

# Rust-free Ride: Zinc Galvanisation's Role In Vehicle Durability

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Zinc is driving a new era of efficiency, sustainability and innovation in the global automotive sector

With India cementing its position as the fourth-largest automobile market in the world, the need for durable, high-performance, and sustainable materials has become more pressing than ever. As of 2022, India had over 354 million registered vehicles, making material innovation essential for efficiency and longevity. However, despite the country's strong automobile production capabilities, vehicle quality is often compromised due to corrosion—one of the biggest threats to the vehicle's structural integrity. Ensuring vehicle durability is critical for the consumer, as a car is often the second-largest investment after a home. The most effective solution to combat this issue lies in zinc-coated (galvanised) steel.

Steel constitutes nearly 70 per cent of most vehicle bodies, making them highly susceptible to rust and degradation, particularly in India's harsh climatic conditions which are characterised by high humidity, warm temperatures, coastal sea salt, and prolonged periods of rain and slush. Further, Indian cars are mostly parked outdoors and are exposed to extreme weather conditions. In recent years, new vehicles have been reported to experience visible rusting within just 2 years of purchase.

Zinc galvanisation—a process that coats steel with a protective zinc layer—significantly enhances resistance to corrosion, ensuring longevity even in harsh environments. Globally, galvanised steel is extensively used in critical automotive components such as body panels, chassis, and undercarriages, providing superior crash resistance, structural stability, and an extended vehicle lifespan. When steel sheets are galvanised, zinc create a metallurgical bond with steel that offers long-term corrosion protection. During erratic climate conditions, car models utilising galvanised steel can stand the test of time as zinc extends the lifespan, safety, durability, and resale value of cars.

Despite its proven advantages, zinc galvanisation remains significantly underutilised in India. While nearly 80 per cent of exported vehicles are galvanised, only 0-25 per cent of domestically sold vehicles undergo the same treatment. Research by IIT Bombay and the International Zinc Association shows that non-galvanised vehicles can experience up to 65 per cent corrosion within five years, compared to just 7 per cent for galvanised ones. This stark contrast reinforces the need for widespread adoption of high-quality zinc galvanisation in domestic manufacturing to align with global safety and quality standards. While India has begun incorporating galvanised and galvanized steel into body panels, this remains largely confined to export models, leaving domestic vehicles more vulnerable to long-term damage—one reason why they often lack anti-perforation warranties.

Beyond corrosion resistance, zinc galvanisation offers economic advantages for both manufacturers and consumers. For car manufacturers, longer-lasting vehicles enhance brand reliability and foster greater customer trust, allowing them to compete more effectively on the global stage. For consumers, galvanised cars come with 'anti-perforation' warranties, often referred to as 'corrosion-free warranties' by automotive manufacturers. These warranties cover anti-perforation, as well as cosmetic paint fading and peeling. In other parts of the world, auto manufacturers offer cosmetic and anti-perforation warranties for five and ten years, respectively. Such warranties are only possible when car body parts are made from galvanised (zinc-coated) steel.

Recognising this, Indian automakers need to increasingly prioritise zinc coatings in the body-in-white (BIW)—the vehicle's structural skeleton—alongside various attached components. The responsibility for the zinc galvanisation of a car body lies with manufacturers, as it can only be done at the production stage. Paint and post-purchase anti-rust treatments are ill-equipped, as any chipping or peeling can lead to the exposure of steel to air and moisture, causing it to rust rapidly. When steel undergoes hot-dip galvanisation, it creates a barrier between the harsh environment and the steel body of the car that ensures long-term corrosion protection. Car bodies built with galvanised steel perform exceptionally well in extreme conditions, offering enhanced durability, lower maintenance costs, and better resale value.

Yet, cost perception remains a key obstacle for the widespread adoption of galvanised steel. Indian consumers often opt for vehicles with conventional paints and coatings, assuming them to be more cost-effective. However, unlike paint and other surface coatings, which can chip and peel, zinc provides sacrificial protection—meaning even if the coating is scratched or dented, it continues to prevent steel from corroding. Importantly, the additional cost of using galvanised steel in car bodies is less than 0.1 per cent of a vehicle's selling price, and this minor investment is recovered within a year through reduced inspection, maintenance and repair costs.

As consumers begin to prioritise long-term durability over upfront cost savings, manufacturers will be compelled to offer domestically the same high-quality vehicles they export globally. Consumer behaviour suggests that car buyers are happy to pay premia for cosmetic features of cars and with a little awareness, they will be more than happy to own corrosion-free cars.

Zinc's significance in the automotive sector extends beyond corrosion protection. It plays a crucial role in multiple applications, from die-casting alloys for vehicle components to advancements in battery technology and tire manufacturing. Zinc alloys such as Hindustan Zinc Die Casting Alloy (HZDA3 & HZDA5) provide superior castability and finishing quality for plating and painting. These properties enable the production of sturdier, fuel-efficient vehicles with improved safety. Common zinc-based components include gear racks, door handles, motor chassis, steering bodies, gear housings, foot pedals, and sliding door levers. Moreover, other emerging areas of zinc application are offering early promise in the form of zinc-based batteries, zinc-oxide in tire manufacturing, zinc-oxide infused bio-composites instead of traditional glass-fibre components, zinc-base lubricant additives for engines, among others.

The global demand for zinc in the automotive sector is projected to grow by 22 per cent by 2030, driven by increasing consumer demand for corrosion-resistant and energy-efficient vehicles. The Asia-Pacific region—led by India and China—is at the forefront of this growth, fuelled by rapid industrialisation and urbanisation. With the rising aspirations of India's burgeoning middle class, there is a clear opportunity for car manufacturers to bridge the gap in zinc adoption and bring the automotive industry in line with global standards.

For India's automotive sector to achieve global benchmarks in durability and safety, both consumers and manufacturers must drive the shift toward zinc galvanisation. While government initiatives like Bharat NCAP safety ratings encourage the use of galvanised steel by rewarding vehicles with higher safety scores, real change will come from market demand and industry leadership. As India's automotive sector continues to evolve, prioritising quality and longevity over short-term savings will be key. A galvanised future is not just about protecting vehicles—it's about ensuring a safer, more reliable, and sustainable journey for everyone on the road.

*The above article has been written by Arun Misra, CEO & Whole Time Director of Hindustan Zinc*

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