

ZERO TOLERANCE VISION

OPTIMISING THE WHEEL-RAIL SYSTEM

**HELPS TO ACHIEVE
CLOSE-TO-ZERO DERAILMENT
DISASTERS**

By Dr. F.A. Wingler, October 2017

ZERO TOLERANCE FOR THE KILLING AND INJURING OF TRAIN-PASSENGERS IN UNWANTED DERAILMENT-DISASTERS

OPTIMISING THE ALL-IMPORTANT WHEEL- RAIL SYSTEM IN INDIA IN ORDER TO ACHIEVE NEARLY ZERO FATAL DERAILMENTS ON RAIL-TRACK ACCOUNT; PART II

By F.A. Wingler, Germany
October 2017

Conclusion: Out-of-box Thinking, Innovations and Technologies assuring nearly **ZERO** fatal Derailment Accidents on Track-Account are in India at hand. Indian Railway Engineers have all the capabilities and competence to adopt those Technologies. For the **"CLOSE-TO-ZERO ACCIDENT GOAL"** and the **"ULTIMATE GOAL TO PREVENT UNWANTED NASTY DERAILMENT-DISASTERS"**, killing and injuring Train-Passengers, massive input in Capital Investment Schemes of long-term certainty and organisational as well logistic Measurements in Safety related Infrastructure Works optimizing the all-important **Wheel-Rail System** on all routes are of paramount importance. With well-maintained Wheels on **Modern Railway Tracks** the likelihood of Derailments will be nearly **ZERO**. Train-Passenger's Freedom from Injury and bodily Harm matters most.

"ZERO TOLERANCE" is a new **"buzzword"** used in particular context with **"ZERO ACCIDENT VISION"** in transport environment and has been recently used by the new Indian Minister of Railways Mr. Piyush Goyal, when calling for Innovation in Railway Safety and speaking at the **INTERNATIONAL CONFERENCE ON TECHNOLOGICAL ADVANCEMENTS IN RAILWAYS & METRO PROJECTS**, 6-7th OCT 2017, Manekshaw Centre, New Delhi. Railway Minister Piyush Goyal stressed on the importance of innovation and out-of-the-box thinking (see: <https://www.ndtv.com/india-news/calling-for-innovation-in-railway-safety-piyush-go...>); see Annexure.

"Zero Incident" really does not exist in the transport environment, as Railway Safety Expert Dr. Willem Sprong, Technical Executive, Gibb (Pty) Ltd, South Africa explained on the **WORLD CONFERENCE OF FUTURE OF TRANSPORTATION**, held 5-6th July 2017 at Cologne, Germany.

Therefore, the challenge is to reduce through a modern **RISK BALLANCE** Safety Approach the likelihood auf unwanted bad incidents to a tolerable level and to mitigate the impact of such unwanted bad incidents and as well the harm it causes; see F. Wingler, **RISK-BALANCE MODEL – a STRATEGY TO**

MANAGE SAFETY AND RISKS IN RAILWAYS, free for download from the website: <http://www.drwingler.com> .

The likelihood auf unwanted bad Train-Derailment incidents, killing and injuring train-passengers, can be reduced to a tolerable level by

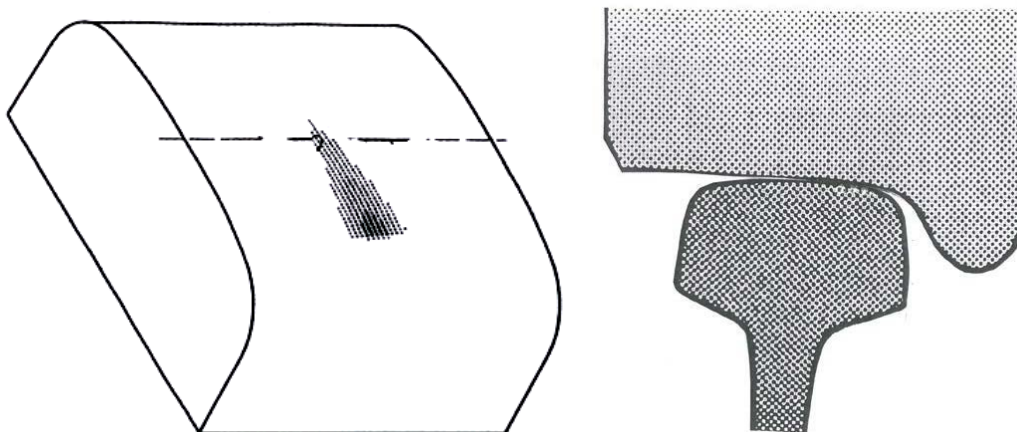
OPTIMISING THE RAIL WHEEL SYSTEM

on all routes of the IR network, not only on few prestigious routes;

(see the papers presented on the International Conventions of the Working Committee on Railway Technology of the Österreichische Verkehrswissenschaftliche Gesellschaft, ÖVG, Austria, held on 15-17th September 2015 at Salzburg and 25-26th 2017 September at Graz, Austria).

Approximately 46 % of India`s Railway Accidents are attributed to Train-Derailments. The contribution of the number of killed and injured Train-Passengers in all the Railway Accidents is the highest in Train-Derailment Disasters.

Trains derail, when something goes terribly wrong in the interactive **Wheel-Rail System**. Therefore, one has to give a glance on what is going on between Wheels of running stocks and Rails of Railway Tracks meeting at an in-elastic steel-on-steel patch with the size of approx. 3 cm³:



Wheel-on-Rail Contact Area between optimised Wheel-Tread and Rail-Head Profile
on straight Run

In the everlasting Struggle for Train Passenger`s Freedom from bodily Harm and Injury one has to optimise on all routes the **Wheel-Rail System**. Modern Railway Track Engineering Methodologies and Technologies applied to all routes help to reach the “**Ultimate Goal to achieve ZERO Fatality**”.

Under the conception “**OPTIMISING THE WHEEL-RAIL SYSTEM**”, the so-called “**DACH**” Railways, German (D), Austrian (A and Swiss (CH), are doing well in pursuing this conception. European Railways have achieved to bring

and keep their railway tracks in sound and healthy condition with nearly **ZERO** Train Derailments. British Network Rail also follows the “**DACH**” conception. In Great Britain, in the past 12 years, not a single train-passenger lost his life in a Train-Accident.

“Indian Railway Engineers have all the capabilities and competence to adopt those Technologies” (see paper of J.S. Mundrey, Rail Consult India, ***“Modern Track Technology leading to Zero Derailments”*** presented on the **INTERNATIONAL CONFERENCE ON TECHNOLOGICAL ADVANCEMENTS IN RAILWAYS & METRO PROJECTS**, 6-7th October 2017 at the Manekshaw Centre, New Delhi. October 2017).

For the **“ULTIMATE GOAL TO PREVENT UNWANTED NASTY DERAILMENT-DISASTERS”**, killing and injuring Train-Passengers, massive input in Capital Investment Schemes of long-term certainty and organisational as well as logistic Measurements in Safety related Infrastructure Works are of paramount importance. With well-maintained Wheels on **Modern Railway Tracks** the likelihood of Derailments will come close to **ZERO**.

However, quality of many IR routes do not match any more the increased traffic-load/volume, they have to carry, and budget allocations are in India a limitation to bring all routes in the needed sound and healthy condition.

IR is afflicted with its short 13 m long rails, not seldom of poor steel quality, welded together by alumino-thermic welding (AT welds) of poor quality to longer rail panels. Inferior welded joints are secured with so-called ***“Joggle Joints”***. For mounting, holes are drilled or torched in the rail-web inflicting additional loss of rail-strength and leading to rail-fractures under traffic load; so also on 30-03-2017 near Kulpahar:



Mahakaushal Express Derailment Site near Kulpahar; 30-03-2017

Alleviation will come with longer milled and factory flash-butt welded rail panels of high steel-quality and of up-to 360 m length, laid with on-track machineries and not any more through damage causing manual labour works.

On several routes the bearing capacity of the formation is poor and not in compliance with the dynamic forces exerted by the train-load. Urgent

strengthening by ballast-cleaning and formation-rehabilitation with Modern Heavy-Duty and High-Performance On-Track Machineries is needed:



Plasser&Theurer Ballast-Cleaning On-Track Machinery

Train-Derailments caused by hill-, mud- or rock-slides/slips, such as recently on 29th August 2017 between Asangaon and Vasind, Distr. Thane,



29th August 2017 Nagpur Durgam Express Derailment between Asangaon and Vasind, Distr. Thane

can be avoided by investment in hillside/slope stabilization/drainage, and/or by learning from the 15th century Incas in Peru through Flattening of Cutting-Slopes providing drained Terraces:



Terrace Sub-Surface Drainage and Stabilization of the Hill-Side Slopes of Machu Picchu
in the Andes of Peru by 15th Century Incas



Flattening of Cutting-Slope providing drained Terraces; Konkan; Railway, India

See: **WATER THE ENEMY OF THE RAIL TRACK**, <http://www.drwingler.com>

Galleries against rock/hill-slides/slips can provide protection:

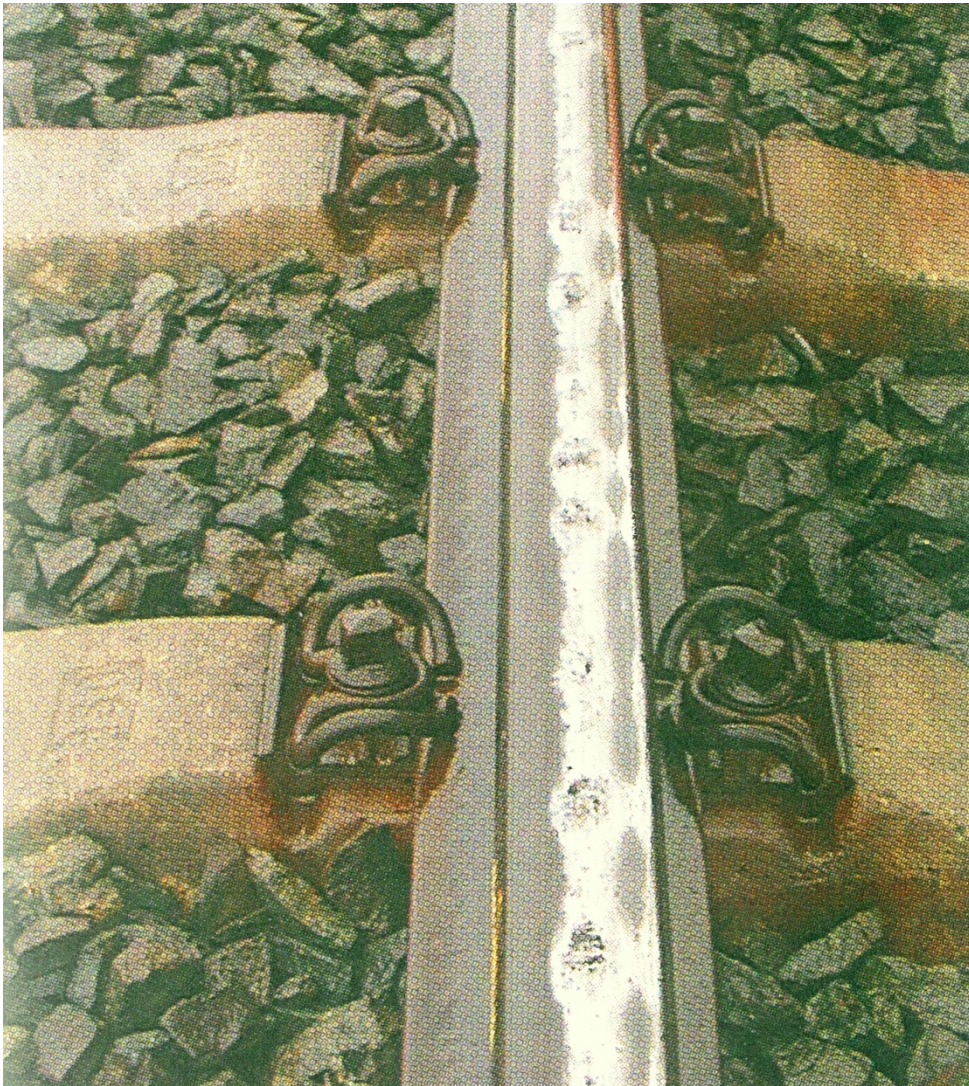


Rock-Fall Protection Gallery and Slope-Stabilization of Canadian National CN at Ashcroft Sub, Mile 109.5, Canada; pict.: Jim McLeod, CN - Chief Engineer

Around the globe, with the introduction of modern AC traction motors and traction control to increase the dispatchable tractive effort and to increase the friction coefficient, railways face increasing problems with Rail Contact Fatigue (RCF) damages like Head-Checks, Squads/Studs, Corrugations, Belgrospieses, Spallings and Micro-Cracks.

Series-Squats are since 20 to 15 years on increase, especially on tracks for mixed traffic. Whereas 1980 squats developed after an incubation period with 50 to 150 Million Gross Tons (MGT), they can appear nowadays on new rails even after 10 MGT developing V-form cracks growing up-to 4 mm under the rail-top surface. They need milling by material abrasion of up-to 4 mm (see: R. Stock and S. Sobiella: ***Elimination of Series-Squats with High-Performance Milling Technology*** in EI, Der Eisenbahn Ingenieur, October 2017, 10/17, p. 26, VDEI-Service, Berlin, Germany; see also the papers presented on the International Conventions of the Working Committee on Railway Technology of the Österreichische Verkehrs-wissenschaftliche Gesellschaft, ÖVG, Austria, held on 15-17th September 25-26th 2017 September at Graz, Austria;

<http://www.oevg.at/veranstaltungen/events/2017/fahrwegoptimierung-des-radschiene-systems-verfuegbarkeit-der-infrastruktur/seminar>).



Series Squats inflicted by modern AC Traction Technology on a mixed Traffic Route in Germany



"Modern" Squat with typical V-shaped Crack penetrating under the Surface



LINMAG Rail Service High-Performance Rail-Milling Train, Type MG 31

Investment in cyclic preventive and targeting (for Friction Management) Rail-Grinding/Milling with high-performance machineries prevents cracks growing deeper into rails before ending up in train derailing rail-fractures, as happened on 7th September 2017 by a rail-fracture at the Howrah-Jabalpur Shaktipunji Express Derailment Site near Obra Dam, India:



Rail-Fracture at Howrah-Jabalpur Shaktipunji Express Derailment Site near Obra Dam, at 7th September 2017

To Minister Piyush Goyal:

Dear Mr. Goyal,

attached you find technical papers with my answers. The top IC-TRAM 2017 conference demonstrated again, that Indian Railway Experts have all the capabilities and competence to adopt Modern Railway Track Technologies. But to make use of it for nearly **ZERO TOLERANCE FOR FATAL DERAILMENT DISASTERS** will need a massive input in capital investment schemes of long-term certainty, structural reforms and reshuffles and a lot of logistic and organizational works with a paradigm-shift to a **GENERATIVE SAFETY CULTURE**, where train-passenger's freedom from bodily harm and injury will be of paramount importance and will matter most. Dr. F. Wingler



Calling for Innovation in Railway Safety, Piyush Goyal says Money No Bar

Speaking at the International Conference on Technological Advancements in Railway and Metro Projects which was also attended by Vice President M Venkaiah Naidu, Piyush Goyal said that budget allocations are a limitation and tend to hold back research and innovation.

[All India](#) | Edited by [Abhimanyu Bose](#) | Updated: October 06, 2017 18:23 IST

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Image tweeted by @PiyushGoyal

Railway Minister Piyush Goyal stressed on the importance of innovation and out-of-the-box thinking

New Delhi: Railway Minister Piyush Goyal today called for innovation in making the railways safer while stressing that enough money is available for the purpose.

Speaking at the International Conference on Technological Advancements in Railway and Metro Projects which was also attended by Vice President M Venkaiah Naidu, Mr Goyal also said that budget allocations are a limitation and tend to hold back research and innovation.

"Personally, I believe a budget is a limitation, it holds you back. Allocation of a budget doesn't allow scientists to flourish as he wants to. Budgets restrict innovation," said Mr Goyal as he called for out-of-the-box thinking to improve rail safety features like as signaling systems and fog vision for locomotive pilots.

The railways is embarking on a massive programme to ensure safety of the entire network, he said. "As much money as required is available for safety."

"I am not even saying it will be made available, I am saying it is available," he said, adding that he cannot make the railways safe without new ideas and he hoped that the conference will help generate innovations.

After a September 30 high-level meeting on Railways Safety in Mumbai, it was decided that foot overbridges, platforms and pathways on platform ends will have the highest priority as safety items with no budgetary restriction.

This follows the furore raised after the stampede on a foot overbridge in Mumbai last month.

The rail minister also pointed to Vice President Naidu's speech on September 27 at the IISc Bengaluru where he said that innovation plays a key role in driving the knowledge-based economy.

To highlight his point, Mr Goyal said that the last time a train with additional speed, comfort and safety features was introduced was

"From 1969 to 2017 we have not embarked on any major new technological initiative that will take us to international standards of passenger safety, comfort, convenience and speed," he said.

Japan, he said, has progressed technologically as it has managed to create an ecosystem where scientists and researchers can think out-of-the-box.

"Our plan for the future is to create an ecosystem where the scientific community will choose to stay in India and not go to NASA," the minister said.

He said the railways is open to engaging with experts in improving the environment, stations and passenger convenience.

Enumerating his expectations from the scientific community, the Railway Minister said he needs technology and know-how to improve driver vision during foggy weather, make the signaling system better, manufacture tracks faster and more efficiently, and predict track failures or fractures.

"I do believe that the time has come for us to aggressively go in for newer technologies and better ways of doing work. We will have to work collectively to see what can be done faster and smarter," he said.

His comments come in the wake of serious questions being raised on railway safety following a string of accidents over the last few months.

Ten coaches of the Kaifiyat Express derailed in August, injuring more than 20 people. This was the second rail accident, coming only days after 23 people were killed in another derailment in Uttar Pradesh.

In the same month, nine coaches of the Duronto Express derailed in Mumbai, although no casualties or injuries were reported.

The Rajdhani Express traveling from Jammu Tawi derailed in New Delhi in September, a week after the Shaktikunj Express derailed in Uttar Pradesh.

(With inputs from PTI)

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Massive Capital-Investment in Track Quality optimising the Wheel-Rail System is no Luxury. It not only cuts overall Life-Cycle Costs but also prevents that Train-Passengers are killed or injured in unwanted nasty Derailment-Disasters!

The costs of improving SAFETY all arise immediately, but the benefits emerge only in long-term. And "long-term" is really a long time and will cover the next 15 years.

Train-Passenger`s Freedom from bodily Harm and Injury matters!