Galvanizing in Cars

Round Table

Dec 21 ,2015

We all love our cars !

We all need our cars….

Sometimes more than our Girlfriend !

Agenda

- Car coatings : Present Status
- Galvanizing : Value proposition
- Cost benefit
- Case Study : US Light weighting challenge
- Hyundai Success Story
- IZA GAP program
- IIT Mumbai Study on Indian Cars : Gravity of the problem
- Role of Hindustan Zinc Ltd
- Open house

Galvanizing in Indian Automobiles

A joint initiative by

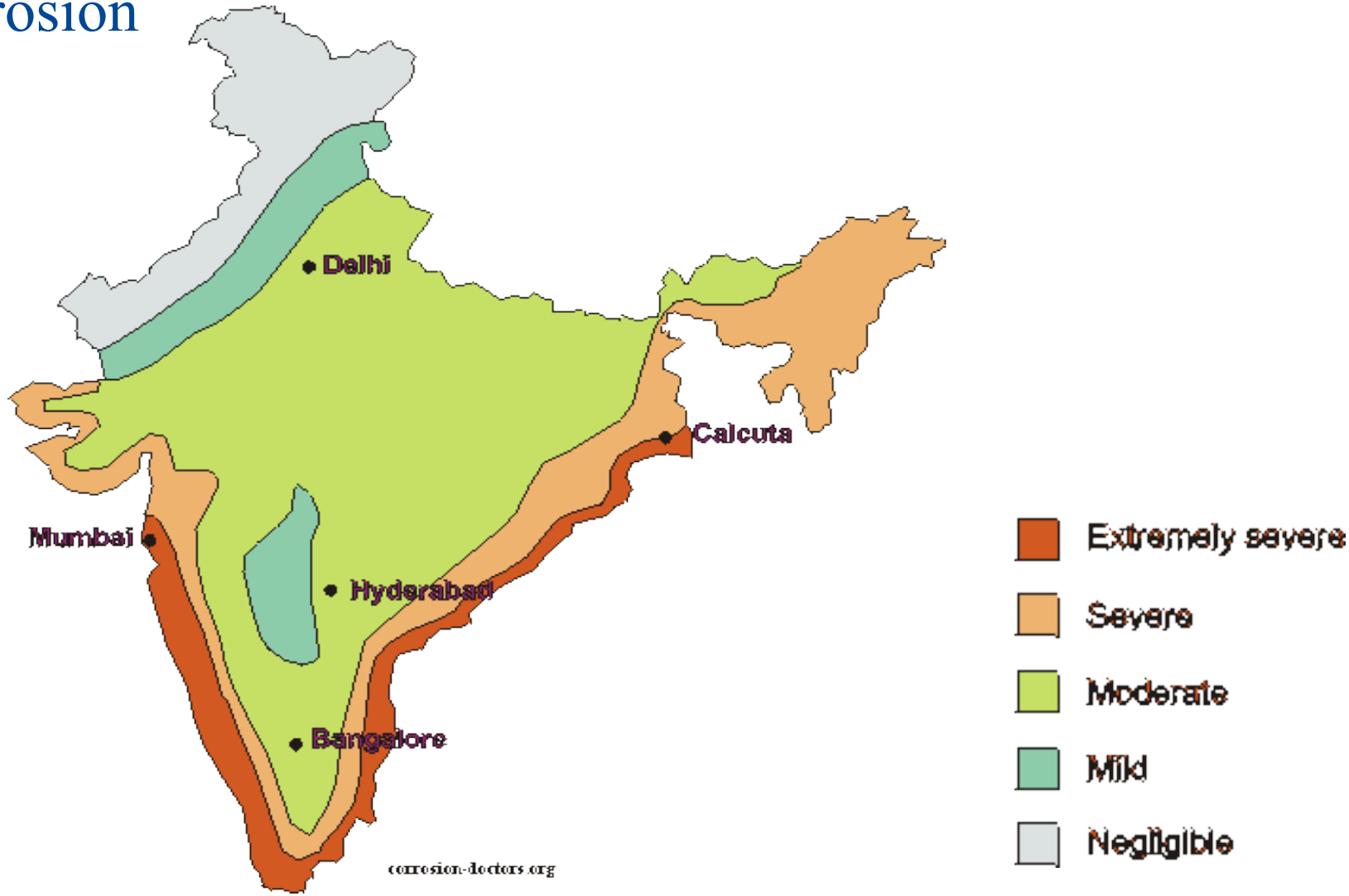
Hindustan Zinc Ltd

International Zinc Association

*Car buyers in Europe, North America, Korea and Japan have long benefitted from unique protection warranties for decades….. Isn't it time for **Indian consumers** ?*

1. India is the 6th largest car manufacturer in the world
2. Global standards are : Anti perforation warranty for up to 12 yrs
3. Galvanizing : The right Starting material for perforation warranties
4. Improved Safety performance of the car
5. Leads to weight reduction & reduced emissions
6. Improved fuel efficiency
7. Reduction in TCO/ Life Cycle cost

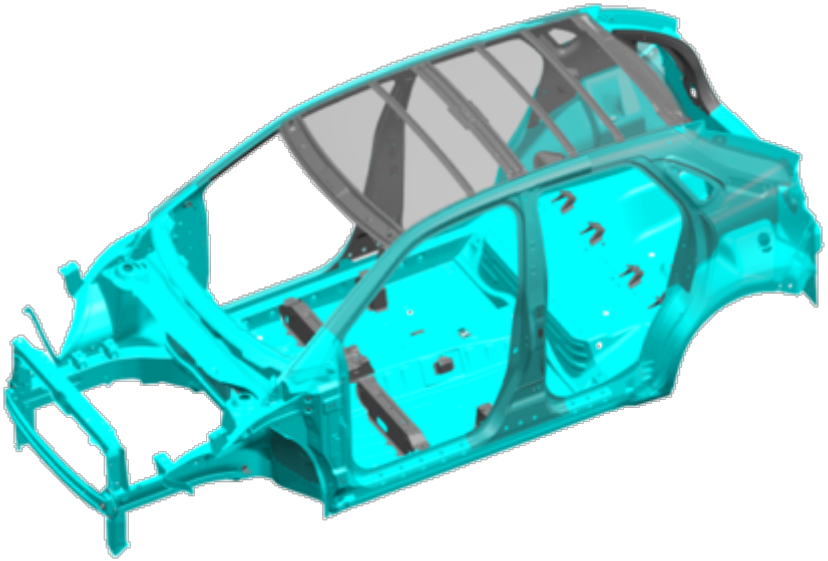
In India more than 5% of GDP is lost every year to corrosion



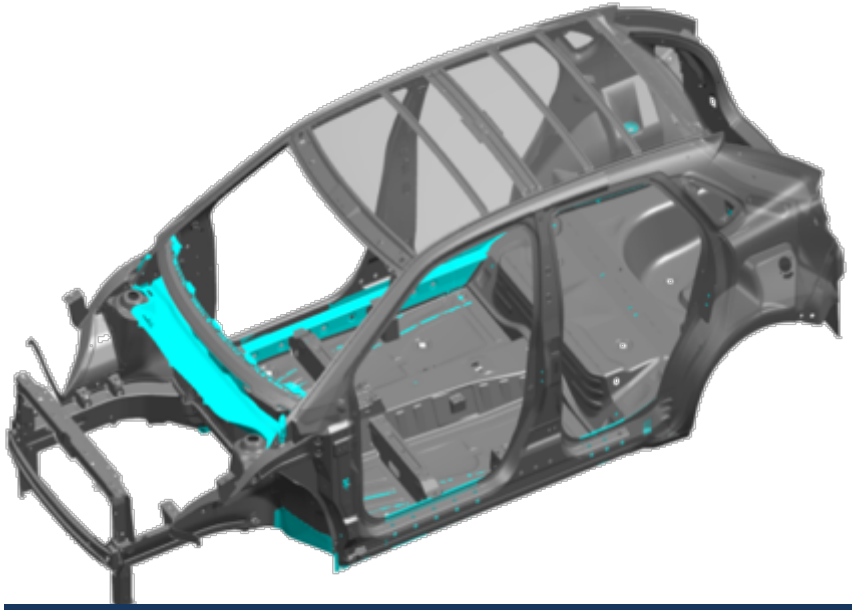
Cars are no exception to corrosion!

Automobile Industry: Present Scenario

- Galvanized steel has been used for decades in Europe, NA, Japan & Korea for body panels and anti perforation warranties are very common
- Indian cars are made from Coated Steels, give the look and feel of International cars, but do not give anti perforation warranties
- India has started using galvanized and galvanneal steel for body panels, but only for export models



For Exports, 70% of body in white (blue) is galvanized

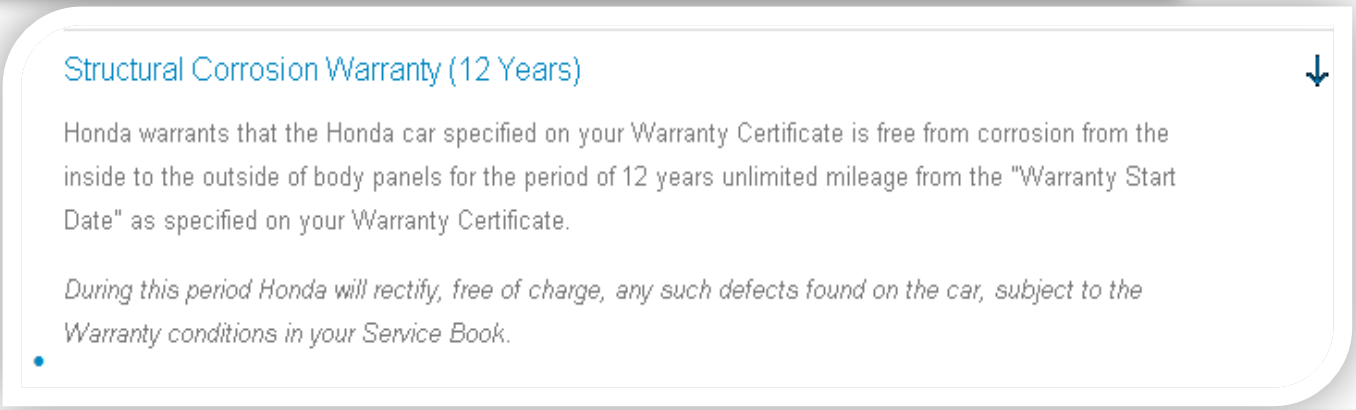


Domestic models, 3% is galvanized, in new models up to 20% is galvanized

How Galvanizing leads to anti Perforation Warranties

- **Galvanizing is a controlled coating of Zinc on Steel in order to protect it from Corrosion**
- **Zinc sacrifices itself to protect the strength and safety of steel in the automobile body in white**

Galvanized Steel : *The right* ***STARTING MATERIAL*** *for car bodies*



Est. Cost – Benefit Analysis

The overall benefit to the automaker to convert a 400 kilogram car body-in-white from cold rolled steel to galvanneal is estimated to offset the higher material and processing cost

Factor	Cost estimate (INR/car)
50G/50G coated steel for entire BIW	4,500
Shorter welding tip life & tip dressing	2,500
Higher utility costs for welding (kwh)	2,000
More frequent die maintenance	4,000
Additional body shop finishing	1,000
Extra Zn phosphate consumption	500
TOTAL COST EXTRA	**14,550**

Factor	Cost Benefit (INR)
Resale of large offal (body sides, doors) to appliance, IT & construction	600 (25%)
50% reduction in warranty claims	750
Reduced usage of waxes, sound absorption epoxies, and lower housekeeping costs	240
Warranty extension marketing opportunity	Potential revenue stream
Market share protection	Soft benefit
CAFÉ improvement through lighter BIW as a result of item 3	240
Improved car inventory control at assembly line (no difference in domestic vs. export models	200
Opportunity to generate new revenues by eliminating need by consumer to buy aftermarket undercoating, UV "Permashine" paint protection	10,000
No annual inspection requirements by car buyer	2500
TOTAL COST BENEFIT	***14,530***

* *Industry Estimates*

All this at what cost ?

Benefits of Galvanizing

- Corrosion resistance / Anti perforation warranties
- Very low maintenance / annual inspection

Cost

- ***0.02%*** of the cost of the car
- One time cost with minimum maintenance / touch up

Costs in INR / car	**Non Galvanized**		**Galvanized**	
	Est. Price	Towards	Est. Price	Towards
Year 1	7000	Initial coatings (Teflon/ UV protection/ Underbody)	9000	Galvanized Anti perforation / surface rust warranty up to 5 years
Year 2	1000	Maintenance		
Year 3	3500	Repeat teflon		
Year 4	1500	Maintenance		
Year 5	3500	Repeat teflon		
Year 6	2500	Maintenance	1000	Only touch up
Total Cost : 6 yrs	19,000		10,000	

The Road Ahead

Learning from International Auto makers

The Road Ahead

Cooperative Initiatives:

- ❑ World Steel Future Steel Vehicle
- ❑ IZA Galvanized Auto body Partnership (GAP)

FutureSteelVehicle

1.State-of-the-future development process

2. 177 kg body structure mass - *39% mass reduction*

3.97% use of HSS and AHSS

4.Nearly 50% GigaPascal steels

5.Enables 5-star safety ratings

6.Nearly 70%Total Lifetime Emissions Reduction

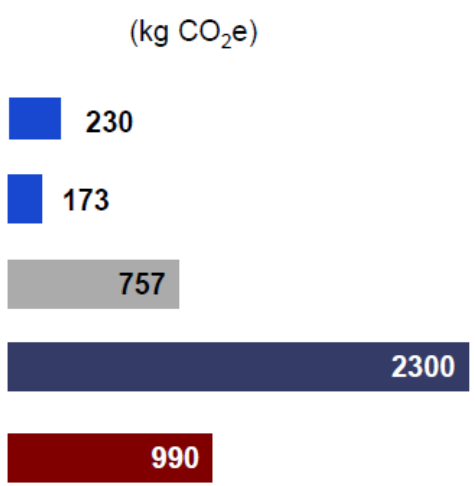
7.Mass savings at no cost penalty

8. Near-term production-applicable solutions

Reduction in Emissions & Light Weighting Go Hand in Hand

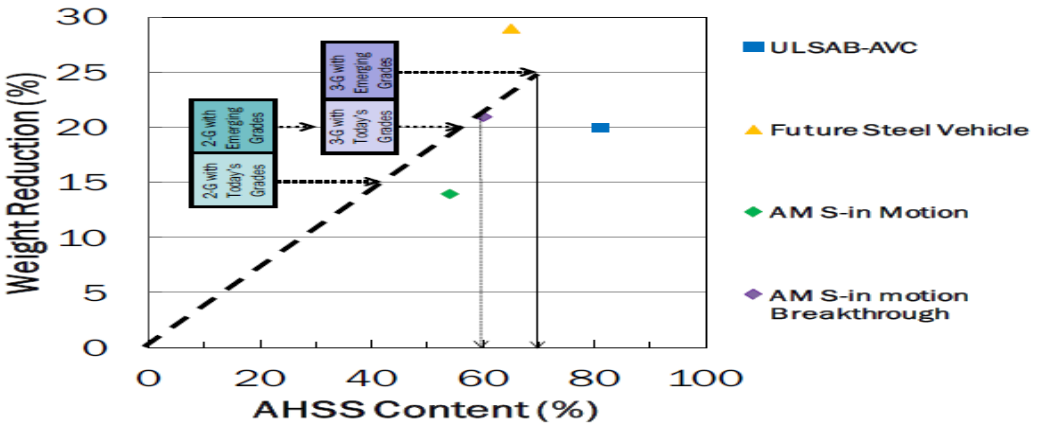
Material Production GHG comparison for a functionally equivalent component - ***example***

	Mid-Range CO_2e	Estimated Part Weight (kg)
Mild Steel	2.3	100
Advanced High-Strength Steel	2.3	75
Aluminium	11.3	67
Magnesium	46.0	50
Carbon FRP	22.0	45



Use of Advanced High Strength Steel (AHSS) leads to significantly lower emissions

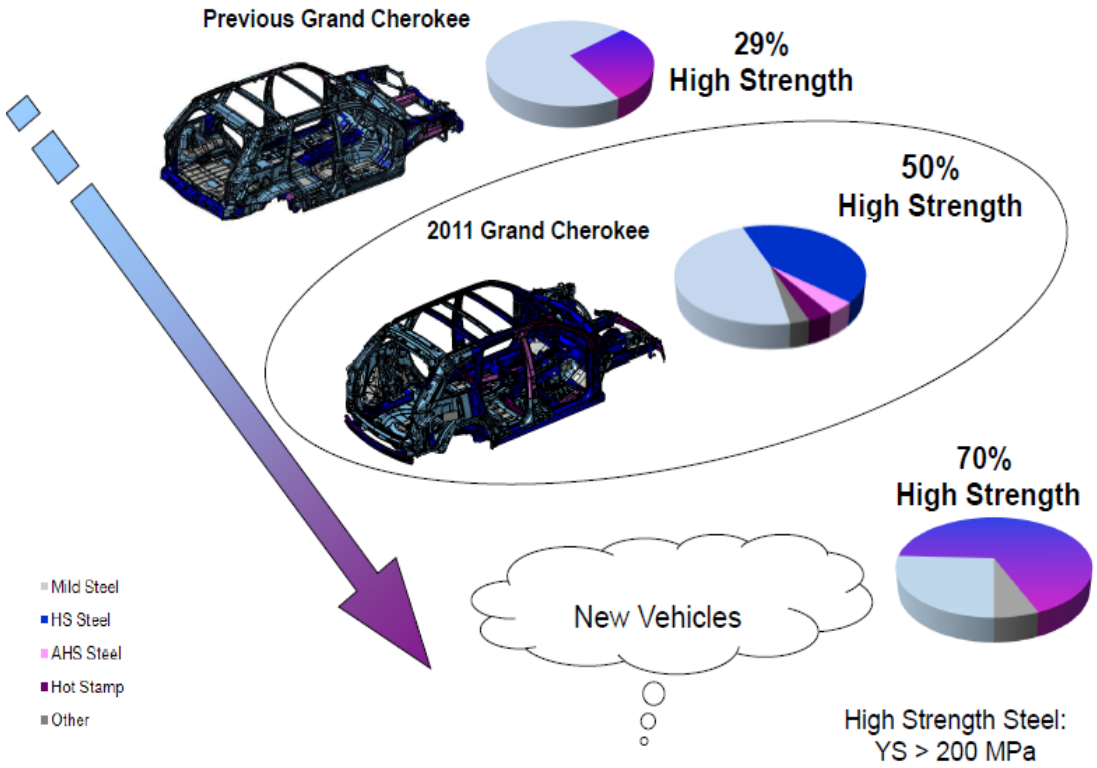
How much weight reduction can steel provide?



Reduction in Emissions & Light weighting Go Hand in Hand

USA CAFE regulations (54.5 mpg by 2025)
Similar for Europe: 95g/km of emissions by 2021

Calls for more use of Advanced Steel



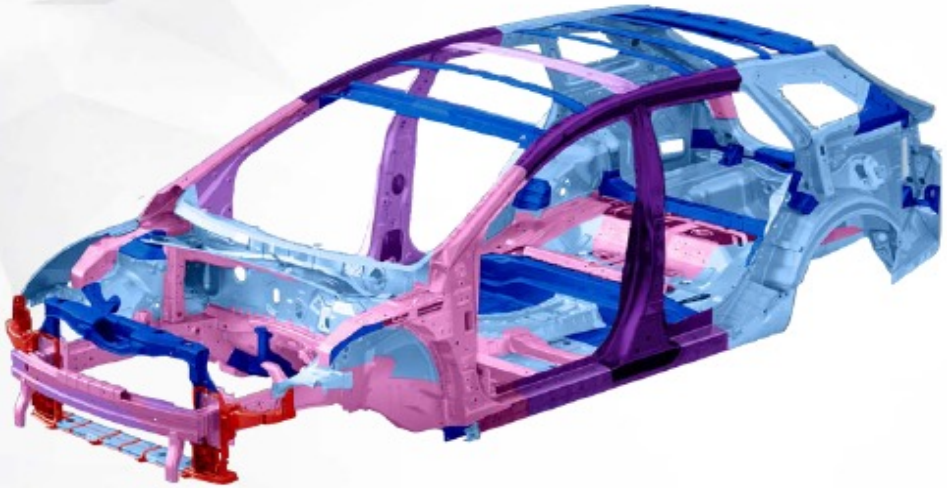
Reduction In Emissions & Light Weighting Go Hand In Hand

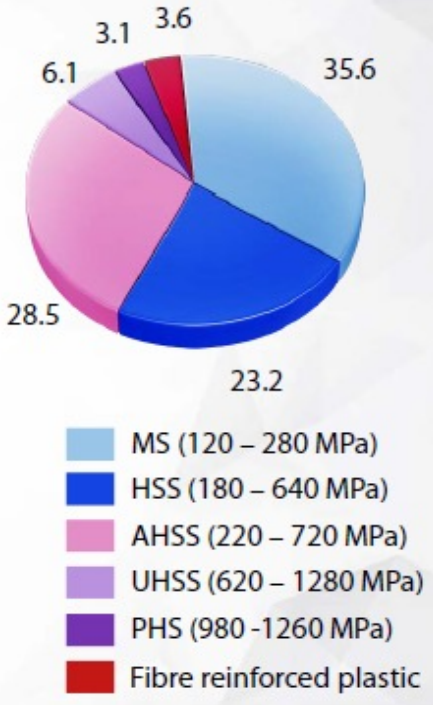
HYUNDAI | NEW THINKING. NEW POSSIBILITIES. i40

Product Concept / BIW Concept

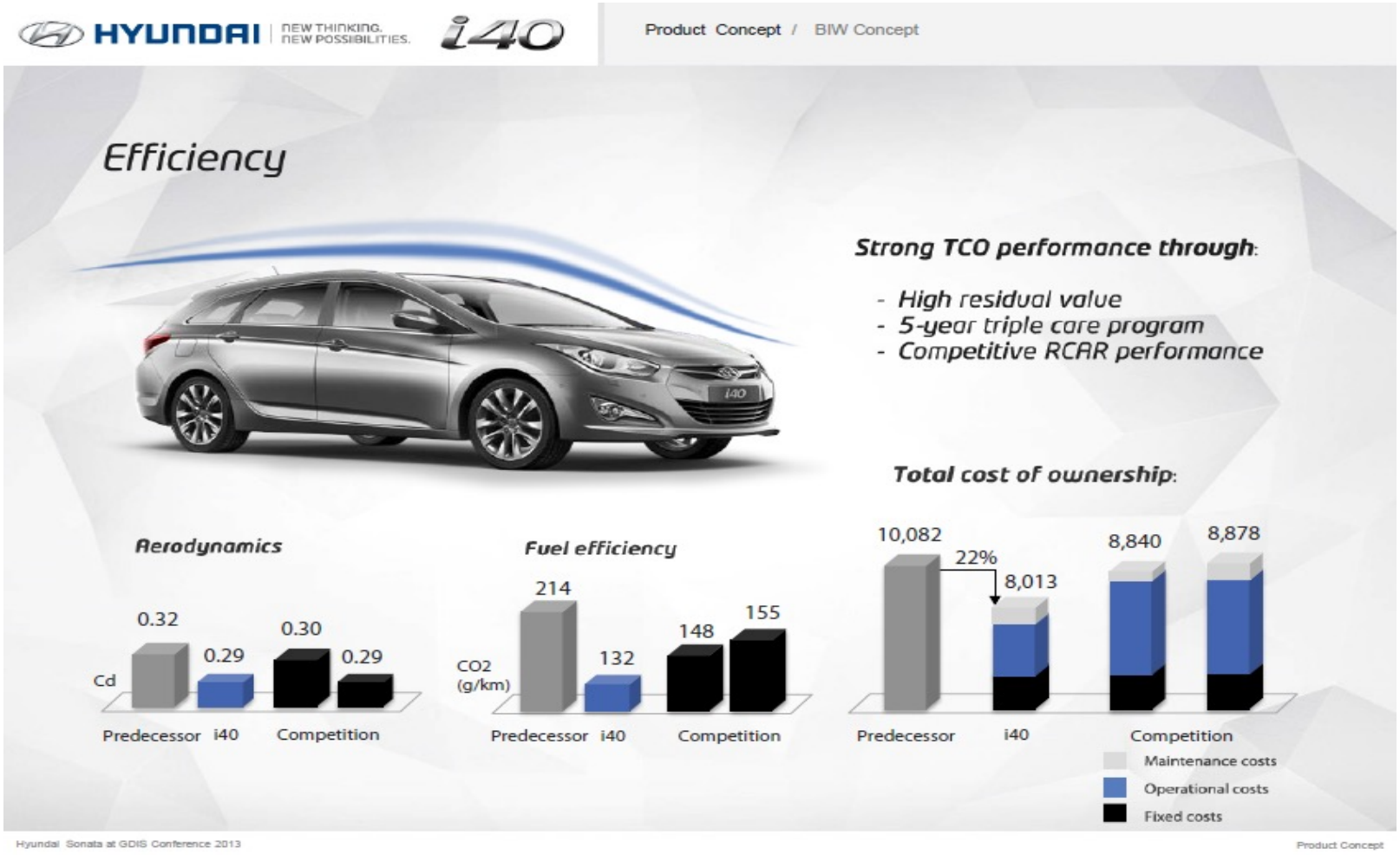
Weight optimization

- Achieved a 7.6% reduction in BIW weight compared to predecessor.





Lower TCO and Improved Fuel Efficiency



Future Ready Cars: Improved Safety with High Strength Steel

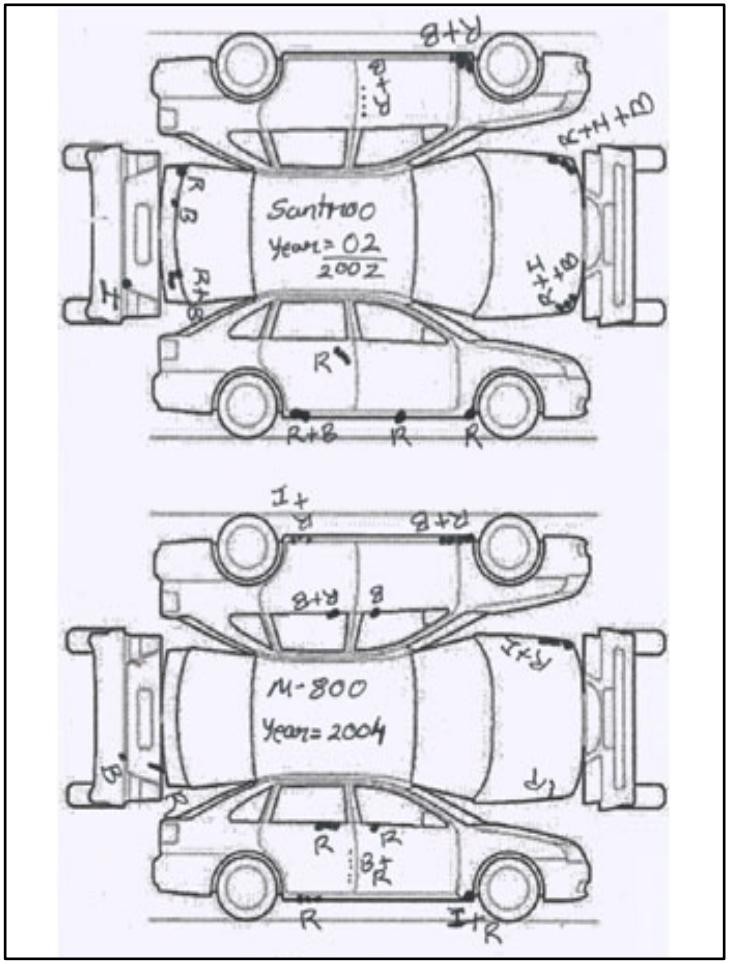
IZA GAP program & GAP Members

19 Global Steel Companies
7 Equipment Suppliers, 1 Automaker, and IZA Members
Funding of USD 1Mn +

The Indian Perspective

Learnings from study by IIT Bombay

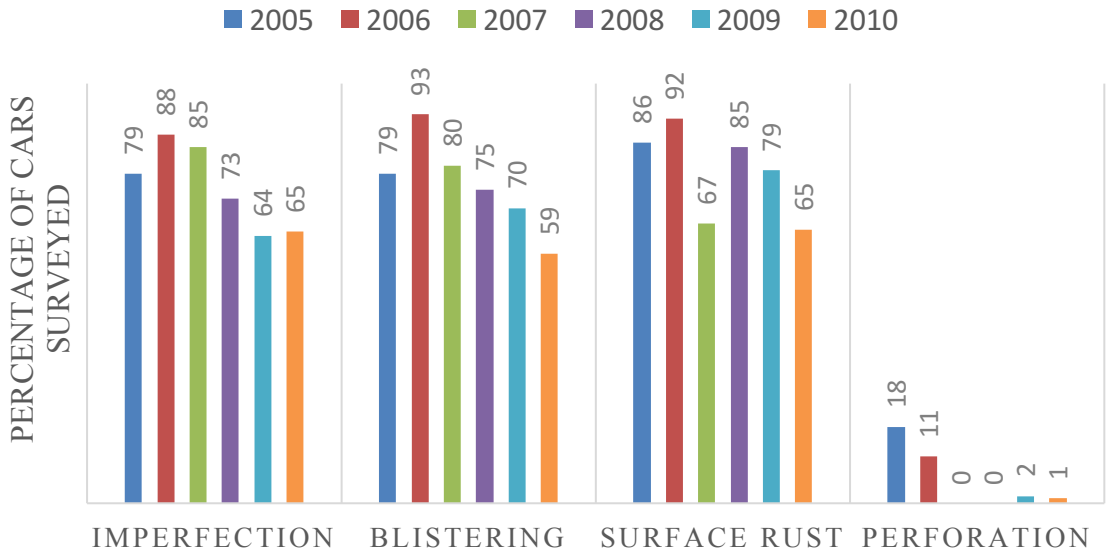
Corrosion in Indian Cars



Schematic diagram of car panels used for survey
R-Rust, B- Blister, I - Imperfection

- The surveys involved inspecting ~ 500 passenger vehicles (less than INR 10 Lakh) ranging in age from 5-10 years old
- The parking lot survey methodology used in conduction this project was similar to that used in previous work conducted in North America in the 1990s
- This allowed comparisons to be made from the North American surveys and this particular Indian Survey
- Coastal areas in Mumbai were chosen for the survey with high density of passenger cars
- Corrosion imperfection categories were : **Blisters, Surface Rust & Imperfections**
- Car body exterior was examined and 4 major corroded areas emerged : **Bonnet** (hood), **Boot** (deck lid) or Hatchback, **Rocker** (Sill) Panel, **Door panels** around the handles

Survey Findings

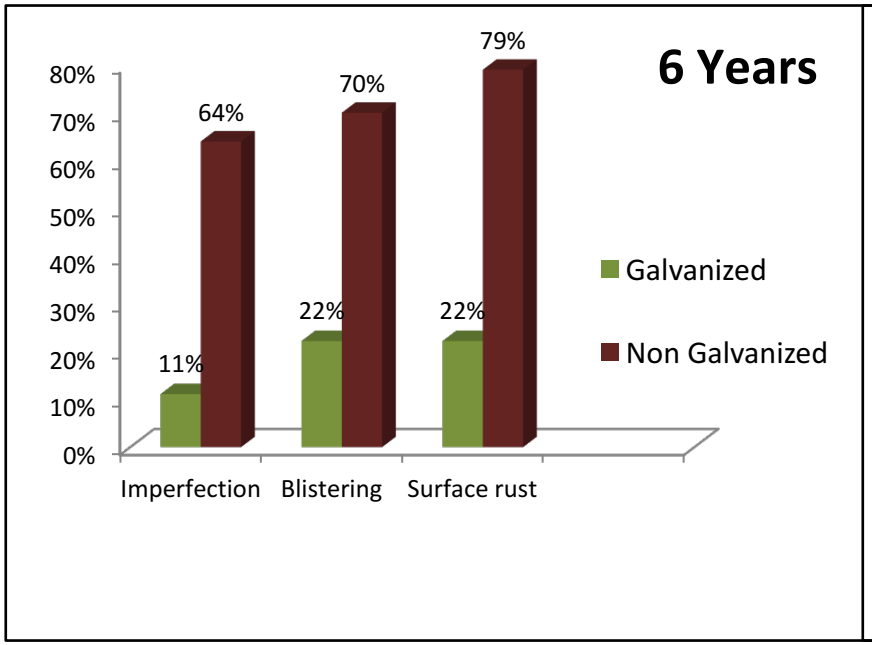


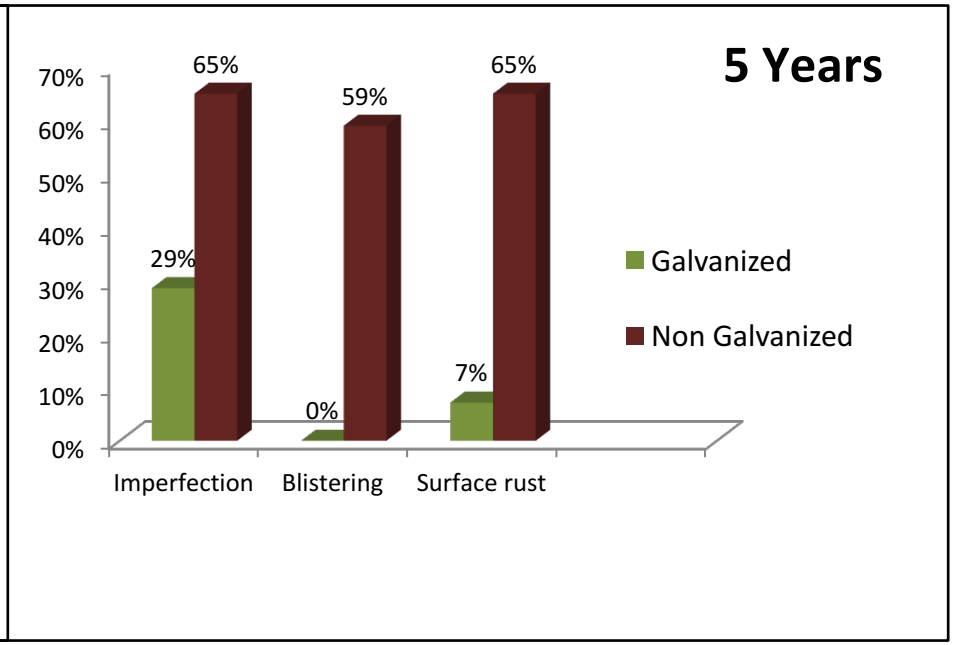
- Graphical representation of the survey summary according to approximate ages, quantity (% of car inspected) and imperfection type
- Significant increase in imperfections after vehicle age of 5 years & above

	Imperfection		Blistering		Surface Rust		Perforation	
	No.	%	No.	%	No.	%	No.	%
Door Handles	124	27%	134	29%	110	24%	9	2%
Bonnet	117	26%	126	28%	180	39%	4	1%
Boot or Hatchback	83	18%	92	20	129	28%	8	2%
Rocker (Sill) Panel	145	32%	159	35%	183	40%	4	1%

Quantity (No.) and Percentage (%) of vehicles exhibiting imperfection for various parts of the vehicle

Survey findings: Galvanized (Small set) vs Non Galvanized





- *Galvanized cars show significantly improved performance (nearly 60%-70%) as compared to non- galvanized cars of the same model year*
- *These results signify the importance of galvanization in automotive steel*

Gravity of the Problem

5+ year old cars on Indian roads today

More than 60% have a problem of surface rust

27 Lakhs

Surface Rust

Reduces steel strength ; a concern for car safety

Reduces fuel efficiency; causes more emissions

More Maintenance cost

Impact on Indian Automobile Industry

- **India is all set to become the fourth largest automotive producer in the world by 2020**
- **Automotive sector is the second largest market for steel consuming about 10million tons of steel and will only grow in coming years**
- **With the increasing demand of automotive vehicles, there will be a growing demand of steel, which forms nearly 70% of the whole car body weight**
- **The performance and longevity of these steel parts will be an important factor to gauge the overall performance of these automotive vehicles.**
- **With these trends, it is imperative to focus on quality and reliability of the automotive body steel parts, and hence its overall performance**

Reference: 1) Steel perspectives for the automotive industry, P. Blain
2) Metals and Mining Sector Report, 2015, India Brand and Equity foundation

Leading the Way

Hindustan Zinc Limited

1st Rampura Agucha Largest zinc mine globally.

2nd Largest zinc-lead miner globally with:

9 million+ MT of ore production capacity

Core Strengths

Reserves & Resources base of 365.1 million MT ensuring mine life of 25 year
Integrated metal production supported by captive power plants
Low cost of operations driven by quality assets and multi-metal recovery
Market leadership in India with strong presence in emerging economies of Asia

Sustainable Development

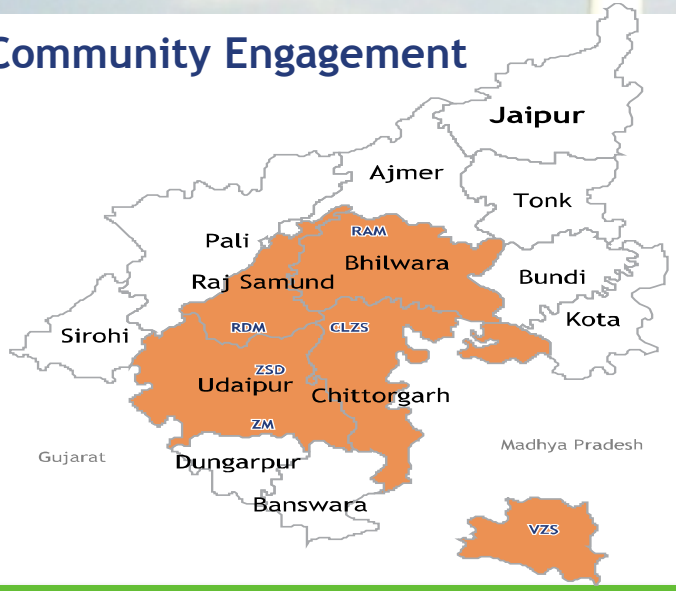
Green Energy

HZL is one of **India's largest wind power producers** with a generation capacity of around **274 MW**

Registered under the United Nations Framework Convention on Climate Change's **(UNFCCC)** Kyoto Protocol for Clean Development Mechanism **(CDM)**

Total annual certified emission reduction (CER) potential of over **497,000 MT of CO2**

Community Engagement



Fostering Self-Reliance through Community Development

- Reaching to more than half a million people in Rajasthan
- Positively impacting lives of more than 100,000 families in 358 Villages in Rajasthan
- Members of United Nations Global Compact (UNGC), TERI-BCSD (Business Council for Sustainable Development) and National Population Stabilization Fund
- CSR initiatives undertaken on local needs of the community focusing on:
  - Health & Nutrition
  - Education
  - Water & Sanitation
  - Sustainable Livelihood
  - Agriculture & Livestock Development
  - Women Empowerment

Diverse Product Portfolio

Zinc

- Special High Grade (SHG) 99.995% under (4 LME registered Brands)
- **Continuous Galvanising Grade (CGG) for Automotive Steels**
- High Grade (HG) 99.95%
- Prime Western (PW) 98.65%

Lead

LME registered under the brand name of "Vedanta 99.99“.

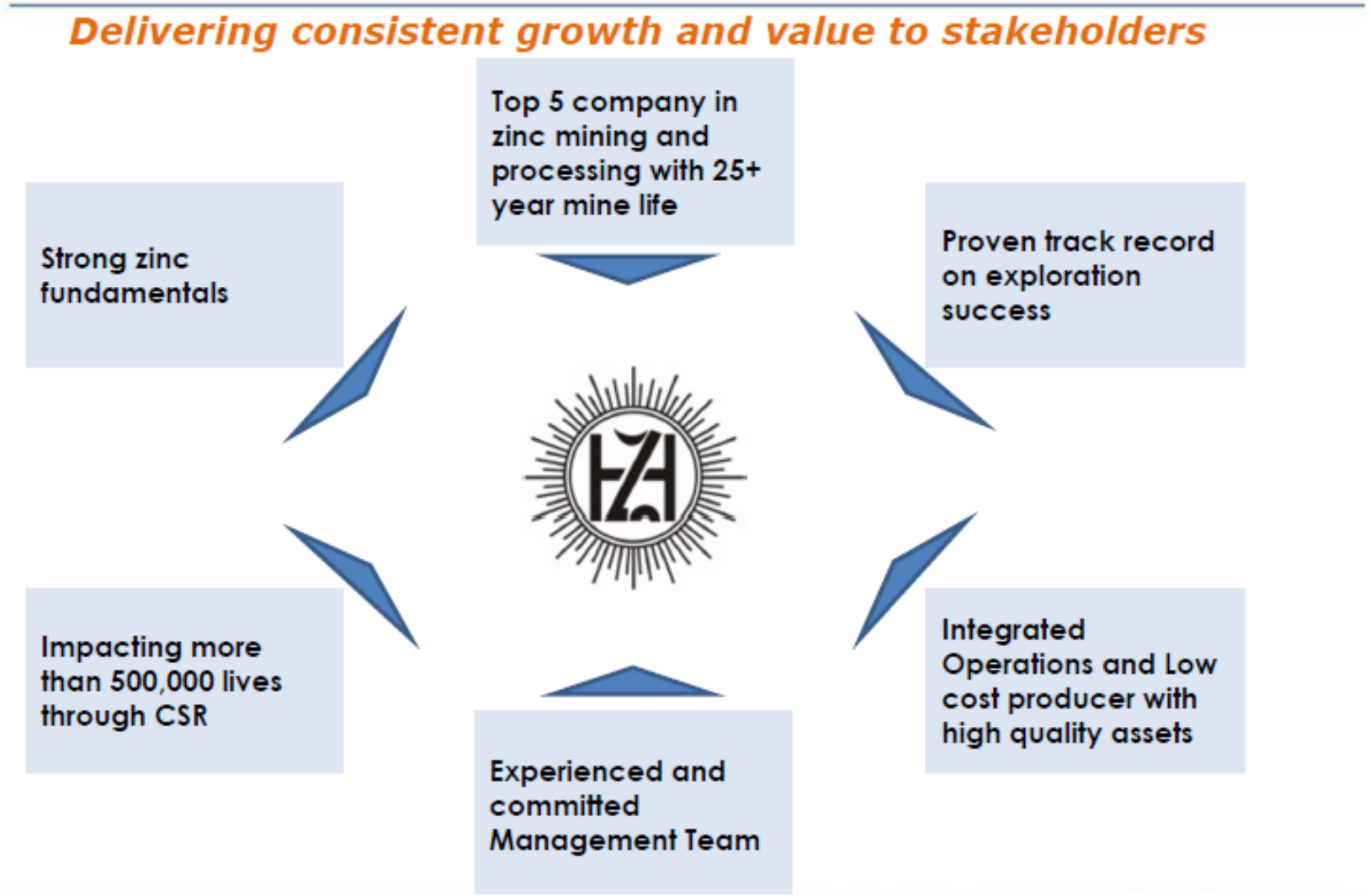
Silver

(99.9% purity). It is casted in the form of bricks weighing 30 kgs.

Cadmium

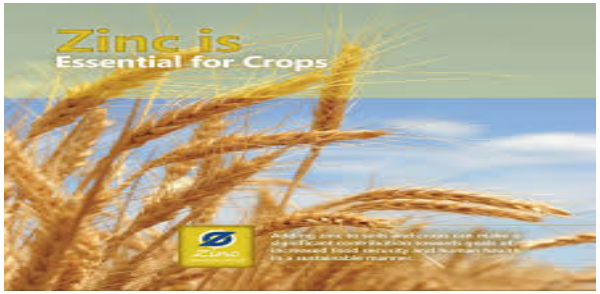
Having a minimum purity of 99.95% to 99.99%; it is casted in the form of pencils weighing from 250 gms to 500 gms.

Delivering consistent value to shareholders

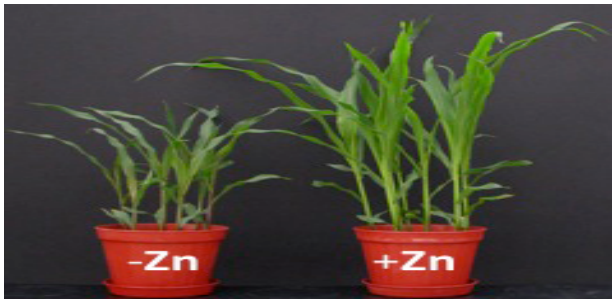


Zinc in Everyday life

Zinc in Infrastructure
Zinc in Agriculture
Zinc builds Nation



Zinc in Automobile
Zinc in Household items



Zinc Saves Lives
Zinc Protects Health
Zinc Gives Strength

We All Need Zinc

Supporting Key initiatives towards Sustainability in Indian Ecosystem

Associations are key advisors to BIS / Ministry for Code specifications

	International Zinc Assn. - Sustainability - New Applications - International Resources	**India Lead Zinc Development Association** - Local Technical Assistance -Wide Indian Membership
First Use Expertise	Galvanized Steel, Die casting Alloys, Zinc Oxides etc	General Galvanizing, Lead Acid Batteries
End Use Expertise	**Automobile**, Construction, Fertilizers, Railways, Highways, Metros etc	Construction, Public Infrastructure , Power Transmission
Sustainability	Zinc Saves Kids, Zinc in Nutrition, Zinc in Fertilizers etc	Battery Recycling ; Clean Environment
Tools	Conferences, In house seminars, exhibitions, e-library, website/ case studies	Directories, Conference, Exhibitions, Local Office
Engagement	Zinc users, Regulators, Ministries, stakeholders, Professors, Architects, Consultants etc	Technical Assistance

Thank You