How to Improve the Indian Railway Systems Using Technology

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Abstract: *This project revolves around the Indian railway systems and how to improvise it. The most important means of transport in India is the railway system. The railway system developed in India is very systematic. There has been a revolutionary change in the railway administration after Independence. The different railways have been coordinated into a single system under central control. It has been divided into several units or zones for economic and administrative reasons. This has resulted in great efficiency for the whole system as a means of transport. The past years saw an increase in railway accidents, raising questions about its safety and the equipment being used currently. This project is divided into four parts first being the causes, second being analysis of the technology being used currently and the third being methods of improvisation*

1. Causes of Train Accidents

Derailments

Between 2003-04 and 2015-16, derailments were the second highest reason for casualties. Of the total track length of 1,14,907 km in the country, 4,500 km should be renewed annually. However, in 2015-16, of the 5,000 km of track length due for renewal currently, only 2,700 km of track length was targeted to be renewed. The Standing Committee had recommended that Indian Railways should switch completely to the Linke Hoffman Busch (LHB) coaches as they do not pile upon each other during derailments and hence cause lesser casualties.But this didn't happen either 2
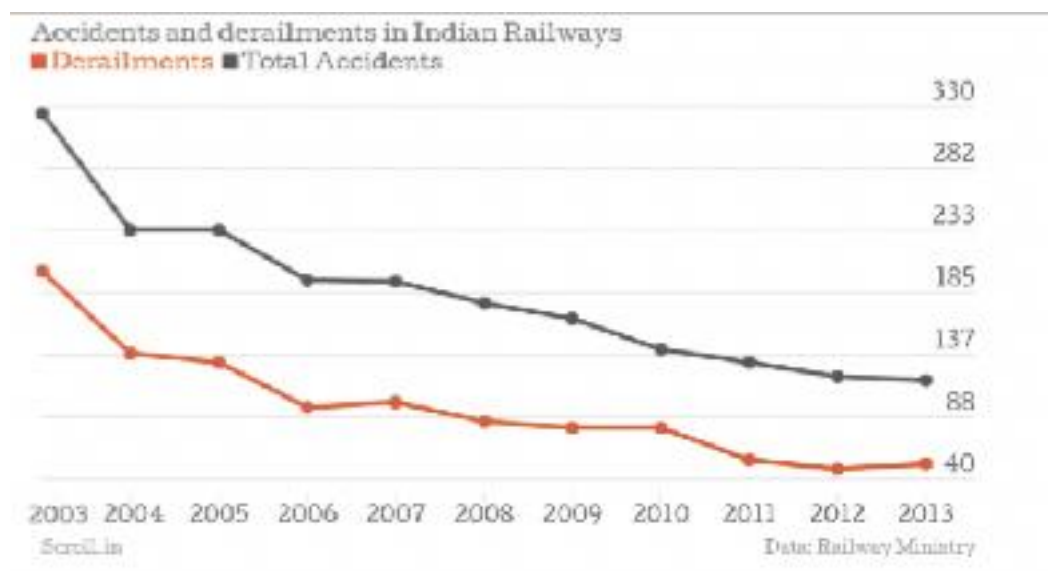
Unmanned level crossings

An unmanned level crossing is the universal term for where a road; path; landing field; or, any other pathway intersects a railway and has no flagman or other safety feature to prevent crossing the path of an oncoming train. It is the place a person is mostly likely to be the fatal victim of a train colliding with them or their vehicle. Currently there are 14,440 UMLCs in the railway network. In 2014-15, about 40% of the accidents occurred at UMLCs, and in 2015-16, about 28%. Between 2010 and 2013, the ministry fell short of meeting the targets to eliminate

Accidents due to failure of railway staff

The Standing Committee on Railways, when examining safety and security in the railways, had noted that more than half of the accidents are due to lapses on the part of railway staff. Such lapses include carelessness in working, poor maintenance work, adoption of short-cuts and non-observance of laid down safety rules and procedures. The committee had recommended that a regular refresher course for each category of railway staff should be conducted.

Accidents due to loco-pilots

Accidents also occur due to signalling errors for which loco-pilots (train operators) are responsible. With rail traffic increasing, loco-pilots encounter a signal at every kilometre and have to constantly be on high alert. Further, currently no technological support is available to the loco-pilots and they have to keep a vigilant watch on the signal and control the train accordingly. Loco- pilots are also overworked as they have to work beyond their stipulated hours of duty. This work stress and fatigue puts the life of thousands of commuters at risk and affects the safety of train operations.

Under-investment in the railways leading to accidents

Various committees such as the High Level Safety Review Committee in 2012 (chaired by Anil Kakodkar) and the Standing Committee on Railways have looked at the aspect of safety in the Indian Railways and made certain

recommendations. According to the Kakodkar Committee, the total financial implication of the safety measures over the five-year period (2012-17) was likely be around Rs 1 lakh crore. In the Union Budget 2017-18, the creation of a Rashtriya Rail Sanraksha Kosh was proposed for passenger safety. It will have a corpus of Rs 1 lakh crore over a period of five years (Rs 20,000 crore per year). While accidents have been decreasing, the number still remains fairly high.

2. Solutions to these Problems

Derailment
Signalling systems

A railway anti-collision and anti-derailment safety system, comprises a self- propelled coach adapted to precede a train. The coach has sensor structure to reveal anomalies or obstacles along railroad tracks, and an integration system between the coach and a train to pilot the coach from the train and to transfer from the coach to the train information as to anomalies or obstacles. The coach responds to the detection of anomalies or obstacles to eject the coach forcibly from the tracks to one side of the tracks.IIT Kanpur is developing a number of technologies for improving the safety of rail journeys. **Derailment Detection Devices** are sensors that are on board trains and detect the possibility of derailment based on movement and tilt.
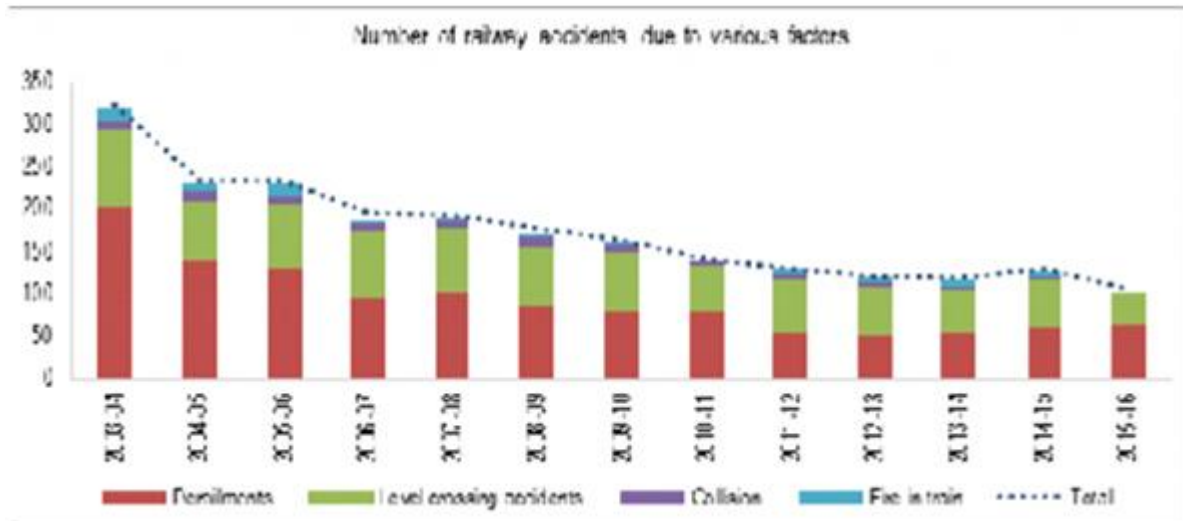
Unmanned level crossing
The Government Railway Police (GRP) here has been compiling information on the number of accidents at unmanned level crossings as well as the crossings where accidents have been frequently reported in the last five years. Thereafter, the railway authorities would be requested to install the `train actuated warning device' (TAWD) at unmanned level crossings where accidents take place repeatedly.

Negligence and the fault of road users have led to accidents at unmanned level crossings. The recent one at an unmanned level crossing at Kambarasampettai near here, which claimed the lives of four persons, was yet another accident caused due to the fault of the road user.

The device would raise an alarm to alert motorists about approaching trains. The GRP plans to organise campaigns to create awareness of the hazards of trespassing on tracks.

Accidents due to railway staff
The only way to reduce the failure by the hands of railway staff is to hire qualified staff members and to ensure that the government initiates various drives for awareness of accidents that can be caused and preventive measure to be taken by the staff in case of san emergency.

Accidents due to loco pilot
Loco pilots are often overworked. The Standing Committee on Railways had recommended that loco-pilots and other related running staff be provided with sound working conditions, better medical facilities and other amenities to

improve their performance. With regard to signals, the committee recommended that the location of signals can be uniformly displayed and be linked with visibility, braking distance and speed.

Expenditure on railways
Funding for railways has been a keen outlook for the Indian government budget tis year, a few highlights are as follows:

- Rs 1.48 lakh crore has been allocated for Indian Railways. Most of this capex will be dedicated to capacity creation.

- 12,000 wagons, 5160 coaches and 700 locomotives are on the way. A major programme has also been initiated by the government to strengthen infrastructure at the Goods sheds and fast track commissioning of private sidings. Optimal electrification of railway network is a priority. Along with that the government is focused on Physical targets of Indian Railways andhas targeted 4,000 km of commissioning during 2017-18. Work on dedicated East and West freight corridors are in progress.

- Government plans to create world-class modern train sets including Train 18 and Train 20. Train 18 and Train 20 will be manufactured at Integral Coach factory, Chennai, announced in Union Budget 2018. Government plans to eliminate 4,267 unmanned railway crossing in next two years.

- For Passenger security, Wifi, CCTVs in all stations and trains will be introduced.

3. A Few Innovative Ideas for Improvisation

Asset Performance Monitor (APM)

Asset Performance Monitor (APM) from GE Digital helps asset-centric organisations drive safer and more reliable operations. They also facilitate optimal performance at a lower sustainable cost by enabling intelligent asset strategies.

GE claims that APM's risk-based intelligent asset strategies balance performance and cost by considering design, operational procedures, and maintenance plans for all assets. APM provides work processes for reliability engineering, maintenance analysis, and environment, health and safety (EH&S), as well as the capabilities of equipment data capture, integration, and visualisation, along with both predictive and diagnostic analytics. With APM, GE believes that clients like Indian Railways could get an enterprise-wide view of the impact of asset performance management activities to help them make better decisions.

Locotrol

Locotrol Distributed Power System is a control and communication system that enables coordinated braking and traction power distribution between lead and remote engines — for faster stopping times, shorter stopping distances. For example, while a train is passing over an incline, Locotrol is able to ensure that different compartments are able to move at different speeds facilitated by radio commands from the lead engine to secondary engines placed at different intervals

Locovision

The Locovision system comprises of six components, all working together to monitor the safety of the railroad. Through superior image quality cameras and real-time data processing, it monitors wayside assets, and also measures 7 track gauge and detects intruders. The system stores all of this information in a hardware infrastructure, and aims to help avoid major asset repairs and fines.

Rail Integrity Monitor

Rail Integrity Monitor (RIM) employs innovative technology with mounted sensors under the locomotive, continuously testing rail integrity in real-time. This can reduce service interruption durations due to both broken rails and shorted track circuits.

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