

POLYGON-CONNECTED AUTOTRANSFORMER BASED AC-DC CONVERTERS FOR POWER QUALITY IMPROVEMENT

ROHOLLAH ABDOLLAHI

Qom Branch, Islamic Azad University, Qom, Iran

(E-mail: Rohollah.abdollahi@yahoo.com)

ABSTRACT

This paper presents the design and analysis of Polygon-Connected autotransformer based ac-dc converters which supplies a direct torque controlled motor drive (DTCIMD) in order to improve power quality conditions at the point of common coupling. The 28-pulse rectified output voltage is accomplished via two paralleled eighteen-pulse ac-dc converters each of them consisting of seven-phase diode bridge rectifiers and the 36-pulse rectified output voltage is accomplished via two paralleled eighteen-pulse ac-dc converters each of them consisting of nine-phase diode bridge rectifiers. A Polygon-connected autotransformer is designed to supply the rectifiers. The design procedure of magnetics is in a way such that makes it suitable for retrofit applications where a six-pulse diode bridge rectifier is being utilized. The aforementioned structure improves power quality criteria at ac mains and makes them consistent with the IEEE-519 standard requirements for varying loads. Furthermore, near unity power factor is obtained for a wide range of DTCIMD load operation. A comparison is made between 6-pulse, 28-pulse, and 36-pulse converters from view point of power quality indices. Results show that the THD of input current is less than 5% for the 28-pulse topology and less than 4% for the 36-pulse topology at variable loads.

KEYWORDS: AC-DC Converter, Polygon-Connected Autotransformer, Power Quality, 28-pulse, 36-pulse, Direct Torque Controlled Motor Drives (DTCIMD's).