International Journal of Scientific Research & Engineering Trends
Volume 6, Issue 3, May-June-2020, ISSN (Online): 2395-566X

Automatic Brake Control Device During Derailment

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***Abstract* – The research paper aims to make/introduce a safetydevice which reduces the derailment cases for Indian Railways. The railway is regarded as one of the most economic and safe mode of transport. The running safety of the rail vehicle has become an issue of great concern for the railway community since the railway began to operate in the world.**

***Keywords*– manufacturing systems, ergonomics, effective ergonomic design, workplaces, workstations.**

I. INTRODUCTION

The train accidents causes damage to infrastructure.Rolling stock and lading, disrupt services and hence the potential to cause casualties, and harm the environment. Derailment of rolling stock is defined as a wheel or set of wheels leaving their due place from the rail top surface. The interference between man and machine has been largely responsible for errors and mistakes. Therefore the understanding of derailment mechanism has become crucial to avoid the derailment and reduce the loss due derailment.

Brake is needed in order to retard and stop the railway within minimum possible time.There are many different braking system that are used in Indian railways such are vacuum brake system, air brake system ,straight brake system ,electro dynamic brake system, mechanical braking system. We all are aware about the cases of derailment in Indian railways, the number of derailment cases increases per year.Generally in order to achieve braking the brake pressure of the pipe has to be released with help of electro pneumatic valve according the requirement.

The braking system of the most of train is based on air pressure type braking. In this arrangement the brake pipe has to be charged at specific pressure such that 5 kg/ cm square. The brake can be released or applied by either charging or discharging the pressure of the system with help of auxiliary equipment. Many researchers have worked to improve or minimize the derailment impact. In conventional braking processes a cumulative effect of accelerating braking process, a commutative effect of accelerating power,brake released condition and moment of inertia exists.We all are aware about the some emergency brake system, it can apply on the emergency condition such as accident, derailment and other emergency period.

Auto emergency brake systems are used in the emergency condition in Indian railways (AEB). This auto emergency brake system works on the speed sensor which is attached to the axel generator of the locomotive. (Thesegenerators are also known as tachometer generator).

How Aeb System Works -
The EBR is depended upon the speed sensor control. The speed sensor gets detection of the speed over the range limit that it senses on and it then can pass the signal to emergency brake relay and then relay cuts-off the power hence brake pipe exhausts and emergency brake is applied on it.When the EBR is charged the 2 brake valves are activated-
EBV1
EBV2

The work of EBV 1 is to cutoff pilot air from A9 to C2 with the additional C2 relay so that it causes the brake pipe to exhaust and the other EBV2 exhausts pressure of brake pipe and causes application of the brake.
EBR- EMERGENCY BRAKE VALVE
AEB- AUTO EMERGENCY BRAKE SYSTEM
EBR- EMERGENCY BRAKE RELAY

Amid Derailment
At the time of derailment if one boggy will be off track at the rail line at this time train willtravel in its own speed, so the driver won't know that the one boggy is derailed. This is the time of initiation of derailment, if at that time driver gets information about the derailment then they can apply brakes. After sometime when momentum will be zero then train can stop and hence the losses due to derailment would be reduced.
Now a day in Indian railways the brake system works when the driver manually senses such derailments but, in this safety device the brake system work automatically and power cut can be made at the moment of derailment by applying the brake. Each rail car has its own brake system having brake components like brake cylinder,brake shoes,a dual air reservoir and a control of AB valve. The AB valve is used to route air from the reservoir (auxiliary and emergency) to the brake cylinder. The brake cylinder isconnected through rods, levers, and slack adjusters to the brake shoes, unlike track brakes that are normally off or unapplied. The brake chamber spring is used to pull the brake shoe away from the wheel and allow the wheel to revolve freely.

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International Journal of Scientific Research & Engineering Trends
Volume 6, Issue 3, May-June-2020, ISSN (Online): 2395-566X

How The Praposed Brake Contril Device Work During Derailment-

At the time of derailment when the push bottom switch operates it passes the signal of the emergency brake and emergency brake system releases the pressure of brake pipe thus the pressure is exhausted down and after few moments the train stops.

Equipment used for this braking system-

1. Brake pipe
2. Feed pipe
3. Distributed valve
4. Check valve(only pass in one direction)
5. Auxiliary reservoir
6. Brake cylinder
7. Exhaust
8. New components added
9. Relay
10. Magnetic valve
11. Push bottom power source
12. Exhaust

Relay is junction of all signal connections which is attached to connect of all wheel of the boggie.

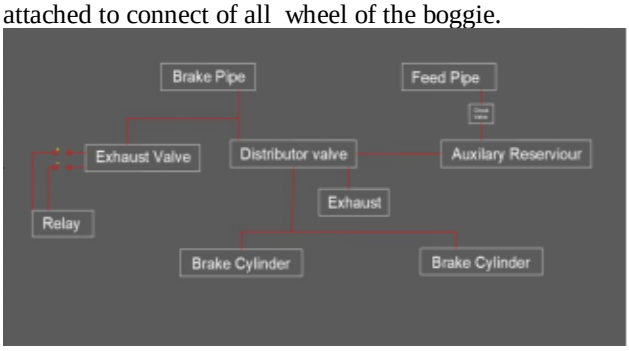

Fig.1. Block Diagram.

Description of block diagram-

When the relay will be operated by the push button switch they will pass signal to the magnetic valve and then thepressure will be released. This new arrangement will be attached in the brake pipe and push button switch will be attached in all the wheel axels.

For the freight stocks on Indian railways air brake is fit with single pipe/ twin pipe graduated release air brake system. It is most efficient and reliable braking system used to run heavy and long trains at high speed.

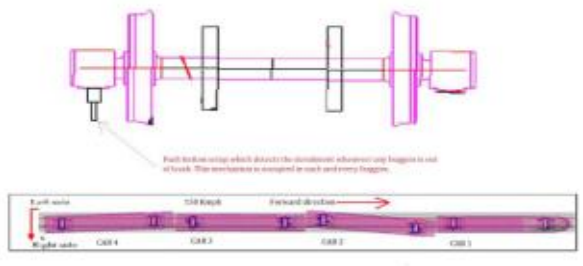

Fig.2. Wheel Axle Setup During Working.

Fig.3. Wheel and Axle.

Mechanism

A new way of braking system in which a push button is employed near rim of train. This push bottom is in ground level attached with the supporting structures of rail wheel and connected to relay. When the train is passed through the broken track or damaged track the emergency circuit gets connected with the track and the switch automatically operates and then it releases the charge pressure and after that the train stops. The system uses push button and a relay attached with the rail wheel. It will activate after derailment to even if the dearaiment happens to a single wheel. Thereafter it will attract the brake junction link between the two bogies thus after derailment the train will automatically retard after covering certain distance.

The push button arrangements must be kept closer to the wheel with the help of static part. The strength of the operating spring has to be enhanced so that it wouldn't trip under connect of normal forging part. The wiring of from push button to the braking motor has to be provided with proper protection.

Fig.4. Working of Electrical Setup with Push Button.

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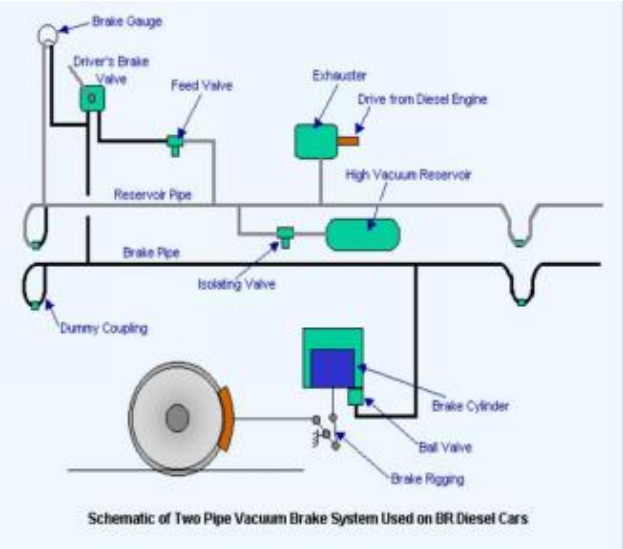

Fig.5. Working Setup.

II. CONCLUSION

The Project uses simple mechanism to avoid massive accidents. The accidents are unfortunate but we can cut off the number of causalities with this automatic braking system.

Strength: More numbers of lives can be saved. The running safety of the rail vehicle may be improved. Intensity and frequency of train accidents due to derailment can be reduced. Infrastructure and property losses due to derailment can be avoided significantly.

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