Intelligent Transport System in Delhi Metro

By

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http://www.delhimetrorail.com
INTRODUCTION

- DMRC as a public transport has shown continuous increase in its patronization.

- Challenges faced by DMRC
  - How to increase utilization/productivity of existing transportation infrastructure
  - Making services attractive by way of service quality for continued patronage
  - How to meet potential growth
  - Integration with other modes of transport

- ITS philosophy and methodology has been continuously resorted to for addressing the challenges
## TRAIN OPERATION AT A GLANCE

<table>
<thead>
<tr>
<th>DELHI METRO</th>
<th>No. of stations (By Line)</th>
<th>NUMBER OF RAKES UTILISED</th>
<th>HEADWAY (In Min)</th>
<th>(PHPDT) (As on 4th Sep `17)</th>
<th>Traffic Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 1-RED</td>
<td>21</td>
<td>25</td>
<td>3’20”</td>
<td>25962</td>
<td>End to End Operation</td>
</tr>
<tr>
<td>Line 2-YELLOW</td>
<td>37</td>
<td>54</td>
<td>2’18”</td>
<td>51034</td>
<td>Intermediate reversal of alternate train at VW, and 1 in 4 at QM</td>
</tr>
<tr>
<td>Line 3&amp;4-BLUE</td>
<td>51</td>
<td>61</td>
<td>2’35”</td>
<td>49747</td>
<td>Intermediate reversal of 1 in 3 trains at Dwarka</td>
</tr>
<tr>
<td>Line 5-GREEN</td>
<td>16</td>
<td>16</td>
<td>3’48”</td>
<td>9585</td>
<td>End to End Reversal</td>
</tr>
<tr>
<td>Line 6-VOILET</td>
<td>32</td>
<td>38</td>
<td>3’24”</td>
<td>23831</td>
<td>Intermediate reversal of alternate train at Badarpur</td>
</tr>
<tr>
<td>Airport Line</td>
<td>6</td>
<td>6</td>
<td>10’00”</td>
<td></td>
<td>End to End Reversal</td>
</tr>
<tr>
<td>TOTAL</td>
<td>163</td>
<td>200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## MILESTONES (RIDERSHIP)

<table>
<thead>
<tr>
<th>Date</th>
<th>Ridership</th>
<th>Remarks (First time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-Dec-02</td>
<td>114,835</td>
<td>0.1 Million</td>
</tr>
<tr>
<td>04-Aug-09</td>
<td>1,008,696</td>
<td>1.0 Million</td>
</tr>
<tr>
<td>08-Nov-10</td>
<td>1,559,166</td>
<td>1.5 Million</td>
</tr>
<tr>
<td>12-Aug-11</td>
<td>2,083,755</td>
<td>2.0 Million</td>
</tr>
<tr>
<td>08-Aug-13</td>
<td>2,508,480</td>
<td>2.5 Million</td>
</tr>
<tr>
<td>11-May-15</td>
<td>3,017,790</td>
<td>3.0 Million</td>
</tr>
<tr>
<td><strong>17-Aug-16</strong></td>
<td><strong>3,369,131</strong></td>
<td><strong>Ever Highest</strong></td>
</tr>
</tbody>
</table>

In last Five years there is an increase of 73.4% in ridership
• It is seen that max. **53.54%** are in the age group of 20-30 years.
• 92.57% are below age of 40 years.
• 2.24% are above 50, of which 0.72% above 60.
Out of 24.59% female passengers only **26.30%** travelled with the family/friends and **73.70%** travelled alone i.e. 18.12% of total passenger.
ITS in DMRC

ITS in DMRC involves:

- Operational efficiency through scheduling and management of trains
- Optimal infrastructure usage
- Reliability and Information management
- Efficiency in Ticketing system
- Traffic integration and Common mobility card
Train Planning & Scheduling

- Balances passenger needs, service performance and maintenance requirements - different (weekly, weekend, special) timetable prepared.
- Use of simulator – minimum operator input
- Train is tracked in the DMRC network through an unique ID. The information is available to the traffic controller in OCC in real time.
- Flexibility of addition/deletion of trips
- Interlacing of 6-car & 8-car rake in a manner to ensure maximum clearance capacity at crowded section during peak or peak of the peak time
- Non-symmetrical headway – to take care of directional traffic
- Implementation of energy saving speed profiles in train time table during off peak and holidays.
- Outstation night stabling of trains, this saves dead KMs, thus saves energy
Rake Requirement

- Rake requirement
  - The rake requirement for different sections is based on the PHPDT figures.
  - PHPDT is calculated through station entry/exit figures.

- Real time insertion/ withdrawal of rakes
  - The ridership of the line on a particular day compared to the last 4 days average used for insertion/ withdrawal of rakes.
  - Ridership of a line is calculated in real time as the number of passengers exiting on the line.
Demand Vs Supply before rationalization
Demand vs Supply After Rationalization

Reduced gap

NEL CAPACITY

PHPDT

• Blue Line network has a split at Yamuna Bank depot.
• The traffic in Dwarka-Dwarka 21 is less. Previously, out of the two branches YBD-NCC had more traffic.
• This traffic pattern was met by reversing every alternate train at Dwarka and running two fixed loops Dwarka 21 to NCC (8-car rakes) and Dwarka- VASI (6-car rakes).
• This met the traffic pattern but there were bunching at Dwarka.
• Now with more 8-car rakes available and traffic of YBD-VASI also picking up, the traffic pattern has been changed to 2 out of 3 trains to go to Dwarka sub-city and do away with fixed loops.
• This has reduced the end to end runtime by around 2 minutes from 90 to 88 min. Also from Dwarka 21 trains for both VASI and NCC are available.
Increasing productivity/ Optimal usage of Infrastructure

- Productivity of staff
- Operation and Security staff deployment:
  - TOM operator deployment (based on hourly token sale)
  - Customer care deployment during off-peak
  - CISF deployment at station
- Lift operation
- Escalator operation (direction of escalator in morning/evening)
- Denomination wise TOM window
Reliability & Information Management

- Centralized incident management system
  - Environmental conditions viz cyclone, earthquake managed centrally from OCC
  - Alarm & incidences for various systems viz traction, signalling, rolling stock etc available at operation control centre
- CCTV surveillance
- System has redundancy and has fallbacks (degraded operations)
- Passenger information system
  - At stations (at concourse / platform)
  - Inside train
  - Outside premises through IVRS, mobile app etc
Reliability & Information Management (cont.)

• Information available to Train controller
  • Train route info in real time
  • Continuous communication with Traffic controller with emergency feature
  • CCTV view of coaches
  • Intercomm with coaches

• Information available to Security personnel
  • Handheld set for communication
  • CCTV surveillance in control room

• Flight Information Display system on Airport Line
Information (signages) at interchange station
Information (signages) at interchange station
Information Management: LCD screen in station
Information at Platform: Car consist on PIDS

Information of car consist of the incoming train so that passengers can relocate.
Information (Planning journey)

MOBILE APP

Route Between Stations
Station Information
Nearest Metro Station
Tour Guide
Metro Museum
Lost and Found
Other Info

Inderlok ↔ Dwarka Sector 21
27.7 KM
25 Rupees
78 Min
24 Stations
1 Interchange

- Inderlok
- Ashok Park Main
- Satguru Ramsingh Marg
- Kirti Nagar
- Moti Nagar
- Ramesh Nagar
- Rajouri Garden
- Tagore Garden
- Subhash Nagar
- Tilak Nagar

RouteInfo  MetroMap  GoogleMap

www.delhimetrorail.com
Information (Planning journey)

Google Map
CCTV surveillance in OCC
CCTV surveillance in CISF control room
Ticketing System of DMRC

- Drive towards cashless
  - Auto top-up through combo card
  - On-line recharge (web, wallet)
  - Payment through POS and Bharat QR code
  - Recharge through SMS

- Self service ticketing modes: Ticket vending machine
- Automation of penalty – recently introduced
- Peak/Off-peak fares introduced from May ‘17 for producing a more balanced traffic pattern during the day and better utilization of infrastructure
- Use of Smart card for small value payment within DMRC premises viz Sulabh, retail outlets etc on anvil
Joint ICICI bank credit card with DMRC smart card

Presenting the ICICI Bank Unifare Credit & Debit Cards
A Delhi Metro Smart Card & Credit or Debit Card combined in one

- No more Queues with Auto Top-Up
- 10% Discount on Delhi Metro fare
- Reward Points redeemable for Metro fares

To apply, SMS 'UNIFARE C' for Credit Card and 'UNIFARE D' for Debit Card to 5676766
Online Recharge Facility

BE A SMART TRAVELLER
Now recharge your smart card in 3 Easy Steps

1. ENTER AMOUNT
2. SECURE PAY
3. RECHARGE AT AVM

*AVMs are installed at METRO STATIONS near EFO(Excess Fare Office)/Customer Care. Click here to view the demonstration of this Web site.

ANNOUNCEMENT
Fares on Airport Express Line To be Reduced from 24th July 2014. For more Details check what's new section
22 May 2014, 12:48

Change in Minimum Add Value in Smart cards through Token Value Machine
22 May 2014, 12:48

WELCOME TO DELHI METRO SMART CARD PORTAL

DMRC Smart Card customers can get an instant recharge without queuing up at stations. They can recharge their smart card from anywhere in the world from this secure platform at no extra cost.

The users can view all the Top Ups done as he transacts and can use his Debit/Credit Card or Net Banking to pay online for an instant recharge. The easy steps are- 1- Enter the amount and card information, 2- Secure pay and 3- Go to AVMs installed at majority stations.

ICICI account users can also recharge their cards with SMS facility. To view the sms format Click here. After sending the SMS, go to AVMs installed at majority stations.
Self service ticketing

TVM (Ticket vending machines)
% of total fare box collection

<table>
<thead>
<tr>
<th>Heads</th>
<th>% share wrt Total earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash (Manual)</td>
<td>68.06</td>
</tr>
<tr>
<td>Cash (TVM)</td>
<td>15.94</td>
</tr>
<tr>
<td>POS</td>
<td>7.87</td>
</tr>
<tr>
<td>Auto-topup</td>
<td>0.02</td>
</tr>
<tr>
<td>TVM POS</td>
<td>0.01</td>
</tr>
<tr>
<td>Bharat QR Code</td>
<td>0.00</td>
</tr>
<tr>
<td>WEB</td>
<td></td>
</tr>
<tr>
<td>Credit</td>
<td>0.16</td>
</tr>
<tr>
<td>Debit</td>
<td>0.08</td>
</tr>
<tr>
<td>Internet Banking</td>
<td>0.12</td>
</tr>
<tr>
<td>SMS</td>
<td>0.02</td>
</tr>
<tr>
<td>Wallet (PayTM, ZipCash)</td>
<td>7.72</td>
</tr>
<tr>
<td><strong>Total Earning</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>
Growth of cashless transaction as a % of total earning

![Bar chart showing growth of cashless transactions as a percentage of total earnings over the months from January 2016 to September 2017. The chart indicates a significant increase in December 2016.](image-url)
“How commuters reach the stations generally?”

- **23.43%** of total participants use their **Own Vehicle** to reach metro station closely followed by **21.15%** who come by auto rickshaw.
Last Mile Connectivity: Traffic integration

- Feeder Buses – 291 buses are being run presently
- Parking -Approx 3.25 lakh sqm space at 97 stations; Additionally multi-level parking at RHW, JPW and NDRU
- Other modes –
  - Halt and Go: Dedicated lane for autos
  - Cycle on Rent – Available at few stations
  - City check-in facility on Airport line
- Payment integration
  - DMRC has a permission from RBI to use DMRC card for allied activities and retail within its premises.
  - Integration with RMGL, Airport express line done
  - Integration with DTC and DIMTS at advanced stage of testing
Traffic Integration: Parking

- Challenges presently: use by non-metro users
- Integrated ticketing with smart card is planned to be implemented
Traffic Integration: Auto rickshaw
CITY CHECK-IN FACILITY AT NEW DELHI METRO STATION
Conclusion/ Way Forward

- DMRC ridership is on a rising curve
- DMRC has sustained high growth through planning and innovative ITS based measures
- Customer satisfaction survey – Consistently good feedback; customers are willing to recommend DMRC services to near and dear ones
- DMRC is an ever learning organization - There are a slew of ITS based measures on the anvil
  - Traffic integration and Management of station approaches
  - Introduction of UTO/DTO in next phase
  - Continued optimization of Time tables
  - Use of smart card at DTC, DIMTS, Parking etc
  - Use of social media viz twitter
Thank You
for
Giving an opportunity
for sharing my views