

**We design the future of
transportation**

Metroİstanbul
**research &
development**

We design the future of transportation



R&D Project

Services

As Metro Istanbul, we are the largest urban rail system operator in Turkey. However, in addition to operations and maintenance, we also carry out numerous high-value-added R&D and localization projects for the systems, vehicles, and equipment we operate and maintain. We provide services and support for rail system projects.

As the only registered R&D Center among active rail system operators in Turkey, we conduct patent studies in various fields.

Fields of Activity

- Electricity
- Electronics
- Rolling Stock and Electromechanics
- Project



R&D

Projects

- Local Signaling Project
- Fixed Rail Lubrication Device
- Predictive Maintenance-oriented Control System Design for Escalators
- AS-AT Valve Test Device
- Moving Catenary System
- Hydraulic Brake Power Unit (HPU) Test Device
- Universal Pantograph System Development Project
- IP-based Passenger Information System
- STINGER BOX Development Project
- TRAM34 Vehicle Production
- TRAM34 Vehicle Body Structural Optimization Project
- Esenler Depot Field Signaling Project
- T4 Tramway Line Mescid-i Selam Zone Signaling System Project
- M2 Alstom Vehicle Passenger Information System
- M1 ABB Vehicle Passenger Information System
- 4th Generation Domestic Tramway Vehicle Production
- Hydraulic Power Unit (ATA HPU) Test Device Production Project for Alstom Tramway Vehicles
- Tramway Tracking System (TTS)
- Regenerative Energy Recovery Project (REGEKAS)
- National Wind Energy Power Plant Project (MİLRES)
- Metrobus Passenger Information System



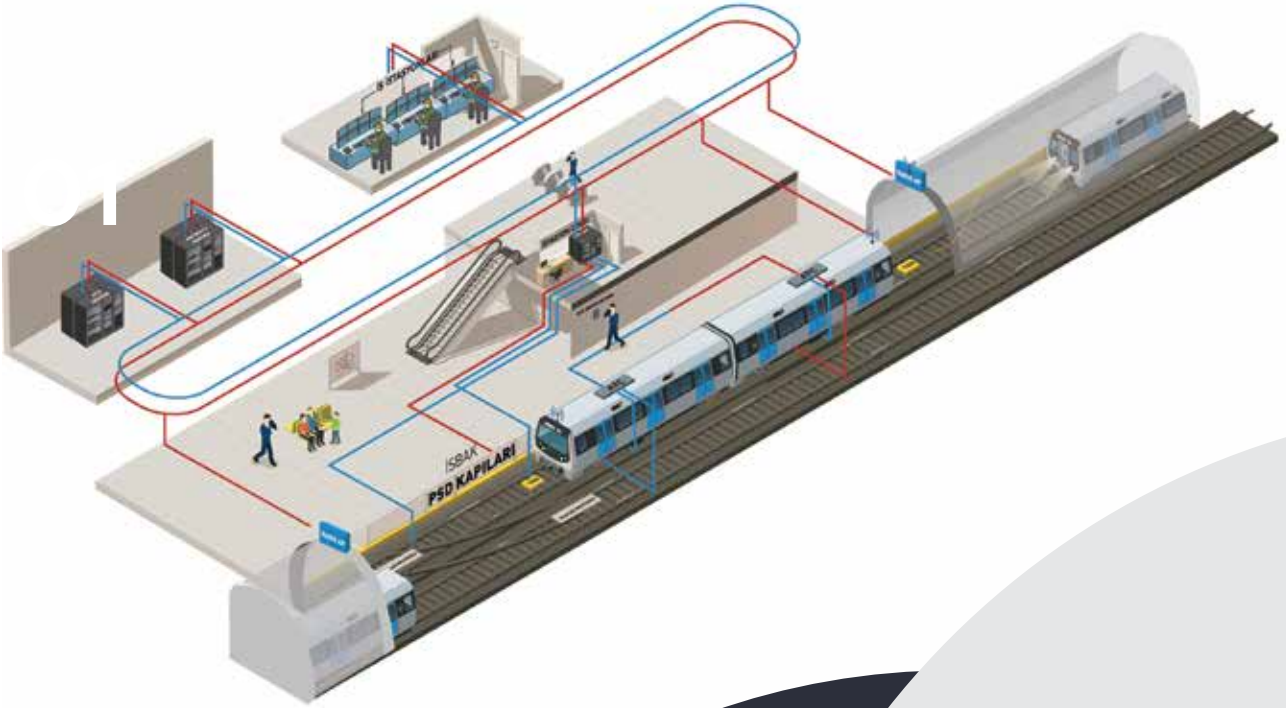


Ozgür Soy

Domestic Signalization

We continue our work without slowing down with the goal of designing, developing, and commissioning an advanced and strategically important automatic train control (CBTC) signaling system in the rail systems sector.

With the CBTC Signaling System project, we will become a rail system operator with our own signaling system technology. The domestic signaling system we will possess at the end of the project will be used not only in Istanbul but also in rail system projects throughout Turkey.





AS-AT VALVE

Test Device

AS and AT valves used in the braking system of rail vehicles balance the pressure in the valves during braking and release. After the faulty valves are repaired, they need to undergo certain tests to ensure their reuse.

The AS-AT Valve Test Device is used to measure the input and output pressures of the valves.

We make a difference

- When AS-AT valves used in vehicle braking systems were faulty in the past, they couldn't be repaired. However, with the device we have developed, we can now perform repairs, tests, and adjustments.
- As Metro Istanbul, with our AS-AT Valve Test Device, we enable the recycling of approximately 20 valves annually on the lines we operate, thus preventing the need for costly new valve purchases.



Fixed Rail Lubrication



In curves with a radius of less than 300 meters, due to the centrifugal force acting on the vehicle, it leans towards the outer rail. This results in increased wear in the outer rail area, increased contact between the wheel flange and the inner rail, leading to noise and wear.

With our new generation fixed rail lubrication device, we have addressed these issues by applying grease to these areas, reducing friction and eliminating noise and wear problems. We have implemented our fixed rail lubrication device at the workshop area of M5 Üsküdar-Çekmeköy Metro Line.



We make a difference

- We minimized friction and rail noise to minimize them.
- We reduced wear on the wheels and rails.
- We developed a dynamic lubrication model that can be applied based on measurements of humidity, temperature, and noise.
- We made the lubrication period and duration fully adjustable according to the conditions.
- We developed rain sensors to prevent lubrication during rainy weather.
- We provided the ability to be passive outside of operating hours.
- With a user-friendly interface, we offered the possibility to measure faults and oil quantity.
- We enabled remote access and intervention through the developed software.
- We automated fault notifications through SAP integration.
- We provided a safer working environment.



Hydraulic Brake Power Unit (HPU) Project Test Device



With the HPU test device, we are able to perform automated testing of Hydraulic Power Unit (HPU) equipment in the train's brake system, including DC motors, switches, valves, sensors, oil tanks, and channels. This device enables us to replace the limited, visual, and manual tests in the existing systems with more comprehensive and high-precision automated processes.



We make a difference

- By using the developed test methods, we have minimized user-related risks as the device automatically generates the test results.
- While the existing test methods required approximately 5 working hours for a single device, the HPU test device has reduced this time to 30 minutes.
- We have reduced maintenance costs by nearly 90%.
- We have created the capability to detect faulty equipment in the brake system at an early stage.
- We have ensured effective and error-free work for maintenance personnel.
- We have enabled automatic reporting through ERP system integration.
- We have enabled testing of all hydraulic power units in the fleet using a single test stand.
- We have achieved time and space savings.

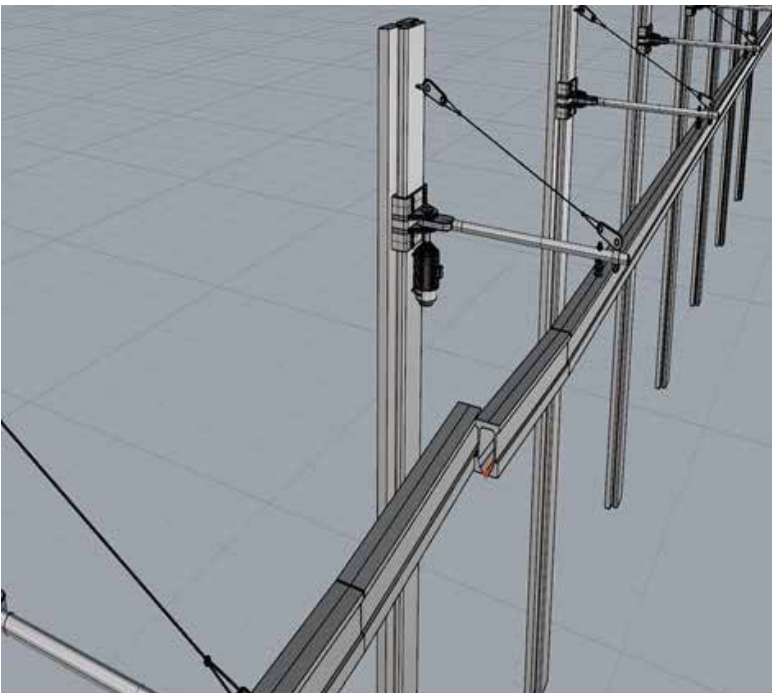


Retractable Catenary System

With the Retractable Catenary System Project, we have developed the design and implementation of a Retractable Catenary System that is integrated with the electrification system to carry out safe and secure maintenance and repair activities in rail system maintenance workshops. We are actively using the Retractable Catenary System at Behiç Erkin Campus maintenance workshop.

We make a difference

- We have achieved labor and time savings in maintenance activities.
- We have localized the system.
- We have made the working environment safe.



Predictive Maintenance Control System for Escalators



We have developed a predictive maintenance application for escalators by adding hardware components that collect data such as sound, vibration, current, temperature, and passenger count from 10 different points simultaneously. These data are analyzed using machine learning techniques.



We make a difference

- We have increased equipment reliability by intervening before failures occur.
- We ensure high passenger comfort and satisfaction.
- We have reduced the need for revisions caused by failures and the associated costs.
- We enable the detection of issues before they result in failures.
- By effectively utilizing maintenance personnel, we have minimized maintenance and repair labor expenses.
- The installation of an artificial intelligence system on escalators allows for continuous improvement based on real-time data.

Localization of Subcomponents for Platform Screen Door System

With the Localization of Subcomponents for the Platform Screen Door System project, we have developed localization and preventive measures for the equipment and submaterials of the Platform Screen Door System located at the stations of our M5 Üsküdar-Çekmeköy Metro Line.



With this project,

- We achieved localization.
- We reduced equipment consumable costs.
- We shortened procurement lead times.
- We reduced dependence on foreign equipment.
- By conducting engineering work on the consumable equipment, we extended their lifespans through new designs and material selections.



Smart, Connected, Autonomous Vehicle and Energy Systems for Efficient, Safe, Secure, and Sustainable Transportation in Metropolitan Areas



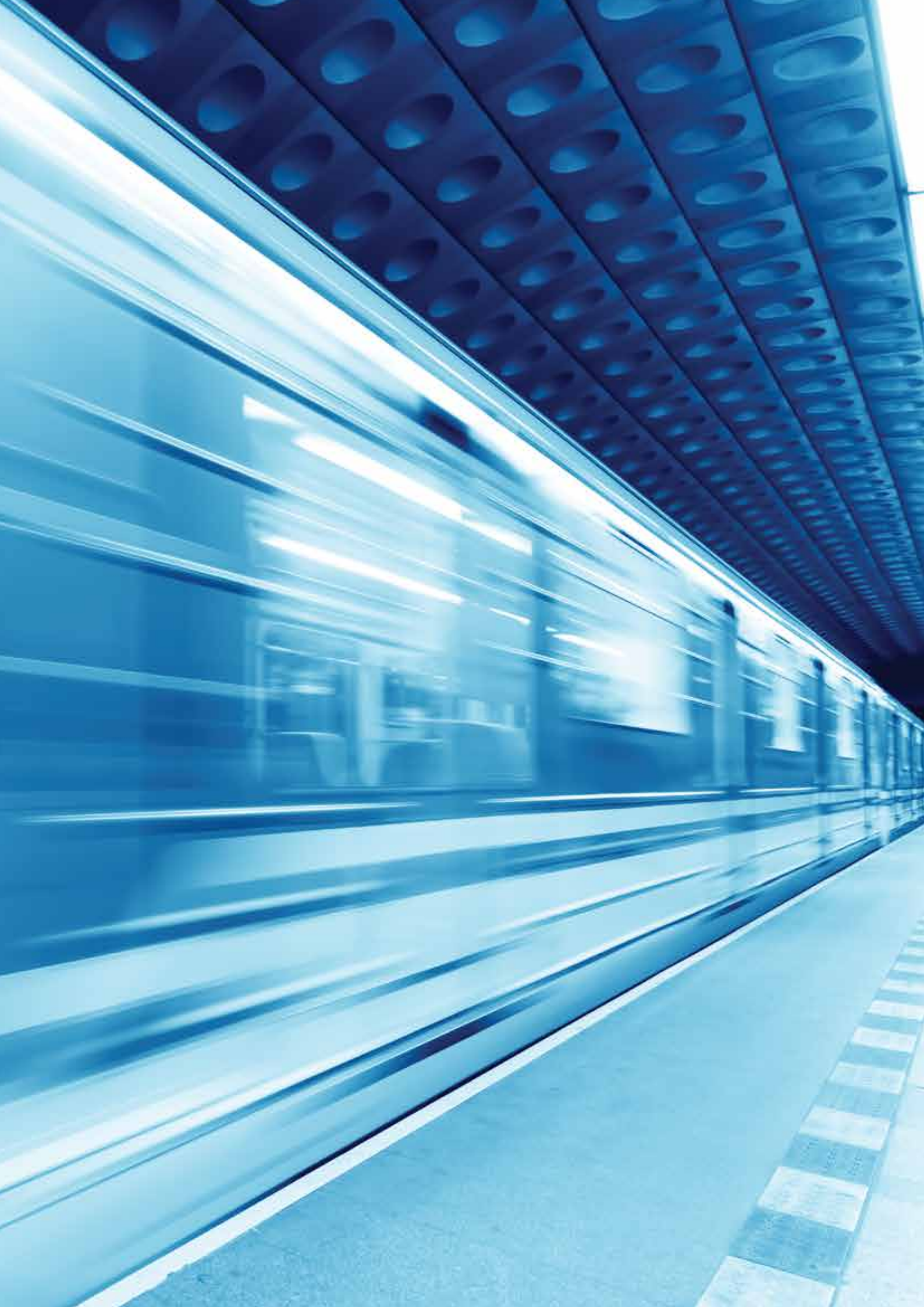
Our project proposal on "Smart, Connected, Autonomous Vehicle and Energy Systems for Efficient, Safe, Secure, and Sustainable Transportation in Metropolitan Areas" has been accepted within the scope of the '2556 TÜBİTAK-Qatar National Research Fund (QNRF) Bilateral Cooperation Program' for R&D and innovation projects.

Within the scope of the project, our aim is to transport passengers to metro stations using connected and autonomous vehicles, which are considered the future of public transportation, with a focus on increased efficiency and safety in the smart city concept. These connected and autonomous vehicles, which will be electrically powered, will have their charging requirements met through fast charging stations integrated into the rail system power infrastructure. This way, the fast charging problem, which is one of the most important challenges for electric vehicles, will be solved thanks to our DC power supply sources.

R&D Side of the Project

Within the scope of the project, we will facilitate the creation of a green transportation chain by utilizing the unused capacity in the rail system to meet the energy needs of another electric transportation solution used for a different purpose. Through the development of an optimal energy management strategy, we will not only obtain a theoretical output with academic value but also a practical product for implementation. This will serve as a benchmark for rail system operators and operators of different transportation solutions, both nationally and globally. With the knowledge and experience gained from the project, we aim to participate in larger-scale projects by collaborating with international funds, particularly high-budget EU Horizon Funds, to bring research and development support to our company and our country. Furthermore, we will submit the theoretical and practical outputs obtained during the project to leading relevant journals worldwide.





Universal Pantograph System



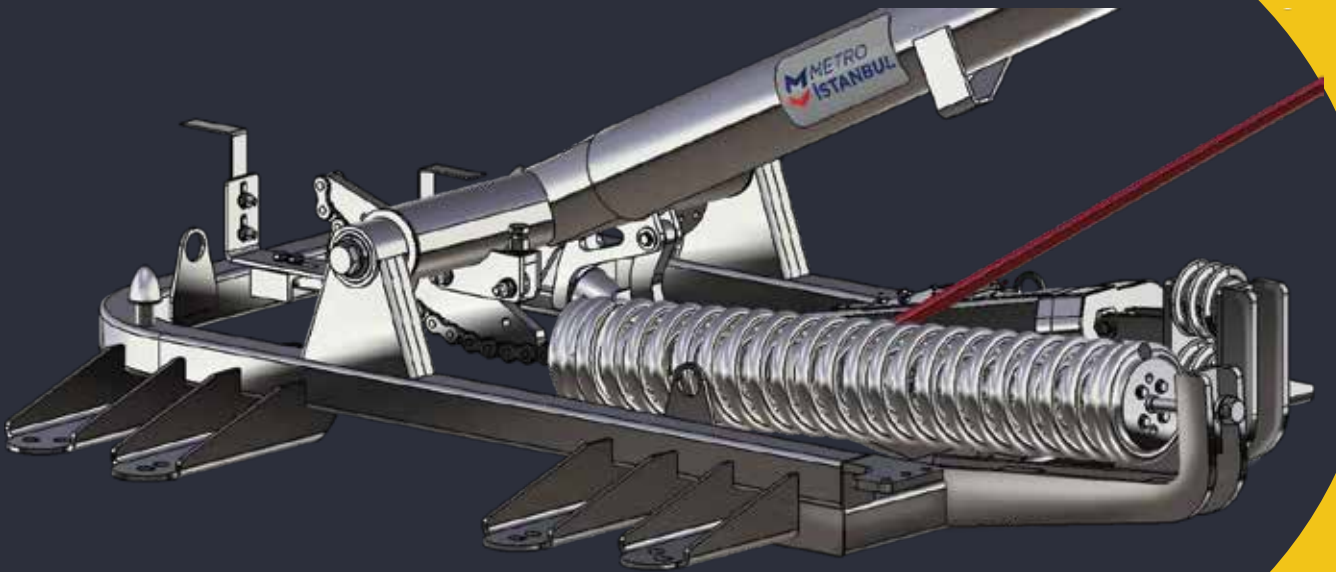
A pantograph is a system that allows the electrical energy necessary for the movement of electric-powered rail system vehicles to be transferred into the vehicle by interacting with the catenary wire.

With the Universal Pantograph System Development Project, we have created a universal pantograph design that enables the common use of 12 different brands and models of pantographs used in 16 different tram and metro vehicles. This will allow us to reduce the number of equipment in our company's inventory and facilitate equipment maintenance.



We make a difference

- We are standardizing the 12 different pantographs into a single type.
- We are producing a pantograph with high RAMS values that fully meets our needs.
- The use of a single type pantograph ensures ease of maintenance and repair.
- The use of a single type pantograph enables maintenance personnel to work more efficiently.
- We contribute to the development and diversification of the supplier ecosystem in rail systems.
- The use of a single type pantograph allows cost savings in planned maintenance.
- We reduce the number and cost of spare parts.



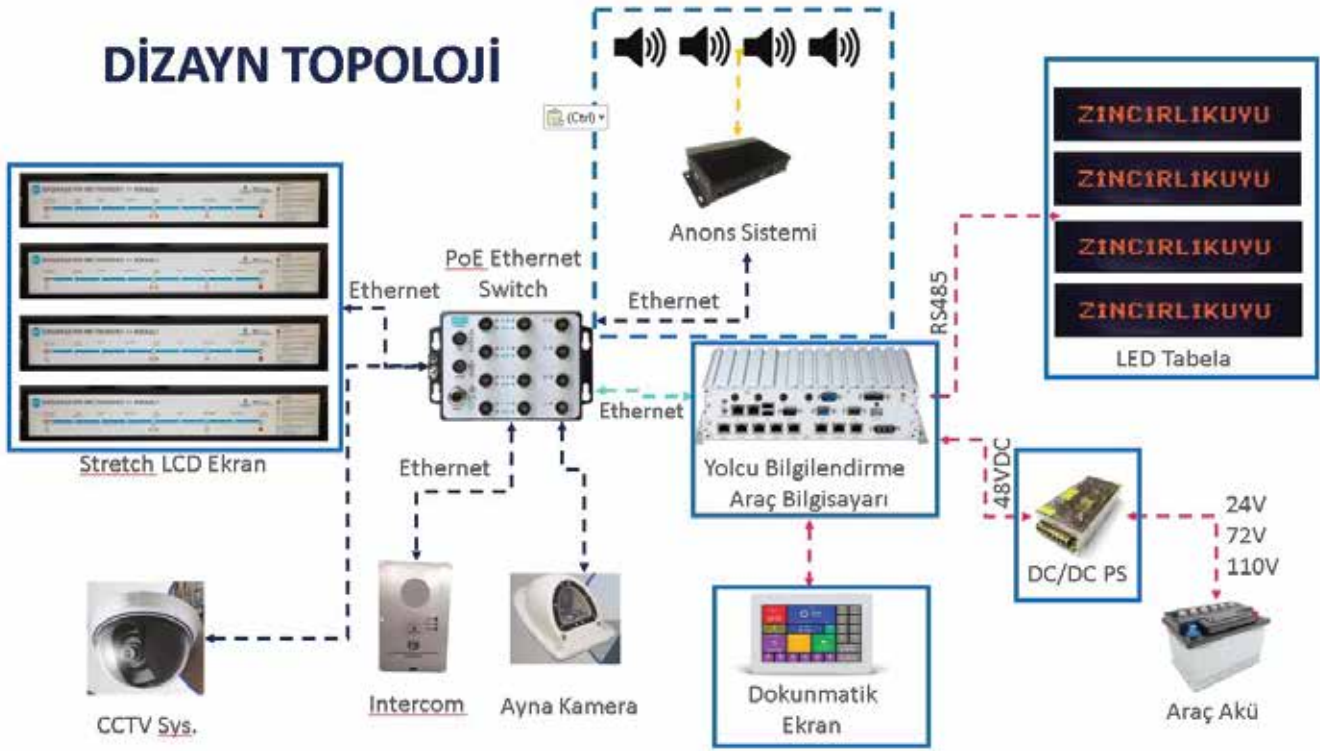
IP-Based

Passenger Information System



In order to provide passengers with access to trip information during their travels in rail vehicles, we have developed a prototype product by designing an onboard IP-based Passenger Information System.

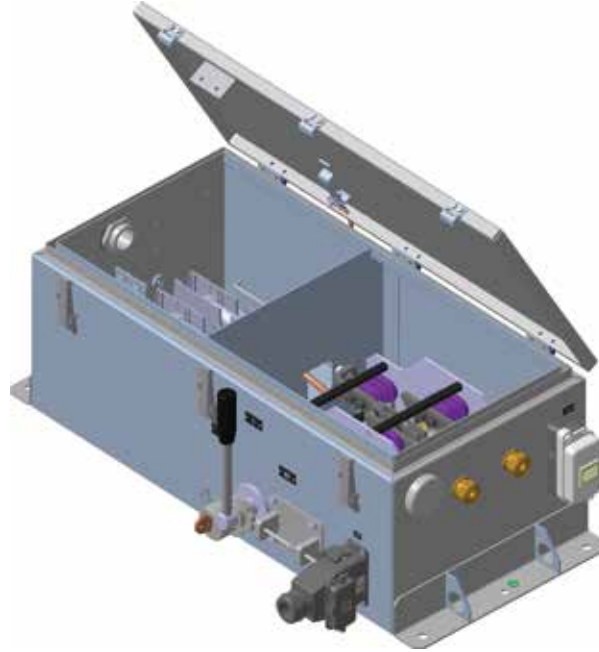
Through our IP-based Passenger Information System, which we designed with the aim of enabling our passengers to access accurate, understandable, and up-to-date information during their journeys;



Project Scope

- Passengers can receive information about their trips through stop and destination announcements.
- Different language options can be provided for passenger information.
- Information about emergency procedures can be provided.
- With the integration of onboard security cameras, the status of passengers inside the vehicle can be monitored.
- Footage requested by official authorities can be obtained in case of criminal incidents onboard.
- Operators can make real-time updates to onboard and external displays through remote updating feature.
- Information about special occasions and events can be easily added to the system to inform passengers.

Stinger Box



In workshop areas where catenary power and third rail cannot be used due to safety reasons, an external vehicle energization system (Stinger Box) is required for intervention on rooftop equipment and conducting onboard function tests. The stinger box system supplies power to the vehicle from the outside. The stinger box units that will be positioned on top of the rail vehicles in the railway system lines need to have a high level of safety and be able to withstand challenging physical conditions.

We make a difference

- Localization of Stinger box panels through coordinated design with the TRAM 34 project.
- Production of Stinger box panels that are compatible with both existing vehicles and the vehicles to be produced within our domestic vehicle project.
- Achieving cost savings in equipment and ensuring quick domestic supply of equipment components.
- Production in compliance with the TS EN 60077-1 standard for electrical equipment of railway vehicles.
- Acquisition of the patent for the Stinger box panel through patent/utility model applications, thereby bringing it into our company's portfolio, and consequently enabling commercial sales to all companies within our organization and those engaged in railway system operations.



TRAM34

*How thankful İstanbul is
How thankful Türkiye is...*



A BRAND NEW METRO İSTANBUL PRODUCT WITH 100% TURKISH ENGINEERING AND DESIGN

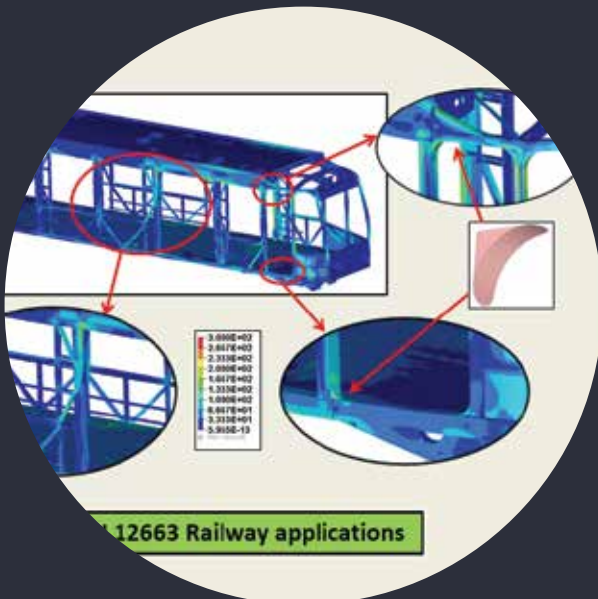
Metro Istanbul first produced a domestic vehicle in 2002, and then in 2014, we manufactured 18 units of 4th generation tram vehicles, which we put into service for the people of Istanbul. These 18 vehicles, used on the T4 Topkapi-Mescidi Selam Tram Line, serve as the vehicles with the lowest failure rate.

In 2021, as a result of the renewed efforts by Metro Istanbul's R&D teams, we have completed the design of TRAM34, a rail system vehicle that is 100% Turkish engineering and design, and has the highest domestic content ratio in Turkey.

With the TRAM34 project, a new generation light rail system vehicle, we will produce 34 tram vehicles initially for service on our T4 line, as part of the Industrial Collaboration Program, following the tender conducted by Istanbul Metropolitan Municipality (IMM).



Structural Optimization of the TRAM34 Vehicle Body



In the TRAM34 project, we reduced the weight of the vehicle by lightening the vehicle body. By doing so, we optimized the weight distribution, resulting in energy savings, extended vehicle lifespan, reduced wear and tear, and increased passenger capacity. With our operational experience, we took this step and developed a lighter, more efficient, and more economical vehicle.

We design the future of transportation



www.metro.istanbul

Head Office
Address: Yavuz Selim Mahallesi
Metro Sokak No: 3 Esenler/İstanbul