

Regenerative Power Storage Equipment CAPAPOST for Hong Kong Mass Transit Railway (Hong Kong MTR)

Keywords Hong Kong, CAPAPOST, Energy saving

Abstract

The South Island Line (East) is one of three new lines that Hong Kong MTR Corporation Ltd. is currently under construction. This line extends from the existing Admiralty Station and will connect five stations of Admiralty Interchange, Ocean Park, Wong Chuk Hang, Lei Tung and South Horizons. The total length of the extended route is about 7km.

For the South Island Line (East), we supplied six site power facilities. These include power receiving facilities, traction power facilities, and power distribution facilities. We supplied regenerative power storage equipment CAPAPOST to two power facilities among them.

1 Preface

In its home base of Hong Kong, MTR Corporation operates ten commuter rail way lines, a Light Rail network, and a high-speed Airport Express Link.

2 Characteristic of South Island Line (East)

The newest 7-kilometre South Island Line (SIL) of the MTR network commenced passenger service on December 28, 2016. It extends the MTR network to the Southern District of Hong Kong from Admiralty, with new stations at Ocean Park, Wong Chuk Hang, Lei Tung and South Horizons. The railway alignment comprises of underground and viaduct sections.

Regenerative trains are used in SIL where the regenerative power is recycled among trains for efficiency.

Regenerative Power Storage equipment (RPS) is provided to store and recycle regenerative braking energy in the Electric Double Layer Capacitors (EDLCs) to provide power supply to trains. This feature contributes to energy saving, stable operation of the traction power system, and reduces the peak traction power demand.

The merits of RPS are as follows:

(1) Regenerative power can be recycled among

trains by means of charge/discharge via RPS corresponding to powering/braking of train operations.

(2) Reduce peak demand of traction power by recycling of the regenerative power.

3 Introduction of Equipment

CAPAPOST is the regenerative power storage equipment using EDLC as the power storage medium.

The application of EDLC are:

(1) The EDLC does not rely on chemical reactions to store energy, so it is suitable for frequently rapid charging/discharging operations and is extremely durable.

(2) The EDLC contains no heavy metals and it is environmentally friendly.

This equipment stores regenerative electric power and discharges its electric power for the running train at the same time. For this reason, the equipment can effectively utilize regenerative electric power and is effective for energy saving and CO₂ reduction.

4 Outline of Equipment

Fig. 1 shows conceptual single line diagram. Figs. 2 to 4 show the appearance of the panels.

CAPAPOST is connected from 1500V DC feeder line via DCCB. It consists of a control panel,

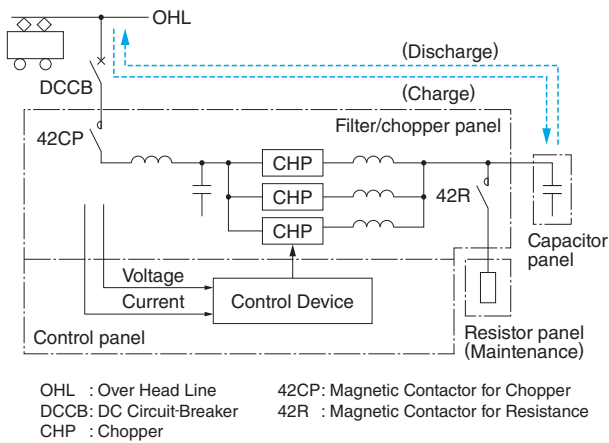


Fig. 1 Conceptual Single Line Diagram

A concept of CAPAPOST and connections of traction power facilities are shown.



Fig. 4 Resistor Panel for Maintenance

An external appearance of the resistor panel for maintenance is shown.

filter panel, chopper panel, DC switch panel (1 set), capacitor panel, and resistor panel.



Fig. 2 Panel Arrays

From front to back, the panel arrays are composed of the control panel, filter panel, chopper panel, and the DC switch panel.

5 Specification of Equipment

The specifications are listed below.

- (1) Nominal input voltage: 1500V DC
- (2) Rated input voltage: 1650V DC
- (3) Maximum voltage: 1800V DC
- (4) Maximum current: 1250A DC (peak)
- (5) Storage Capacity: 20MW·s

[Capacitor]

- (1) Rated voltage (Module): 170V DC
- (2) Capacitance (Module): 4.7F ± 10%
- (3) Internal resistance (Module): 0.66Ω ± 20% (25°C)
- (4) Rated voltage (Series): 1360V DC
- (5) Voltage range: 500V DC – 1360V DC

6 Postscript

The SIL (East) started its business at the end of December 2016. As good as the beneficial effects of this line extension by Hong Kong MTR are, it is expected that there will be an improvement of convenience for the local population and tourists.

Lastly, we would like express our special thanks to the project-related people for your valuable advice and cooperation during the construction work.

- All product and company names mentioned in this paper are the trademarks and/or service marks of their respective owners.



Fig. 3 Capacitor Panel

An external appearance of the capacitor panel is shown.