

# ELECTRIC TRACTION AND ENERGY SUSTAINABILITY



WHO IS  
MM?



### **MM Spa**

is the leading engineering company in Italy in the design and construction of public transport infrastructure and urban requalification works aimed at the sustainable development of the area in which it operates.

Set up in Milan in 1955, MM constructed the city's entire underground railway network – 108 stations along its route of over 100 km – and major road and hydraulic engineering works.

The experience gained in this field has enabled the company to transfer its know-how all over Italy, taking part, for example, in the construction of the underground systems of Naples, Rome, Brescia and Turin, the rapid surface transit systems of Padua and Venice and the BreBeMi A35 motorway; and overseas in the underground systems of Copenhagen and Thessaloniki.

The services offered by MM Spa range from the planning of operations to technical and economic assessments, from preliminary investigations to works management, from design validation to tests, final inspections and quality control.

Today, MM is a business partner working alongside the institutions in the execution of major public works, which, due to the complexity of their design and the size of their financial commitment, require consolidated management capabilities and support in the technical and administrative fields.

Since 2003 MM has also managed the Water Service of Milan, handling groundwater withdrawal, purification, distribution, wastewater collection and treatment and, in general, the maintenance and investment plan of the water supply and wastewater networks.

On 1st December 2014, MM Spa took over the management of the real estate of the City of Milan, which consists of over 38,000 items of property including council houses, garages and other buildings. To this aim, MM set up the new organisational unit called "MM Casa", which will work alongside the other company facilities already operating in the management of the city's services.



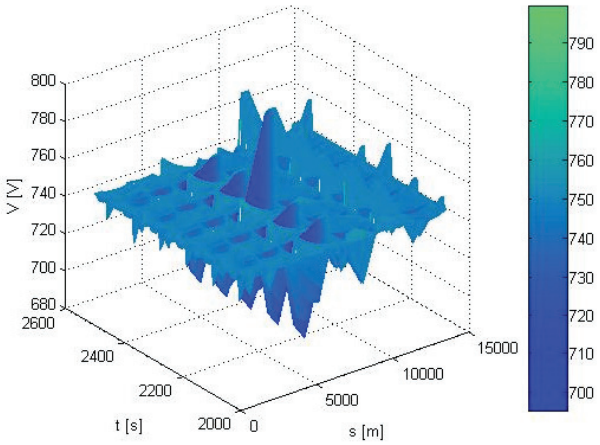
Public transport rail systems in an urban areas, such as underground networks and tramways, have an energy need that is a significant component of the total operating cost. Much of this energy is required by the electric traction for vehicle running; the remaining is used by the fixed installations.



Electricity is generally drawn in medium voltage from the suppliers and is then transformed and distributed to the line, station and traction requests using appropriate equipment.

The growing demand for vehicle performance in order to improve the service offered in connection with transport capacity (seating capacity, acceleration, top speed, etc.) and on-board comfort (auxiliary services, heating, air conditioning, etc.) entails an equivalent growing demand for traction energy.

It is therefore necessary, during the design phase, to assess and, if necessary, adopt the possible solutions to minimise power consumption in order to limit operating costs and pursue better sustainability of the transport systems.





## MM'S ROLE IN ELECTRIC TRACTION



**MM Spa was set up in 1955 as the engineering company that designs, builds and delivers the city's underground lines ready for immediate use to the operator on behalf of the City of Milan.**

During the 60 years it has been in business, MM has continued to work on electric traction systems while progressively expanding its expertise to other areas, such as the tram sector, and working not only for the City of Milan, but also for many other cities, both in Italy and abroad.

Due to this extensive experience in the field of electric traction, MM is today able to offer technical and consulting services in the fields of design, contract work, construction management, supervision, validation, etc.



### AMONG OUR REFERENCES

In the course of its design, construction management and supervision activities, MM has to date managed the construction of nearly 50 Electric Traction Substations to supply power to about 100 km of underground lines, of which about 60 km are electrified at 1500 VDC by overhead contact line and about 40 km at 750 VDC by third rail system. Today these lines have 108 stations in operation, for the power supply of which MM also supervised the construction of more than 150 transformer substations, along with their medium voltage interconnection networks.

Likewise, many electric traction substations and transformer substations have also been designed and put into operation for tramlines and metros.

### > ENERGY SUSTAINABILITY IN TRACTION

Rail transport has always been considered one of the means of public transport with the least environmental impact due to its low energy consumption and absence of local emissions.

Nevertheless, it too has to reckon with the need for an increasingly more efficient use of energy and not only for environmental necessities, but also for economic requirements.

Based on the European directives that aim at sustainable transport and reduced energy consumption, MM has for some time been committed to pursuing the goal of optimising the electric traction system.



## **SERVICE FOR SIZING AND DESIGNING GUIDED ELECTRIC TRACTION TRANSIT LINES**

On the basis of its vast and diversified experience, MM offers service of designing and sizing all types of electric traction power supply systems, starting from traffic and operation data, the plano-altimetric characteristics of the line and any restrictions to be respected in positioning electric substations.

The electric traction system design service also takes into account, and can be integrated with, the design of the power supply systems for the station and line services.

MM carries out projects of all levels, from feasibility studies to the preliminary, final, executive and construction projects.

Depending on the design level requested and any other specific requirements, MM's activities may comprise production of the traction system calculation reports (with the electrostatistical method or a method based on electrical simulations of the traction network) and the drafting of descriptive reports and technical specifications, standards, maintenance plans, wiring diagrams, equipment layouts, cable plans, etc.

Today the modern rolling stock used on underground systems or tramlines is equipped with the so-called regenerative braking, which means they are able to put part of the energy previously absorbed during acceleration back onto the traction network. However, this returned energy can be reused directly only if other vehicles are in the section.

MM has the expertise for assessing the applicability and potential economic savings in systems that store and recover the energy the vehicle generates when braking. Some solutions, such as supercapacitors (on board or in the substation) and reversible substations, enable 10% to

45% of the total energy consumed to be recovered for electric traction, depending on the specific case.

Choosing the system to adopt is, however, never simple because both higher investment costs and possible technical and maintenance problems may counterbalance the potential savings in operating costs.

It is therefore essential that the design be developed in all of its stages taking into account all aspects and comparing all of the possible technological solutions that the market has to offer.

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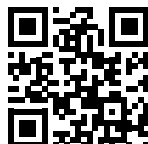
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