MITIGATION OF HARMONIC DISTORTION USING ACTIVE POWER FILTER

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ABSTRACT

Power quality now becomes a major concern especially for commercial and industrial customers. Harmonics distortion produced by the non-linear loads will lead to lots of power quality problems. This paper presents a study on harmonics distortion in an electrical distribution system. The first part of the study is to analyse the real data from UiTM (Pahang Campus). Reliable Power Meter (RPM) Software is used to analyse the harmonics distortion. The second part is to simulate the harmonics distortion theoretically using the 13-bus IEEE Industrial Distribution System circuit. The Power System CAD (PSCAD) 4.2.1 Software (educational edition) is used for this purposed. Active Power Filter (APF) is used as a method of to alleviate the harmonic distortion.

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CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

Power quality is a customer driven issues and now it become a very important factor. Non-linear loads cause the current to vary disproportionately with the voltage during each half cycle. Examples of nonlinear loads are battery chargers, electronic ballasts, variable frequency drives, and switching mode power supplies [1]. Power system is design to function at the fundamental frequency, which is 50 Hz in Malaysia or 60 Hz in United States. Ideally, voltage and current waveforms are perfect sinusoids. However, because of the increased popularity of electronic and these non-linear loads, the waveforms quite often become distorted.

This deviation from a perfect sine wave can be represented by harmonics—sinusoidal components having a frequency that is an integral multiple of the fundamental frequency [2]. To quantify the distortion, the term total harmonic distortion (THD) is used. The term expresses the distortion as a percentage of the fundamental (pure sine) of the voltage and current waveforms.

Current harmonics is a problem because they cause increased losses in the customer and utility power system components. Below are some examples of effect on harmonics [3]:

i. Overheating and damage to neutral conductors
ii. Overheating and damage to panel board feeders
iii. Line voltage distortion
iv. Higher Common mode voltage
v. Nuisance tripping of circuit breaker
vi. Overheating and premature failure of distribution transfor