Increasing Power Quality in a 6-pulse DC-Traction Substation

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***Abstract*—This paper presents an active DC-traction substation with six-pulse uncontrolled rectifier, whose structure and control ensure the braking energy recovery and increased power quality in both traction and regeneration regimes. The key component in the power structure is a voltage source inverterbased shunt active power filter connected properly between the DC-traction line and the power supply. To meet the goal of unity power factor at the power supply side, the current provided by the inverter is indirectly controlled through the supply current. In the generation of the reference current, the adopted algorithm involves the intermediate transformation of the currents' threephase system into a rotating phasor synchronous with the voltage space phasor. A dedicated Matlab-Simulink has been conceived for the whole system. The results of the simulation show that, during the traction regime, the shunt active power filter succeeds in injecting the proper required currents in the point of common coupling, so that almost sinusoidal currents are drawn from the power supply under unity power factor. During the regeneration regime, the voltage source inverter injects active power into the power supply, also under almost unity power factor conditions.**

***Keywords*—active power filter; DC-traction; harmonics; power quality; reactive power**

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