

MODELING, MONITORING, AND ASSESSMENT OF POWER QUALITY PERFORMANCE ON ITC FEEDER AT KFUPM CONSIDERING SOLUTION FOR IMPROVEMENT

Supervised by/ Dr. Mahmoud Kassas Students/ Ibrahim Al-Monaqil, Saeed Sultan, Azzam Al-Mutairi, Turki Al-Suwat, Ali Al-Ramadan

Project Objectives

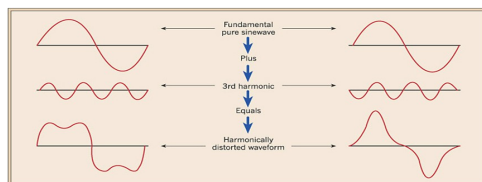
Study about power quality issues and expose to harmonics problems, learning about the use of professional PQ equipment, collecting data from ITC feeder, modeling, design, and simulation of filter using matlab to enhance the power quality.

Introduction

Power quality is a branch of electric power studies that concern about transmitting a sufficient high grade of electric service. In order to reach a high quality of power, it needs to be provided at stipulated magnitude as well as frequency . The following are Typical Power Quality Problems:

- Sags
- Swells
- Voltage Imbalance
- Interruptions
- Notching
- Harmonics

This project interests in studying Harmonics issue. Harmonics are the multiplied number with the fundamental frequency (see the figure below).



The distortion by harmonics can be calculated by mathematical relation known by **THD** (Total harmonic distortion) as follows:

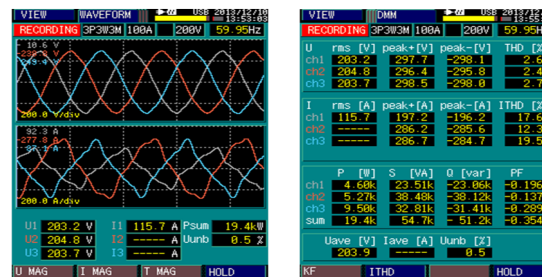
$$THD = \frac{\sqrt{\sum_{n=2}^{\infty} I_n^2}}{I_1}$$

Collecting Data

The data in this project from ITC of KFUPM by an analyzer device called Hioki- 3197. Hioki- 3197 is a power quality measurement instrument for monitoring, recording and analysing the power quality of AC power systems, and the anomalies that often cause malfunctions to occur in electrical equipment used in factories, offices and other buildings.

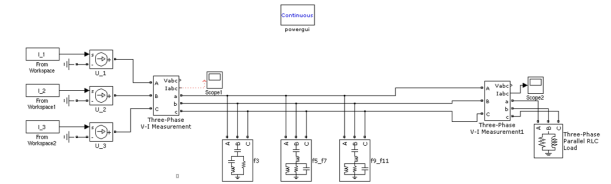


The collected data has a noticeable distortion for a filter to be designed for (the figures below are samples)

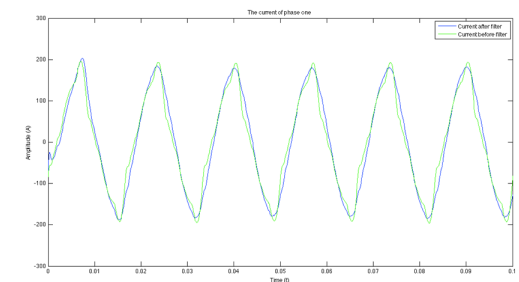


Simulation

In the simulation, it has been added a passive filter to the system to reduce all high frequency signals .



After connecting the filter, the current of each phase become almost a pure sinusoidal signal (the figure below is for one phase)



Conclusion /

In this project, it has been used a passive power filter to reduce the effect of the harmonic signal in the ITC feeder at KFUPM. This design is very helpful for increasing the power quality of the system. Because the THD in currents are 16.6%, 12.5%, and 18.5% in phases 1, 2, and 3 respectively. Then after filtering, it the THD has been reduced in each phase to become 3.4%, 2.56%, and 3.2, respectively, and it became in acceptable ranges.