



Environmental Potentials

Power Quality For The Digital Age

National Center of Testing Technology Shanghai:
Efficiency and Energy Savings on a Resistive
and Inductive Load

Abstract: The National Center of Testing Technology in Shanghai, China, tested an EP-2000 on an inductive and resistive load to measure energy consumption. Electrical configuration is single phase 220V. The resistive load is 700W where as the inductive load is a 1HP (approx 740W) induction motor. These two loads are switched alternatively by a program timer. The resistive load is supported by a non-linear bridge rectifier. Measurements are taken before and after EP installation.

Test procedure/experimental setup: Single phase 220V electrical supply is feeding the test apparatus. Resistive load of 700W and inductive load of 1HP (740W) are arranged such a way that they can switch alternatively to the supply by using a program timer. Bridge rectifier is used before the resistive load. A watt hour meter is used to measure the energy consumption of this test setup. EP module is installed between the watt hour meter and program timer. Test on this setup is conducted for 7 days with and without EP unit installed. Measurements are taken in both conditions and are compared.

Test Set-up: Wattage consumption is measured for 7 days before EP and 7 days after EP.

Results: Average per day is calculated to be 19.53kWh before the EP unit is connected. Average consumption is measured to be 18.51kWh after the EP unit is installed. This shows after installing EP units, the systems electrical consumption reduced by 5.2 %

Explanation: In the test procedure both resistive and inductive loads are used separately. However, an additional capacitive load is also added to the test set up in the form of bridge rectifier. This complete test setup is identical to the real world load scenario. Losses in the motor are classified into i^2R losses in the rotor and stator winding, core losses consisting of eddy current and hysteresis losses, mechanical losses consisting of brush and bearing friction, residual stray load losses. These motor losses are not constant at any given point of time and are directly related to the frequency of the noise on the supply line. Frequency noise on the power line has to be removed in order reduce motor losses.

Frequency noise on the power line will cause negative effects on the bridge rectifier's transistors such as misfiring, erratic response and false triggering. Fast switch acting behavior of the bridge rectifier will generate frequency noise towards the resistive load and also towards the line through the neutral wire. This will cause excessive heating (i^2R losses) of both the resistive load and the neutral wire. False triggering of the transistors will also cause inefficient performance of the resistive load.

EP's filter removes the frequency noise generated in the electrical system, thereby reducing the energy consumption of the load.

Conclusion: EP installation on the test setup reduced overall electrical consumption of both the loads by 5.2%



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测试报告

TESTING REPORT

(2002) 无测字第 061028 号

Certificate No.

委托单位 Environmental Potentials
Customer

委托书编号 001740
Order Number

样品名称 Waveform Correction Absorber
Name of Sample

型号/规格 EP2000
Model/Type

样品编号 1#
Number of Sample

受样日期 2002.04.15
Date of Receipt

受样方式/地点 (单位) 送样/Offered by Customer
Way / Place of Receipt

测试项目 节能效果测试/Efficiency Test
Testing Item

测试依据: 按用户提供的依据/Offered by Customer
Reference of Testing



批准 毕宇 核验 陆福政 测试 李国瑞
Signature of the Approver Examiner Tester

批准日期: 2002 年 05 月 13 日 (测试单位专用章)
Issued Date Year Month Date



本中心是国家科委批准的《国家级分析测试中心》批准文号为: (85) 国科发条字 447 号。

检测所用的主要测量设备 (名称/编号):

Main Equipment Used (Name/No.)
电能表/200902
watt-hour meter

检测时环境条件

Environmental Condition

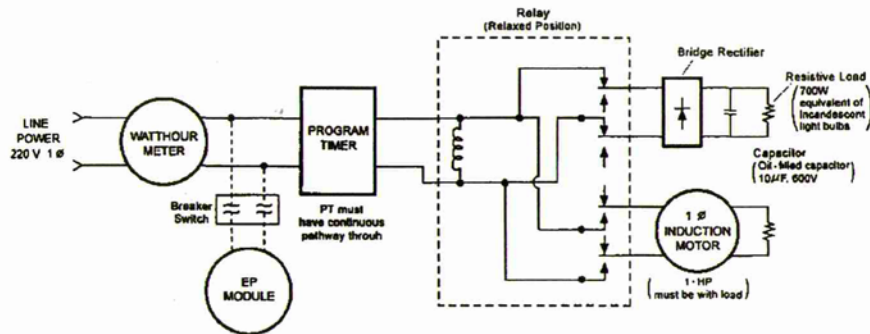
环境温度: 18℃~22℃ 湿度: 55%RH~70%RH; 其它: /
Ambient Temperature Humidity Others

检测数据/结果:

Data/Result of Testing

一、测试线路图 (由用户提供)

Test Diagram (Offered by Customer)



二、负载参数

Loads Parameters

- | | |
|--|------|
| 1. 电阻负载
Resistive Load | 740W |
| 2. 感应马达负载
Induction Motor (with Load) | 704W |

三、测试步骤 (由用户提供)

Test Procedure (Offered by Customer)

- 继电器每隔五分钟交替切换电阻负载和感应马达负载;
The loads were switched alternately by Program Timer
- EP2000 不接入线路, 重复步骤 1, 连续测试七天, 每隔 24 小时读出电能表的读数;
Repeat the procedure 1 for 7 days with the EP2000 disconnected, read the readouts of the Watt-hour meter every 24 hours;
- 将 EP2000 接入线路, 重复步骤 1, 连续测试七天, 每隔 24 小时读出电能表的读数。
Repeat the procedure 1 for 7 days with the EP2000 connected, read the readouts of the Watt-hour meter every 24 hours.



四、测试数据

Test Data

1. 未接 EP2000 时的耗电量

Wattage Dissipation with EP2000 Disconnected

日期	时间	电能表读数 (kW·h)	耗电量 (kW·h)
Date	Time	Wattage	Wattage Dissipation
04.20	18:15	0.11	0.00
04.21	18:15	19.72	19.61
04.22	18:15	39.25	19.53
04.23	18:15	58.78	19.50
04.24	18:15	76.30	19.52
04.25	18:15	97.82	19.52
04.26	18:15	117.36	19.54
04.27	18:15	136.85	19.49

平均日耗电量

The Average Wattage Dissipation per Day
W1=19.53 kW·h

2. 接入 EP2000 时的耗电量

Wattage Dissipation with EP2000 Connected

日期	时间	电能表读数 (kW·h)	耗电量 (kW·h)
Date	Time	Wattage	Wattage Dissipation
04.27	22:15	140.18	0.00
04.28	22:15	158.78	18.60
04.29	22:15	177.37	18.59
04.30	22:15	195.91	18.54
05.01	22:15	214.41	18.50
05.02	22:15	232.89	18.48
05.03	22:15	251.33	18.44
05.04	22:15	269.78	18.45

平均日耗电量

The Average Wattage Dissipation per Day
W2=18.51 kW·h

3. 节能效果

Efficiency

$$E = (W1 - W2) / W1 \times 100\% = 5.2\%$$

五、结论

Conclusion

测试数据表明, 接入 EP2000 后, 能耗比原来降低了 5.2%。

The testing data illustrates that when the EP2000 is connected, The wattage dissipation can be reduced 5.2%.

测试结果内容结束
End of Results