Chapter 2: LITERATURE SURVEY

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of the sub-title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Review of Literature survey</td>
<td>17</td>
</tr>
<tr>
<td>2.2</td>
<td>Objective of the Thesis</td>
<td>21</td>
</tr>
<tr>
<td>2.3</td>
<td>Scope of the Thesis</td>
<td>22</td>
</tr>
<tr>
<td>2.4</td>
<td>Organization of the Thesis</td>
<td>22</td>
</tr>
<tr>
<td>2.5</td>
<td>Conclusion</td>
<td>23</td>
</tr>
</tbody>
</table>
2.1 REVIEW OF LITERATURE

The literature survey shows that there has been a lot of work done in the field of FACTS controllers and even then there is a great need to improve the real and reactive power control strategy, voltage control, transient stability enhancement and power quality improvement. Recent developments in FACTS technology are a great boon in mitigating the power quality problems like voltage sag, swell etc., and hence, in improving the stability of the power systems.

The vision of the FACTS has been formulated by the Electric Power Research Institute (EPRI) in the late 1980s. FACTS concepts, role of FACTS controllers in power systems and introduction to the application of these controllers are discussed in [1-7], not focused on voltage sag and swell. The term ‘power quality’ has become one of the most prolific buzzword in the power industry since late 1980s. J.K.Philips et al.[8] proposed power quality and harmonic distortion on distribution systems. G.F.Reed et al.[9] described the improved power quality solutions using advanced solid state switching and static compensation technology.

M.H.J.Bollen[10], Ray Arnold[11], A.Ghosh et al.[12], Ambra Sannino et al.[13], A.De Almeida et al.[14], K.Chandra sekaran et al.[15], YashPal et al.[16] presented various power quality problems and mitigation techniques by various FACTS devices, this does not deal with power quality improvement using different inverter based
STATCOMs. E.Larse et al.[17] had given benefits of GTO based compensation systems for electric utility applications. IEEE/CIGRE working groups have given FACTS over view[18], S.Fakuda et al.[19] presented introduction to series connected multi-converter systems. R.M.Mathur and R.S.Basati [20], M.A.Perez et al.[21], K.Narasimha Rao et al.[22] presented introduction to FACTS controllers and application of FACTS devices in power system and not discussed about voltage sag and swell in multi-bus systems.


al.[32] described embedded solution to protect textile process against voltage sags C.Edwards et al.[33] proposed static compensator for distribution system, K.K.Sen [34] presented modeling and application of STATCOM, Lichun et al.[35], PraneshRao et al.[36], P.S.Sensarma et al.[37] have presented introduction to STATCOM and performance evaluation using STATCOM in power systems.

P.Giroux et al.[38] proposed modeling and simulation of a distribution STATCOM using SIMULINK power system blockset and not focused on different types of inverter based STATCOM systems.


Jianye Chen et al.[41], M.G.Molina et al.[42] proposed control, design and simulation of DSTATCOM focused on alternate energy storage for power quality improvements but not discussed about voltage sag and swell compensation. S.V.Ravi Kumar and S.Sivanagaraju [43] proposed simulation of DSTATCOM and DVR in power systems. B.Geethalakshmi et al.[44] presented a combined multi pulse-multilevel inverter-based STATCOM for improving the voltage profile and transient stability of power system.


Wei-Neng Chang and Kuan-DihYeh[70] presented Design and implementation of DSTATCOM for fast load compensation of Unbalanced Loads. Parag Nijhawan et al.[71] presented application of PI controller based DSTATCOM for improving the power quality in a power system network with induction furnace load.

2.2 OBJECTIVE OF THE THESIS

- The objective is to improve the power quality of multi-bus system by reducing sag, swell, THD and compensation time.
• The selection of the best STATCOM among VSI, CSI, Push-pull and ZSI based STATCOMs to achieve the above object.
• The comparison of VSI, CSI, Push-pull and ZSI based STATCOM systems are not reported in the literature.

### 2.3 SCOPE OF THE THESIS

Modeling and simulation of eight-bus, fourteen-bus and thirty-bus test systems for the improvement of Power quality using VSI, CSI, Push-pull and ZSI-based STATCOM systems. Comparison of different STATCOMs for multi-bus systems with and without STATCOM are presented.

### 2.4 ORGANIZATION OF THE THESIS

The work reported in the thesis is organized into eight chapters.

Chapter 1 presents the concepts of power quality and the principle of STATCOM.

In Chapter 2, literature survey and problem definition of the present work are reported.

Chapter 3 illustrates the modeling and simulation of the VSI-based STATCOM.

In Chapter 4, design, modeling and simulation of two-bus and eight-bus CSI-based STATCOM systems are presented. The VSI is replaced by the CSI in STATCOM system.

In Chapter 5, the simulation of two, eight-bus and fourteen-bus push-pull inverter-based STATCOM systems are presented. Push-pull
inverter-based STATCOM is suggested, since it requires reduced number of devices.

Chapter 6 describes ZSI-based STATCOM system and provides the simulation of multi bus system using ZSI. This work proposes ZSI-based STATCOM to improve the power quality. This chapter deals with simulation of two-bus and fourteen-bus ZSI-based STATCOM systems. Hardware module for the ZSI-based STATCOM is also presented here.

In Chapter 7, case studies on thirty bus system, IEEE ten-bus system and IEEE 33- bus system are presented.

Finally, in Chapter 8 overall conclusions of the thesis and some suggestions to carry out further work in this field are proposed.

**2.5 CONCLUSION**

In this chapter, reviews of all the major research literatures presented in the area of power quality improvement. This chapter also presents objective, scope and organization of the chapters of the thesis.