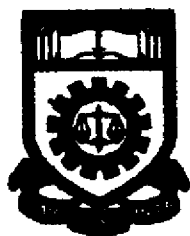


POWER QUALITY MONITORING AND ANALYSIS

This thesis is presented in partial fulfillment for the award of
Bachelor Degree in Electrical Engineering (Hons.)
INSTITUT TEKNOLOGI MARA



ISMAL BIN BAKAR
FACULTY OF ELECTRICAL ENGINEERING
MARA INSTITUTE OF TECHNOLOGY
40450 SHAH ALAM

MEI 1997

ACKNOWLEDGEMENT

In the name of Allah s.w.t the Most Gracious , Ever Merciful who has given me the strength and ability to complete this project and report

I would like to express my deepest gratitude to my project supervisor En. Mohd Zaki bin Abdullah for his valuable guidance, comments and ideas towards the success of this project.

My gratitude also goes to my family who had given me moral support, assistance and prayed for my success. Also thank to all my colleague for suggestion and contribution toward the success of the project.

Finally thanks to the TNB District Manager Port Klang and his technical staff who are very cooperative and also to staff of Power System Laboratory and Maintenance Department, thank you and I wishes you all the best.

ISMAIL BIN BAKAR
Institut Teknologi MARA
40450 SHAH ALAM
SELANGOR

ABSTRACT

Power quality exist today because of the incompatibility of the sensitive equipment to the typical power quality supplied by utility systems. Some of the sensitive loads are particularly vulnerable to short term or momentary interruptions. The increasing use of computers and other sensitive equipment , such problems will continue to grow unless correction measures are taken.

This project has been tailored to monitor and analyse all type of disturbances which might be available in the selected location in Institut Teknologi MARA and TNB Port Klang substation feeder to Jabatan Laut Selangor. This data is hopefully will indicate the source of disturbance and help in finding an improved plan for the system.

It is hope that with all the records and compiled data bases, utility engineer and maintenance department can now be able to control the quality of power system effectively.

TABLE OF CONTENT

ACKNOWLEDGEMENT

ABSTRACT

CHAPTER	PAGE NO.
1 INTRODUCTION	
1.1 OVERVIEW	1
1.2 WHY CONCERN ABOUT POWER QUALITY	1
1.3 DEFINITION OF POWER QUALITY	2
1.4 POWER QUALITY 'EQUAL' VOLTAGE QUALITY	3
1.5 CBEMA CURVE	3
2 POWER DISTURBANCES	
2.1 POWER QUALITY DISTURBANCES	5
2.1.1 STEADY STATE VOLTAGE CONSIDERATION	5
2.1.2 TRANSIENT	5
2.1.2.1 IMPULSE TRANSIENT	6
2.1.2.2 OSCILLATORY TRANSIENT	7
2.1.3 LONG DURATION VOLTAGE VARIATION	8
2.1.3.1 OVERVOLTAGE AND UNDERVOLTAGE	8
2.1.3.2 SUSTAINED INTERRUPTION	8
2.1.4 SHORT-DURATION VOLTAGE VARIATION	8
2.1.4.1 INTERRUPTION	9
2.1.4.2 SAGS	9
2.1.5 VOLTAGE IMBALANCE	9
2.1.6 WAVEFORM DISTORTION	9
2.1.6.1 HARMONICS	9
2.1.6.2 NOISE	10
2.1.6.3 VOLTAGE FLICKER	11
2.1.7 POWER FREQUENCY VARIATION	12
2.2 SOURCES OF POWER DISTURBANCES	12
2.2.1 LIGHTNING	12
2.2.2 FAULTS (SHORT CIRCUIT)	13
2.2.3 SWITCHING	13
2.2.4 CAPACITOR SWITCHING	14
2.2.5 MOTOR STARTING	14
2.2.6 CYCLIC AND VARIABLE LOAD	14
2.2.7 NONLINEAR LOADS	15
2.2.8 WIRING AND GROUNDING	15
2.3 EFFECT OF POWER DISTURBANCES	15
2.3.1 INTERRUPTION AND SAG	15
2.3.2 TRANSIENT OVERVOLTAGES	16
2.3.3 HARMONICS	16
2.3.3.1 IMPACT ON TRANSFORMER	16
2.3.3.2 IMPACT ON MOTOR	16
2.3.3.3 IMPACT ON VOLTAGES	17
2.3.3.4 IMPACT ON SHUNT CAPACITOR BANKS	17

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Both the electric utilities and the end users of the electrical power are becoming more sensitive to disturbances that arise both on the supplying power system and increasingly concerned about the quality of the electric power. End user equipment is within the customer facilities. The primary reason that the majority of utility customers in the past are experiences few problems with the quality of power is that most customer loads are quite insensitive to variations in power supply disturbances.

The proliferation of computer-like products (or “sensitive loads”) has created a whole new areas of power quality consideration, namely sensitive loads. Many new load devices contain microprocessor-based controls and power electronic devices that are sensitive to many types of disturbances. There is an increasing awareness that much of this new user equipment is not designed to withstand the disturbances on typical distribution systems.

The other major concerned of power quality is the emphasis on the overall power system efficiency devices such as high-efficiency, adjustable-speed motor drives and shunt capacitors for power factor correction. This will result in increasing harmonics level on power systems.

1.2 WHY CONCERN ABOUT POWER QUALITY?[1]

The ultimate reason that we are interested in power quality is the economy value. There are economic impacts on utilities, their customers, and supplier of the load equipment.