



Braking Energy Recovery System

Railway

INTRODUCTION

Jema Energy is a company specialized in providing customized power conversion systems since 1953.

Most trains are now equipped with a regenerative braking system that converts the braking energy into electrical energy. This electrical energy can be either stored onboard (i.e. capacitors) or injected into the catenary.

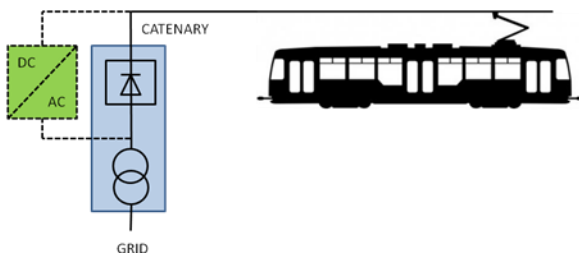
For trains running on DC power this energy cannot be returned to the grid as the AC/DC catenary power supply systems are unidirectional.

So in case there's no other train close by, which consumes this energy or the onboard energy storage system is full, than it will automatically switch over to rheostatic braking (i.e. the generated electrical power is dissipated as heat in brake grid resistors).

In order to avoid this waste of energy Jema Energy can provide a system that allows the regenerative braking system to return the energy back to the grid or to be stored in a fixed ESS.

Braking Energy Recovery System - Grid

The braking energy recovery system consists basically of a DC/AC converter which can be connected in parallel to an existing substation.



Schematic layout of the braking energy recovery system - grid

The braking energy recovery system can be used for 750, 1500 and 3000 VDC catenary voltage with available powers from 200kW up to 2MW peak customized to fit the estimated energy savings of each substation location.

Benefits

- Installation in parallel with the traction power supply substation, the system is supplementary to the existing equipment.
- Very efficient energy recovery due to less energy conversion steps compared to storage systems.
- It does not affect the reliability of the existing traction power supply system.
- Reliable system, based on more than 20 years of experience in designing robust industrial power converters.

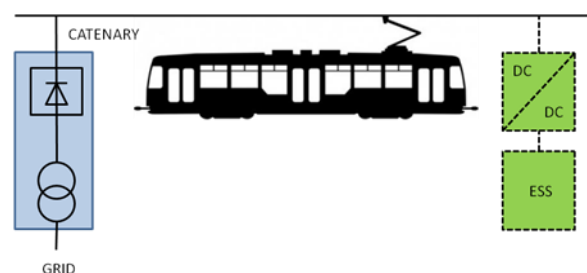
- Quick return of investment (ROI) in a few years depending on the installation characteristics.
- Low maintenance design, static power converter, air cooled.
- Alternatively the system can compensate the reactive power making the substation more efficient.
- Alternatively the system can work as an active harmonic filter.
- No extra short circuit current on the catenary is added due to the very fast electronic current limitation.
- The system can also feed the catenary and can be used as back-up during peak hours or when the main traction power supply system fails.

Braking Energy Recovery System - ESS

Another configuration is a system that consists of a DC/DC converter with an Energy Storage System (ESS) which permits to store the energy locally instead of returning the energy back to the grid.

Benefits

- Independent system can be located anywhere along the line where energy recovery is optimal.
- It does not affect the reliability of the existing traction power supply system.
- Reliable system, based on more than 20 years of experience in designing robust industrial power converters.
- Low maintenance design, static power converter, air cooled.
- Voltage stabilization in weak points of the line by compensating voltage sags.
- Easy to implement, no special requirements or regulations needed as the system is not connected to the grid.
- Possible cost savings by low peak power energy supply contract.



Schematic layout of the braking energy recovery system - ESS