

332 A. Frilli et al. Fig.5 Comparison between the measured and numerical speed profile (ETR 1000 on the Firenze- Roma high speed line) Fig. 6 Comparison between the measured and calculated power consumption W_c (a) and voltage V_c (b) include an axle skidding controller yet). Figure 6a, b show the comparison between the numerical and experimental power ...

Energy Storage Systems (ESSs) play a very important role in today's world, for instance next-generation of smart grid without energy storage is the same as a computer without a hard drive [1]. Several kinds of ESSs are used in electrical system such as Pumped Hydro Storage (PHS) [2], Compressed-Air Energy Storage (CAES) [3], Battery Energy Storage (BES) ...

The studies conducted so far on the recovery and utilisation of regenerative braking energy of metro trains have focused on the development of on-board energy storage systems or energy storage ...

The second solution is recovery of the regenerative braking energy of trains, which can be provided by trains' timetable adjustment, use of reversible substations to return the energy to upstream network and energy storage systems (ESSs) (Martinisa and Gallob, 2013), (Gonzalez Gil et al., 2014).

The Hybrid Energy Storage System (HESS) design developed for the Athens Metro combines efficiently the higher power density and (dis)charging cycles of supercapacitors (coping the high frequency of train stops producing energy) with the superior energy density of batteries (matching a slower release and a longer energy consumption time of ...

In this paper, the stationary super-capacitors are used to store a metro network regenerative braking energy. In order to estimate the required energy storage systems (ESSs), line 3 of Tehran metro network is modeled through a novel approach, in peak and off-peak conditions based on the real data obtained from Tehran metro office.

Thanks to the unique advantages such as long life cycles, high power density and quality, and minimal environmental impact, the flywheel/kinetic energy storage system (FESS) is gaining steam recently.

The recovery of braking energy is a very important technology for hybrid electric vehicles. When the internal combustion engine vehicle decelerates to a stop, the vehicle's kinetic energy is ...

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author={Reza Teymourfar and Behzad ...

A model of a train with an on-board energy storage device as well as a network model for estimating the energy recovered by the train is presented. Different scenarios are analyzed to ...

In this paper, the decommissioned train equipment is selected, and the energy conversion method is considered, and a new regenerative braking energy recovery and utilization method is proposed, which is composed of decommissioned power converters, traction motors and vortex spring energy storage devices using mechanical elastic energy storage.

Focusing on the energy-conservation train operation issues, this paper proposes an effective real-time train regulation scheme for metro systems with energy storage devices. Specifically, to minimize train timetable deviation, passenger waiting and energy consumption, we formulate a mixed-integer nonlinear programming model to generate energy-efficient train ...

The application of electrical energy storage system in metro system enables the regenerative braking energy to be utilised in order to achieve energy savings. ... a generalised train, and the energy storage system for energy recovery. The substation consists of two step-down star-delta and delta-delta transformer, connected to wye connection ...

To efficiently recycle the regenerative braking energy of a metro train, a hybrid regenerative braking energy recovery system with a dual-mode power management strategy is proposed, ...

The energy storage device state of charge (SOC) is considered, so as to realize the maximum usage of the ESS. ... In order to utilize braking energy of metro vehicles at high recovery efficiency ...

The energy contracts made by São Paulo metro at free energy market for the coming years already provide for the cost of the energy until the year 2023. In both cases, the value of the energy costs is adjusted annually by the inflation rate, adopting an average value of 3,5% according to market prospects for the coming years.

conditions, energy storage systems (ESSes) have come to play an essential role. In this paper, some recent developments in rail way ESSes are reviewed and a comprehensive comparison is

On-board energy storage devices (OESD) and energy-efficient train timetabling (EETT) are considered two effective ways to improve the usage rate of regenerative braking energy (RBE) of subway ...

The focus of this work is therefore on the investigation of braking energy recovery in tram, metro and light rail networks, which are supplied with DC voltage, by using stationary storage systems or bidirectional substations. ... [17]. de la Torre et al. [34] discussed the application of hybrid energy storage devices, i.e.

Li-Ion batteries and ...

This paper investigates the benefits of using the on-board energy storage devices (OESD) and wayside energy storage devices (WESD) in light rail transportation (metro and tram) systems. The analysed benefits are the use of OESD and WESD as a source of supply in an emergency metro scenario to safely evacuate the passengers blocked in a metro train ...

where q is the anti-vibration factor and $q > 0$ ($q = 0.1$ in this paper).. 2.2 DC BUS Voltage Control Based on Improved ADRC. In the urban railway system, the control of the DC bus voltage of the power supply network is crucial, which is of great significance to the safe operation of the whole system, so the ADRC control strategy with strong anti-interference performance is ...

Energy Recovery Devices (ERDs) are at the core of saving energy in the operation of any seawater reverse osmosis (SWRO) desalination facility. Isobaric or "positive displacement" devices such as the PX Pressure Exchanger are the most efficient solution available today and can reduce the energy consumption of SWRO systems by up to 60%.. This paper will examine ...

Abstract: Aiming at the problem that it is difficult to recycle the braking energy generated by the frequent braking of metro trains, this paper puts forward to store and utilize the regenerative ...

Since the energy storage capacity of battery is much greater than the coil spring, the electric energy storage method always participates in energy recovery throughout the entire braking process. The total recycled energy ($E_{sum 1}$) is the sum of the deformation energy of the coil spring and the feedback energy to the power battery.

This paper focuses on the urban rail transit energy storage recycling method based on the utilization of regenerative braking energy, studies the basic working principle of ...

The energy devices for generation, conversion, and storage of electricity are widely used across diverse aspects of human life and various industry. Three-dimensional (3D) printing has emerged as ...

In the seawater desalination system, the energy recovery system is a crucial part, as it consumes a lot of energy and plays a guiding role in the recovery efficiency. Therefore, in the energy recovery system, the recovery rate and energy consumption are the key factors to guide the system design. In order to make the energy recovery device achieve a high recovery ...

To address this, here we propose a single-phase immersion cooling system with latent heat thermal energy storage (LHTES) devices to recover waste heat. Furthermore, an innovative LHTES device with palmate leaf-shaped fins is designed by bionic techniques. ... Apart from this, the biomimetic LHTES device is applied to waste heat recovery in data ...

They are the most common energy storage used devices. These types of energy storage usually use kinetic energy to store energy. Here kinetic energy is of two types: gravitational and rotational. These storages work in a complex system that uses air, water, or heat with turbines, compressors, and other machinery. It provides a robust alternative ...

The high-energy device can be used as an energy supplier to meet long-term energy needs, while the high-power device can be used as a power supplier to satisfy short-term high power demands. Batteries and fuel cells are ESS devices that can be integrated into an HESS to meet the energy requirements in railway systems.

The speed simulation result of the metro when the flywheel energy storage system is not involved in the work is shown in Fig. 5(a). The speed simulation result of the metro when the flywheel energy storage system participates in the work is shown in Fig. 5(b). When the metro is in the idle state, the speed of the metro is maintained at 30 km/h.

Abstract: Aiming at the problem that it is difficult to recycle the braking energy generated by the frequent braking of metro trains, this paper puts forward to store and utilize the regenerative braking energy by using flywheel energy storage device. When the subway starts, the flywheel decelerates to release the energy; when the subway brakes, the flywheel accelerates to ...

The choice of energy recovery device can significantly impact a plant's overall efficiency. A study published in Energy Efficiency Considerations for RO Plants: A Comparative Study found that switching from a Pelton Wheel to a PX device could reduce energy consumption by up to 1.5 kWh/m³ in a typical seawater RO plant.. The Impact of Energy Recovery on Plant ...

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