

## Chapter 2

### Literature Review

#### 2.1 Literature Review

A comprehensive literature review was carried out to study various cascaded multilevel inverters in terms of their working principle, classification, circuit topologies, control techniques and industrial applications. In addition to that fault-tolerant methodologies of various cascaded H-bridge multilevel inverters were reviewed.

##### [1] A Survey on Cascaded Multilevel Inverters

*K. Gopakumar et al.*; IEEE Transactions on Industrial Electronics, Vol. 57, No. 7, July 2010

- Review of cascaded multilevel inverters in terms of their working principle, circuit topologies, control techniques and industrial applications.

##### [2] Recent Advances and Industrial Applications of Multilevel Converters

*K. Gopakumar et al.*; IEEE Transactions on Industrial Electronics, Vol. 57, No. 8, August 2010

- Classification of multilevel converters
- CHB is well suited for high-power applications because of the modular structure that enables higher voltage operation with classic low-voltage semiconductors

##### [3] Survey on Fault-Tolerant Techniques for Power Electronic Converters

*Wenping Zhang et al.*; IEEE Transactions on Power Electronics, Vol. 29, No. 12, December 2014

- Review of fault-tolerant methodology

##### [4] Open Switch Fault Detection in Cascaded H-Bridge Multilevel Inverter using Normalised Mean Voltages

*Anjali Anand et al.*; IEEE 6th International Conference on Power Systems (ICPS 2016), New Delhi, March 2016

- Advantages and applications of CHBMLI
- Normalised mean voltage method

**[5] A Modified Level-Shifted PWM Strategy for Fault-Tolerant Cascaded Multilevel Inverters with Improved Power Distribution**

*Seok-Min Kim et al.*; IEEE Transactions on Industrial Electronics, Vol. 63, No. 11, November 2016

- Level-shifted PWM method for a 7-level CHBMLI

**[6] Reconfigurable Multilevel Inverter with Fault-Tolerant Ability**

*Hossein Khoun Jahan et al.*; IEEE Transactions on Power Electronics, Vol. 33, No. 9, September 2018

- If there is a fault in any switch of left-side (*or right-side*) leg; all the switches of that side leg of all the modules are bypassed.
- It means that full-bridge topology is converted to half-bridge topology.
- If there is a fault in switch of left-side leg as well as right-side leg; all the modules are bypassed and redundant H-bridge is used.
- Ordinary relays like SPST, SPDT etc. cannot be used.
- Special relays are to be developed.

**[7] Fault-tolerant structure for cascaded H-bridge multilevel inverter and reliability evaluation**

*Mohammad Mehdi et al.*; IET Power Electronics, Vol. 10, Issue 1, 2017

- Isolation and elimination of faulty modules using relays
- Control circuit to continue normal operation by means of remaining healthy modules
- Authors have not explained some special type of relays used in their work.
- Authors have suggested a fault-tolerant structure which can handle faults under Mode-1 and Mode-4 only.

## **2.2 Research Gap**

During the process of literature review, several research gaps were found like used of traditional relays, used of additional relays and change in circuit configuration. These research gaps were helpful in forming the problem on which this research work is founded.