



Satic ES120V Power Saver

3rd Party Power Verification

Eco JAB Enterprises

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This report outlines a series of tests comparing Satic Pulse CFL lamps with comparable lamps marketed by competitors commonly found on retail shelves and shows the distinct differences in power usage and efficiency in the comparison.

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Introduction

My name is Jerrod Brown, President of EcoJAB Enterprises, LLC. It is EcoJAB's objective to gather and present accurate, understandable and usable data to help both individuals and businesses make quality decisions on both "going green" and saving money.

As to the reason for this document, EcoJAB was hired by Satic Incorporated to work in conjunction with Dr. Bradley Layton, Energy Technology Department Chairman, and Tom Gallagher, Electronics Technology Department Chairman, at the University of Montana College of Technology to conduct an independent third party assessment and evaluation of the Satic ES120V Global Energy Saver (GES) product. This evaluation was to include power testing of commonly used 120-volt appliances in a controlled laboratory environment as well as in the typical American home. Care was taken to select a broad range of appliances for testing power consumption and characteristics with and without the ES120V using industry standard testing equipment.

In electric power transmission and distribution, "volt-ampere reactive" (var) is a unit used to measure reactive power in an AC electric power system. Reactive power exists in an AC circuit when the current and voltage are not changing at the same time. All electric equipment requires "vars" - a term used to describe the reactive or magnetizing power required by the inductive characteristics of electrical equipment such as motors and transformers. In general, the flow of vars results in energy losses and may be charged accordingly by the power company. Using devices such as the GES may provide benefits by optimizing power factor which results in decreased energy losses, reduced harmonics, better voltage regulation and increased system capacity.

This report provides study data concerning types of appliances, testing equipment and procedures for comparing use with and without the GES. The results of this study support the use of Satic's ES120V Global Energy Saver to meet recent federal mandates to conserve energy and reduce power consumption.

Under full disclosure, EcoJAB Enterprises is not certified under the 10 C.F.R. PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS.

If you have any questions, please feel free to contact EcoJAB directly.

Sincerely,

A handwritten signature in black ink, appearing to read "Jerrod Brown", with a long horizontal flourish extending to the right.

Jerrod Brown

Overview

EcoJAB provided data collection and analysis of the Satic ES120V Global Energy Saver after establishing testing guidelines and data collection methodologies for the purposes of presenting technical information for the benefit of the typical American consumer. Data collection of the ES120V was accomplished using commercial equipment that is widely accepted by the industry.

Testing Environment:

To test the Satic model ES120V plug-in unit in a controlled laboratory environment, an isolated utility power panel, a P3 Kill-A-Watt meter, a Belkin power strip, and an ENVI Powersave CC128, Current Cost energy monitor, were used for assessment. The P3 Kill-A-Watt meter provided voltage, amperage, watts, and power factor efficiency information at the load. The ENVI monitor provided monetary costs and secondary information through contacts that were attached to the breaker panel at a 120 volt, 15 amp circuit breaker. The P3 Kill-A-Watt meter was attached to an isolated electrical test receptacle on the circuit mentioned earlier. The Belkin power strip was then attached in series, via the isolated test receptacle, through the P3 Kill-A-Watt. Appliance loads were then plugged into the power strip. The power strip allowed the ES120V to be inserted in parallel to the test loads, removed, and added to clearly see and capture consistent “before and after” readings by both meters simultaneously to make sure results were the same for accuracy. Statistical results were gathered both with and without the ES120V in the circuit.

Additional field testing was conducted in non-controlled home environments whereby the home appliances were plugged into a Belkin power strip that was plugged into a P3 Kill-A-Watt meter that was plugged into the home 120V outlet that normally fed the appliance with power. Each appliance was then plugged into the power strip for testing. The power strip allowed the ES120V to be inserted in parallel to the test loads, removed, and added to clearly see and capture consistent “before and after” readings. As in the controlled laboratory environment, the P3 Kill-A-Watt meter provided voltage, amperage, watts, and power factor efficiency information at the load. The ENVI Powersave monitor was not used in the home environment tests.

The data collection and the design described above involved certain measurement issues that included:

- When reviewing data involving watts and costs with the ENVI Powersave, there was one watt of power at a relatively high PF value of 95 being used by the P3 Kill-A-Watt.
- The ENVI Powersave cost analysis also had a limitation. Monthly costs above \$10.00 are rounded up to the nearest dollar value. Because of this rounding, there is some loss of precision with the ENVI instrumentation, though it is felt that the test results still prove an accurate example of monetary savings.

The ENVI meter was set at \$0.099 per kWh base cost for electricity which, it must be noted, is relatively low by industry standards.

For comparison purposes, a set of commonly used appliances were included in the testing and analysis. A list of these appliances with their applicable name, manufacturer, marketed wattage and name plate specifications can be found in Table 1. Comparison testing with and without the ES120V involved measurement of energy conservation and power consumption.

Economic and Energy Test:

A combination of the P3 Kill-A-Watt and the ENVI Powersave monitor were used in the controlled laboratory environment to collect data related to energy usage in terms of voltage, amperage, watts, and power factor. The results of these assessments in the controlled laboratory environment can be found in Table 2. Table 3 illustrates the related difference in amps, volt amps, power factor and potential expense based on the results found in Table 2. The results of the residential field environment assessments can be found in Table 4. Table 5 reports the measured differences in amps, volt amps, and power factor with and without the ES120V.

Table 1: Appliance Make, Model and Name Plate Rating Information

Test Type	Product	Model	Name Plate Rating
Controlled	Ace 1/2 hp- under sink disposal	M# 200	120V/6.9A
Controlled	LinCare-elite oxygen concentrator	M# newlife	120v/4A
Controlled	LinCare- nebulizer	M# 8350	115v/1.9A
Controlled	Magic Chef - mini fridge	M# MCWC50dst	115V/2 A
Controlled	Monster – mini fridge- 2.9 cu ft	M# G-5C	115V/2.5A
Controlled	Kirby vacuum-2008 NASA designed	M# G10D	120V/7A
Controlled	Black-n-Decker Shop Vac- portable wet-n-dry	M# UV200	120V/3.5A
Controlled	Whirlpool - Energy Star – upright fridge- 12.5A inrush	M# ED5PHEXRS00	112V/6.5A
Controlled	Essick Air Products- portable swamp cooler	M# BFC2000	120V/3.3A
Controlled	Kelvinator Deluxe A/C	M# S208D1QA	115V/10A
Test Type	Product	Model	Name Plate Rating
Field	Daewoo Nano Silver A/C- Energy Star 5350 btu/h	M# DWC-054R	115V/4.5A
Field	Whirlpool A/C -type 0055	M# AC0068MP0	115V/4.5A
Field	Royal Sovereign A/C	M# ARS-1250A	115V/12A
Field	Kenmore - Energy Star A/C	M# 580-72056200	115V/4.5A
Field	Electrolux vacuum	M# C134D	115V/11A
Field	Hoover Wide Path 6000 - steam vac	M# F6023-900	120V/9.2A
Field	PowerGlide 4 gallon air compressor	M# 60900015	120V/13A
Field	LakeWood Eng. 20" Box fan- high speed selected	M# 200DL2	120V/2.1A
Field	1995 Kenmore Coldspot - side by side fridge- doors opened	M# 106-9557621	115V/6.5A
Field	1995 Kenmore Coldspot - side by side fridge- doors closed	M# 106-9557621	115V/6.5A
Field	Whirlpool Top-freeze refrigerator- doors opened	M# ET18DKXAN10	115V/6.5A
Field	Whirlpool Top-freeze refrigerator- doors closed	M# ET18DKXAN10	115V/6.5A
Field	Montgomery Ward - chest freezer 21 cu ft - 1/4 hp	M# FFT-8955-00G	115V/4.3A
Field	Kenmore Coldspot- upright freezer - 16 cu ft	M# 106-8262180	115V/3.5A
Field	Sanyo - mini fridge	M#SR-366W	120V/9 A
Field	Maytag dishwasher - Energy Star mobile – fill& heat	M# MDC4650AWW	120V/9.0A
Field	McGowan - 5 gal water heater/cooler- cooling mode	Cordley Tempright	115V/5A
Field	Pro-Form 785 - tread mill - @ 6 mph (typical setting)	M# 785	120V/12A
Field	GX-99 - Endermatherapy Vibrating System	M# Workout Masseur	110V/1A
Field	Whirl-Pool HD - super cap. washer (various cycles)	M# LA5580XTW0	120V/10A
Field	Kenmore 80 Series HD- super cap. plus washer (various cycles)	M# 110-23812100	120V/10A

Table 2: Controlled Laboratory Appliance Tests With and Without Satic ES120V

<i>Product</i>	Test results: Without Satic ES120V					Test results: With Satic ES120V				
	<i>Volts</i>	<i>Amps</i>	<i>Volt-Amps</i>	<i>PF- Efficiency</i>	<i>\$\$ per mo. @ \$0.10 per kWh</i>	<i>Volts</i>	<i>Amps</i>	<i>Volt-Amps</i>	<i>PF- Efficiency</i>	<i>\$\$ per mo. @ \$0.10 per kWh</i>
Under sink disposal	119.1	4.53	539.5	32%	\$ 35.00	119.2	3.7	441.0	39%	\$ 28.00
O2 concentrator	119.3	4.3	513.0	75%	\$ 35.00	119.3	3.7	441.4	85%	\$ 28.00
Nebulizer	119.1	1.26	150.1	45%	\$ 9.05	119.1	0.67	79.8	88%	\$ 4.88
M.C. mini - fridge	119.4	1.62	193.4	60%	\$ 12.00	119.4	1.02	121.8	91%	\$ 8.00
Monster mini - fridge	119.2	2.55	304.0	69%	\$ 20.00	119.6	2.01	240.4	88%	\$ 15.00
Kirby vacuum	119.7	5.27	630.8	92%	\$ 43.00	119.1	5.04	600.3	96%	\$ 41.00
B-n-D Shop-vac	119.3	3.23	385.3	96%	\$ 26.00	119.3	3.11	371.0	98%	\$ 24.00
WP upright side by side	117.3	1.71	200.6	73%	\$ 10.00	117.1	1.42	166.3	98%	\$ 8.76
Swamp cooler	119.5	3.15	376.4	61%	\$ 26.00	119.5	2.48	296.4	78%	\$ 21.00
Kelvin. A/C	119.5	1.32	157.7	84%	\$ 10.00	119.7	1.15	137.7	97%	\$ 9.34

Note- ENVI Powersave rounds all dollar values above \$10.00 to the nearest dollar amount showing relative accuracy but low precision

Table 3: Projected Controlled Laboratory Appliance Percentage Savings Using Satic ES120V

Product	Amps	Volt-Amps	Change in PF %	% @ \$0.10 per kWh
Under sink disposal	18%	18%	7%	20%
O2 concentrator	14%	14%	10%	20%
Nebulizer	47%	47%	43%	46%
M.C. mini - fridge	37%	37%	31%	33%
Monster mini - fridge	21%	21%	19%	25%
Kirby vacuum	4%	5%	4%	5%
B-n-D Shop-vac	4%	4%	2%	8%
WP upright side by side	17%	17%	25%	12%
Swamp cooler	21%	21%	17%	19%
Kelvin. A/C	13%	13%	13%	7%

Note- the skew in values from PF change to \$\$ saved is in part due to the precision of the ENVI

Table 4: Residential Appliance Tests With and Without Satic ES120V

Test Type <i>Commercial / Residential</i>	Product <i>Description</i>	Test results: Without Satic				Test results: With Satic M# ES120V			
		<i>Volts</i>	<i>Amps</i>	<i>Volt-Amps</i>	<i>PF- Efficiency</i>	<i>Volts</i>	<i>Amps</i>	<i>Volt-Amps</i>	<i>PF- Efficiency</i>
Residential	Daewoo - A/C	120.8	3.27	395.0	78%	121	2.83	342.4	91%
Residential	WP - A/C	121.3	3.57	433.0	94%	121.3	3.2	388.2	99%
Residential	RS - A/C	117.2	10.28	1204.8	88%	117.2	10.01	1173.2	93%
Residential	Ken - A/C	119.2	3.77	449.4	96%	119.4	3.79	452.5	98%
Residential	Electrolux vacuum	115.8	8.97	1038.7	96%	115.8	8.81	1020.2	98%
Residential	Hoover steam vac	118.1	9.03	1066.4	96%	118.4	8.94	1058.5	98%
Residential	PG air compressor	115.1	12.71	1462.9	98%	115.1	12.68	1459.5	98%
Residential	LWE box fan	120.2	1.93	232.0	76%	120.1	1.46	175.3	97%
Residential	Ken. S*S fridge (open)	118.9	2.9	344.8	97%	118.9	2.83	336.5	99%
Residential	Ken. S*S fridge (closed)	118.6	1.61	190.9	89%	119.6	1.45	173.4	96%
Residential	WP top freeze – fridge (open)	119.3	1.74	207.6	95%	119.6	1.67	199.7	97%
Residential	WP top freeze – fridge (closed)	119.3	1.41	168.2	92%	119.6	1.36	162.7	95%
Residential	MW - chest freezer	118.9	3.33	395.9	74%	119.2	2.61	311.1	87%
Residential	Ken upright freezer	119.5	1.89	225.9	73%	119.5	1.46	174.5	96%
Residential	Sanyo mini-fridge	117.3	0.73	85.6	67%	117.4	0.61	71.6	81%
Residential	Maytag portable dishwasher- fill & heat	117.6	2.2	258.7	98%	118.1	2.27	268.1	96%
Residential	Water cooler	117.7	1.23	144.8	73%	117.7	0.8	94.2	97%
Residential	Tread mill	117.8	6.35	748.0	44%	117.8	5.71	672.6	48%
Residential	Therapy vib @ 50%	118.5	0.83	98.4	48%	118.5	0.72	85.3	56%
Residential	Therapy vib @ 75%	118.9	0.85	101.1	56%	118.8	0.83	98.6	69%
Residential	WP washer- agitate	118.6	8.72	1034.2	49%	118.8	7.95	944.5	54%
Residential	WP washer- drain & spin	118.1	9.37	1106.6	61%	118.4	8.23	974.4	69%
Residential	WP washer- spin	118.3	8.41	994.9	50%	118.3	7.63	902.6	55%
Residential	Ken washer- fill	119.3	0.08	9.5	96%	119.6	0.86	102.9	7%
Residential	Ken washer- agitate	118.5	8.49	1006.1	49%	118.5	7.75	918.4	55%
Residential	Ken washer- drain & spin	118.7	8.24	978.1	37%	118.7	7.39	877.2	41%
Residential	Ken washer- spin	118.5	8.28	981.2	47%	118.4	7.42	878.5	53%

Table 5: Projected Residential Appliance Percentage Savings Using Satic ES120V

<i>Appliance Model and Type</i>	<i>Amps</i>	<i>Volt Amps</i>	<i>Change in PF %</i>
Daewoo - A/C	13%	13%	13%
WP - A/C	10%	10%	5%
RS - A/C	3%	3%	5%
Ken - A/C	1%	1%	2%
Electrolux vacuum	2%	2%	2%
Hoover steam vac	1%	1%	2%
PG air compressor	0%	0%	0%
LWE box fan	24%	24%	21%
Ken. S*S fridge (open)	2%	2%	2%
Ken. S*S fridge (closed)	10%	9%	7%
WP top freeze – fridge (open)	4%	4%	2%
WP top freeze – fridge (closed)	4%	3%	3%
MW - chest freezer	22%	21%	13%
Ken upright freezer	23%	23%	23%
Sanyo mini-fridge	16%	16%	14%
Maytag portable dishwasher- fill & heat	-3%	-4%	-2%
Water cooler	35%	35%	24%
Tread mill	10%	10%	4%
Therapy vib @ 50%	13%	13%	8%
Therapy vib @ 75%	2%	2%	13%
WP washer- agitate	9%	9%	5%
WP washer- drain & spin	12%	12%	8%
WP washer- spin	9%	9%	5%
Ken washer- fill	-975%	-978%	-89%
Ken washer- agitate	9%	9%	6%
Ken washer- drain & spin	10%	10%	4%
Ken washer- spin	10%	10%	6%

Test Results

The testing was concluded and data reported in terms of percentage savings of amps of electrical current, total volt-amps of apparent power, change in power factor and projected monetary savings (for laboratory results only). Comparison testing with and without the Satic ES120V in the controlled laboratory environment demonstrated a consistent reduction of amps, total volt amps, and projected cost of operation when the Satic ES120V was installed. In addition, there was a consistent power factor increase when it was installed.

In the residential field tests there were only two appliance tests where the Satic ES120V didn't demonstrate a reduction of amps, a reduction of total volt amps and an increase in power factor. The two tests that demonstrated different results were both measured during a passive filling of water for a portable dishwasher and a washing machine. In these situations, there was still current draw of the Satic ES120V and no inductive motor activity. Hence, these tests should be kept in appropriate context. Where there was inductive motor activity for all the other tests, the Satic ES120V performed consistent with the controlled laboratory tests.

The age of the appliances was observed to have an impact. In particular, the possible integration of capacitance in the newer appliances that are EnergyStar-rated demonstrated high power factors initially without the Satic ES120V and, as a result, little or no improvement with the Satic ES120V.

Conclusion

The results of this independent third party product comparison study suggest the following with respect to use of the Satic ES120V with common household appliances:

- The Satic ES120V will increase the power factor and related efficiency of household appliances that utilize inductive motors.
- The Satic ES120V will decrease amperage of household appliances that utilize inductive motors.
- The Satic ES120V will decrease total volt-amps of apparent power for household appliances that utilize inductive motors.
- The Satic ES120V will reduce the cost of operation of household appliances that utilize inductive motors.