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"As India becomes the fourth-largest automobile market, the need for durable materials like zinc for galvanization is crucial for enhancing vehicle performance, sustainability, and safety."

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"India's rise as the fourth-largest auto market highlights the need for durable materials like zinc to boost vehicle performance and safety." (Image: FE)



By Professor Anand S. Khanna

As India emerges as the fourth-largest automobile manufacturing market in the world, as per reports by Infomeric, the demand for durable and safe materials in vehicle production has become critical for achieving optimal performance, sustainability, and fuel efficiency. Nearly 80% of most vehicle bodies are composed of steel, which is highly susceptible to corrosion, leading to deterioration of the vehicle's structural integrity. Zinc, the world's fourth most consumed metal, offers numerous benefits in the automotive sector, primarily through zinc galvanization.

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With the rising aspirations of India's burgeoning middle class, automakers are increasingly pressured to produce vehicles that meet global standards while addressing local consumer needs. Informed consumers are now seeking vehicles with 'corrosion-free' or anti-perforation warranties. In response, car manufacturers are incorporating more zinc-galvanized body parts to align with customer demand and international benchmarks.

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Galvanization involves applying a layer of zinc to steel to protect it from corrosion, enhancing its durability, longevity, and structural integrity. Zinc-galvanized steel provides superior corrosion resistance, particularly in regions exposed to erratic weather, including heavy rainfall, heat, humidity, salt, and extreme pollution. This protection significantly extends the lifespan of vehicles. Zinc shields steel from pollutants such as CO2, SO2, and chlorides, and it can withstand up to 1,000 hours of salt spray testing.

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While the initial cost of zinc-galvanized vehicles may be slightly higher, it saves consumers from costly repairs, maintenance, and replacements in the long run. However, consumers must actively demand zinc-galvanized vehicles, as the responsibility lies with manufacturers to integrate galvanized steel during production. It is crucial that consumers inquire about anti-perforation warranties and factor that into their purchasing decisions. Post-purchase anti-rust coatings or paints are not reliable, as they chip and peel, exposing steel to corrosion. In contrast, zinc galvanization forms a durable bond with steel, offering self-healing properties that ensure continued protection even if perforations occur.

Research by the International Zinc Association and IIT Bombay suggests that non-galvanized vehicles can experience up to 65% corrosion within five years, whereas vehicles using galvanized steel see just 7% corrosion over the same period. Globally, the demand for zinc in the automotive sector is forecasted to increase by 22% by 2030, driven by consumers' growing preference for corrosion-resistant vehicles. In India, this trend is becoming more evident as the automotive industry strives to meet global standards and combat harsh climatic conditions.

While international markets like North America, Europe, and Japan use zinc-coated bodies in over 90% of their vehicles, adoption in India lags at around 20-25%. Interestingly, nearly 70% of vehicles that India exports are zinc-coated, but this is not the case for cars produced for the domestic market. As India strives to become the world's largest automobile manufacturing and consumption market, the role of zinc in combating corrosion is becoming increasingly critical.

Zinc-galvanized steel provides superior protection against harsh environmental conditions, making it essential for long-lasting vehicle durability. Automakers must prioritize zinc coatings to meet growing consumer demand for reliability and longevity. Consumers, too, can safeguard their investments by choosing vehicles with anti-perforation warranties, ensuring their cars withstand the test of time. The cost of galvanization is minimal compared to the overall cost of a vehicle, yet it guarantees long-term protection against India's humidity, salt, and other harsh conditions, offering tremendous value to both manufacturers and consumers.

To be attributed to Professor Anand S. Khanna, Retd., IIT Bombay- Metallurgical Engineering Department, Chairman SSPC India

About the Author: Prof. A.S. Khanna, a globally renowned expert in surface engineering and materials science, served for 27 years at the prestigious IIT Bombay, mentoring 27 Ph.D. scholars and over 150 Master's and B.Tech. projects. His groundbreaking research, with 350+ publications and 4,500 citations, spans Organic Paint Coatings, Nanotechnology, and Graphene Manufacturing. He is the author of three authoritative books on coatings and corrosion. Currently, as Chairman of SSPC India, he drives innovation in surface engineering. Prof. Khanna's numerous national and international honors underscore his enduring global influence and leadership.

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