



Pavement Evaluation through Non-Destructive Technique

A Way Forward

Presented by:

ASHISH WALIA

Research Scholar, IIT Roorkee

Supervisors:

Prof. Rajat Rastogi

IIT Roorkee

Prof. Praveen Kumar

NIT Delhi

Prof. S S Jain

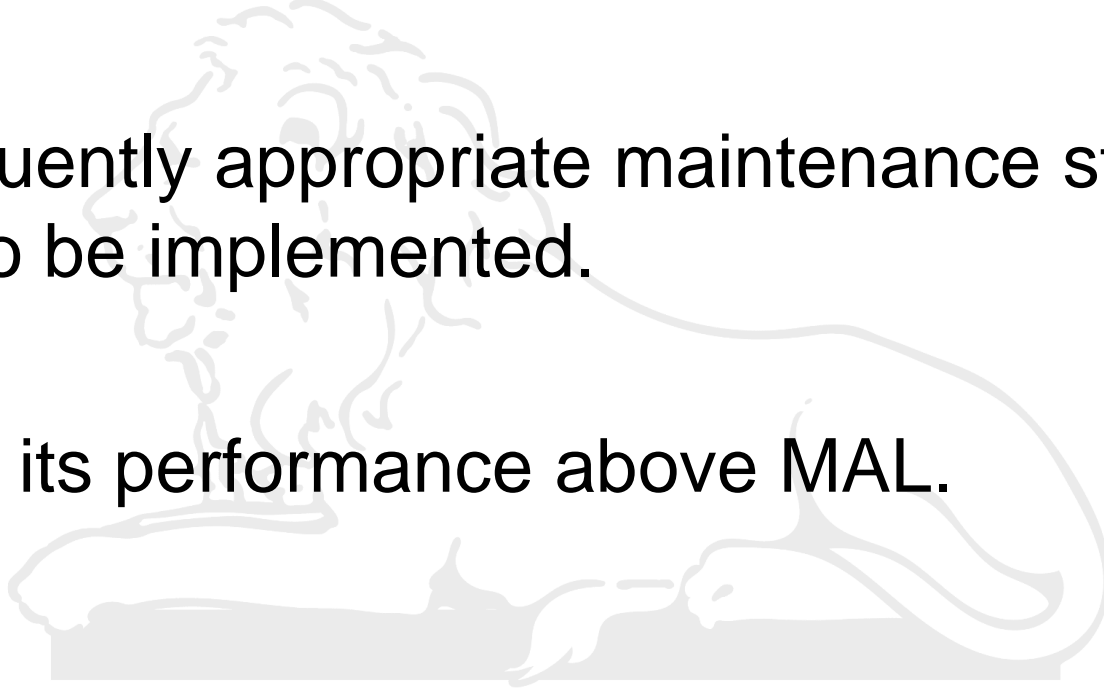
IIT Roorkee



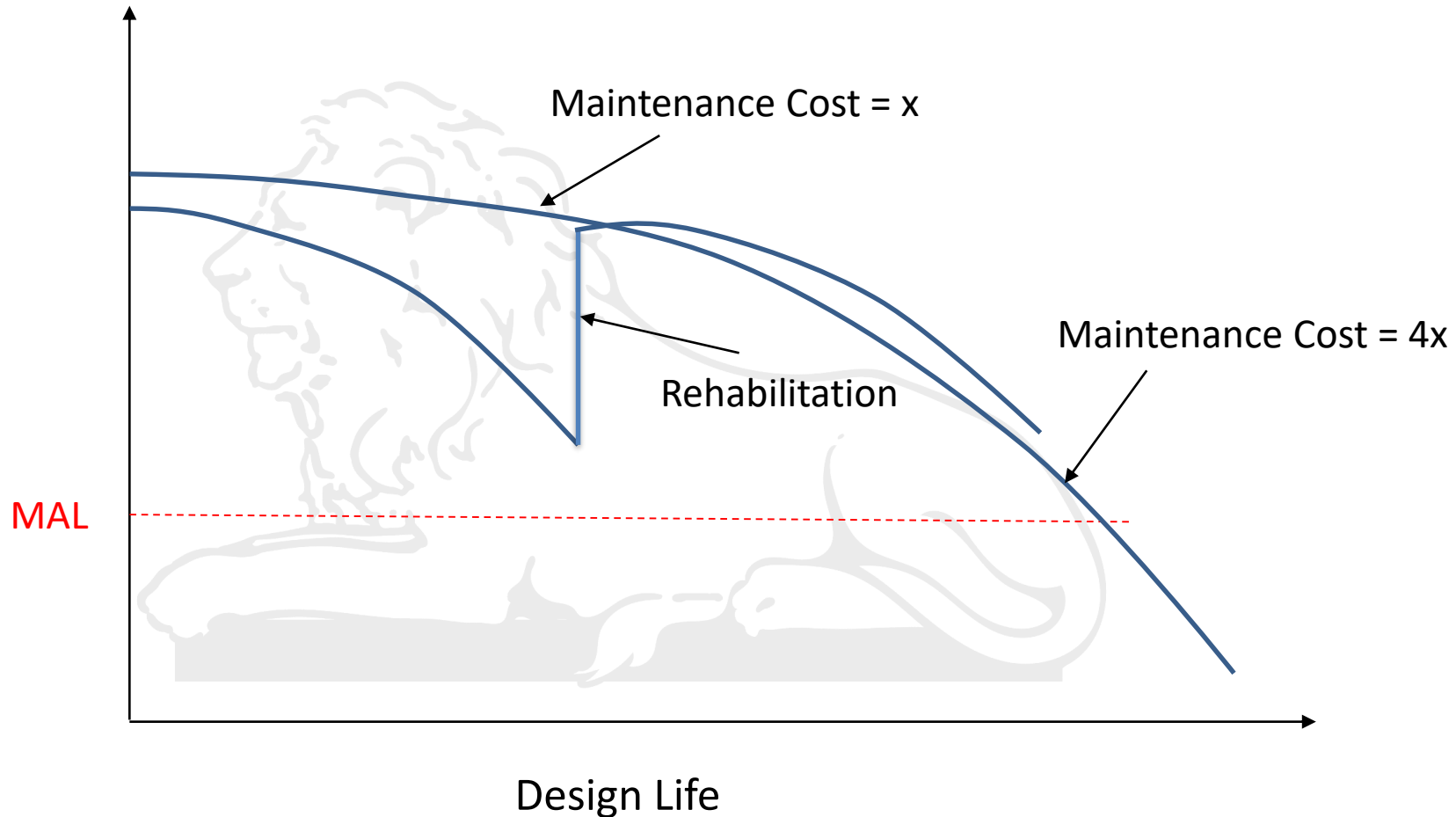
Pavement Evaluation



- To sustain existing infrastructure, need to assess it.
- Consequently appropriate maintenance strategy needs to be implemented.
- To keep its performance above MAL.

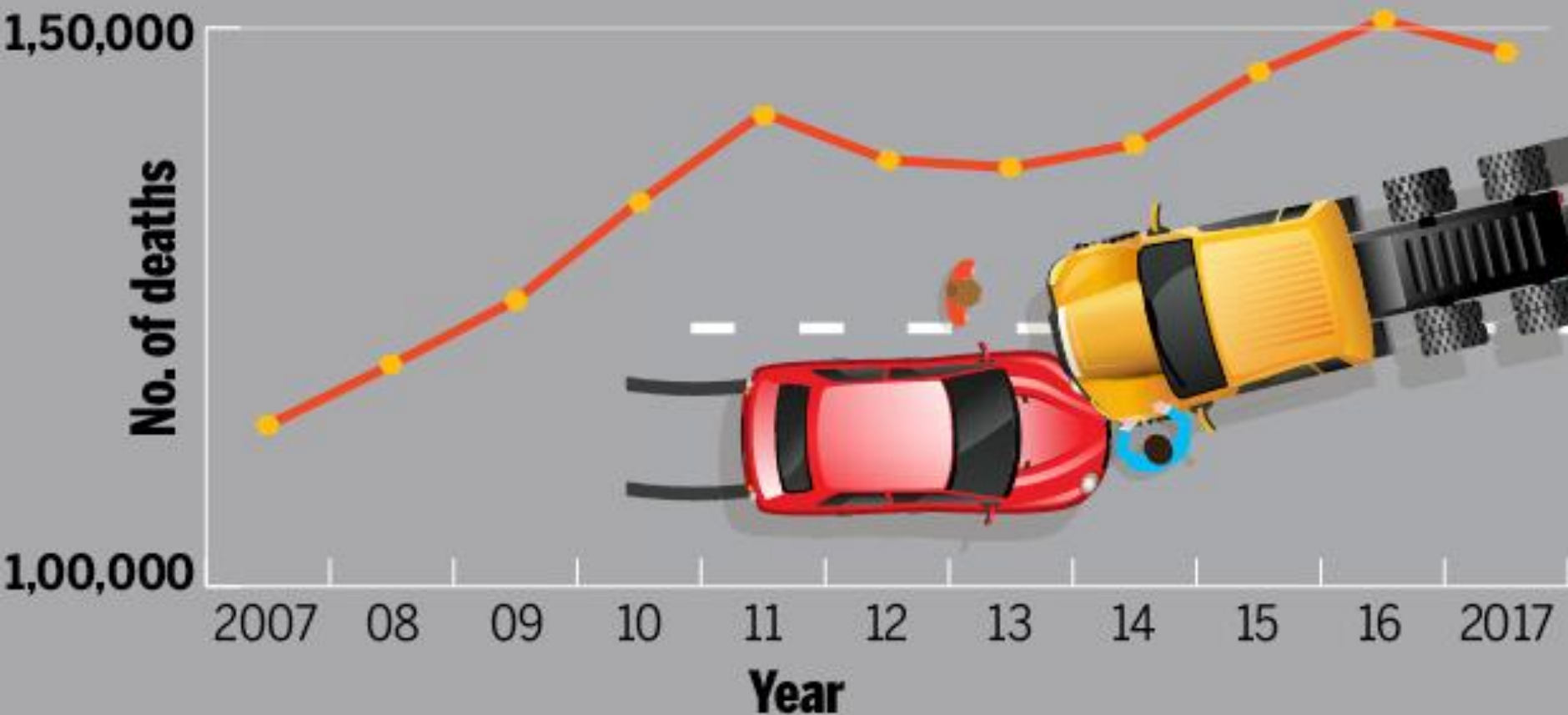


Pavement Performance



Road Accidents

ROAD FATALITIES IN INDIA



Source: Ministry of Road Transport and Highways

Deteriorating Scenario

- In last decade, the annual average death crashes is more than 1.3 lakh i.e. more than population of small Indian cities like Roorkee, Darjeeling and Greater Noida etc.
- In 2017, Potholes related accidents claimed 3597 deaths in comparison to 803 due to terrorist attack.
- Exponential increase in traffic volume further worsens the pavement condition.

Why Pavement Evaluation?

- According to DHL, travel time required on Indian roads are 2 and 3 times more compared to China & Europe respectively.
- According to KMPG report, average speed is 30-40 km/hr in contrast to 60-80 km/hr worldwide including China.
- Surface freight cost per km is USD 0.07 compared to Japan's USD 0.037.
- Bottlenecks on Indian road network hinders its GDP growth by 1 to 2 %, equivalent to 10 M new jobs every year.

Kinds of Pavement Evaluation

Functional

v/s

Structural

Riding Quality

Strength

Destructive

v/s

Non-Destructive

Cut Sections

NDT devices

Non-Destructive Evaluation

- To assess the pavement strength without intrusion.
- Principle of deflection measurement corresponding to specified load.
- Cost-effective apart from accurate and reliable.
- Benkelman Beam, Road Rater, FWD, LFWD.

FWD – Falling Weight Deflectometer

- Combination of load imparting unit, deflection measurement unit and controlling unit
- Impulse loading to realistically simulate moving traffic wheel load
- Deflections measured through geophones at radial distances
- Back-calculation analysis to obtain material properties of different layers individually.

Mechanistic-Empirical Approach

- M-E method combines principle of mechanics for determination of pavement response with empirically obtained failure criteria.
- Pavement response is direct function of Thickness, Elastic modulus and Poisson's ratio.
- FWD helps to estimate 'mechanistic part'.
- But still left gap b/w critical response and failure prediction.

GPR - Ground Penetrating Radar

- Non-invasive equipment used to analyze sub-surface.
- Combination of transmitting and receiving antenna.
- Principle of wave propagation through different medium.
- Transmitted waves reflected back from layer interfaces due to change in dielectric constant.
- Thickness, moisture content, air voids and other anomalies.

Benefits of NDT Evaluation

- Extremely advantageous compared to conventional methods in terms of lesser cost & time.
- More reliable and accurate results without introducing any permanent damage.
- More rational M & R approach can be adopted with mechanistic pavement response.
- Inclusion of state-of-the-art technology provides further scope to develop efficient and effective PMS.