Presentation on
Bus Based Public Transport in Bangalore:
Achievements, Initiatives and Vision.

By
C.G.Anand
Chief Mechanical Engineer (Production and Transport Planning)
BMTC

22-03-2013
Presentation Structure

• Introduction: Transport in Bangalore & the Bangalore Metropolitan Transport Corporation (BMTC)

• On-going BMTC Initiatives to improve Bus service quality

• Going Forward: what does Bangalore & BMTC need to maintain and grow the share of public transport?

• General Thoughts: What do Indian Cities need to make Sustainable Transport a Reality?
Introduction:

Transport in Bangalore & the Bangalore Metropolitan Transport Corporation (BMTC)
3rd Largest City in India

5th Largest Metropolitan Area

2011 Population: 8.5 Million (Metro Area)

Population Growth (2001-2011): 65.2%
Bangalore City Transport Scenario

### Vehicular Split (2011)
- Cars: 18.73%
- Other: 8.70%
- Autos: 3.19%
- 2 W: 69.22%
- PT Buses: 0.16%

### Motorised Trips - Modal Split (2011)
- 2-W: 38%
- Car: 9%
- Auto: 11%
- PT: 42%

Sources: Bangalore Mobility Indicators 2011, Karnataka RTO
BMTC System Indicators

6,472 Buses (688 AC, 5655 Ordinary)

4.9 Million Passengers Daily

2,398 Routes
BMTC Daily Ridership
2004-2012

Since 2004 -
Overall Increase: 64.7%
Annual Rate of Growth: 6.4%
Dramatic Increase in Service Supply

Bangalore Bus Service Supply Indicators
2004-2012
Grid Route services

Hospital Special services

Womens services

Bangalore rounds services
Traffic and Transit Management Centres (TTMCs) Under JNNURM Scheme

- BMTC is the first urban transport organization to get JNNURM funding for a national pilot project for an innovative idea called TTMC

- 10 TTMCs have been built and are operational in Bangalore
Examples of BMTC Experience -

Traffic and Transit Management Centres (TTMCs)

Developments on BMTC Land that include Bus Service Support Infrastructure as well as Commercial Complexes
To meet some of the objectives of the National Urban Transport Policy.

To provide an integrated transportation facility with adequate facilities and amenities to cater to the requirements of all user groups.

To encourage use of public transport through provision of park and ride facilities in the bus terminal.

Smooth flow of all types of traffic to and from the terminal such that there is no congestion/disturbance caused to traffic along the main road.

To create a mixed-use development with shopping, malls and other commercial activity, to enable people to fulfill all these needs through using bus transport.
Facilities at T T M Cs

- **Bus terminal**
  - Bus bays
  - Platforms
  - Seating & lighting
  - Public conveniences
  - Information systems
  - Safety and security

- **Bus maintenance depot**
  - Maintenance bays,
  - Washing platform
  - Bus parking
  - Services and Utilities
  - Fuel filling station
  - Amenities for crew

- **Passenger amenities**
  - Bangalore One centers
  - Other citizen amenity centers
  - ATMs
  - Daily needs shopping

- **Park and Ride facilities**
BIG BAZAAR in TTMC

Space for Bicycle in TTMC

ATM in TTMC

Space accommodated to Regional Commissioner and BMRCL in TTMC

Bicycle spacing in TTMC
Availability of Lift for the vehicles in TTMC

Space for shop in TTMC

Space for shop in TTMC

Space for shop in TTMC

Seating facilities for commuters in TTMC

Bus bays for intercity Buses in TTMC
Waiting lounge and Information of buses to commuters in TTMC

Toilet facilities for the Public in TTMC

Bus bays for intercity Buses in TTMC

Toilet facilities for the differently abled in TTMC

Ticket reservation counter in TTMC
Pass Counter in TTMC

A/c Lounge in TTMC for Airport Passengers

A/c Lounge in TTMC for Airport Passengers

City Bus entry in TTMC

Departure time of airport buses in TTMC
TTMC Jayanagar 4th BLOCK
Project Cost: Rs. 12.90 Crore
TTMC, Kengeri,
Project Cost: Rs. 30.47 Crore
Completed on 10th Jul 2010
TTMC Banneraghatta
Project Cost: Rs. 5.50 Crore
Completed on 29th, Aug 2010
TTMC Shantinagar
Project Cost: Rs. 108.50 Crore
Completed on 23rd Sep 2010
TTMC Whitefield

Project Cost: Rs. 37.30 Crore, Completed in January-2011.
TTMC Koramangala

Project Cost: Rs. 66.20 Crore
Completed in Feb-2011.
TTMC Domlur

Project Cost: Rs. 17.55 Crore
Completed in March-2010.
TTMC Yeshwanthpur
Project Cost: Rs. 92.00 Crore
Completed in May-2011.
TTMC, Banashankari
Project Cost: Rs. 33.10 Crore
Completed on 04-12-2011
TTMC Vijayanagar
Project Cost: Rs. 58.10 Crore
Completed in March-2011
Public Response - Commuters feedback

- Very good facility,
- Great facility
- Good service
- Very good
- Sri Gurumalla, TC was very courteous and prompt to recover my lost mobile phone. He is very good, intellectual and respected person.
- It is very clean maintained with very good facility.

- Facilities are excellent, neat and clean services are very good and even the inspector Incharge equally co-operating.
- ** facility [lovinsh Agarwal, 9582197856]

- Very good service
- Drivers and Conductors are well behaved people.
- I stop using my car [H. manjunath, Cell nO.9900276446]
- Thank you very much it was great experience [ofirandlital wendersman, ISRAEL]

- Excellent facilities
- Good Co-operations by Inspectors
- Good Service arrangements
### Economic Value of Time Saved per Passenger

<table>
<thead>
<tr>
<th>Economic Value of Travel Time Saved</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus Trips Through TTMC</td>
<td>5392 trips</td>
</tr>
<tr>
<td>Minutes saved per Bus Trip</td>
<td>2 min</td>
</tr>
<tr>
<td>Total Hours Saved Per Day by Buses</td>
<td>179.73 hours</td>
</tr>
<tr>
<td>Total Full Days (Equivalent per Year)</td>
<td>300 days</td>
</tr>
<tr>
<td>Total Hours Saved Per Annum by Buses</td>
<td>53,920 hours</td>
</tr>
<tr>
<td>Average Passengers Per Bus Trip through TTMC</td>
<td>50 Passengers</td>
</tr>
<tr>
<td>Total Time Saved per Annum by Passengers</td>
<td>26,96,000 hours</td>
</tr>
<tr>
<td>Average Wage per Hour</td>
<td>40 Rs./hour</td>
</tr>
<tr>
<td>Total Value of Time Saved</td>
<td>Rs. 10,78,40,000</td>
</tr>
</tbody>
</table>
### Economic Value of Fuel Saved by BMTC

<table>
<thead>
<tr>
<th>Diesel Saved</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bus Trips Through TTMC</strong></td>
<td>5392 trips</td>
</tr>
<tr>
<td><strong>Minutes saved per Bus Trip</strong></td>
<td>2 min</td>
</tr>
<tr>
<td><strong>Total Hours Saved Per Day by Buses</strong></td>
<td>179.73 hours</td>
</tr>
<tr>
<td><strong>Total Full Days (Equivalent per Year)</strong></td>
<td>300 days</td>
</tr>
<tr>
<td><strong>Total Hours Saved Per Annum by Buses</strong></td>
<td>53,920 hours</td>
</tr>
<tr>
<td><strong>Diesel burned per idle hour</strong></td>
<td>1.09 litres/hour</td>
</tr>
<tr>
<td><strong>Total Diesel Saved</strong></td>
<td>58,773 litres</td>
</tr>
<tr>
<td><strong>Average Cost of Diesel</strong></td>
<td>52.64 Rs./litre</td>
</tr>
<tr>
<td><strong>Total Value of Diesel Saved</strong></td>
<td>Rs. 30,93,810.72</td>
</tr>
</tbody>
</table>
On – going BMTC Initiatives to improve Bus service Quality
On-going Initiatives

- Intelligent Transport Systems for BMTC
  GPS based bus tracking and performance monitoring Passenger Information Systems at bus shelters

- Additional investments in TTMCs and Terminals

- Route Rationalisation & Service Quality Improvement

- Ethanol Blended with Diesel for reducing Emission.

- Passenger Information system PC Based interactive touch screen - KIOSKS Machine for TTMCs and Bus Stations.

- CNG Buses - Preparedness of BMTC.

- CC Camera Surveillance System.
ITS: GPS based bus tracking
Route Rationalisation

Direct Services

Integrated Services
Structure

Why Ethanol- Diesel Blend
What is Ethanol Diesel blend
Emission reductions using Ethanol /Bio Diesel
Advantages
C D M Benefits
INDIAN TRANSPORT EMISSION SCENARIO

• Transport sector accounts for 25% energy consumption

• 12-15% of GHG emission

• Apart from CO2 substantial amounts of other pollutants such as SPM, HC, NOx and CO are also emitted

• Expected growth in the sector poses a serious threat to climate change
What is Ethanol Diesel?

A premium ethanol diesel fuel blend with:

- 7.7 vol% Fuel Ethanol
- 0.5 vol% Multi Patented Proprietary Additive
- 91.8 vol% Regular Diesel
- Enhanced Lubricity
- Improved Cetane
- Improved Corrosion Resistance
- Outstanding Static Properties
- Compatible with High Sulphur Diesel, Low Sulphur Diesel, Biodiesel and ULSD
- Less polluting
- Excellent response
- No Power/Torque loss
On site diesel ethanol blending facility

- Computerised blending equipment offers high accuracy and homogenous blending of all components - fully automatic. No need for human intervention
Increased Demand for Cheaper, renew able environmentall y cleaner fuel

Reduces fossil fuel dependence and import bill

Reduces fossil fuel dependence and import bill

Increased Demand for Ethanol

Sugarcane: Cheapest source of manufacturing

Cheaper, renew able environmentall y cleaner fuel

Direct correlation with oil prices

Reduction of pollutants

PM Reduced: 20 to 46%
NOx Reduced: 1.8 to 6%
CO Reduced: 12 to 23%
Smoke Reduced: Up to 70%
Visibly cleaner air

> Ethanol Diesel substantially reduces:

- White smoke caused by incomplete combustion during ignition of cold engines
- Black smoke composed of carbon particles containing oil
BMTC Ethanol Diesel Evaluation

- Computerised Blending Equipment and ethanol storage tank installed
- Ethanol diesel blend is extremely clear and stable
- Instant effect on reducing black & white smoke emissions
- No material compatibility issues
- Engines are observed to be running as normal
- Stage 1 of a 3 Stage emission reduction programme by Energenics
# Latest Cost of Ethanol Diesel

<table>
<thead>
<tr>
<th></th>
<th>Rate</th>
<th>%</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>52.64</td>
<td>0.918</td>
<td>48.32</td>
</tr>
<tr>
<td>Ethanol</td>
<td>33.95</td>
<td>0.077</td>
<td>2.61</td>
</tr>
<tr>
<td>Solubliser</td>
<td>200</td>
<td>0.005</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Rate of Mixture** 51.93

Savings in Rs 0.71 per lts
Passenger Information KIOSKS
Advantages Of KIOSKS:

Route Maps - KISOKS shows on screen route maps so that user can see the route the bus will take.

Route Planner - Passenger makes entry about journey starting and end information the touch screen suggests the Route nos, timings, platform no, etc.,

Fares, distance, time for journey, Area wise sorting, Bus stop location-display: KIOSK allows the Passengers to view the displays
Compressed Natural Gas (CNG)

- **Induction of CNG Buses**:
  - CNG is dispensed to vehicles at maximum 200 kg/cm² pressure.
  - CNG is colourless, odourless, Non-toxic and lighter than air, the dead weight of HSD filled in buses could be reduced considerably thereby the load on the buses is reduced.
  - CNG is environmental friendly, compared to conventional type of fuel and hence a better alternate and safer fuel.
  - CNG is cheaper for automobile application.
  - CNG improves fuel efficiency.
  - CNG has high auto ignition temperature (540°C)
Natural Gas

- Mixture of hydrocarbons (predominantly methane)
- Specific gravity: 0.65 – 0.71 w.r.t air.
- Gross Calorific value: 9500 – 10000 Kcal/SCM
- Flammability Limit: 4 – 14% by volume in air.
- Auto Ignition temperature: 540 degree Centigrade
- Flame temperature: 1790 degree Centigrade

Based on the request from M/s. GAIL to provide land along the outer ring road of Bangalore for setting up the sectionalized valve and tap off points, BMTC has provided 225 sq mts. Of land at Depot-25 (Agara) and the work of setting up the sectionalized valve and tap off points has been completed.
Tata CNG Bus

Volvo CNG Bus

Volvo City Bus CNG
Closed Circuit Camera:

- **Scope**

- Each bus will have 2 Closed Circuit Camera.
- One mobile digital video recorder and other accessories.
- The system will cover the bus saloon area and will have 48 hrs continuous recording (video) facility.
ADVANTAGES OF CC CAMERA

- Tracks all reported incidents and evidence in case of incidents reported.
- Data stored at multiple locations for reported incidents.
- Acts as a major deterrent for criminals.
- Increases safety of staff and passengers.
- At the minimum provides a perception of safety.
- Monitoring other routing activity:
  - Occupancy, Closing and opening of doors, Parking at Bus bay.
- The advantages of CCTV cameras is, if a crime is committed the culprit will be eventually caught.
- Recording is another advantage in future for backup of images.

- Security personnel can easily monitor all activities within range of the cameras, and clearly note any suspicious or unauthorized behaviour, while getting a clear image of the person engaged in the activities.
Going Forward:

What does Bangalore & BMTC need to maintain and grow the share of public transport?
Going Forward

Investments required can be categorised as:

1. Fleet:
Bus fleet will require continued replacement and expansion, to ensure an adequate number of buses are available but also that they are of high enough quality

2. Support Infrastructure:
This includes passenger terminals and bus shelters, but also depots, workshops and other ‘operator-side’ infrastructure

3. ITS for bus services:
Advancements in technology need to be leveraged to improve public transport: ‘Regular’ ITS systems must be implemented immediately, but also software for bus scheduling, internal processes etc
Going Forward

- In the long run, however, private vehicle ownership is likely to continue to increase and congestion will increasingly negatively affect bus services.

- It is clear that **bus priority** will need to be developed to maintain high service quality and standards.

- This can take many forms - bus lanes, signal priority, dedicated corridors, BRT and so on - and the ‘right’ solution for any given area will depend on local context.

- But the concept of bus priority itself needs to move to the top of the Public Transport Investment agenda.
General Thoughts:
What do Indian cities need to make Sustainable Transport a reality?
1. Multimodal Mobility
Commuter options in London

- UNDERGROUND
- BUSES
- DLR
- TRAMS
- RIVER
- TAXI-PRIVATE HIRE
- BARCLAYS
- Emirates AIRLINE
- DIAL-A-RIDE
2. Intermodal Connectivity
3. Integration of Land Use and Transport
4. Disincentives for Private Vehicle Use
Thank You