International Journal of Applied and Natural Sciences (IJANS)
ISSN (P): 2319–4014; ISSN (E): 2319–4022
Vol. 13, Issue 1, Jan–Jun 2024; 13–34

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

HIGHER ATTAINABLE BALANCED LINE TO LINE VOLTAGES CASCADED H-BRIDGE STATCOM WITH SECURE AND EFFECTIVE FAULT ANALYSIS

Dr. P. Lilly Florence[1], Dr. S. Richard Prabhu Gnanakan[2], Dr. B. Mary Juliet[3], K. Balamurugan[4], K. Nageswari Rosy[5], B. Jamal Mohamed Nasar[6] & R. Sujatha[7]

[1,2,3]Professor, Department of Chemistry, M.A.M. School of Engineering (AUTONOMOUS), Siruganur, Trichy - 6211052

[4,5,6,7]Assistant Professor, Department of Mathematics, M. A.M. School of Engineering (AUTONOMOUS), Trichy-6211052

ABSTRACT

Fault-tolerant operation ability is of great importance for stable operation of cascaded H-bridge (CHB) converters, under open-circuit (OC) or short-circuit (SC) switch failures in sub module (SM). In this paper, an improved fault- tolerant control strategy is proposed for CHB based static synchronous compensator (STATCOM) under SM faults. First of all, compared with the conventional fault-tolerant method of directly bypassing the faulty SMs, the proposed fault-tolerant method takes advantage of the healthy switches of the faulty SMs, where they are still able to generate either positive or negative voltage level. As a result, more output voltage levels can be generated, and it raises the attainable balanced line-to-line voltage, especially when different fault types exist at the same time. Then, based on the specific condition of OC fault or SC fault, when the output voltage reference of the faulty phase reaches its limit, the references of the other two healthy phases are redistributed to generate the desired line-to-line voltage. With the reconfiguration of modulation waves, the attainable balanced line-to-line voltage can be further improved. In addition, the proposed fault-tolerant method possesses the ability of cluster voltage balancing, which is an important issue for the STATCOM application. Simulation and experimental results validate the effectiveness of the proposed fault-tolerant method.

KEYWORDS: *Sub Module (SM) Fault, Fault-Tolerant Control, Cascaded H-bridge (CHB), STATCOM, Line-to-Line Voltage*

Article History

***Received:** 11 Jun 2024 | **Revised:** 12 Jun 2024 | **Accepted:** 13 Jun 2024*