Scientific Journal of Impact Factor (SJIF): 4.72

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 3, March -2017

Paris Metro Line no -14

The Advance Transportation System

Harshal Bodiwala[1], Vasav Rakholia [2],Akshay Sanepara[3],Apurv Kapadia[4]

[1, 2,3,4] *M.Tech in Construction Management, MIT Art, Design and Technology*

Abstract —*Paris metro is the ideal way to get around Paris fast and easily. There are 16 lines (Including 2 "bis") traversing the city. Each line has a different color and number. So even if the abundance of lines appears overwhelming when you first look at a metro map, it quickly becomes easy when you understand how it works. Any given metro station each metro line will have 2 platforms, one for each direction. Each direction is marked by its terminus station, the last station on the line. Paris Metro Line no- 14 as operated completely automatically, it was a driver less system.*

Keywords-*Metro line -14, driverless system, automatically, ideal, terminus station*

I- INTRODUCTION

A. PARIS AND IT'S METRO SYSTEM

Paris is the capital and most-populous city of France. Situated on the Seine River, in the north of the country, it is in the center of the France region. The City of Paris has an area of 105.4 square kilometers (40.7 square miles).The Paris Region covers 12,012 square kilometers (4,638 square miles), and has its own regional council and president. It had a population of 12,005,077 as of January 2014.

The Paris Region had a GDP of €624 billion (US $687 billion) in 2012, accounting for 30 percent of the GDP of France, and ranking it as one of the wealthiest five regions in Europe. it is the banking and financial center of France, and contains the headquarters of 29 of the 31 companies in France ranked in the 2015 Fortune Global 500

The **Paris Metro** is a rapid transit system in the Paris Metropolitan Area. A symbol of the city, it is noted for its density within the city limits and its uniform architecture, influenced by Art Nouveau. It is mostly underground and 214 kilometers (133 mi) long. It has 303 stations, of which 62 have transfers between lines. There are 16 lines, numbered 1 to 14 with two lines, 3bis and 7bis, which are named because they started out as branches of lines 3 and 7; later they officially became separate lines; the Metro is still numbered as if these lines were absent. Lines are identified on maps by number and color, and direction of travel is indicated by the terminus.

It is the second-busiest subway system in Europe, after Moscow. It carried 1.541 billion passengers in 2012, (up from 1.524 billion in 2011), 4.210 million passengers a day. It is one of the densest metro systems in the world, with 245 stations within the 86.9 km^2 of the city of Paris. Chalet – Les Hales, with 5 Metro lines and three RER commuter rail lines, is the world's largest metro station.

The first line opened without ceremony on 19 July 1900, during the World's FairParis Metro Lines. The system expanded quickly until the First World War and the core was complete by the 1920s.In the late 1990s, the automated line 14 was built to relieve RER line A.

Figure 1 Subway Station of Paris

Paris Metro Lines

Line name	Opened	Last extension	Stations served	Length	Average interstation	Journeys made (per annum)	Termini
Line 1	1900	1992	25	16.6 km / 10.3 miles	692 m	213,921,408	La Défense Château de Vincennes
Line 2	1900	1903	25	12.3 km / 7.7 miles	513 m	95,945,503	Porte Dauphine Nation
Line 3	1904	1971	25	11.7 km / 7.3 miles	488 m	91,655,659	Pont de Levallois Gallieni
Line 3bis	1971	1971	4	1.3 km / 0.8 miles	433 m		Porte des Lilas Gambetta
Line 4	1908	1910	26	10.6 km / 6.6 miles	424 m	155,348,608	Porte de Clignancourt Porte d'Orléans
Line 5	1906	1985	22	14.6 km / 9.1 miles	695 m	92,778,870	Bobigny Place d'Italie
Line 6	1909	1942	28	13.6 km / 8.5 miles	504 m	104,102,370	Charles de Gaulle - Étoile Nation
Line 7	1910	1987	38	22.4 km / 13.9 miles	605 m	121,341,833	La Courneuve Villejuif Mairie d'Ivry
Line 7bis	1967	1967	8	3.1 km / 1.9 miles	443 m		Louis Blanc Pré Saint-Gervais
Line 8	1913	1974	37	22.1 km / 13.8 miles	614 m	92,041,135	Balard Créteil
Line 9	1922	1937	37	19.6 km / 12.2 miles	544 m	119,885,878	Pont de Sèvres Mairie de Montreuil
Line 10	1923	1981	23	11.7 km / 7.3 miles	532 m	40,411,341	Boulogne Gare d'Austerlitz
Line 11	1935	1937	13	6.3 km / 3.9 miles	525 m	46,854,797	Châtelet Mairie des Lilas
Line 12	1910[13]	1934	28	13.9 km / 8.6 miles	515 m	81,409,421	Porte de la Chapelle Mairie d'Issy
Line 13	1911[13]	2008	32	24.3 km / 15.0 miles	776 m	114,821,166	Châtillon - Montrouge Saint-Denis Les Courtilles
Line 14	1998	2007	9	9 km / 5.6 miles	1,129 m	62,469,502	Saint-Lazare Olympiades

B. DRIVER LESS SYSTEM IN EUROPE:

Completely driverless systems and lines [edit]

Europe [edit]

- Copenhagen Metro - AnsaldoBreda Driverless Metro.
- Barcelona Metro line 9 and Barcelona Metro line 10 - Siemens CBTC
- Turin Metro - VAL type system.
- Paris Métro Line 14 - opened on 15 October 1988 - Siemens CBTC
- Paris Métro Line 1 - Driverless system started to operate in mixed mode (drived train and driverless train) on 3rd November 2011. Last manually driven train will be removed by end of 2012 - Siemens CBTC
- Rennes Metro - VAL type system.
- Toulouse Metro - VAL type system.
- Lille Metro - inaugurated on 25 April 1983, the first using the VAL system.
- Lyon Metro Line D Rubber-tyred trains run automatically with no driver on board, controlled by a system known as MAGGALY (Métro Automatique à Grand Gabarit de l'Agglomération Lyonnaise). - Siemens CBTC
- Nuremberg U-Bahn - U3 and U2 lines (manned trains in case of need)
- Lausanne Metro - line M2

II- DATA COLLECTION & OBSORVATION

A. Metro Line No – 14

a- ***Need of Metro Line No -14***. The central section of the RER Line A, between Gare de Lyon and Auber, is a section with important passenger traffic. In rush hours, some 62,000 passengers commute on the line in one direction every hour. The main purpose of the Parisian metro line 14, or METRO (Metro Est-Ouest Rapider), was to offer a sustainable solution to the overloaded traffic. The METRO line runs parallel to the section of RER Line A between Gare de Lyon, Chalet and the Madeleine—Saint-Lazare district, therefore relieving Line A of about 8,000 passengers per hour in each direction. The METRO line also aims to promote the development of the urban hub around southeast Seine, with the creation of the François Mitterrand National Library.

b- ***Infrastructure.***The section in operation from Bibliothèque François Mitterrand to Gare Saint-Lazare is entirely underground. Thanks to the lighting shafts, some stations are lit up by natural light.Specific work concerned: the terminal on the left bank of the Seine river: the Bibliothèque François Mitterrand station was built under the SNCF project management, partly underground and partly elevated, with fine-tuned phasing so as to maintain SNCF rail traffic at surface level at Boulevard Massena station. The Seine river crossing: from its left bank terminal, Line 14 crosses the river to the right bank by means of an underwater tunnel. The technique used was the one of submerged caissons. The section between the Boulevard de la Bastille and the Louis XVI Square: from the Madeleine station onwards, a two-track tunnel was built entirely below the water table. It is 4,550 m long with a 7.5 m inner diameter, and was drilled by a tunneling machine specially built for the project. Excavated earth was removed via barges on the river Seine. The rest of the line was built by classic tunneling methods.

B. STATION:

The completed METRO project includes 18 stations, of which 13 are within Paris: 8 of them provide connections with 11 metro lines, 5 of them ensure connections with 5 RER lines. Furthermore, the line serves two main SNCF railway stations: Gare de Lyon (and its station in annex at Berczy) and Gare Saint-Lazare. The key words of the station design are comfort and safety to ensure the quality of daily travel. The stations are spacious, colored and well lit, as well as cater for physically disabled, visually or auditory impaired passengers.

Figure 2 Olympiad Station

Figure 3 Chatelet Station

III- ROUTE

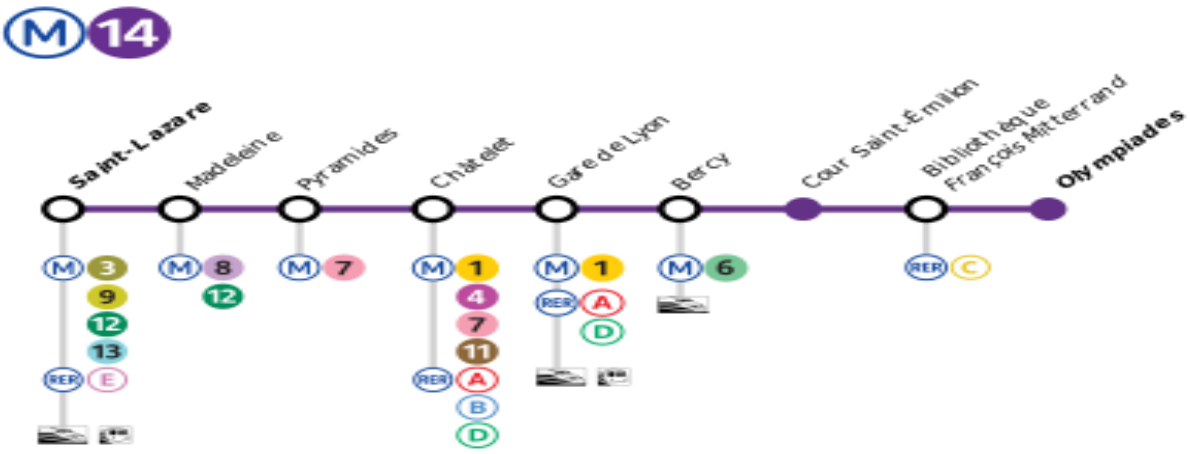

Figure 4 Route of metro line 14 Paris

A. FEATURES:

Stations are audibly announced twice at each stop. Visible indicators near the doors alert thehearing-impaired of door closure. All trainsets on line 14 allow passengers to walk from one end of the train inside the train all stations are accessible to wheelchairs Line 14 uses moving block signaling as opposed to fixed block signaling (This reduces "traffic jams" caused by traditional signaling). The line is the deepest of the regular Metro Lines.

B. SUPERSTRUCTURE:

From a technical point of view, Line 14 of the Parisian metro is fully automated. Originally, the headway between two trains was 105 seconds at peak hours. It has been reduced to reach 100 seconds. 4 new trainsets were purchased in 2012. This additional rolling stock enabled to reduce the headway to 85 seconds. It is possible to run mixed traffic on the line and operate conventional metro trains while the new fully automated system remains into operation. This facility, despite downgrading the overall operation with a lengthened headway, is used as back-up service or at slack hours for work trains.

C. ROLLING STOCK

The trains are driverless, rubber-tired rolling stock, MP 89 type. It has good suspension and is silent, causing no vibrations and thus no noise pollution to its neighborhood. The first train version for METRO comprised of 6-car train sets, measuring 90 m. Subsequently, it is made up of 8-car train sets, measuring 120 m. The first 6-car train sets could carry some 720 passengers at an average speed of 40 km/h. Journeys are fast, taking only 13.30 minutes between Olympiads and Gare Saint-Lazare.

D. PLATFORM SCREEN DOORS

The 'cutting-edge' safety feature in modern subways consists of transparent doors that separate rail tracks from platforms. Train doors and platform doors are aligned and open simultaneously after the train has stopped. Subway systems with platform screen doors are also called PSD, platform edge doors, or PED) or half-high platform gate doors (PGD).

These doors help to:

- Prevent accidental falls off the platform onto the lower track area, suicide attempts and homicides by pushing.
- Prevent or reduce wind felt by the passengers caused by the piston effect which could in some circumstances make people fall over
- Reduce the risk of accidents, especially from service trains passing through the station at high speeds.
- Improve climate control within the station (heating, ventilation, and air conditioning are more effective when the station is physically isolated from the tunnel).
- Improve security — access to the tracks and tunnels is restricted.
- Lower costs — eliminate the need for motormen or conductors when used in conjunction with Automatic Train Operation, thereby reducing manpower costs.
- Prevent litter build up on the track, which can be a fire risk.
- Improve the sound quality of platform announcements, as background noise from the tunnels and trains that are entering or exiting is reduced.

Their primary disadvantage is their cost; installing a system typically costs several million USD per station. When used to retrofit older systems, they limit the kind of rolling stock that may be used on a line, as train doors must have the same spacing as the platform doors; this results in additional costs due to depot upgrades and otherwise unnecessary purchases of rolling stock. They also impede natural ventilation, increasing climate control costs.

The doors also pose their own safety risks. The primary risk is that people may be trapped between the platform doors and the train carriage, and be subsequently crushed when the train begins to move. Cases of this happening are rare, and may depend upon door design.

E. OPERATING SYSTEMS

METRO is highly safe, thanks to its highly sophisticated equipment capable of: train control for the entire line, particularly at the terminal stations; automatic train operation with permanent safety speed control; at stations, control of train stopping and departure, opening and closing of train doors and platform screen doors; monitoring traction power supply in total security and the various alarm systems linked to train movements, ensuring the audio-video surveillance in platforms and train interiors by CCR operator.

F. SIGNALLING SYSTEM:

Metro as a CBTC (Communication Based Train Control) system was supplied by Siemens Transportation Systemsincluding monitoring from an operations control centre, equipment for 7 stations and equipment for 19 six-car trains, resulting in a headway of 85 seconds.

a. CBTC:

- **Communications-Based Train Control** (**CBTC**) is a railway signaling system that makes use of the telecommunications between the train and track equipment for the traffic management and infrastructure control.
- By means of the CBTC systems, the exact position of a train is known more accurately than with the traditional signaling systems. This results in a more efficient and safe way to manage the railway traffic.
- Metros (and other railway systems) are able to improve headways while maintaining or even improving also the safety.

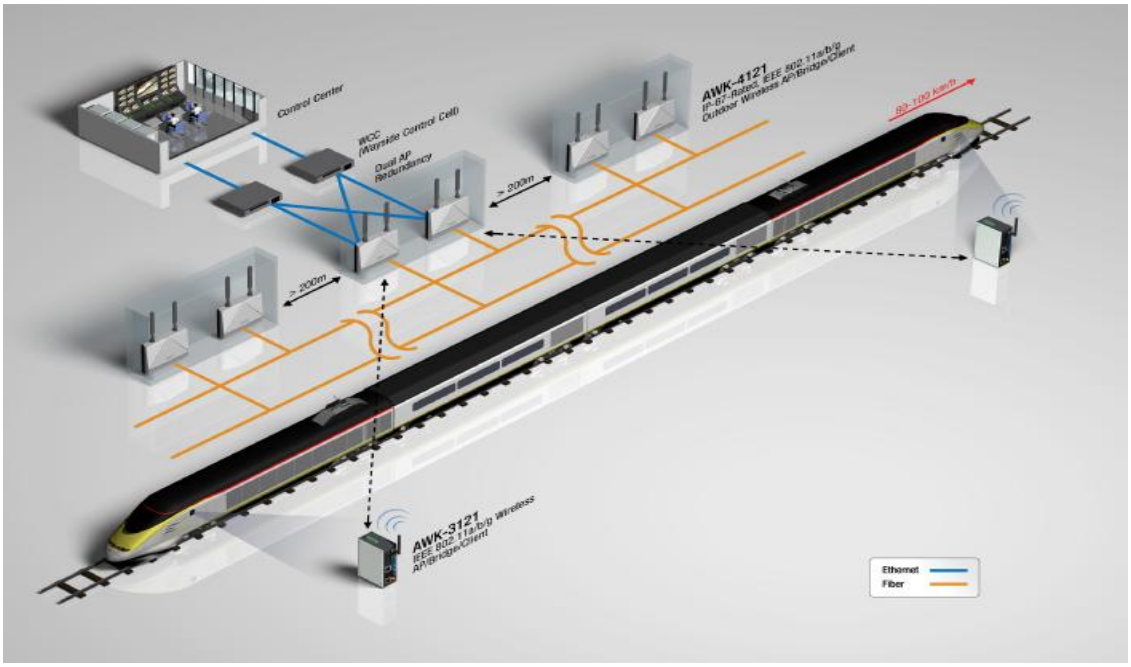

Figure 6 CBTC

IV- CONCLUSION

1. Since the metro is totally automatic and driverless, the metro runs daily and the problem caused in transportation in Paris due to the strikes of driver is eliminated.
2. The opening of platform screen doors only when the train arrives results in the prevention of suicide or people falling on the tracks.
3. The metro has an improved headway of 85 second due to the moving block signaling system as compared to the conventional fixed block signaling system having headway of 105 second.
4. The metro can be operated at a faster rate.
5. The metro has an enhanced reliability of as much as 99%.
6. Since the manpower required is less and the trains run at uniform speed, the operating cost is less.
7. This automatic metro is a convenient mode of travel that can be used by all; even the hearing impaired can board the train safely by the visible indicators on the doors when the doors are about to close.
8. However, the electronic system is the key and the failure in this system may result in the indefinite delay of such metro.

V- REFRENCE

[1] *"Ile-de-France : 14 rames MP05 de plus pour la ligne 14". 14 November 2012. Retrieved March 19, 2013.*
[2] *"New section of Metro Line 14 opened". InfraSite.net. 2 July 2007. Retrieved 6 July 2007.*
[3] *La Vie du Rail magazine, Météor: Les premiers pas du métro de l'an 2000, number 2507, date 9 August 1995, page 16*
[4] Communiqué de presse RATP - La ligne 14 fête ses 5 ans ! PDF Retrieved 5 October 2011. **(French)**
[5] Le Parisien, *Le métro compte une nouvelle station*, article du 26 juin 2007
[6] Conseil général des Ponts et Chaussées - *Effondrement sur le chantier METRO* PDF (824 KB), avril 2003
[7] Journal *l'Humanité* - Une cour d'école s'effondre à Paris
[8] MétroPole - La couleur pourpre www.metro-pole.net Retrieved 5 October 2011. **(French)**
[9] MétroPole - Les pieds dans la prise... www.metro-pole.net Retrieved 5 October 2011. **(French)**
[10] MétroPole - Coincé à faire un demi-tour www.metro-pole.net Retrieved 5 October 2011. **(French)**

