THE ULTIMATE GOAL TO PREVENT FATAL TRAIN-ACCIDENTS IN INDIA

- VISION: “CLOSE-TO ZERO” –

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The application of “leveraging Developments in Monitoring Technology for optimizing Track, Bridge, Cutting and Tunnel Maintenance” should pay off with tangible impacts for the “Ultimate Goal to prevent Railway Accidents” in reducing the risk of train-passengers “Close-to-Zero” to be
caught up in fatal, nasty and unwanted **Train-Accidents** on account of track, bridge, cutting- and tunnel defects.

**Quotations:**

Safety is achieved by HIGH TRACK QUALITY. High Track Quality is achieved by ACTIONS TO BE TAKEN. The tool for Strategic Planning of Actions to be taken is an encompassing cadastral TRACK CONDITION REPORT or AUDIT, encompassing all routes of the network, based on the data of LEVERAGING ASSET CONDITION-MONITORING.

The Prerequisite for MODERN RAILWAY SERVICE are Modern High Track-Quality and sound and healthy Rail-Tracks on all Routes of the Network, fit for the given Traffic Load and Speed – and India is up for Modern World-Class Railway-Service.

Natural Laws do not allow cheaper Short-Cut Routes to Safety, even not through appeals to the Ingenuity of Track-Experts.

Safety is a matter of CAPITAL INVESTMENT SCHEMES OF LONG-TERM CERTAINTY for Safety related Infrastructure and Rail-Road Works.

A profound strategy for condition based **PREVENTIVE TRACK-MAINTENANCE, -OVERHAUL and -RENEWAL** will not only ensure the longest life from the track at the lowest possible overall Life-Cycle-Costs, but will also help to ensure “CLOSE-TO-ZERO” FATAL DERAILEMENT DISASTERS.

This requires maintenance intervention and track renewal before a track deteriorates to a point below a minimum condition threshold. This implies that the condition of the track must be determined on a regular basis through Inspection, Measuring and Recording. This implies also that Intervention-Threshold Levels are set.

Measuring the condition of assets and infrastructure (tracks, cuttings, bridges, tunnels) manually by surveying gangs is time-consuming, cost-intensive and not accurate enough for any modern rail-track today, and in addition it is unsafe for the patrolling men.

Measuring and monitoring vehicles replace manual measuring, monitoring and surveying of track condition.

Infrastructure measuring vehicles can be equipped with a combination of various available measuring systems to establish the condition of the whole network, depending on the requirements of the railway in regard of safety and economy.
Modern and Risk-free Railway-Service needs Modern High Quality Rail-Tracks on all routes, fit for the Traffic Load and Speed. And in this point India is tremendously bad ordered.

For the **Journey Time Cutting** between Mumbai and Ahmedabad pleasing privileged passengers, who can afford a higher ticket prize, India is ready to operate with huge financial allotments as well with high logistic, organization and training efforts. For this purpose India is prepared to build the longest railway tunnel in Asia and to bring a track on the longest elevated structure of highest Technology and Safety Standards on the Indian Sub-Continent.

But what is India’s Strategic Planning to reduce on conventional rail-tracks the likelihood of nasty and unwanted Derailment-Disasters, with often high mortality rates, to "**CLOSE-TO-ZERO**" for the "**ULTIMATE GOAL TO PREVENT TRAIN-ACCIDENTS**" and what are the leveraging and tangible **ACTIONS TO BE TAKEN**?

Many routes are plagued by:

- Long Welded or Continuous Welded Rails (LWR/CWR) composed with short 13 m Rails, which are welded by AT-Technology often of poor quality, bandaged with Joggle Fish-Plates and prone for in-service failures, as well by Routes consisting of Patch/Tinkering Repair Maintenance Works = underlying factors for the spate of fatal Derailment Disasters.

- Mark III elastic Rail Fastenings, oft of poor metallurgic properties, aging, corroding and loosening the clamping force, and hence, becoming loose or falling off with the need of frequent surveillance to be driven back in the shoulder-plate housing by patrolling key-men, and this in a hazardous environment.

- Switches and Crossings with defective, corroded and worn V-Crossings (Frogs).

- Unprotected and unfenced Rail-Tracks, especially in urban and suburban areas, used by population as foot path, level crossing, social meeting point and garbage dumping ground.

- Old and ailing Track Sub-Structures in poor bearing condition and often not properly drained.

- Tunnels not up to state-to-the-art Safety Standards (especially on the Konkan Railway Line).
Narrow and insufficient surveyed Cuttings with insufficient stabilised and drained Side-Slopes with the risk of earth-slips, mud-slides and rock/bolder-falls.

Tangible **Actions to be taken** are besides structural and organizational reforms:

- Sufficient long-term Capital Investment Schemes of long-term Certainty for modern Infrastructure and Rail-Track Works.
- Provision of long milled Rails of high metallurgic Steel Quality on all routes of the network.
- Factory and Way-Site robotic Flash-Butt Welding; and where required, AT-Welding by specially trained Gangs under strict supervision of well qualified Supervisors and by following strictly the laid down working rules/manuals.
- Rail-Fastening Systems with Vossloh/Schwihag Tension-Clips or Pandrol Fastening Systems with Fast-Clips.
- Switches with High Precision and Dimension V-Crossings of high steel-alloy Quality, high Precision and Dimension sturdy Guard-Rails.
- High and sturdy/solid Rail-Fencing Walls assembled from ready-made concrete slaps on solid fundaments in urban and sub-urban areas.
- Formation Rehabilitation/Strengthening/Reengineering.
- Effective Area Surface Water -Management, effective Track-Drainage Systems, Catch-Drains and precaution and preventive Surface-Water Management Measurements.

More technical Railway Papers dealing with **SAFETY ON INDIAN RAILWAYS** and **modern Developments in Track Technology and Engineering**, the reader can find free for download on the website: [http://www.drwingler.com](http://www.drwingler.com)
PICTURE GALLERY

I. Plagues of Indian Railways:

Result of Tinkering Repair Works and of In-Service Failure of Joggle Fishplate bandaged poor Quality AT Weld, Kalyan, 2017

Rail Fracture between Raskharswan and Barambo Station, Jharkhand, detected on 10th November 2017
A common Scenario on Indian Rail Tracks: Fallen-off MARK-III Clips

Patrolling Key-Man driving back loosened MARK III Clip in risky Environment
Indian Standard MARK III ERC Fastening System in Need of high Surveillance and Service Expenditure

Littering and Loitering, a common Scenario on Indian Rail Tracks
Doronto Express derailed in Mud-Slide on an insufficient protected Line near Asangaon, Maharashtra, on 29th August 2017; and avoidable Train Mishap

Kamayani and Janta Express Twin Derailment on 4th August 2015 in Harda District at a Bridge Abutment due to insufficient Flash Flood and Surface Water managed and protected Flood prone Plane of the Machak River; an avoidable Train Mishap
Matsyagandha Express derailed on June 16th, 2004, near the Village of Amboli, Distr. Raigad, due of Bolder-Falls in an insufficient protected Cutting; an avoidable fatal Train Mishap

Flash-Flood Train Disaster of high Mortality Rate on 29th October 2005 near Valingonda, Andhra Pradesh, due to a raptured Irrigation Tank upstream; an avoidable Train Mishap
II. Actions to be taken:

Track Monitoring and Surveillance with Diagnosis EM SAT 120 Car from Plasser & Theurer Pict. by PI&Th

Track and Rolling Stock Condition Monitoring with On-Board Sensors on scheduled running Trains, making Use of Newton’s Law Mechanism, Belgium Railway; Pict by IRJ
Controlled Transport of Long Milled High-Quality Rails; Pict. by Vossloh

Gentle Handling of long milled Rails with Gantry Cranes for Dedicated Freight Corridor, India
Mobil robotic Flash-Butt Welding with ATP from Plasser&Theurer; Picture by Pl&Th

Digital controlled “SMART-WELD/SMART-JET” AT Welding, Th. Goldschmidt, Pict. by Th. Goldschmidt
Laying of modern Switch on Western DFC at Madhopur Station, India

Modern High precious and continuously welded V-Crossing by Vossloh, Germany, Pict. by Vossloh
“Fit-And-Forget” Rail-Fastening Systems

Left: Vossloh Tension Clamp; Right: Pandrol Fast-Clip

Rail-Track Fencing/Protection with ready-made Concrete Slabs, German Railway
Mechanized Sub-Structure/Formation Rehabilitation/Strengthening with Heavy-Duty and High-Performance On-Track Machinery, Pict. by Swietelsky, Bahnbaub, Germany

Effective deep Track-Drainage, Pict. by PULSE ENGINEERING, Germany
Stepwise Slope Stabilization with Catch-Drains

Terrace Cutting Stabilization, Chiltern Main Line, UK
Monitoring and Anchoring of Rock-Site, Pict. by PULSE ENGINEERING, Germany

Rock-Fall Protection Gallery of Canadian National; Pict. by CN
Rock-Fall Protection Gallery of Canadian National, Pict. by CN

Tunnel Entrance Protection at new Gotthard Base-Tunnel, Switzerland
Silberg-Tunnel Entrance Protection on new High-Speed Line, Germany

Construction in Progress of elevated Track-Structure over Flash-Flood prone Plane of Nilwala River, South Sri Lanka; Matara-Beliatta Rail-Extension Project 2017, Pict. by P. de Silva