



Environmental Potentials

Power Quality For The Digital Age

**ENERGY SAVINGS RELATED TO USING EP
FILTER/PROTECTORS WITH INDUSTRIAL MOTORS**

AN ENVIRONMENTAL POTENTIALS WHITE PAPER

Original Report By
Industrial Technology
Research Institute

Abstract

This white paper review looks at the energy savings realized in a 3rd party laboratory at Industrial Technology Research Institute of Taiwan (ITRI) by combining the filtering effects of an EP 2000 Filter/Protector unit, combined with a 440V, 25HP motor. During this evaluation the EP Filter/Protector unit was evaluated for both standard immunity tests and energy consumption effects of the load (motor). The savings calculations were made using the readings measured before and after the EP 2000 Filter/Protector unit was installed. All details of the testing are provided to allow other 3rd party evaluation and to confirm this data.

Based on the data gathered in this report, the EP-2000 clearly demonstrated energy savings of 7% or more. While the laboratory report reflects the affects of one waveform corrector with one motor, actual facility savings is directly related to the number of motors and EP waveform correctors installed throughout the facility. A coordinated and distributive placement of the waveform correction products within a facility has shown the best facility performance and the quickest return on investment (ROI) model (typically less than 1 year).

Scope of Report

Industrial Technology Research Institute in Taiwan conducted an experiment with an EP-2000 unit in the energy and research laboratory. Load used in this experiment is a motor with ratings 440V, 25HP 60Hz. Equipment under test is the EP-2000 Wye configuration model. Electrostatic discharge test is conducted on the EP unit under ambient temperature conditions 24-26 degree centigrade and 55-65% relative humidity. Tests results are captured using a standard power quality analyzer.



Before Installation

It is clearly observed from the readings that the current and voltage distribution on the three phases of the system are not equally distributed.

Voltage magnitudes are Phase A = 239.2 Vrms; Phase B 242.6 Vrms; and 250.6 Vrms on three phases respectively.

Current magnitudes are Phase A = 9.78 Arms; Phase B 10.21 Arms; and 13.08 Arms on the corresponding three phases.

Theoretically, the voltage and current on three phases should be equal in magnitude, when this is not the case inefficiencies in the motor performance take effect. To compensate for these inefficiencies more energy is needed to drive the motors, which in turn causes excess heat. The imbalance in the current and voltage distribution can be due to various parameters present in the facility.

Imbalance in the current magnitudes creates a load imbalance. This imbalance will cause heat in the motor, a decrease in slip efficiency, a decrease in the efficiency of the motor and an increase of energy consumption.

After Installation

Attached readings were taken after installing the EP-2000 waveform corrector. When comparing the before and after readings, it is evident that the current and voltage magnitudes are corrected and the quality of power provided to the motor is significantly improved. Correcting the power quality begins equalizing the voltage magnitudes.

Voltage magnitudes are Phase A = 240.9 Vrms; Phase B 245.6 Vrms; and 248.8 Vrms on three phases respectively.

Current magnitudes are Phase A = 9.58 Arms; Phase B 9.85 Arms; and 12.27 Arms on the corresponding three phases.

This data demonstrates that the EP-2000 is actively filtering and correcting the waveform.



Report Summary Conclusion

The EP-2000 unit is tested under electrodischarge tests at the Energy and Research laboratories Taiwan. Energy consumption readings before and after EP installation were measured and analyzed.

Before the EP unit was installed, the energy consumption of the motor is 5.2 kW and after the EP unit installed it is 4.8kW. This represents a 7.7 % increase in energy loss reduction. EP reduced the motors energy consumption by balancing the impedance of the motor with capacitance found in the EP-2000. Reactive power decreased from 6.097kvar to 5.99kVar Facilities use inductive load motors in industrial manufacturing process (HVAC, Refrigeration). Improving the power quality delivered to industrial motors means more than just energy savings; it also means lower motor heat and longer lasting bearings and brushes. When you combine lower motor maintenance with lower energy bills, this quickly adds up to real savings in your facility.





POWER ELECTRONIC MEASUREMENT REPORT

Application : KLC INC.
 Address : 1928 TYLER AVE, SUITG M-168,SO.ELMONTE,
CA 91733
 Manufacture : ENVIRONMENTAL POTENTIALS INC.
 Address : 1802 N. CARRSON STREET , SUITE 212-2132
CARSON CITY , NV 89701
 Sample Name : WAVEFORM CORRECTION ABSORBER
 Model : EP-2000 Y Type
 Date Received : SEP-25-2001
 Date Tested : SEP-28-2001



WE HEREBY CERTIFY THAT: The object of these measurements were made to establish a common and reproducible basis for evaluating the performance of electrical and electronic equipment when were subjected to the immunity test. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.

	Name	Signature	Date
Testing Engineer	Chin-Tao Huang	<i>Chin-Tao Huang</i>	<i>OCT. 04. 2001</i>
Approving Manager	Mu-Ping Chen	<i>Mu-Ping Chen</i>	<i>Oct. 05, 2001</i>
Director	Chih-Hsin Chen	<i>Chih-Hsin Chen</i>	<i>Oct 25, 2001</i>

Notes :

1. This report will be invalid if duplicated or photocopied in part.
2. This report refers only to the specimen(s) submitted to test, and is invalid as separately used.
3. This report is invalid without examination stamp and signature of this institute.
4. The tested specimen(s) will be preserved for thirty days from the date issued.



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1. General Information

1.1 Description of laboratory

Name of laboratory : Energy & Research Laboratories
Industrial Technology Research Institute
Laboratory location : J100 ,195-6,sec.4, Chung Hsing Rd.,
hu-Tung Chen. Hsin-Chu, Taiwan 31015 R.O.C.

1.2 Description of EUT

MANUFACTURER : ENVIRONMENTAL POTENTIALS INC.
SAMPLE NAME : WAVEFORM CORRECTION ABSORBER
MODEL : EP-2000 Y TYPE
POWER SUPPLY : AC 440V/60Hz, three phases
POWER CORD : Unshielded cable , 5.0m

1.3 Description of peripherals

(1) Moter

Manufacturer : TECO CORP.
Model number : AEAF
Output power : 25HP , AC440V , 60 HZ

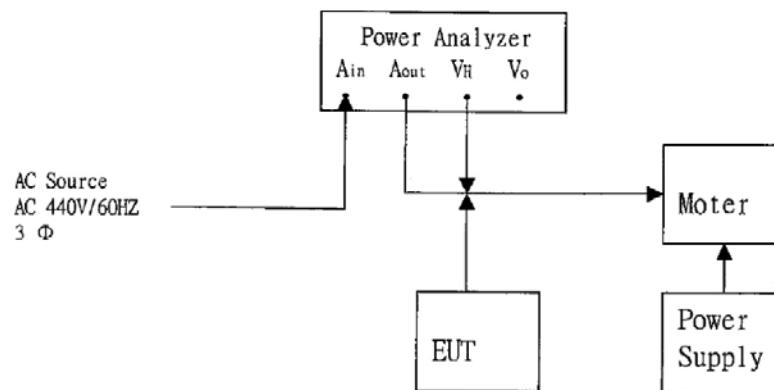
(2) POWER SUPPLY

Manufacturer : EPE
Model number : DUAL-TRACKING DC POWER SUPPL
Serial number :



1.4 Measurement condition of the EUT

1. Input power : AC 440V/60Hz , Three phases
2. Setup diagram of the EUT





2. Electrostatic Discharge Test

2.1 Test equipment

MANUFACTURER OTYPE	MODEL No	SERIAL No
VLOTECH POWER ANALYZER	PM 3000A	AH06/7679

2.2 Climatic conditions :

Ambient temperature : 24 °C ~ 26 °C

Relative humidity : 55 % ~ 65 %

2.3 Measurement results :

A. WITHOUT EUT MEASUREMENT DATA

UNIT LINE	kW	kVA	kVAr	V	A	PF
CH1	1.79	2.28	1.487	239.2	9.78	0.779
CH2	1.26	2.51	2.18	242.6	10.21	0.484
CH3	2.15	3.25	2.43	250.6	13.08	0.656

B. WITH EUT MEASUREMENT DATA

UNIT LINE	kW	kVA	kVAr	V	A	PF
CH1	1.66	2.30	1.55	240.9	9.58	0.737
CH2	1.19	2.44	2.11	245.6	9.85	0.496
CH3	1.95	3.03	2.33	248.8	12.27	0.637



2.4 PHOTOS OF EUT MEASURE

EUT : WAVEFORM CORRECTION ABSORBER
MODEL : EP-2000 Y Type

