CHAPTER ONE

INTRODUCTION

1.1 Background

Nowadays, the world seen a rapid increase of power electronics, based loads connected to the distribution system. These types of loads draw non sinusoidal current from the main power source, hence these loads called nonlinear loads. Normally power systems are designed to operate at frequencies of 50 HZ or 60 HZ, but these nonlinear loads produce current and voltage with frequencies that are integer multiples of the fundamental frequency. These higher frequencies are called electrical pollution is known as power system harmonics. The nonlinear loads appear to be prime sources of harmonic distortion in a power distribution system. In addition, the harmonic currents produced by nonlinear loads can interact adversely with a wide range of power system equipment, most notably capacitors, transformers and motors, causing additional losses, overheating, overloading and electromagnetic interferences. Also, Harmonics are caused by various reasons such as saturation, switching and winding connections in transformers, shunt capacitors resonance and nonlinear loads.

To eliminate these effects in electricity distribution system (non-sinusoidal voltages, harmonic currents, unbalanced conditions, power de-rating, etc.) different types of compensators have been proposed to increase the electric system quality, One of those compensators is the active power filter (APF), in order to protect the electrical equipment from getting damaged due to harmonic voltage distortion. They can also be used to improve the power factor.

1.2 Problem Statement

Today Harmonics has become the common problem because there are many modern electronics equipment ,These types of nonlinear loads are causing many problems such as generate harmonics , poor power factor on the AC side and distortion of AC supply voltages that effects the performance of the equipment. The Incidence of harmonic related problems in power system distribution is high, so awareness of harmonic issues can help to increase plant power system reliability. On the occasions that harmonics are a problem, it is either due to the magnitude of the harmonics produced or a power system resonance.

The research in general on how eliminate harmonic in power system distribution by design Active power filter which is most technically advanced solutions offer guaranteed results and have no adverse effect on the isolated power system to solve this major problem.

1.3 Project Objectives

The main objectives of the research are:

1- Study harmonics phenomena and its sources, causes and effects in power system distribution.

2- Improve the power quality of the system by reducing the harmonic distortion using Active power filters.

3- Design Shunt Active filter.

4- Simulation of shunt active power filters to verify its most technically effect filter in mitigating harmonics.

1.4 Thesis Lay-out

Project is consists of five parts:

- Chapter One: Gives an overview of the subject and the contents of the chapters in the thesis.

- Chapter Two: Cover a literature survey of the thesis. The main topics discussed here harmonic definition, harmonics indices, effects of harmonics, sources and causes and passive filter.

- Chapter three: cover an active filter configuration, comparison of passive and active, active filter types and control techniques used for active power filter.

- Chapter four: contains of system configuration, active filter control, hysteresis current controller, three phase (IGBT) transistor, control of active filter by PWM, simulation and results.

- Chapter five: conclusion and recommendation.