Explained | What is the electronic interlocking system in railways?

PREMIUM

Understanding how the electronic interlocking system works and what led to the tragic train accident in Odisha's Balasore.

June 05, 2023 08:09 pm | Updated 08:09 pm IST

SUMEDA

More than 250 people were killed and over 1,000 injured in a multi-train collision near the Bahanaga Bazar station in Balasore, Odisha on June 2. | Photo Credit: PTI

trains and a goods train in Odisha's Balasore district that left 275 passengers dead and more than 1,000 injured.

Minister for Railways Ashwini Vaishnaw said a "change made in the electronic interlocking and point machine" led to the accident. On Sunday, the Railway Board recommended a CBI investigation as it identified "signalling interference" as the main cause of the accident in its preliminary probe. "The Commissioner of Railway Safety has investigated the matter... we have identified the cause of the incident and people responsible for it. It happened due to a change in electronic interlocking," the Minister said, while insisting that the crash was not linked to the Kavach system.

The KAVACH is an indigenously developed Automatic Train Protection (ATP) system by the Research Design and Standards Organisation (RDSO) in collaboration with the Indian industry. It is meant to provide protection by preventing trains from passing Red signals and thereby avoid collision.

What is an interlocking system?

Interlocking is an integral part of railway signalling. It refers to a mechanism that controls the movement of trains to ensure trains move safely through a controlled area. The system is an arrangement of signals and points, which may be inter-connected mechanically or electrically or both, which operate so that a train can move from one track or junction to another safely, without coming in the way of another train.

Electronic interlocking (EI) is an advanced signalling, computer-based system that uses electronic components to manage the movement of trains and the configuration of tracks. The EI, which is based on software, is designed to prevent two trains from running on the same track at the same time. It ensures that a train gets a go-ahead only when the route ahead is clear. The system is an alternative to the conventional Relay Interlocking system.

As of last year, 2,888 stations in India were equipped with an electronic interlocking system — comprising 45.5% of the Indian Railways network.

The EI signal system comprises three crucial elements:

Point switch: A train can change its track using a point. These are movable sections of a track which guide the wheels towards either the straight or diverging track. Switch points are operated using switches to lead trains in the desired direction. For instance, if a train has to change lines, the switch point is activated ahead of time and the point is locked. A point machine is a device used for locking point switches and plays an important role in the safe running of trains.

Track circuit: These are electrical circuits on tracks to detect the presence of a vehicle or a train on a section of track. Track circuits help to verify whether a particular route is clear or occupied and if it is safe for a train to proceed.

How does the system work?

Two information points form the basis of the EI signal system — a signal to pass is given based first on which direction the track is set, and second on whether the divergent track is free of obstruction. A moving train first gets a signal if it has to move straight or switch to a new track. The EI system then directs a train to an empty track at the point where two tracks meet. And circuits prevent another train from running on that block.

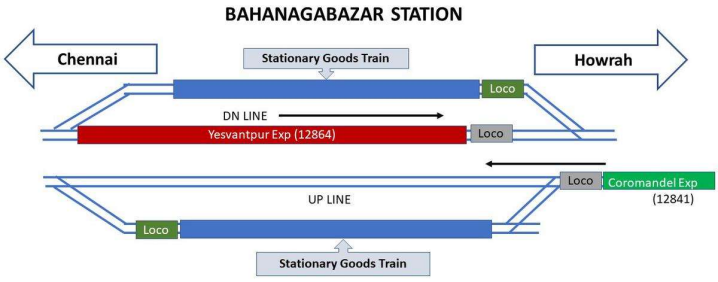
All activities in the signalling system are recorded in a microprocessor-based system called a data logger. It acts like the black box of an aircraft and can store and process signal data to generate reports.

The affected stretch where the accident took place on Friday (June 2) was also equipped with an EI system.

What led to the Odisha crash?

A signalling failure is suspected to have caused the accident. The Coromandel Express heading to Chennai from Kolkata was initially given the green signal to enter the Up Main Line, but the signal was then taken off, as *The Hindu* reported earlier. The train did not have a scheduled stoppage at the Bahanaga Bazar station, which it was approaching when it moved out of the main track and entered the loop line, which is a side track used to

At the time, the Coromandel Express was running at a speed of 128 kmph (80 mph). The impact of the crash was such that the engine of the Coromandel Express and the first few coaches jumped the tracks, toppled and hit the last two coaches of the Yeshwantpur-Howrah train heading in the opposite direction on the Down Main Line, running at a speed of 126 kmph.



It is, however, not yet clear why the signal was given and taken off, and whether the signal was showing 'green' or 'red' when the Coromandel Express crossed it.

As to why the EI system did not prevent the Coromandel Express from moving to the loop track, senior railway officials claim that the "error proof" and "fail safe" system could have been tampered with.

"It is called a 'fail safe' system, so it means that even if it fails, all the signals will turn red and all train operations will stop. Now, as the minister said there was a problem with the signalling system. It could be that someone has done some digging without seeing the cables. Running of any machine is prone to failures," Jaya Verma Sinha, Member of Operation and Business Development, Railway Board, said in a briefing on the crash on Sunday. "99.9% there is no possibility of the machine failing but there is a 0.1% chance of failure," she said, and added, "That possibility is always there in all kinds of systems."

The driver of the Coromandel Express, meanwhile, has been given a clean chit. Officials said the driver was within the speed limit and had not jumped any signal.

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