HARMONICS CURRENT MINIMIZATION USING PASSIVE FILTER WITH TWO DIFFERENT CONFIGURATIONS

EIMI DIYANA BINTI ROSLI
(2006130621)

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITII TEKNOLOGI MARA (UiTM)
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ABSTRACT

This thesis investigates the performance of passive filter in reducing harmonics. An analysis and simulation on passive filter to reduce the harmonic distortion was done consisting of inductor and capacitor which was used to reduce the harmonic effects in the current source of the rectifier circuit. Two configurations of passive filter were done to observe the difference on total harmonic distortion (THD) which is shunt passive filter and low-pass broadband filter.

A simulation using MATLAB was done using full bridge rectifier circuit since rectifier is one of the sources of harmonic. Studies were made to consider the effectiveness of using passive filter in reducing the harmonics distortion. The study that was carried out intended in proving that low-pass broadband filter offer higher reduction in the total harmonic distortion (THD) as compared to shunt passive filter.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The power quality (PQ) problems in power utility distribution system are not new, however lately their effect has increased the engineer awareness [11]. The definition of PQ problems is "any power problem occurs in voltage, current or frequency deviations that result in failure or miss operation towards customer's equipment" [2]. This poor power quality affects the efficiency and operation of electrical devices. Some of the examples on PQ problems are voltage sag (also called a "dip") is a reduction in the rms line voltage of 10 to 90 percent of the nominal line-voltage. The duration of a sag is 0.5 cycle to 1 minute [10]. Common sources of sags are the starting of large induction motors and utility faults.

Voltage swell is opposite to the sag. A swell is a brief increase in the rms line-voltage of 110 to 180 percent of the nominal line-voltage for duration of 0.5 cycles to 1 minute. Sources of voltage swells are line faults and incorrect tap settings in tap changers in substations. An impulsive transient is unidirectional variation in voltage, current, or both on a power line. The most common causes of impulsive transients are lightning strikes, switching of inductive loads, or switching in the power distribution system. These transients can result in equipment shutdown or damage if the disturbance level is high enough. An interruption is defined as a reduction in line-voltage or current to less than 10 percent of the nominal, not exceeding 60 seconds in length [9].

The other example of PQ problems is harmonic. Harmonics are sinusoidal voltages or currents having frequencies that are integer multiples of the frequency at which the supply system is design to operate [13].