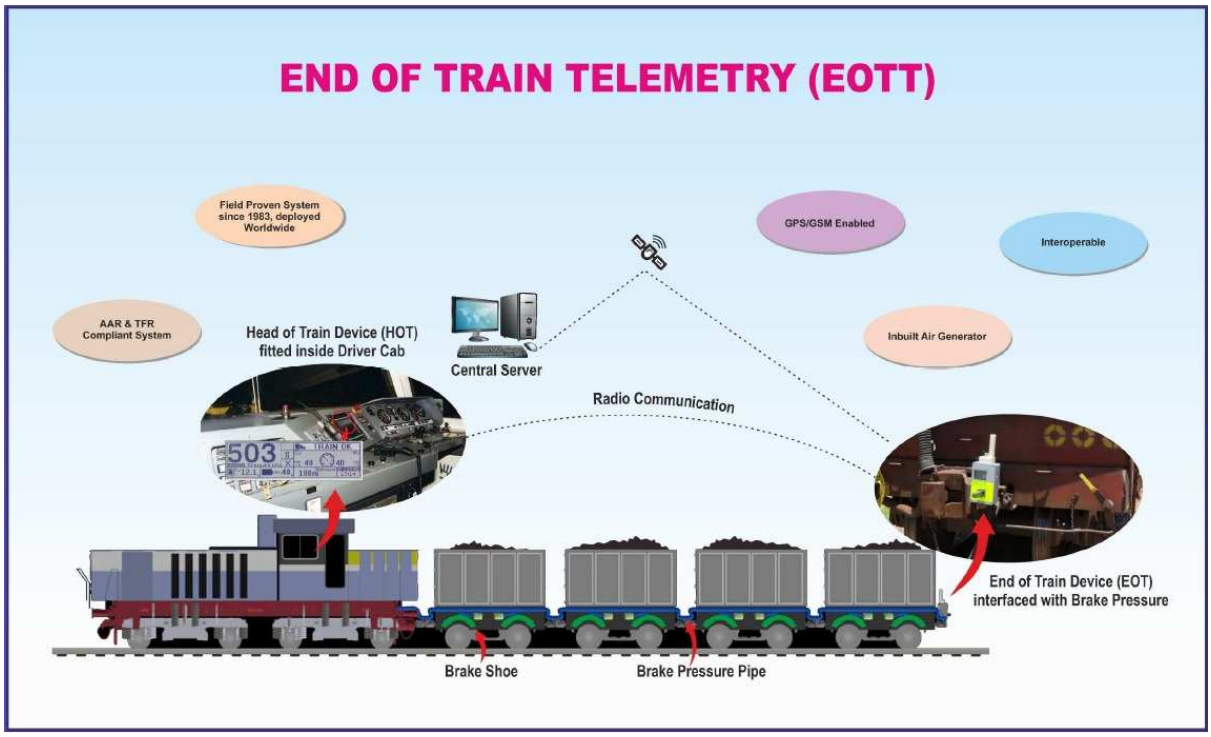
Real Time Train Information System (RTIS).

Tracking Trains and Railcars in Real Time

By Inteletrack, South Africa



Background

The present generation of EOTT is based on the basic AAR specification and has been in operation for the past 30 years.

With the advancement of technology, the next generation EOTT can contribute significantly in the following fields:

- Efficiency of rail operations
- Safety
- Cost Effectiveness

Technically, the next generation EOTTs will be fitted with GPS and GSM in the cab unit as well as in the rear unit. For dark terror, satellite communication on the locomotive can be installed. The present generation of EOTTs only implemented the first block of the AAR specification. The next generation of EOTTs will be required to implement the second and third blocks as per the AAR specification to accommodate the GPS information.

Efficiency of Rail Operations.

The Indian Railways experimented with GPS devices in locomotives to prove a sustainable solution for Real Time Train Information System (RTIS).

The next generation EOTTs are already fitted with GPS and GSM. By utilizing the information from the EOTT cab unit, the RTIS can be implemented without additional hardware and antennas.

The NG-EOTT will allow the entering of the following information into the cab unit:

- Train Number
- Locomotive Number
- Crew number

This information will be updated in real time to a central database.

By linking the consist of the train to the train number, each wagon can be tracked in real time or alternative the railcars can be individually tracked via satellite transponders.

This information will form the baseline for managing freight trains in India more efficiently.

Safety

With the implementation of EOTTs, the brake van and guard will be replaced with a rear unit EOTT. Therefore, the safety function of the guard also needs to be replaced by EOTT functionalities.

- ***Train Complete***
  When wagons separate from the train, the guard could immediately report the problem to the train driver via radio. By using GPS information from the cab and rear unit, the next generation EOTTS can continuously monitor the integrity of the train. Should wagons separate, this is reported immediately to the train driver to take action.
  Due to the propositional brake system, the brake pressure at the rear of the train cannot be used as a complete train indication.
- ***Track Clear***
  When a train moves into a loop, the guard would report to the train driver that the last wagon clears the main line.

The next generation EOTTs has a built in odometer that can be activated by a single button. When the locomotive enters a loop, the train driver will activate the odometer. The length of the train is displayed to the train driver. As the train moves, the counter is decremented until the full train is in the loop. The train diver can therefore ensure that the full train is in the loop before stopping the train safely.
This function can also be used to determine when the full train exits a loop or other speed limit areas. This will enable the train to increase its speed safely.

- ***Collision Warning***
  One of the function of the guard is to place crackers on the track to warn oncoming trains of a potential danger.
  With the next generation EOTTs, the rear unit can act as an emergency radio beacon. An oncoming train will receive an alarm as well as the distance to the potential danger.
- ***Dragging Equipment Detection***
  Derailments are unfortunately one of the regular unwanted incidents in railways. Conventional derailment detectors are normally installed about one to two kilometres from critical points such as railway bridges. Electricity is mostly not available at these sites and solar power lends itself to vandalism. The next generation EOTTs allows for the incorporation of wireless DEDs. The DED is fitted on the track and is powered by a lithium battery with life of 8 to 10 years.
  On detection of a derailment, a low power transmitter sends an alarm to the EOTT rear unit. The EOTT rear unit relays the alarm to the cab for display to the train driver. An extra bit in the AAR protocol is allocated for this alarm.
  This method of implementation derailment detection is very cost effective and will lead to major cost saving due to the prevention of these types of accidents.
- ***Data Loggers***
  With GPS fitted in the cab and the rear units, data can be logged with an accurate GPS date and time stamp. This will improve the ability to analyse the sequence of incidents should it be required to be compared with other external events. The logging information can be stored on a SDcard in the equipment and also be downloaded in real time if required.

- ***Train Length***
  With GPS in the cab and rear units, the length of the train is available. At the start of a journey, the train length can be compared with the wagon list supplied to the train driver. Missing or additional wagons can be located in this way. The size of the on a specific route limit the length of the train. By knowing the correct length of the train, potential problems with trains that are too long can be avoided.

- ***Common Screen***
  One of the major problems in modern locomotive are the number of computer screens to be installed for different application such as light vision and ATP. The next generation EOTTs are fitted with an Ethernet port that can communicate with any other computer in the cab of the locomotive.
  All critical information can therefore be displayed on a common screen that will increase safely and visibility.
- ***Weight***
  With the use of the latest battery technology, it is possible to reduce the weight of the rear unit to below 10 kg. This will not only improve the handling of the equipment but will also allow women to install the equipment in the future.

Cost Effective

The brake van can be replaced with an additional freight wagon. On a 50 wagon train, this will allow for more freight to be moved per train and therefore be more cost effective.

Summary

Modern railways depend on information, communication and tracking. The next generation EOTTs need to operate in this environment to enable the railways to be successful in the future.

Tracking Individual Railcars in Real Time Anywhere

Inteletrack have developed the ultimate railcar tracking device for the African environment. Ten railcar trackers were installed on railcars destined for Zambia. The performance of the railcar tracker exceeded all expectations.

Railcar Tracker

The railcar tracker consist of a satellite transponder that is mounted in a rugged bracket and is power by solar energy.

Satellite Transponder

Many tracking devices are available that using GSM as communication medium. The problem in Africa is that these device must communicate with mobile phone towers. These towers are mostly not located next the railway lines and therefore large sections are not covered by GSM.

The satellite transponder can be mounted anywhere on the side of a railcar 100% communication is guaranteed.

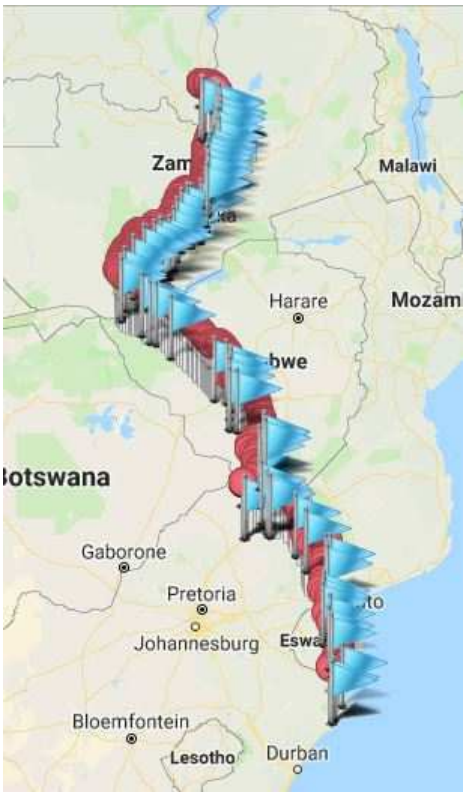
Rugged Mounting

The satellite transponder is protected with a 100mm polycarbonate window that is used on aircraft. It can withstand the impact of a hammer or fallen trees next to the rail track.

Solar Power

Solar power ensure continuous operation for the lifetime of the railcar tracking device. Even with no sun light, the device will still report up to 30 days.

Real Time Tracking



The tracking parameters for the tests was set as follow:

The device reports on the following incidents:

- When moving, every 15 minutes
- When stationary , every 12 hours
- Change from stationary to move – If the railcar move more than 200 meters in 4 minutes.
- Change from moving to stationary – if there is no more than 200 meters movement in 4 minutes period.

A web browser display the real time movement of the railcars. The red dots indicate movement and the blue dot the stoppages.

As the system is not land based, 100% coverage was reported from Richardsbay to Kitwe in Zambia.

An API to interface with the customer's database is also available.

Derailment

During the trip, three railcar derailed near Pemba.

It was possible to exactly display the position of the railcars next to the track. Due to the rugged mounting of the railcar tracker, the system survive the derailment and recovery of the wagons. The railcar trackers continued tracking the railcars 100 % on the route to the destination and back.

Reliability.

Ten railcars were fitted with the railcar tracker and after 10 weeks all the units are still 100 % functional.

Telemetry

The basic tracking unit can be expanded into a telemetry unit that can monitor door open/ close, fuel levels an even locomotive parameters using Modbus interface.

Logistics.

Of the original 10 railcar trackers installed on a train, it landed up in 7 different locations due to the derailment of wagons and repair of faulty wagons. This illustrate the complexity of management of the logistic of railcars in the African environment.

Cost

Due to the high efficiency of the data transmission with satellite, the monthly running cost of the tracking is very low.

Summary

The technology for tracking trains and railcars everywhere in real-time is available and tested, it only need to be implemented.