Evaluation of Performance Indicators for Sustainable Low carbon among ISO 14001&ISO 50001 Dealers of Honda Automobile in Thailand

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Abstract

There is growth of economic activities in the manufacturing sector and the service sector that has an impact of environmental deterioration as well effect of the quality of life of citizens in Thailand. The operator should have responsibility to control the process, track and resolve potential hazards systematically (ISO Certification, 2010) centre of vehicles with energy and environmental management standards ISO 14001 and ISO 50001 standards assist in the management of existing resources sparingly. The operators has to focus on energy and resource using efficient management systems with stability to handle more power. This research aims to evaluate the performance indicators of the factors that affect energy, efficiency and environmental management standards ISO 14001 and ISO 50001 and compliance of the Automobile dealers. The stratified samples of among 63 branches under the Center of Honda Automobile Co., Ltd. with an environmental management system ISO 14001 and ISO 50001 have been focused as the area of study. The research tool consists of four areas of electricity, water, waste and greenhouse gasses have been studied using ANOVA one-way and two-way. The results showed that the amount of electricity, water, solid hazardous waste, liquid hazardous waste, general waste and a amount of greenhouse gasses in 2012, auctioned during 2013 and 2014.

Keywords ISO 14001/ Environmental Management System /ISO 50001 /Energy Management System /Automobile dealer

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INTRODUCTION

Due to the greenhouse effect, the world has a higher temperature and the forecast depicted the production of energy is the main cause of carbon dioxide released into the atmosphere In Thailand the energy sector with the greenhouse gas emissions is in a high proportion as the top 96 countries in the world over the past ten years. The temperature in Thailand has gone up 0.3 degrees Celsius. (Wattananukit Rawat, 2000) In the current industry sector, the key is to create a balance between the economic progress and to protect the system of the greenhouse. At the same time, it can be used as a tool to manage many business sectors to its potential to compete in the economy. It is accountable for the impacts of resource and environment. The dealers of automobile as one of the establishments of environmental management systems and energy by the ISO 14001 and ISO 50001 standards help in the management of the existing resources in the power management. So, to reduce or mitigate the problem in global warming, the system of energy consumption with the reduction of greenhouse gas emissions.

Hence, the investigator has paid attention in performance management standard of environmental and energy in accordance with the ISO 14001 Standards and ISO 50001. The entrepreneurs as dealers of Honda automotive industry in Thailand has been selected as a case study.

A. *Objective of the study*

1. To study the performance indicators of the environmental management and power among dealers of Honda Automobile having ISO 14001 and ISO 50001 standards.

2. To assess factors that affect the performance of the environmental management and power *among dealers of Honda Automobile having ISO 14001 and ISO 50001 standards*.

B. Scope of the study

Population:

About 63 dealers of Honda Automobile in Thailand with limited use of the Environmental Mnagement System and the energy Management System in accordance with ISO 14001 and ISO 50001 was included in the study.

Variables:

The independent variables included the use of electrical energy, water, fuel Consumption, and the amount of carbon foot print.

The dependent variables included the performance of the Environmental Management System and the power management ISO 14001 and ISO 50001 standards.

Duration of the study:

The duration of the research is from January to September, 2015.

C. Scope of Content

1) Documenting are view to report results of quality and other information related to the environmental and energy among the dealers of Honda Automobile in Thailand.

2) Evaluates the quality of measurement data on the quality of the environment and energy in accordance with the document management standard ISO 14001: 2003 and ISO 50001: 2012

3) Trend analysis of the performance of the application to the standard of the Environmental Management and the power of the Automobile dealer in Thailand.

4) Evaluates the performance quality of Environmental and energy among dealers of Automobile in Thailand as a guide to the application to the development and for continuous improvements.

II. RESEARCH METHODOLOGY

This research was quantitative in nature by bringing data from representatives of Honda Automobile Thailand. Ltd. of 63 branches. The calculated sample size 63 branches was by means of sampling using probability. The samples were a stratified based, the regions in, Thailand were as follows:

Bangkok and vicinity	23	branches.
Northeast	11	branches.
Eastern	14	branches.
South	8	branches.
North	7	branches.

*A. **Collection of Documents***

2.1 The researcher explored the performance of enterprises certified environmental management system ISO 1 4 0 0 1 and energy management system ISO .50001

2.2 The compilation of data based on the list of establishments certified environmental management and energy management systems, ISO 1 4 0 0 1 and ISO 5 0 0 0 1 at random by the sector in the country.

2.3 The research was contacted to dealers to gather all information, The researcher has verified the authenticity of the information for analyzing the data.

2.4 The information on the storage of energy resources and support (Kingkeaw *Buttanu*, 2005) were collected from 2012 to 2014. The collected data were as follows.:

• Power consumption

• Water Consumption

(Water supply and / or groundwater).

• waste (municipal waste, hazardous waste, and recycling).

• The number of car repair service center.

• Carbon footprint

A. ***Data Analysis***

The study continued to analyze the data processing education using the program and analyze the data.

Part 1 energy and resources index analysis in the dealers since 2012-2014

A. Analysis by electricity index

$$\text{Electricity Index (KWh/cars)} = \frac{\text{electricity / year (kWh)}}{\text{Number of car repair Automobile Dealer (cars)}}$$

B. Analysis by water resources index

$$\text{Water Resources index (unit/ cars)} = \frac{\text{water consumption/ year(Unit)}}{\text{Number of car repair Automobile Dealer (cars)}}$$

C. Analysis by waste index can be divided into 3 categories.

$$\text{Hazardous solid waste index(Kg/cars)} = \frac{\text{Hazardous s}}{\text{Number of car repair Automobile Dealer (cars)}}$$

$$\text{Hazardous liquids waste Index(L/ cars)} = \frac{\text{Hazardous liquids waste}}{\text{Number of car repair Automobile Dealer (cars)}}$$

$$\text{General waste index (Kg / cars)} = \frac{\text{General waste / year (kg)}}{\text{Number of car repair Automobile Dealer (cars)}}$$

Computing the carbon footprint.

The formula to computer the volume of carbon dioxide from energy use or greenhouse gas management activities of the organization.

Carbon footprint = activity data X emission factor values or absorb Greenhouse gases

Source: (Greenhouse Gas Management Organization: (2011,17)

D. Analysis of greenhouse gas index.

Greenhouse Gas Index (kgCO2eq/ cars) = greenhouse gases

Number of car repair
Automobile Dealer (cars)

The test sample and 4 indices from the above shows a normal distribution.

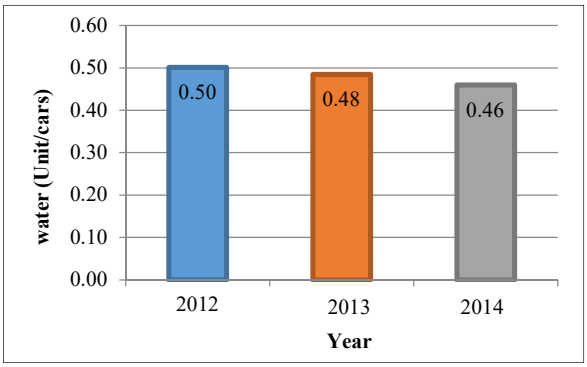
The data were analyzed using Histogram to determine the frequency of data. Hypothesis was tested by using ANOVA one way (One-Way Analysis of variance) to determine the relationship between the index and energy resources in 2012-2014 with the performance standards of environmental management and energy according to ISO 14001 and ISO 50001 in the establishment of Honda Automobile company in Thailand.

Part 2 Analysis the factors that affect the performance of environmental management in accordance with ISO 14001 and the power in accordance the standard ISO 50001. In the accompanying car dealers researcher.

– The hypo thesis testing employed two-way ANOVA (Analysis of variance Two-Way) in order to find out the relationship between the energy and the resources index 2012 – 2014 with the efficiency of a environmental management system and find relationship between energy and resources index with a factor of the size of the establishment, period operated mechanism affects the performance of a standard environmental management system for the establishment of the dealers.

III. Results And Discussion

TABLE I



SHOWS THE INDEX ELECTRICAL ENERGY, WATER RESOURCES, SOLID WASTE, LIQUID WASTE AND GREENHOUSE GAS EMISSIONS AN AVERAGE ANNUAL

Type	Year		
	2012	2013	2014
Electric (kW-hr/cars)	1710.16	1713.63	1695.25
Water (Unit/cars)	31.57	30.55	28.94
Solid waste (Kg/cars)	21.68	20.7	15.92
Liquid waste (L/cars)	114.66	102.16	106.82
Waste (Kg/cars)	45.78	44.36	42.14
Carbon emission (kg CO2-eq/cars)	1291.32	1277.39	1260.2

A. Results of an analysis of Index measures the energy and resources in the workplace from the Automobile dealer in 2012-2014.

TABLE II

SHOWS THE INDEX ELECTRICAL ENERGY SINCE 2012-2014.

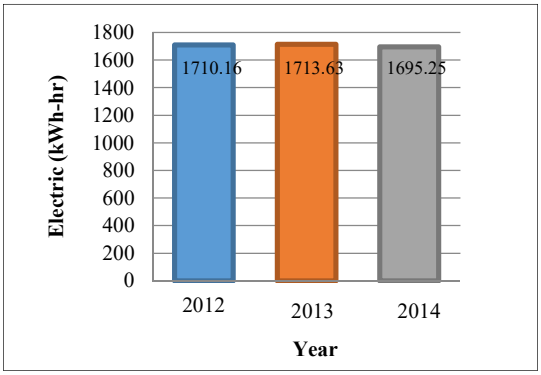


Fig.1 A comparing the average of electricity consumption since 2012-2014.

From Table II the annual average of electrical energy Index used within the automobile dealer datelines with the year 2013 and 2014 *(*datelined from 1713.630 as 1695.250 kilowatt hours per car*)*, whereas in the year 2013 the index increased *(*From 1710.160 as 1713.630 kilowatt hours per vehicle*)* . The experiment showed that the statistic F = 0.11 and a sig. = 0. 990, which was significant more 0. 05 for power index. It was concluded that the establishment of Honda cars from the year 2012 to 2014 in three years were not different.

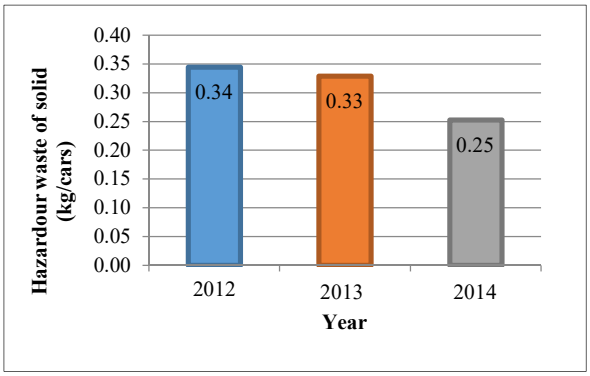
TABLE IIII

SHOWS THE INDEX WATER RESOURCES SINCE 2012-2014.

Fig. II Compare the average Water consumption since 2012-2014.

Table III shoes an annual average of Water Resources Index among automobile dealer datelined in the year 2012 to 2013 & 2014 *(*down from 31.570, 30.550 and 28.940 unit per cars*)* . And The experiment showed that the statistic F = .340 and a sig. = .712, which is significantly at more than the 0.05. Hence, water index could be concluded that the establishment of Honda cars in the year 2012 to 2014 were not different.

TABLE IV



THE INDEX OF HAZARDOUS WASTE OF SOLID SINCE 2012-2014.

Fig.III Compares the average solid hazardous waste dewing since 2012-2014.

Table IV shows the solid hazardous waste index for among automobile dealer from in 2012 is datelined the year 2013 and 2014 *(*down from 21.68, 20.70 and decreased 15.92 kg per car*)* . The study showed that the statistics F = 2.501 and a sig. = .085, which was significantly at more than the 0.05. Therefore, the researcher concluded that the establishment of Honda cars from the year 2012 to 2014 in three years were similar and does not show any difference.

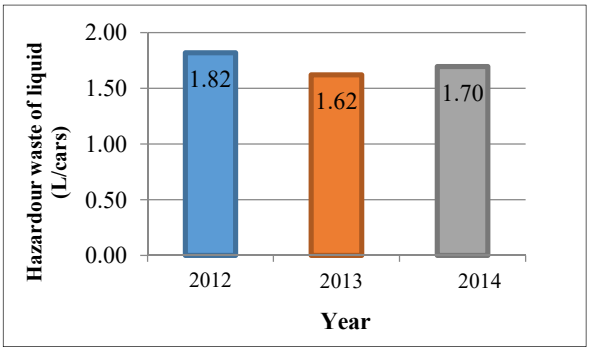


TABLE III

SHOWS THE INDEX OF HAZARDOUS WASTE OF LIQUID SINCE 2012-2014.

Fig. IV Compares the average fluid hazardous waste *since 2012-2014.*

Table IV shows the fluid hazardous waste index is fluid among automobile dealers is down from 2012 to the year 2013 and 2014 *(* down from 114.66, 102.16 106.82 and liters per car*)*. The results of the analysis of variance for index of hazardous fluid waste among the Honda automobile dealer for the year 2012-2014 for 3 year does not vary. The results of the study showed that the statistic F = .432 and a sig. = .656, which is significantly more than the 0.05. Hence, the fluid hazardous waste index could be concluded that among dealers of Honda cars not different over three years in 2012-14.

TABLE IVI

SHOWS THE INDEX OF INDEX GENERAL WASTE

SINCE 2012-2014.

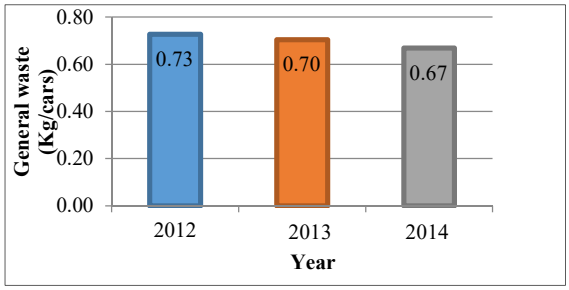


Fig. V Compare the average fluid hazardous waste *since 2012-2014.*

Table VI shows the general waste index among the dealers of automobile during 2012 is down from the year 2013 and 2014 *(* datelined from 45. 78, 44. 36 and 42. 14 kg per cars) the study showed that the statistic F = . 135 and a sig. = .874, which is significantly more than the 0. 05. Therefore, general waste index has been concluded that the establishment of dealers of Honda could be did not vary for the period of three years

TABLE VII

SHOWS THE INDEX OF GREENHOUSE GAS

EMISSIONS SINCE 2012-2014

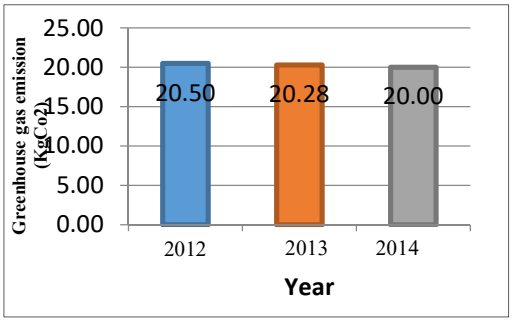


Fig. *VI Compare the average greenhouse gas emissions since 2012-2014.*

Table VII, shows annual average of greenhouse gas emissions index among dealers of the automobile during 2012 was, down from the year 2013 and 2014 *(* datelined from 1291. 320, 1277. 390 and 1260. 200 Kilograms Carbon Dioxide per cars*)* . The results of the study showed that the statistic F = . 051 and a sig. = . 951, which is significantly more than 0. 05. The greenhouse gas emission index could be concluded that the among establishments of dealers of Honda cars during the year 2012 to 2014 did not vary significantly for three years.

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B. factors that affect the performance of the environmental management and energy in accordance with the ISO 14001 and ISO 50001 Standards in the automobile dealer.

The size of the automobile dealer as a factor affects the performance of the environmental management and energy analysis of variance based on the service dealers.

Table VIII shows the electricity index of mid-sized cars, Honda Service Center. during the year 2012 was down from 2013 and 2014 (down from 590.3199, 545.9672 and 523.8499 kW hours per car), and an analysis of variance for electricity index of Honda car midsize enterprises were powerful enough to reduce the use of electric power enterprises in the sample. On the other hand, a unified center of small and large, were not powerful enough to reduce the power usage.

TABLE VIII

SHOWS THE INDEX FOR ELECTRICITY IN THE DEALERS THERE IS A DIFFERENT SIZE FROM 2012-2014

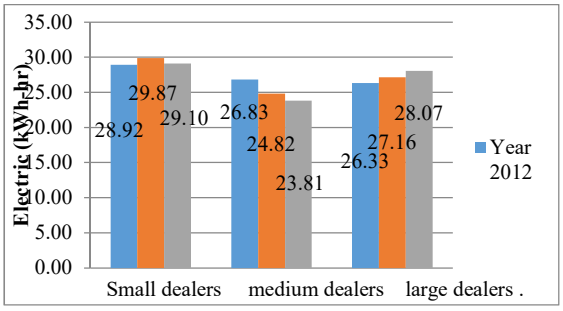

Fig.VI Compares the average electricity in the dealers there is a different size from 2012-2014

TABLE IX

SHOWS THE INDEX FOR WATER IN THE DEALERS THERE IS A DIFFERENT SIZE FROM 2012-2014

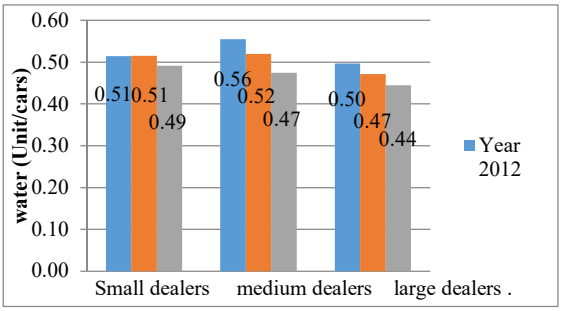

Fig. VII Compare the average water in the dealers there is a different size from 2012-2014

Table X shows the center of the small, medium-sized and large dealers has been ineffective in reducing water used inside the car example. The analysis of variance index of water. Center of Honda large since 2012-2014, for three years were not different.

TABLE X

SHOWS THE INDEX FOR SOLID HAZARDOUS WASTE OF *THE DEALERS THERE IS A DIFFERENT SIZE FROM 2012-2014*

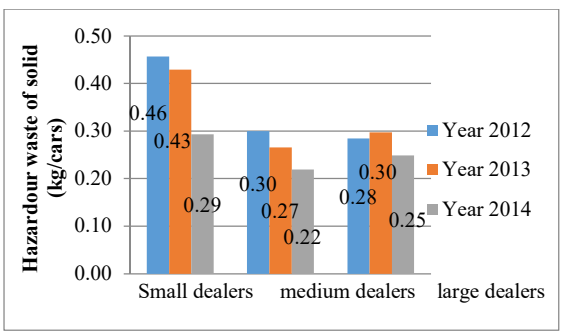

Fig.IX Compares the average solid hazardous waste in the dealers there is a different size from 2012-2014

Table XI, shows the index value of solid hazardous waste among small enterprises increased from 2012 to 2013 but again it increased from 2013 to 2014, The analysis of variance index of solid hazardous waste of Honda cars, small establishments since 2012-2014 found that a decrease in year-on-year of the 2013 the year 2012 and 2014.

An index of solid hazardous waste within a medium-sized car service center during the year 2012 down from 2013 and 2014 (down from 7.050, 6.080 and 4.880 Kg), The analysis of variance index of the solid hazardous waste of Honda car midsize establishments during 2012-2014, the establishment of medium enterprise from the year 2012 to 2014 showed a decrease in volume. 2014 from the year 2012 and the year 2013. Small and medium-enterprises managed in effective way to reduce the amount of solid waste among the dealers. The large enterprises of auto center has been doing ineffectively to reduce the amount of solid waste among dealers.

TABLE XI

SHOWS THE INDEX FOR FLUID HAZARDOUS WASTE OF *THE DEALERS THERE IS A DIFFERENT SIZE FROM 2012-2014*

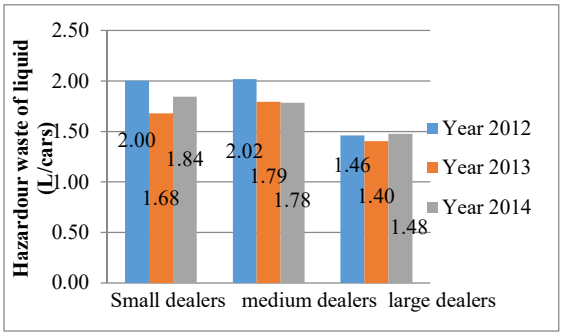

Fig.X Compares the average fluid hazardous waste in the dealers there is a different size from 2012-2014

Table XI shows the center of the small, medium-sized and large dealers has been ineffective in reducing *fluid hazardous waste*. The analysis of variance index of *fluid hazardous waste* large enterprise of Honda automobile during 2012-2014, for three years were not different.

TABLE XII

SHOWS THE INDEX FOR GENERAL WASTE OF *THE DEALERS THERE IS A DIFFERENT SIZE FROM 2012-2014*

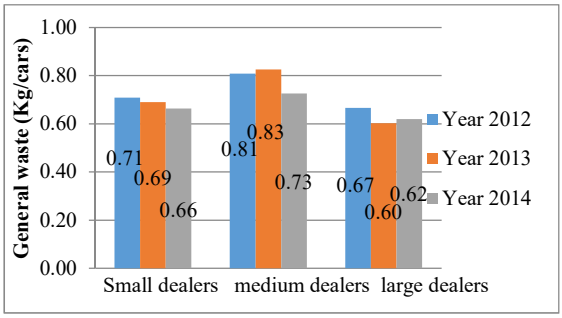

Fig. XI Compares the average general waste in the dealers there is a different size from 2012-2014

Table XIII shows the center of the small, medium-sized and large dealers has been ineffective in reducing *general waste* as per cases of dealer of car. The analysis of variance for *general waste* index among the Centers of large Honda dealer enterprises during 2012-2014 are not different for three years.

TABLE XIII

SHOWS THE INDEX FOR GREENHOUSE GAS EMISSIONS OF *THE DEALERS THERE IS A DIFFERENT SIZE FROM 2012-2014*

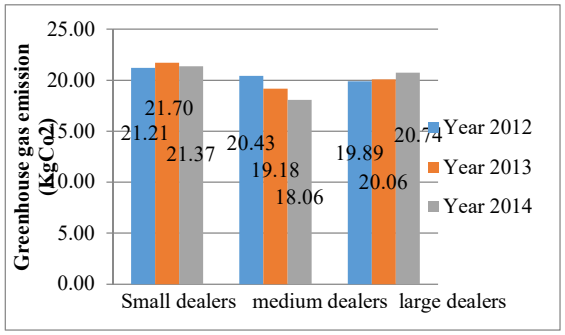

Fig. XII Compares the average greenhouse gas emissions in the dealers there is a different size from 2012-2014

Table VX, shows an average annual greenhouse gas index emissions among the midsize car service center during 2012 was down from the year 2013 and 2014 (449. 480, 421. 990 and 397. 220 kilograms of carbon dioxide per kilowatt hour / units) based on the analysis of variance index of greenhouse gasses during 2012-2014.

A greenhouse gas emissions/ vehicle was different in each year 214, decreased from the year 2012 and the year 2013 by the year 2012 and year 2013 data were not different. In the center of the midsize car powerful enough to reduce the greenhouse gas emissions. The center of the small and large cars has been ineffective in reducing the greenhouse gas emissions.

TABLE VX

SHOWS HYPOTHESIS TESTING OF *THE DEALERS*

Independent variable	**dependent variable**	**Analysis result**	**P-Value**
During the operation for 3 years	electricity	F = 0.124	0.884
During the operation for 3 years	Water supply	F = 0.474	0.629
During the operation for 3 years	Hazardous waste of Solid	F = 1.473	0.253
During the operation for 3 years	Hazardous waste of Liquid	F = 1.205	0.321
During the operation for 3 years	general waste	F = 0.003	0.997
During the operation for 3 years	Greenhouse gas	F = 0.109	0.897
During the operation for 4 years	electricity	F = 0.121	0.886
During the operation for 4 years	Water supply	F = 0.154	0.858
During the operation for 4 years	Hazardous waste of Solid	F = 3.031	0.066
During the operation for 4 years	Hazardous waste of Liquid	F = 5.207	0.013 *
During the operation for 4 years	general waste	F = 0.289	0.751
During the operation for 4 years	Greenhouse gas	F = 1.188	0.321
During the operation for 5 years	electricity	F = 1.244	0.301
During the operation for 5 years	Water supply	F = 5.702	0.007 *
During the operation for 5 years	Hazardous waste of Solid	F = 2.934	0.067
During the operation for 5 years	Hazardous waste of Liquid	F = 0.724	0.492
During the operation for 5 years	general waste	F = 3.402	0.045*
During the operation for 5 years	Greenhouse gas	F = 0.968	0.39
During the operation for 6 years	electricity	F = 0.874	0.464
During the operation for 6 years	Water supply	F = 0.697	0.534
During the operation for 6 years	Hazardous waste of Solid	F = 2.708	0.145
During the operation for 6 years	Hazardous waste of Liquid	F = 1.295	0.341
During the operation for 6 years	general waste	F = 4.305	0.069
During the operation for 6 years	Greenhouse gas	F = 1.544	0.288
During the operation for 7 years	electricity	F = 0.26	0.773
During the operation for 7 years	Water supply	F = 0.134	0.875
During the operation for 7 years	Hazardous waste of Solid	F = 1.408	0.26
During the operation for 7 years	Hazardous waste of Liquid	F = 0.359	1.043
During the operation for 7 years	general waste	F = 0.359	0.701
During the operation for 7 years	Greenhouse gas	F = 0.440	0.648

C. Factors of time the system of the automobile dealer

Table XV shows The factors on time the system affects the performance of the environmental management and energy analysis of variance based on the amount of time working on the system, 4 years has an index of the type of the fluid and 3 years with the amount of reduced to a significant time and working on the system, 5 years index is a general waste reduced significantly.

IV. RESULTS

The study covered trial Index measures of electrical energy and resources in the workplace. The automobile dealer was found that they did not have the performance of the environmental management and energy by the ISO 14001 Standards and ISO 50001 standards. It was not sufficient to reduce the amount of energy and resources within the center of the car and the Automobile dealer of Small Service, Automobile dealer medium Service, within the duration of 4 years and the time working on the system and 5 years as the factors that affect the performance of the environmental management and energy by the ISO 14001 Standards and ISO 50001 in the center of the Automobile dealer.

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