Development of Moscow Metro, Moscow
Central Circle and eco friendly transport

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Moscow Metro
Agenda

Moscow Metro 2010-2018 development

Increase of capacity. Rolling stock and infrastructure development

• Rolling stock development
• Infrastructure development
• Passenger flow control

User-friendly ticket system

Urban passenger transport development
Key figures

- 259 stations available at the moment
- 222 metro stations
- 6 monorail stations
- 31 MCC stations
- Over 5,500 cars fleet used in operations
- 56,000 employees
- 1935 - opening of the first station
- 83 years of sustainable operation
- 2.5 bln passengers per year
- 8.5 million passengers on a week day
- The shortest headway worldwide, maintained during the whole rush-hour period
- But for Moscow Metro the level of air pollution would have increased by 39%
- Comparing to the largest transport companies (passengers per year):
  - 32.8 million
  - 79.3 million
  - 1 bln
  - 2.4 bln
Moscow Metro – leading system both in infrastructure and passenger indicators

№1 in volumes of passenger transportation in Western Semisphere

№1 in maximum carrying capacity

№1 in minimal headways maintained on all lines during all rush-hours, min

№1 in operation during extreme weather conditions (temperatures from «-40» till «+40» and atmospheric condensations

In 2017 Moscow won the UITP «Special recognition» award for city transport and infrastructure development projects – for Moscow Metro extension and modernization projects including launch of MCC
Network length of Moscow Metro has significantly increased during 2010-2018 years, including the launch of Moscow central circle.

**Moscow Central Circle key info and launch effects**

- **83 stations** opened (including 31 Moscow Central Circle stations)
- **160 km** of track constructed (including 54 km of Moscow Central Circle)
- **4 depots** were opened

**Moscow Central Circle**

- **31 interchange stations** to ground transportation
- **20 interchange stations** (to Moscow Metro)
- **9 interchange stations** to railway transport
- **5 min. headway** between trains during peak hours
- **90 min.** takes to travel over the full circle

**Key info**

- **15% reduction** of passenger traffic intensity of the small Circle Line
- **20-40% reduction** of passenger traffic intensity of central railway terminals

**Additional info**

- **15 million passengers** more are transported annually due to new stations and line constructions
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Future plans by 2020

**Rolling stock upgrade**
- over 1,600 of new “Moskva” cars
- 60% of new trains by 2020

**Infrastructure renewal**
- in late 2019 – early 2020 the two first MCD lines are going to be launched which will improve the transport availability for 3.7 million people

**Passenger services development**
- Loyalty programme development:
  - Accrual of bonus points while traveling within the underground network
- Standardization of working principles for Employees-to-Passengers
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«Moskva» train created by passengers and specialists of Moscow Metro

More than 150 proposals from passengers concerning «Moskva» train functional specifications were received and analyzed at «Aktivniy grazhdanin» (Active citizen) Mobile App.

- USB charging devices installed at intermediate cars
- Handrails of special form
- Special adaptive lighting and air conditioning

Proposals from drivers led to the improvement of technical aspects of the rolling stock

- Improvements in driver’s control and informing system
- Sensors that monitor more than 100 indicators

«Moskva» train (81-765)
264 cars / 33 trains already delivered in 2017
1874 cars / 248 trains will be delivered by the end of 2020

- Air conditioning and disinfection systems
- Sensor informational panels with interactive metro map and opportunity to create routes
- Adaptive lighting – cold in the morning and warm in the evening
High-tech "Lastochka" trains operating at MCC are becoming more convenient

- **42 «Lastochka» trains**
- **177 train pairs per working day**
- **150 train pairs per weekend day**
- **1,500 people train maximum capacity**
- **40 years life cycle of a train**
- **Climate-control system**
- **Cycling carriers, wheelchairs and carriages can be transported in 2\textsuperscript{nd} or 4\textsuperscript{th} car**
- **Accessible for disabled passengers**

**Moscow Central Circle rolling-stock**

- **Wi-Fi**
- **Walkthrough gangway**
- **Anti-vandal glass**
- **Washrooms**
- **Sockets 220 V**
- **Special allocation of seats 2+2 arrangement**
- **Hand-rails for passengers**
- **Monitors in cars**
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Urban passenger transport development
Moscow metro takes care of the passengers’ comfort

Stations have become brighter and more vivid

- **27** new illumination networks were installed.
- **700,000** bulbs were replaced to illuminate the whole district of Tagansky.

Walls and floors are cleaner

- **17,950** new employees are at disposal of the Cleaning Center.
- **610,3** m of signs were washed off the walls at all metro stations.

Escalators have been renewed

- **21** escalators were completely replaced at the Krasnye Vorota station.
- **171** escalators are repaired.

New stations are new places to clean

- **56,000** items of equipment are at disposal of the Cleaning Center.

Air conditioning has been improved

- **1,715** escalators are repaired.
- **807,000** m³ of air is passed through the Metro’s ventilation system. The volume would be enough for all Parisians to breathe for 70 years.
- **+74** ventilation shafts were replaced at stations and in tunnels.

Did you know that…?

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- **17,950** new employees are at disposal of the Cleaning Center.

We are for the cleanliness of the walls

- **+273** new floor washing machines.
- **Did you know that…?** It takes only 40 minutes to clean paint stains and signs off the walls since the moment of their detection.
Reliable infrastructure

Passengers can notice the track infrastructure improvements implemented in 2017-2018.

Due to the comprehensive renovation of roads and railways, we decreased noise level at stations and in wagons by 20% and reduced delay time of trains by 30%.

Working day and night

The diagnostic complexes of train type “Sinergiya” help to inspect tracks in a daytime without any impact on a train schedule. At night, it is time to replace the tracks. This is done at night by 11,708 employees.
Московские Центральные Диаметры (МЦД) в московском транспортной системе

1. **Regular headways between trains**
   - Минимальные интервалы между поездами - 5 минут
   - Удобство фиксированных интервалов между поездами позволяет людям не думать о расписании
   - Создание поверхности метро

2. **High-tech rolling stock**
   - Удобные поезда со современными услугами
   - Увеличение вместимости пассажиров благодаря городскому сидению

3. **Unified ticket system**
   - Объединенное билетное решение для всех видов городского транспорта
   - Современные способы оплаты заезд
   - Бесплатный пассажирский обмен между станциями метро, Московским Центральным Кольцом и Московскими Центральными Диаметрами

4. **Comfortable passenger infrastructure**
   - Объединение и современное архитектурное решение в синтезе с удобством пассажиров
   - Унификация материалов для оптимизации расходов на обслуживание

5. **Integration with other modes of transport**
   - Строительство транспортных узлов и близкая интеграция с метро, Московскими Центральными Кольцами и наземным транспортом
   - Улучшение соседних территорий и оптимизация пешеходных подходов к станциям МЦД
Moscow Central Diameters

<table>
<thead>
<tr>
<th>Stage 1 total:</th>
<th>Length(km)</th>
<th>Stations</th>
<th>Inter-change stations</th>
<th>Pass. journeys (MIO per year)</th>
<th>Additional passenger capacity (thousand/day)</th>
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<tbody>
<tr>
<td>MCD 1</td>
<td>52</td>
<td>28</td>
<td>12</td>
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<tr>
<td>Stage 1 total:</td>
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<td>66</td>
<td>27</td>
<td>91.5</td>
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<tr>
<td>MCD 3</td>
<td>88</td>
<td>43</td>
<td>14</td>
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<td>360</td>
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<td>MCD 4</td>
<td>80</td>
<td>37</td>
<td>20</td>
<td>43.1</td>
<td>319</td>
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<tr>
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<tr>
<td>MCD 6</td>
<td>79</td>
<td>37</td>
<td>17</td>
<td>78.9</td>
<td>319</td>
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<tr>
<td>Stage 2 total:</td>
<td>314</td>
<td>146</td>
<td>65</td>
<td>242.9</td>
<td>1391</td>
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<tr>
<td>Total by 2023</td>
<td>446</td>
<td>211</td>
<td>92</td>
<td>334.4</td>
<td>2280</td>
</tr>
</tbody>
</table>

Cumulative effects from all Moscow Central Diameters

- **Moscow Region**
  - Reduction of Moscow Region citizens’ travel time by 2.1 times
  - Improved suburban trains service for 2,376,000 people
  - Increase of passenger capacity by 2,280,000 per a day

- **Moscow**
  - Reduction of Moscow citizens’ travel time by 1.8 times
  - Number of passengers 334,000,000 per a year
  - Improved suburban trains service for 6,176,000 people

- **Suburban rails**
  - Decrease of railway stations workload by 20%
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- **Passenger flow control**

User-friendly ticket system

Urban passenger transport development
Cashiers with mobile terminals, mobile desks and sales through agents (10 thousand sale points) help to increase carrying capacity of ticket windows twice if needed.

More than 1,200 specialists are trained to manage big passenger flows during mass events. All specialists have communication devices that work regardless of mobile operators and city connection channels.

Multiple reservation of all systems, reserve trains and brigades that passed special trainings at all stations.

Unified standard of service during mass events that was created on the basis of more than 50 events with total amount of more than 70 thousand people each.

When the stations are closed we use standard navigation, electronic devices and distribute hot tea.

Additional (reserve) personnel at stations

Trained personnel

Work of sales channels

Standard of service during mass events
Since 2013 Moscow Metro has constantly assisted disabled passengers with traveling around the network.

Key performance indicators

- Over 250 employees helping disabled passengers
- 217 maximum of assisted passengers within a single day in 2018
- Over 800,000 disabled passengers were assisted
- 12 assences for wheelchairers
- Over 60 adapted routes across Moscow
- Over 1,500 positive comments

Current services

1. Assistance for passengers with reduced mobility with traveling around the network:
   - in the metro
   - within rail stations
   - at bus stations SUE “Mosgortrans”
   - on Aeroexpress to airports
   - within the city to social objects
   - within the MCC

2. Accompanying of all the passengers with reduced mobility, of children groups, of elderly passengers

3. Cooperation with socially oriented organizations:
   - The All Russia Association of the Blind
   - The All Russia Association of the Handicapped Persons
   - Moscow Museums
   - The Nikolai Ostrovsky State Museum
   - The Pushkin State Museum of Fine Arts
   - The State Tretyakov Gallery
   - National park Tsaritsyno
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Moscow Metro has unique ticket system

Moscow Transport Metro ticket system allows to use one unique Troika card to pay the fare in all types of public transport and other services. Troika card allows to make fare free interchanges between Moscow metro Moscow Central Circle

**Payment ecosystem of the «Troika» card:**

- Visits of museums, Moscow planetarium, Moscow Zoo
- Purchases in the largest parks of Moscow
- Integration in ticket systems with other cities
- Bike sharing and other services
- Integrated in bank cards of 8 largest Russian banks

**More than 21 MIO «Troika» cards** were purchased by passengers

<table>
<thead>
<tr>
<th>Electronics with integrated «Troika» card</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key chains</td>
</tr>
<tr>
<td>Rings</td>
</tr>
<tr>
<td>Bracelets</td>
</tr>
<tr>
<td>Magnet ticket</td>
</tr>
</tbody>
</table>

**Apple Pay, Samsung Pay, AliPay**

- Samsung pay
- Apple Pay
- Mastercard
- PayPass
- Visa PayWave
- Yandex Money
- AliPay
- Google Pay
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Special electric bus design suited for Moscow

Electric bus design is done in the style of the Moscow transport rolling stock, which includes buses, trams and metro trains.

- Highlighted logo of Moscow transport – familiar symbol of the transport system – is easy to notice under any weather conditions.
- Expressive headlamps emphasize the mask form. Narrow diode stripe operates as daytime running lamps.
- The other part comprising of diode lamps combines main and deep-beam headlamps and direction indicator lamp.
- Electric bus board is decorated with a bright picture standing out among other buses as a new, eco-friendly transport.
- Unified mask form shapes a positive image of the city transport as a trustworthy transit partner.
- Wide route indicator fitted with color diode board enables passengers to see and recognize their routes from a distance.
- Video screen displaying information on routes – a new, noticeable navigation element convenient for passengers.
Minimum passenger capacity – 85 people, length – 12 m (same as bus length)
Costs are 10% less than those of trolleybuses
Distance traveled without recharging – 40 km (100% operation with the climate control system on)
Maximum weight – 18 t (same as bus weight)
Charging time – 3-6 minutes
Battery weight – 3.2 t
Life cycle of electric bus – 15 years (life cycle of bus – 7-8 years)
Diesel heating

Technical features

Passengers’ comfort

100% lower floor of the interior with special fonts for visually impaired people
Low noise levels (15% more quite than trolleybus and 30% than buses)
Wi-Fi
3 doors with the width of 1,200 mm
USB-connectors (min – 2) for mobile phone charging
Eco-friendly transport
Most modern media system (3 times more info spaces)
Climate control system for the interior and driver cabin (operating mode -40/+40 degrees)
Infrastructure for ultra fast charging of electric buses is being created

Average charging time
3 - 6 minutes

The system can be connected to rectifier substations, which are available after the catenary dismantling

The infrastructure is working in different temperature conditions: from -40 to +40 C

Special design for Moscow City

Produced in the brand of Moscow Transport

Light stripe. The color is changed from yellow to blue during the charging
Electric buses

Contracts were signed with the winners of electronic auctions

- KAMAZ PTC: 100, 31
- GAZ Group: 100, 31

Service maintenance contract - 15 years

First operational results (1 September – 15 October)

- 10 electric buses
- 3500 routes
- 44500 km
- 165000 passengers

6th residential district of Bibirevo VDNK (south)