

DELHI METRO AUTOMATION USING PLC AND SCADA

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Abstract

Delhi metro “The Lifeline of Delhi” has been taken by the Government of India and the Government of National Capital Territory of Delhi, in equal partnership has set up a company named Delhi Metro Rail Corporation Ltd. under the Companies Act, 1956. The government took the project to resolve the issues of traffic and accidents. Due to uncontrollable traffic problems of life and death arose. Delhi is metropolitan city with over 16.75 million people. Maximum percentage of people from the given count comes for work and employment in Delhi. To accommodate this huge number has played a very crucial role. Delhi metro not only solve traffic problems but also addressed problems like time saving, energy management, greener aspects and pollution problems, crossing the barriers of economical status bars as all kind of people travel in together in large numbers. This brings co operation towards each other.

Index Terms: PLC, SCADA, Sensor, Automation, DMRC, Fire Alarm, Relay

Introduction

Metro rail was a fascination for people of Delhi about 20 years ago because it has solved those issues which were a major problem for Delhiites. It has changed the things for not only people who are using it but for those also who are not as it has reduces pollution making the city the greener and the better place to live and work. Physical construction work on the Delhi Metro started on October 1, 1998. After the previous problems experienced by the Kolkata Metro, which was badly delayed and 12 times over budget, the DMRC was given full powers to hire people, decide on tenders and control funds. The project is being carried out in phases - Phase I (65.11km) and Phase II (128km) have been completed. On this project of Delhi metro we will basically deal with the ATO through automation technology of PLC and SCADA.

AUTOMATIC TRAIN OPERATION

The Automatic Train Operation (ATO) System is responsible for Train Operation between the Stations. The Train Speed, Acceleration / Deceleration and Braking shall be automatically controlled, without the Driver’s intervention, preventing unnecessary Braking, Stopping and Starting. ATO is basically divided into three parts:

a) Train Protection:

Train detection-monitoring of the track to determine the presence and location of trains. This system enables all the functions i.e. flashing the message before the arrival of the train on the platform prior to 3 minutes so that all the passengers should get alert for the boarding. Here the sensor in the figure-detects the presence of train, monitors track and measures the train distance from the platform for various data and uses.

- **Route interlocking**-preventing trains on crossing, merging, or branching routes from making conflicting (unsafe) moves that would cause a collision.

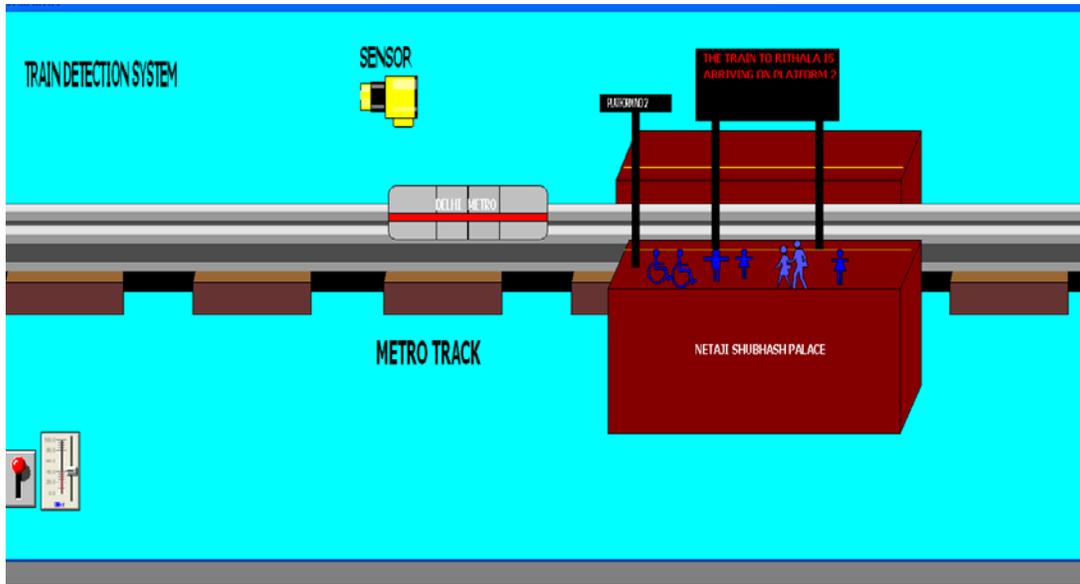


Figure 1: Route Interlocking

- **Over speed protection**-assuring that train speed remains at or below the commanded or posted civil speed limit as to prevent collisions resulting from going too fast to stop within the available distance and to prevent derailments due to excessive speed on curves or through switches.

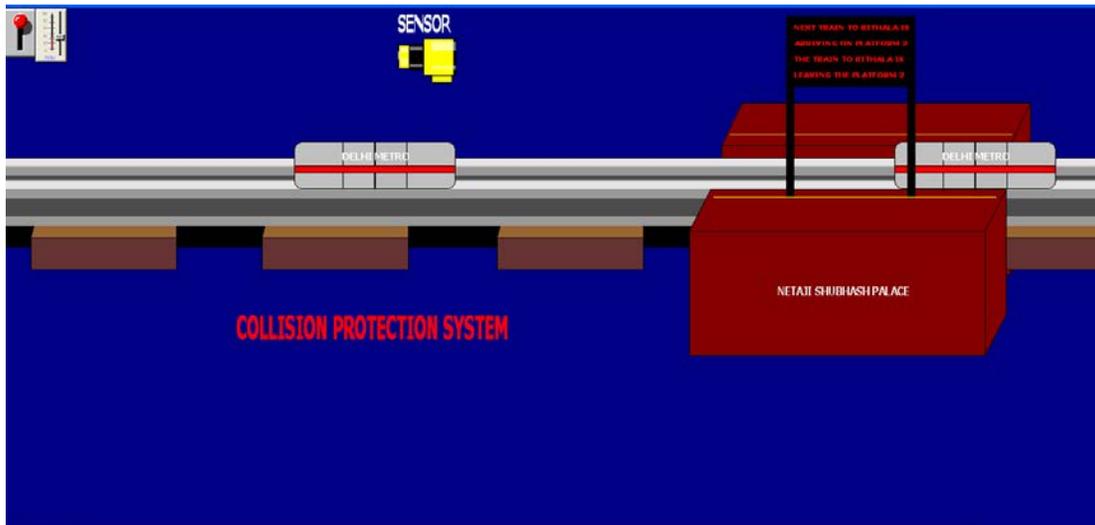


Figure 2: Over Speed Protection

- **Train and track surveillance**-observing conditions on and in the vicinity of the track ahead of the train and monitoring safety related conditions on board the train. In the figure-the track surveillance is done which sends the signal for the departure of the train at the station so that the track should be clear for the coming train
- b) Train Operation**
- **Speed regulation**-controlling train speed, within the constraints of over speed protection; make the run according to schedule. The speed of train is already been discussed through figure in Train and track surveillance part of train protection.
 - **Station stopping**-bringing the train to a stop within some specified area in a station.

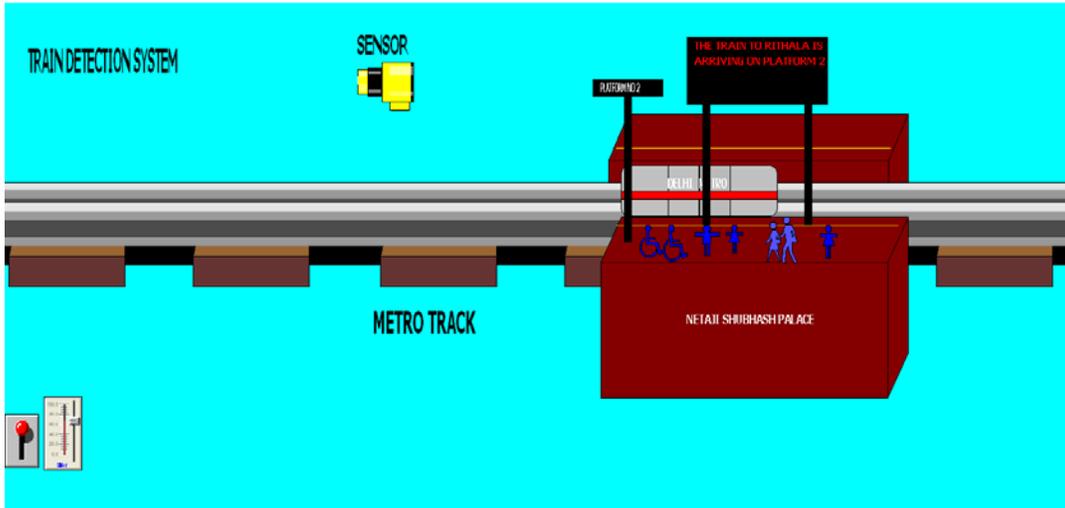


Figure 3: Station Stopping

- **Door control**-opening of doors in stations to permit passengers to enter or leave the train and closing of doors when the train is ready to Start.

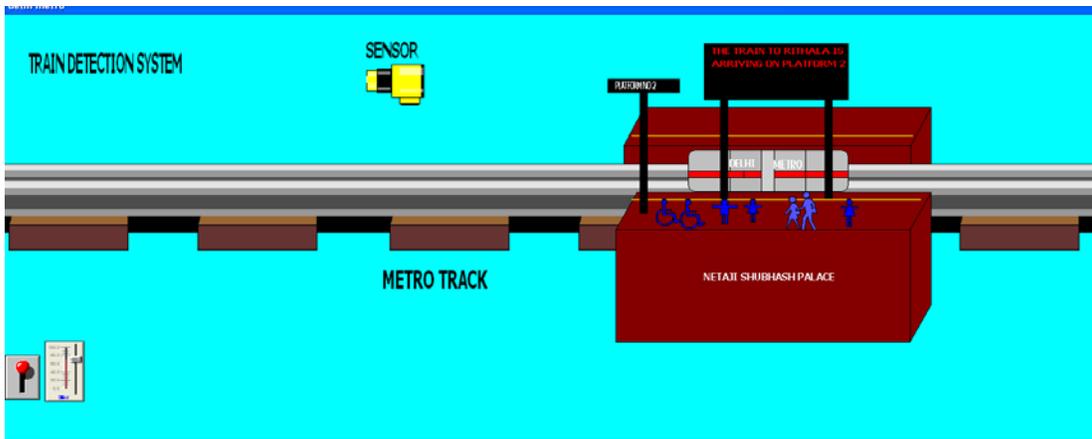


Figure 4: Opening of Door

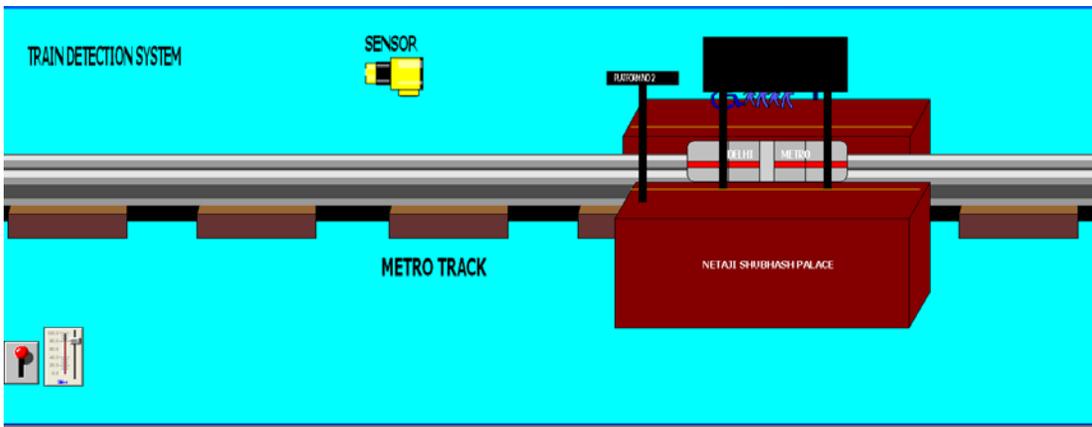


Figure 5: Closing of Door

- **Train starting**-initiating train departure from a station after the doors are closed (provided the train protection system permits it).

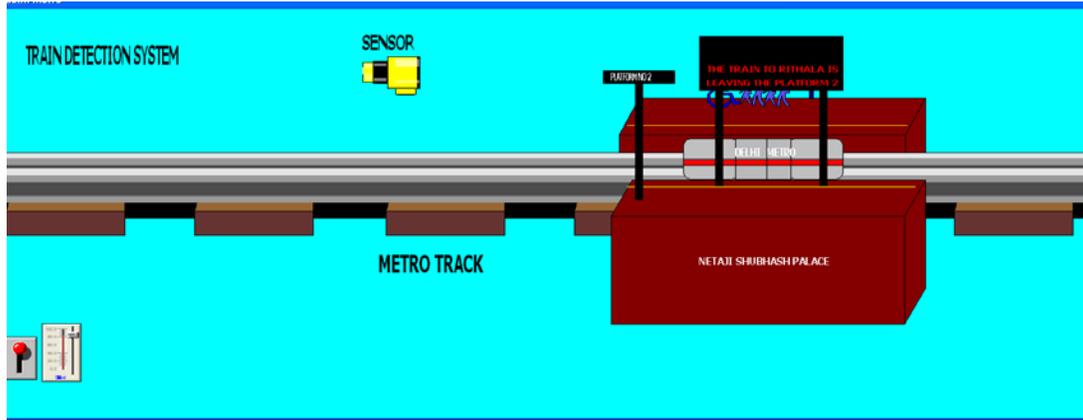


Figure 6: Train Started after the Door are closed

c) Communication and signaling

The communication system is the meant by which the information needed to carry out all other train control functions is transmitted and exchanged.

- Train protection—information necessary to locate individual trains, to assure their safe separation, to prevent over speed, and to control movement at route interlocking.
- Command and status-information on the operational state of the system, command signals to control train and switch the movement, and feedback to determine the response of system elements to command inputs.
- Emergency—information on the nature and location of emergency events and summons for help to elements within the transit system or to outside agencies (e.g., fire, police, medical, and rescue).
- Passenger service—information relating to train service and system operation for the purpose of assisting passengers using transit facilities.
- Maintenance—information needed to plan or conduct preventive and corrective maintenance.
- Business operations--operational information used to maintain a record of (plan for) work force allocation, vehicle utilization, procurement of supplies and equipment, operating expenses, and system patronage.

CONCLUSION

ATO is the basic technology used in all metros all over the world .The other metros and trains also use technologies like ATP(Automatic Train Protection),ATS(Automatic Train Supervision) in future Delhi metro has proposed the metro as driverless metro train reviewing all aspects have conclusion with two new proposed improvements:-

- Exit and entry door for the metros should be different that is opposite side.
- Delhi metros have limited seats so it can be resolve by using automatic seating system. This system will have automatic rectangular slabs of 60cm in width, 200cm in length and 50cm in height and on the roof there will be automatic hangers for hanging the bags.

REFERENCE

1. <http://www.railway-technical.com>
2. http://www.delhimetrorail.com/about_us.aspx#Introduction
3. http://articles.timesofindia.indiatimes.com/2013-11-21/india/44326276_1_dmrcjakarta-metro-Delhi-metro-rail-corporation
4. <http://indianexpress.com/article/cities/delhi/come-be-our-consultant-kuwait-to-delhi-metro/>
5. <http://indianexpress.com/article/cities/delhi/come-be-our-consultant-kuwait-to-delhimetro/>