWS FOR SUSTAINABLE WHEEL OPTIONS

Analysis of the emissions for which Maxion Wheels is directly or indirectly responsible points to the need for actions and collaborations that will deliver real change. In the past, standards and regulations guided progress; today voluntary commitments and market forces are the main drivers.

On top of this, changing consumer preferences about climate change are helping to drive responsible sourcing, with OEMs responding with specific supplier sustainability requirements. Today, Maxion Wheels is actively running several customer programs that require specific sourcing for green energy and/or materials, and we know these requirements will continue to increase.

At the same time, wheels remain a big part of a car's visual appeal and, whether online or in a showroom, wheel options are still a key moment in buyer journeys.

For automakers committed to action, Maxion Wheels' renewable energy and sustainable materials sourcing already provides customers with lower-CO2 wheel options.

"Our life cycle analysis data highlights priorities for action and drives continuous advances. It also helps us work closely with value chain partners on research, concepts and pilots to deliver major CO2 reductions in series production."

MARK GERARDTS, Vice President, Global Sales and Marketing

MAKING PROGRESS

Maxion Wheels is on course to reduce Scope 1 and 2 CO2 emissions in 2025 by 30%, and 70% by 2030.

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First of a new generation of secondary aluminum wheels

Maxion Wheels' commitment to developing truly sustainable and affordable wheel options has produced a new generation of alloy wheels. Made using 100 percent secondary aluminum, sourced exclusively from recycled post-consumer alloy wheels, the 15" wheel demonstrates the scale of CO2 reductions possible – and the benefits of circular business collaborations.

Manufactured at Maxion Wheels light vehicle aluminum wheels plant in Santo André, Brazil, the pilot project uses the company's recycling partners and own energy-efficient melting process. Cradle-to-gate CO2 emissions for the finished wheel are 62 percent lower than for the same current alloy wheel produced using primary aluminum.

Maxion Wheels is developing partnerships to increase the number of wheels it can produce with secondary aluminum. Collaborations with customers are a critical step in realizing the full potential of circular sourcing models.



100% secondary aluminum and 100% renewable electricity were used to deliver a cradle-to-gate CO2 reduction of 62% when compared to the current series production wheel.

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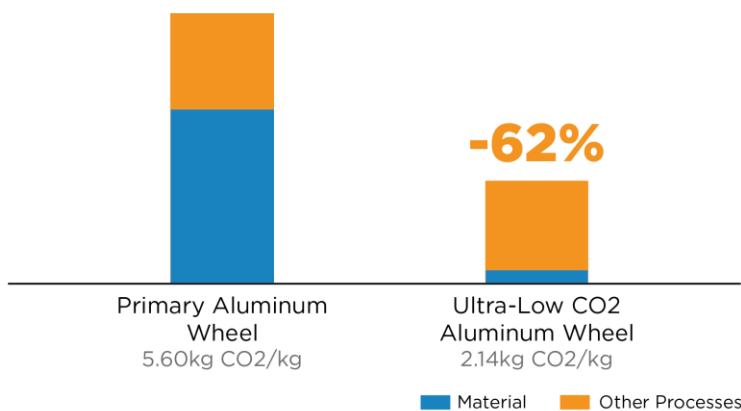
CIRCULAR CAPABILITIES PROVEN

The Brazil project followed an existing customer wheel design with the automaker defining the styling and specifications. The secondary aluminum was produced by recycling post-consumer alloy wheels. Maxion Wheels works with supply chain partners to source the wheels and separate them from other materials and contaminants.

The wheels are shot blasted, completely removing residual paint. Once clean, the aluminum wheels are melted, and the chemical composition adjusted to ensure the alloy meets OEM specifications.

USE OF POST-CONSUMER ALLOY WHEELS DRAMATICALLY REDUCES CO2

In 2023, using 100% post-consumer alloy wheels, Maxion Wheels reduced the CO2 equivalent footprint of a light vehicle aluminum wheel by 62%.



Source: Calculated and evaluated by LCA Studio, Prague (EF 3.1 GWP 100)

RESPONSIBLE SOURCING

Maxion Wheels has led wheel producers in joining the ResponsibleSteel and Aluminum Stewardship Initiative. Engaging in the work of these critical industry bodies, Maxion Wheels is helping shape industry standards and drive growth of certified sustainable material sources and grades.



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SCALING UP CO2 SAVINGS

Maxion Wheels has mapped CO2 equivalent emissions for the recycled material process to the same standards as for its series production programs. Produced in Brazil using hydroelectric power, CO2 emissions for the finished wheels are less than 2.14kg CO2 per kilogram of wheel. An identical wheel made in the same plant using primary aluminum would have a CO2 footprint of 5.60kg CO2 per kilogram of finished product. In Europe, low CO2 footprint requirements are on the average of 5kg to 8kg CO2 per kilogram of wheel.

The energy mix in Brazil makes our aluminum wheel facilities in Santo André and Limeira ideal sourcing locations for sustainable wheels. Although different locations naturally have different Scope 1 and 2 profiles, the benefit of substituting primary aluminum with 100 percent secondary material is universal.

Scaling up this project will be possible with further development of supplier capacity. The main barrier to mass production is cost and availability.

“Confidence in the performance and finish quality is no longer a question. The development of a new secondary material supply base is running fast, and strategies for greener raw materials purchasing are starting to solidify.”

GIORGIO MARIANI, Vice President, Global Supply Chain

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Low CO2 steel fast tracks greenhouse gas emissions reductions

Maxion Wheels' commitment to accelerate the reduction of CO2 equivalent emissions has led to the launch of a new generation of steel wheels. These wheels are the result of strategic partnerships with steelmakers that ensure new "green" steel grades are available in suitable material grades for wheel applications.

Produced at Maxion Wheels light vehicle steel wheels plant in Manresa, Spain, the ultra-low CO2 steel wheel demonstrates ample advantages over conventional steel. Cradle-to-gate emissions for the 16" electric last-mile delivery fleet wheel are 3.02kg of CO2 per kg of finished wheel. With low-CO2 steel and electricity from renewable sources, this figure falls to 1.19kg per kg – a 61 percent reduction.

For applications where every mile counts, steel wheels not only contribute to extending range, they also improve total cost of ownership providing fleet customers with a cost-effective sustainable solution.



Low CO2 steel and use of 100% renewable electricity produced a cradle-to-gate 61% reduction of CO2 equivalent emissions when compared to the current series production wheel.

LOW CO2 NEVER LOOKED SO GOOD

With the lowest CO2 footprint from a primary material, steel not only offers a fast track to sustainability, it also offers affordable style. Styled steel wheels with or without covers are a more environmentally friendly alternative to aluminum.

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A CLEAR PATH FOR ACTION

Phasing out the low-cost, higher emissions materials that help make mobility affordable is a challenge the automotive industry must solve if it is to create a carbon neutral future. Maxion Wheels is supporting vehicle manufacturers taking the first steps in this direction.

The focus to date has been on electric vehicles, primarily new premium models, and platforms. Not all vehicle fleets can achieve 100 percent electrification with many organizations seeking more affordable ways to deliver CO2 equivalent footprint reductions. A growing number are receptive to ideas on how to demonstrate action on climate commitments.

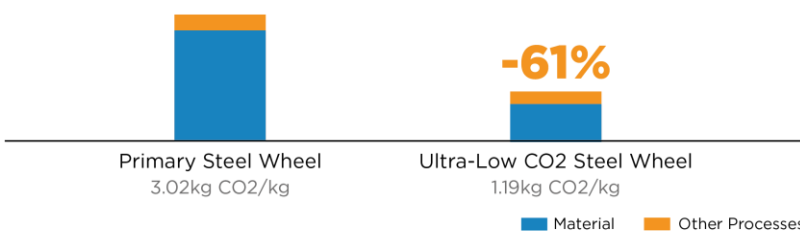
For the brands able to commit, strategic partnerships with suppliers and steelmakers that ensure new “green” steel grades are available for wheels will be a wise decision. Securing volumes of this affordable, sustainable solution should be a priority.

PRODUCING GREEN STEEL

The term “green” steel is not yet precisely defined as several paths are available. As steel producers work to reduce their environmental impact, energy sources for material processing will change to more renewables and the use of recycled scrap will increase.

GREEN METAL PROCESSING AND RENEWABLE ENERGIES RESULT IN LOWEST CO2 WHEEL SOLUTIONS

In 2023, using steel produced from blast furnace processing and recycled scrap, plus 100% renewable electricity, Maxion Wheels reduced the CO2 equivalent footprint of a light vehicle steel wheel by 61%.



Source: Calculated and evaluated by LCA Studio, Prague (EF 3.1 GWP 100)

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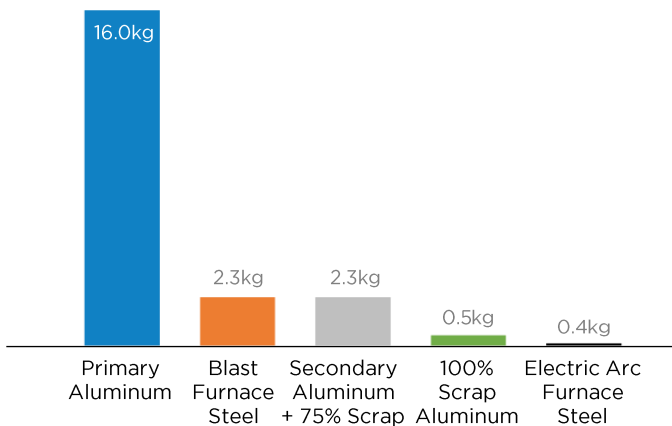
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Renewable energy can reduce the CO2 equivalent footprint of a wheel, but the biggest opportunity lies in the emissions-intensive raw materials wheels use. Around 75-85 percent of a wheel's CO2 footprint is from the raw material, regardless of whether it's steel or aluminum.

Conventional primary aluminum is the most CO2 equivalent intensive. For each kilogram of primary aluminum produced, depending on the energy source, 3.5 to 25 kg of CO2 is released into the atmosphere. Production of a kilogram of conventional primary steel emits 2 to 2.5kg of CO2. With conventional steel's significant advantage over aluminum, switching to steel can provide immediate reductions.

SUSTAINABLE MATERIALS: KNOW THE BENEFITS

Comparison of CO2 equivalent intensity of steel and aluminum production.



Source: Energy Transition Commission.

GREEN ALUMINUM

Maxion Wheels is developing partnerships to make 100% secondary aluminum wheels viable in series production. Collaborations with customers are a critical step in realizing the full potential of circular sourcing models.

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ALUMINUM'S CO2 BURDEN

As previously stated, production of aluminum is energy intensive. Around 80 percent of the emissions comes from converting aluminum oxide into aluminum. Electrolysis requires huge amounts of electricity and renewable sources for this are limited.

Aluminum is highly recyclable, however, and the recycling process is significantly more energy efficient than primary production. Melting scrap aluminum to produce secondary aluminum requires just five percent of the energy needed to make the primary metal.

STEEL'S SUSTAINABLE APPEAL

Lower-CO2 steel is possible as steel manufactures transition from traditional processes to new technologies, use of renewable energy sources, and an increase in the use of scrap

With a kilogram of low CO2 steel typically having a carbon footprint of around just 500g, the introduction of “green” steel wheels is a priority for CO2 equivalent reduction strategies.

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LOW CARBON LOCATIONS

For the overall footprint of the wheel, the local energy mix is the second largest factor in its CO2 footprint. For this reason, Brazil is likely to play a significant role in global emission reduction strategies. The country has a low-CO2 energy mix based on hydropower and biofuels with 80 percent of its electricity generated from renewable sources.

Considering a wheel's raw materials and production location have the greatest impact on a finished wheel's CO2 equivalent footprint, Maxion Wheels' global network of 24 production facilities from Brazil to China, each with its own energy mix, enable us to reduce our overall footprint and offer customers multiple sourcing options.

"The remarkable success of our ultra-low CO2 sustainable wheel projects is proof series production of affordable, sustainable wheel solutions is possible — today."

RALF DUNING, Vice President, Global Engineering

MAXION WHEELS YOUR PARTNER FOR AFFORDABLE SUSTAINABLE MOBILITY

As the world's largest and most advanced producer of vehicle wheels, Maxion Wheels is working to develop the broadest range of affordable, sustainable wheel solutions. Whether you are producing economy cars, last-mile delivery fleets or luxury sedans, reducing the carbon footprint matters to us all.

GREEN POWER

By 2030, 90% of our electricity will be from renewable sources. In 2022, we already reached 37%. We continuously improve the energy efficiency of our processes and operations.

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