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Prototype Model of Electric Locomotive Traction System

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Abstract: ***Electrical locomotive is driven by DC series motor of 12V. The torque produced by motors is used to move the locomotive. The main supply to the motor is given through pantographs. The total length of path is 6 feet approximately. The other main equipment are rectifiers, Step-down transformer. Rectifier is used for conversion of alternating current to direct current, Step-down transformers used for convert high voltage power to a low voltage The railway is one of the largest and oldest methods of the transportation in our country serving many people in many ways. The major problem in railways is derailing and obstruction to the locomotive in different ways. Traction is basically two types, electrical traction and nonelectric traction. Electric traction is most advantageous and economical with less maintenance when compared to other.***
Keywords: DC series Motor, traction system, pantograph, Locomotive.

I. INTRODUCTION

Railway is a largest means of transportation in India and it is ranked in the world as fourth largest railway network. Railway works under the Indian railway which is a state-owned organization of the Ministry of railway. Indian railway traction system uses 1.5 kV DC around Bombay and 25Kv ac is used in rest of the country. The supply for traction system is taken from state utility which is three phase sources at 132/220 kV. The traction OHE required 25 kV supply, so only two phases are taken and step down to single phase 25 kV through transformer which is present at traction substation. This 25kV is fed to the OHE from feeder then to locomotive pantograph which is at the roof of locomotive. In our college, we created this prototype model of an electric locomotive. The electric locomotive is driven by DC series motor of 12V. The torque produced by motors is used to move the locomotive. The main supply to the motor is given through pantographs. The main motive To Design AC Traction System used for Practical Applications.

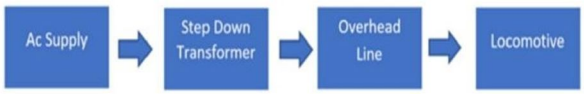


FIG NO. 1 BLOCK DIAGRAM ELECTRIC LOCOMOTIVE

Electric locomotive that are completely power by electricity, electric locomotive is faster than other types of locomotives. but how electric converted an engine work, in this project we will learn the working function of an electric locomotive. the electricity is supplied to the locomotive through overhead cable which carry alternating current AC these cables are connected to a power station that produced the required electricity The first stage is transformer which is converted 230 volts to 24-volt AC in overhead line and this alternating current which is carry pantograph, pantograph which touch in overhead line and collect electricity it run over busbar on the roof of locomotive through circuit breaker, this device is used to protect the locomotive form short ci+-rcuit and over load current. A single- phase ac converted and engine work the output current from the circuit breaker transfer to rectifier where it is converted to direct current dc further the dc is used to regulate the traction motor connecter to the wheel as the motor rotates the wheel are driven the traction motor.

II. METHODOLOGY

The electric locomotive is driven by DC series motor of 12V. The torque produced by motors is used to move the locomotive. The main supply to the motor is given through pantographs. The main motive To Design AC Traction System used for Practical Applications. And the other main equipment are relays, rectifiers, signal controllers.

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Rectifier is used for conversion of alternating current to direct current. The relays and the signal control system are connected together to trace the location of the locomotive. There are different methods are used in tractions systems such as AC traction & DC tractions.

1) Step down Transformer

The Step-down Transformer converts the incoming 230 volts ac supply are connected in primary side of transformer i.e., called as input supply voltage. The transformer converts into 230 volts to 24volts AC, 50hz. & The secondary side of transformer is called as output is 24 volts Ac supply the output supply are also connected inoverhead line

2) Rectifier

A rectifier is an electrical device that converts alternating current, which periodically reverses direction, to direct current. In this project bridge rectifier is used a bridge rectifier is a type of full-wave rectifier that uses four or more diodes in a bridge circuit configuration to convert alternating (AC) current to a direct (DC) current.

3) DC MOTOR

A DC motor is any motor within a class of electrical machines whereby direct current electrical power is converted into mechanical power. Most often, this type of motor relies on forces that magnetic fields produce. Regardless of the type, DC motors have some kind of internal mechanism, which is electronic or electromechanical. Inboth cases, the direction of current flow in part of the motor is changed periodically. A 12v dc motor is small and inexpensive, yetpowerful enough to be used for many applications. Because choosing the right DC motor for a specific application can bechallenging, it is important to work with the right company. A prime example is MET Motors, which has been creating high-qualitypermanent magnet DC motor.

General Properties or characteristics-
It should have less maintenance cost. It should have high efficiency.
Long life. Low initial cost.

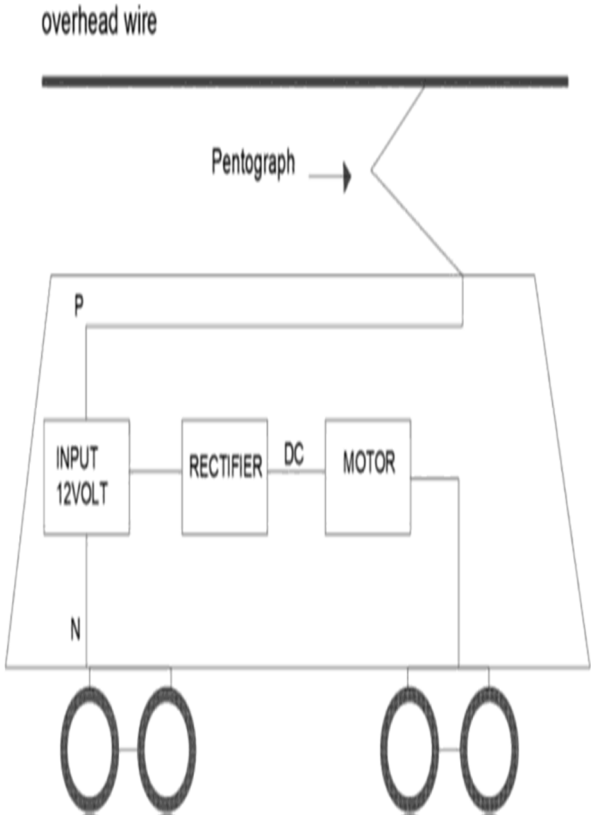


Fig. No.2 Prototype Model of Electric Locomotive

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III. DETAIL OF IMPLEMENTATION

Above This AC Traction System block diagram. information on each individual block in our effort for a prototype electrical locomotive. Pantograph, Step Down Transformer, motor controller, DC Series Motor, Rectifier Unit, etc. are all included in it. Electric locomotivesare quicker than other types of locomotives since they are entirely powered by electricity. But in this project, we'll find out how an engine that has been modified to run on electricity works.

The locomotive receives energy through overhead cables carrying AC (alternating current). The power station that generated the necessary electricity is where these wires are attached. The pantograph, which touches the overhead line and collects electricity, is powered by an alternating current that is converted in the first stageby a transformer from 230 volts to 24 volts in the overhead line. A circuit breaker is used to protect the locomotive from short circuits and overloaded currents. A single-phase ac engine is converted, andthe output current is transferred from the circuit breaker to a rectifier, where it is converted to direct current (DC). The DC is then used tocontrol the traction motor connecter to the wheel, which is poweredby the traction motor.



Fig.3 Hardware Implementation

IV. CONCLUSIONS

In real life we cannot visit to a railway traction system. Becauseit is very dangerous and we don't get permission to visit the system. The prototypes model of electric traction system helps to study the traction systems. This project understands how the electric traction system works. The Electric locomotive are playing a vital Role in railway system till now. Basically, the traction system is divided intotwo parts such as AC traction and DC traction. Both systems are its own advantages and disadvantage. This prototype model helps us tostudy the working of electric traction system.

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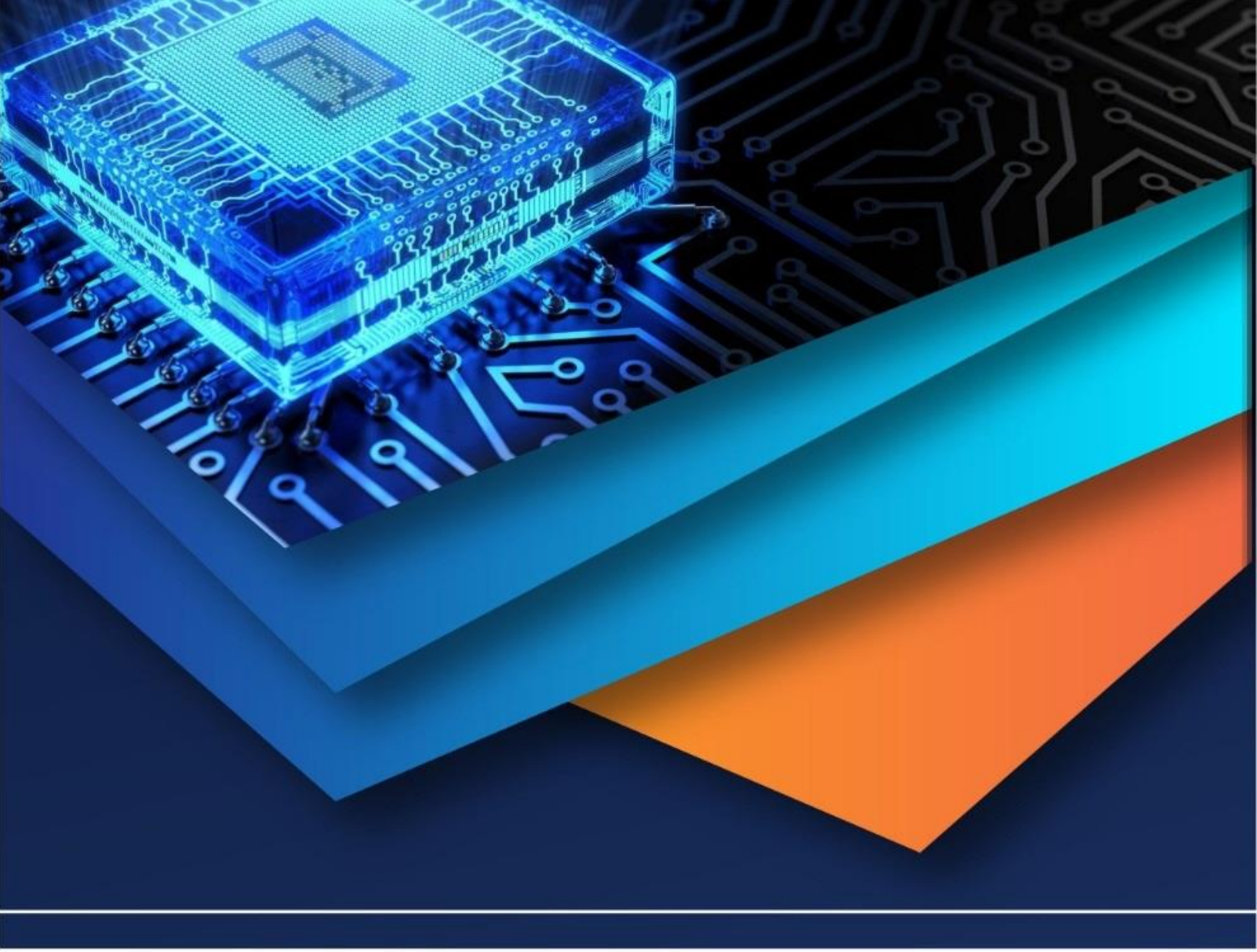
V. FUTURE SCOPE

This prototype model can be upgraded in future. In this we can addan automation system like if a big object falls on the track it will detect and send danger signal to the station and another system when station is coming the train will adjust their speed and stop on stationif required. We can also add the feature of automatic opening and closing the train door when the train is at the station, also we can implement fault detection system for electrical lines fault or track fault. Can add 2 more trains. We can make a station signal that will work automatically. In trains we can add various braking system like emergency braking, Electropneumatic breaks Air Brakes. We can add railway track crossing point which is used by people and vehiclesand also control this point automatically

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