International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 05, 2020
ISSN: 1475-7192

IMPORTANCE OF SOFTWARE APPLICATION 'KAVACH'

Dhananjay Kantibhai Prajapati*, Ravi Sharma, Varun Sharma, Atul Kumar Sharma

Abstract:

The main purpose of Kavach is to protect the train from accidents. After seeing so many accidents in the train, Indian Railways implemented an indigenous technology which is called Kavach. Kavach is an indigenously developed automatic train protection (ATP) system. This system has been developed by the Research Design & Standards Organization (RDSO). This cover is the world's cheapest and indigenous train protection system. This system activates the automatic brake system in the train if the loco pilot stops controlling the train. What I fail to do is that this system automatically controls our trains and it will cost only Rs 50 lakh per kilometer to install this system. While the cost of this system is around Rs 2 crore, if this system is confirmed then this system will be exported all over the world. This technology was tested on 4 March 2022. In which Rail Minister Ashwini Vaishnav was in one locomotive and GM of South-Central Railway in the other locomotive, this test was conducted between Gulgudda and passed Chitgidda railway station. During this test, both the trains came face to face in their scheduled speed. While moving, the Kavach system got activated and automatic brake system got activated in both the locomotives and both the locomotives stopped at a distance of 380 meters. In which jumping the red signal was also tested.

Keywords: Railway**,** TCAS**,** ATP**,** RFID, Atmanirbhar Bharat

Introduction:

The main purpose of Kavach is to protect the train from accidents. After seeing so many accidents in the train, Indian Railways implemented an indigenous technology which is called Kavach.

Kavach is a railway protection system. Kavach is an indigenously developed automatic train protection (ATP) system. According to Indian Railways, Kavach system protects the trains from collision. Due to this system, the train jumps and gives a signal to the train. This system has been developed by Research Design & Standards Organization (RDSO). This cover is the world's cheapest and indigenous train protection system. This system activates the automatic brake system in the train if the loco pilot stops controlling the train. What I fail to do is that this system automatically controls our trains and it will cost only Rs 50 lakh per kilometer to install this system. While the cost of this system is around Rs 2 crore, if this system is confirmed then this system will be exported all over the world. This technology was tested on 4 March 2022. In which Rail Minister Ashwini Vaishnav was in one locomotive and GM of South-Central Railway in the other locomotive, this test was conducted between Gulgudda and passed Chitgidda railway station. During this test, both the trains came face to face in their scheduled speed. While moving, the Kavach system got activated and automatic brake system got activated in both the locomotives and both the locomotives stopped at a distance of 380 meters. In which jumping the red signal was also tested. The locomotive did not cross the red signal because it was necessary to apply brakes due to cover and it was found that near the gate signal the automatic horn started blowing and the speed of the train increased from 60km. I drove for 30km and the train moved in the loop lane.

WHAT IS KAVACH?

This is a safety system which is developed in the year 2012 by the name of Train Collision Avoidance System (TCAS). Which is named as Kavach.

This is a set of electronic equipment and radio frequency identification (RFID) equipment which is installed in

the locomotive along with the signaling system.

Corresponding Author: Dhananjay Kantibhai Prajapati
Assistant Professor, Information Technology, Arya Institute of Engineering and Technology, Jaipur, Rajasthan
Assistant Professor, Electrical Engineering, Arya Institute of Engineering, Technology and Management,
Science student, SSVM School, Jaipur, Rajasthan,
Science student, Bihar Public School, Siwan, Bihar

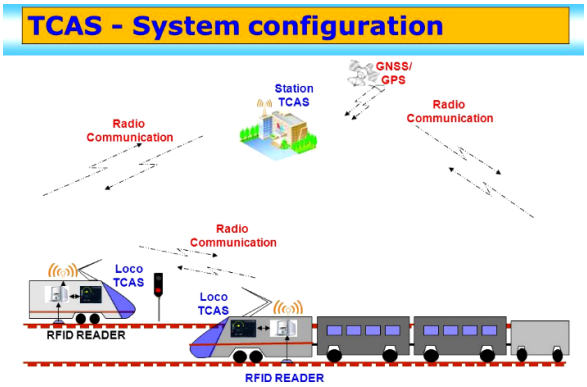

Figure: 1 (TCAS System)

How does rail Kavach prevent collision between two trains?

In this technology, the engine is connected to the signal system and control tower through micro processor, global positioning system i.e., GPS and radio communication. This prevents collision between two engines like a train, which is reducing the rail cover.

If after observing the signal a train is ahead of the train which will follow the train then this system will stop it by applying automatic brake at a safe distance. That is, it is better to be proud.

Work…

- If there is a red signal to the loco pilot, it will be visible in the display system installed in the engine that the loco pilot has covered two kilometers.
- Despite this, if the loco pilot sees the red signal and increases the speed, the cover will be activated.
- The vehicle immediately sends an alert message to the loco pilot and also activates the engine braking system.
- Even if the loco pilot does not apply brakes, automatic brakes are applied and the train stops at a safe distance.

Features:

- Prevent of signal passing in danger .(SPAD)
- Continuos update of movement authority with display of signal aspects in driver machine interface (DMI)/ Loco pilot operation cum indication panel (LPOCIP)
- Automatic breaking for prevention of over speeding.
- Auto whistling wheel approaching level crossing gates.
- Prevention of collision of between two locomotives equipped with functional Kavach.
- SOS messages during emergency situation.
- Centralized live monitoring of train movements through network monitor system.
- It will also carry features of the high-tech European Train Control System Level-2 in future.
- The current form of Kavach adheres to the highest level of safety and reliability standard called Safety Integrity Level 4.

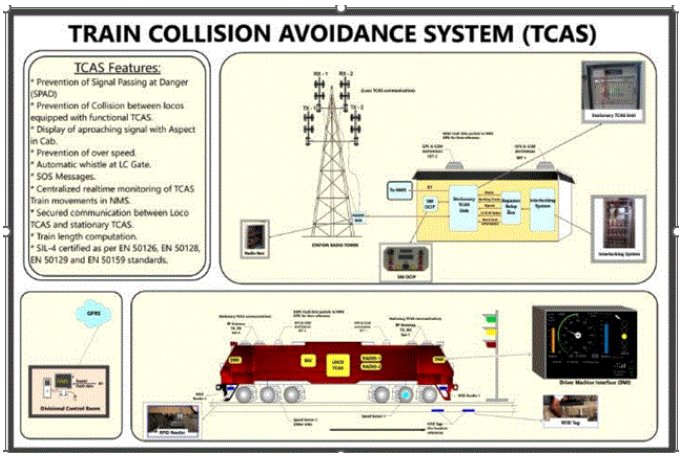

Figure: 2(TCASsystem)

KAVACH Deployment startegy of Indian railway:

- As a part of the efforts to strengthen "Aatmanirbhar Bharat", Indian Railway is planning to implement KAVACH protection system to an extent of **2000 kms during 2022-23.**
  Around 34,000 kms of network will be brought under KAVACH.
- **96** percent of railway traffic is carried on Indian railway high density network and highly used network routes. To transport this traffic safely, KAVACH works are being taken up in a focused manner as per following priority set by the Railway board.
- **First Priority:** High density routes and on New Delhi -Mumbai &New Delhi Howrah section for 160km/h with Automatic block signaling & centralized traffic control, since such sections have higher chance of human errors on part of drivers as trains run closer to each other.
- **Second Priority:** On the highly used network with automatic block signaling & centralized traffic control.
- **Third Priority:** On other passenger high density route with automatic block signaling.
- **Fourth Priority:** All other route.

- The system will be further extended to an additional 4000 to 5000 kms from next financial year.
- 4G spectrum has been allocated to Indian railway which will assist in further improving the reliability of train operations.

What is the upgrade?

- In the new avatar, India wants to position Kavach as an exportable system, a cheaper alternative to the European systems in vogue across the world.
- While now Kavach uses Ultra High Frequency, work is on to make it compatible with 4G Long Term Evolution (LTE) technology and make the product for global markets.
- Work is on to make the system such that it can be compatible with other already installed systems globally.

How does TCAS work in Railway?

This is a system that makes self-driving trains possible. Or stop yourself from bumping into each other. As we see, there are signals on the railway track also. This system gives a signal 500 meters before the signal when it receives instructions that the train has to stop for a certain period of time or provides a speed to the train where the train has to stop. TCAS is required to be functional up to maximum train speed of 200 kmph. The on-board Loco TCAS equipment also shows the speed, movement authority, target distances, approaching signal aspects etc. to the Loco Pilot.

Features of TCAS:

Loco TCAS unit and Stationery TCAS unit Self-Test - perform an automatic self-test when the equipment is switched ON. Operation modes - capable of supervising the 13 operational modes. Display of Signal Aspect - on DMI. Train Length Assignment - automatically calculate train length by the loco TCAS unit on receiving the required information from Stationary TCAS unit. Train location - determine the location of the train with the help of RFID tag data and Speed sensor output. Speed calculation and indication - Loco makes speed profile/ brake curve for different situations based on movement authority, speed restriction and other information as received from Trackside sub-system. Prevention of Signal Passing at Danger (SPAD) - supervise the movement authority based on the signal aspect, point position and the status of the berthing track circuit. Supervision of speed limits - supervise to static and dynamic train speed profiles. Prevention of Head on & Rear end Collisions - preventing Head on & Rear end collisions in Station as well as Block section. Prevention of Side Collision (infringement to adjacent lines) in Block Section - automatically generating SoS from a loco TCAS unit if it stops for a specific amount of time (Default: 10s) in the block section. Protection of Roll Back - detecting Roll Back of the train through train interface. Manual SoS generation/Cancellation - manually generating and cancelling SoS from both Stationary and Loco TCAS unit.

Coclusion:

- According to a railway official, if there is a sudden obstacle in front of a fast-moving train, then no technology can prevent that accident.
- According to my opinion, if there is already a fault in the train, can the armor prevent an accident from occurring?
- The armor should be improved this much.

- There should also be a provision in the Kavach system that if there is any disturbance in the train, then an emergency message should be sent to the nearby station that there is some fault in the train.
- If the train deviates from its track, the automatic brakes in the train get activated.
- Also update the Kavach tracks whether the track is broken or not. Is there any fault in the track?
- If the train has to meet you then take the train which runs on the current automatic band. Because no passenger dies because of the current.
- North East Express met with accident (Raghunathpur, Buxar, Bihar) Regarding the accident in our train, an employee on duty in our train told me that when I was doing some work, I felt that there were sudden breaks in the train and I started getting tired in the train. And then the train hit me hard and I lost consciousness. And then I almost derailed.
- Some people traveling in that train told that after the train accident, electric current started coming in the train due to which people were facing difficulty in selling.

References:

1. Specification of Train Collision Avoidance System (TCAS).
2. Https://rdso.indianrailways.gov.in/uploads/files/Handbook%20on%20Train%20Collision%20Avoidance%20System_April%202021(2).pdf
3. Https://konkanrailway.com/uploads/pdfs/367_ACD_PRESENTATION-E-MARCH13_0.PDF
4. 5.https://rdso.indianrailways.gov.in/uploads/files/Handbook%20on%20Train%20Collision%20Avoidance%20System_April%202021(2).pdf
5. 6.https://scr.indianrailways.gov.in/view_detail.jsp?Lang=0&id=0,5,268&dcd=17518&did=16466572709172D12B0CC844BFE647645B054E831B761
6. R. K. Kaushik Anjali and D. Sharma, "Analyzing the Effect of Partial Shading on Performance of Grid Connected Solar PV System", *2018 3rd International Conference and Workshops on Recent Advances and Innovations in Engineering (ICRAIE)*, pp. 1-4, 2018.
7. R. Kaushik, O. P. Mahela, P. K. Bhatt, B. Khan, S. Padmanaban and F. Blaabjerg, "A Hybrid Algorithm for Recognition of Power Quality Disturbances," in *IEEE Access*, 2020.
8. Kaushik, R. K. "Pragati. Analysis and Case Study of Power Transmission and Distribution." J Adv Res Power Electro Power Sys 7.2 (2020).
9. Gireesh, K., Manju, K. And Preeti (2016) “Maintenance policies for improving the availability of a software-hardware system,” in 2016 11th International Conference on Reliability, Maintainability and Safety (ICRMS). IEEE.
10. Jain, M., Kaushik, M. And Kumar, G. (2015) “Reliability analysis for embedded system with two types of faults and common cause failure using Markov process,” in Proceedings of the Sixth International Conference on Computer and Communication Technology 2015. New York, NY, USA: ACM.
11. Kaushik, M. Et al. (2015) “Availability analysis for embedded system with N-version programming using fuzzy approach,” International Journal of Software Engineering Technology and Applications.