Locomotive energy storage optimization

Can a dual-mode hybrid locomotive manage energy consumption?
This study proposes an energy management strategy (EMS) for a dual-mode hybrid locomotive equipped with a fuel cell, supercapacitors, and batteries, and intermittent access to an electrified overhead catenary. It is inspired by the Ragone plot and does not consider information or predictions of future load consumption.

Which locomotive simulation models are used to implement the optimization algorithm?
This section outlines the diesel-electric and hybrid-electriclocomotive simulation models used as a basis for the implementation of the optimization algorithm. It also outlines the freight train return trip driving scenario for the investigated mountainous railway route which is subsequently used in the optimization study. 2.1.

How does a battery hybrid locomotive work?
The engine-generator for the battery hybrid locomotive is downsized (scaled by a factor 0.8 [22]), and it produces the electrical power Pg for each Notch setting according to Table 1 under the control of the energy management system.

How much power does a locomotive use?
This power is used to recharge the SC and batteries to their maximal SOC. In this strategy, the total cost is even negative -EUR4.69. In the scoring cycle, the locomotive is driven for 70.86 km during more than 2 h. The locomotive and its ancillaries consume around 260 kWh.

Can railway freight haul be optimized for battery-hybridized locomotive-based traction?
Even though this aspect of railway freight haul has not been investigated here, it represents the next step in the optimization analysis of railway freight haul for both conventional and battery-hybridized locomotive-based traction.

Can a dual-mode locomotive increase energy recovery during braking?
The global energy reduction is around 1.1% compared with the second EMS and 12.8% without energy recovering. These results show a real opportunityto increase the energy recovered during braking. A dual-mode locomotive has a common drivetrain that operates on not- and electrified tracks.

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The Advanced Locomotive Technology and Rail Infrastructure Optimization System (ALTRIOS) is the first fully integrated, open-source software to simulate and optimize the rollout of cost ...

In addition, the research trends of regenerative braking energy utilization technology in urban rail transit were analyzed, and future research can focus on system topology optimization,...

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This paper proposed an EMS to define power distribution references in a dual-mode locomotive equipped with a FC system, a SC system, batteries, a braking resistor, and intermittent access to a DC electrified ...

To solve this problematic, a design tool by optimization of the hybrid system is presented. The models of each energetic elements and the energy management strategy based on filter ...

The use of on-board energy storage on a locomotive for rail quarry transport is considered. ... The optimization results indicate possible reductions of the fuel consumption of ...

quarry railway transport; electric locomotive; on -board energy storage system; traction drive; induction motor . 1. Introduction and Literature Review ... Optimization of Hybrid On-Board ...

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