A Study on Compact Fluorescent Lamps- Awareness and Utilization Among Households in the District of Coimbatore,India

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Abstract

CFLs as lamps intended to replace incandescent lamps and having overall lengths of eight inches (20 cm) or less. CFL bulbs require low energy than what other bulbs requires for operating. Compact fluorescent lights (CFLs) use between one-quarter and one-third as much electricity as incandescent bulbs to provide the same amount of light. Iin households that use CFLs, the average number of CFLs is greatly outweighed by the average number of incandescent lights. This paper is a study to measure the current level of awareness of CFL amongst the households and identify efficient ways to increase the awareness amongst the people. This study also attempts to measure the market potential of CFL bulbs .This study will be helpful in judging the scope of LEDs in the future. The sample for this study was collected from the city of Coimbatore, Tamilnadu. A total of 200 samples were collected through survey using quota sampling technique. The result of the study shows that awareness about the CFL bulbs play a bigger role in purchase decision of CFL bulbs. And also the study shows that most of the demographic factors are not associated with the awareness level. More importantly, the study also highlights the future of CFLs and its market space through the determination of Market Potential.

Introduction

CFL is the symbol of energy of saving since 1980. By 1990s the sales of CFLs grew very high because of the awareness programs. Compact Fluorescent Lamp (CFL) is the smaller form of fluorescent tubes, which is easy to install in any Lamp fixtures. National Lighting Product information Program defines CFL as fluorescent lamps that have a tube of diameter of 16 mm or less and circular CFLs[1]. CFLs as lamps intended to replace incandescent lamps and having overall lengths of eight inches (20 cm) or less. CFL bulbs require low energy than what other bulbs requires for operating[2]. For example, a 27-watt CFL generates approximately 1800 lumens, compared to 1750 lumens from a 100 watt incandescent. CFLs also have a significantly longer service life, 6000–15000 hours compared to 750–1000 hours for a standard incandescent[3].

Despite of the promotions activities growth of market was slowing down in the middle of 1990s. India takes 1/5 of total consumptions in the entire world which is comparatively high when considered. Previously in India power was given in subsidized rate so that people were spending it liberally without warring about appliances which is not the same now. So there is good potential market for CFL bulbs.

The important factors of CFL usage are,

- CFL are energy saving bulbs.

- CFL have longer life span.

- CFL has better lighting.

- CFL are eco friendly.

CFL bulbs consumes less energy than that an incandescent that is being used. By changing all those incandescent to CFLs the energy consumption is reduced. CFLs have a longer life span when compared to the other lamps in the market. This is one factor which people should be aware of for their regular usage where in they are actually lacking in. Once people understand this factor they automatically change to the CFLs. Compared to the other lamps in market the CFLs provide better lighting. This better lighting is not by using extra energy but by using lesser energy than other lamps in the market. This is also one unique point that a user should follow to reduce their electricity bill with better lighting. As per the doctors and research papers it is said that the improper disposal of the lamps may cause diseases like breathing suffocations. This is caused because of the chemicals content in incandescent bulbs. In CFL bulb this chemical content is controlled so when disposed it doesn't cause any health related hazards. All these factors are mainly concentrated by many CFL manufactures in their promotion part which is successful only to certain level.

In this research, the researcher has identified factors which will influence the market to purchase and use CFLs in their house. These factors are actually benefits that are different from other lamps in the market. The awareness of households on these factors itself will make people purchase CFLs. But people are actually not aware of all the factors are not aware of some of the factors. In the survey questionnaire itself the researcher provided with test questions which will actually list out all the factors and its advantages. This effort of the researcher will lead to awareness on the energy consumption benefits provided by CFL. This survey also in a way conveys to respondents the ill effects caused by using other bulbs in market and which won't be happening in the CFL. Research are also in a part creating the awareness about government subsidized offer on the CFL which is already happening in other stats and very soon going to happen in Tamil Nadu also.

Literature Review

Compact Fluorescent Lamps (CFLs) provides opportunity for residential savings as well as environmental benefits. Energy literature proclaims that compact fluorescent lamps (CFL) are an icon of energy efficiency, and that they have favorable economic and environmental benefits over incandescent bulb. The benefits of CFL are,

- Easy to install,

- Fit regular lighting fixtures,

- Longer life expectancy

- Less electricity to produce the same amount of light and cut costs by over 80 percent.

Jabavu Clifford Nkomo, 2005. Consumer choice in an energy efficient lighting context

The market potential of CFL comes from Government drive to increase access to electricity, the Reconstruction and Development Programme (RDP). Energy consumption patterns among households vary depending on fuel prices, sources of income and access to energy sources[4].

The purchase of a CFL is based on two main factors. First one is the consumer's subjective evaluation, and the second one is preference for the product. But the consumers are hesitant to buy CFL because of high initial cost. The consumer makes a purchase if he perceives that the resulting utility gained by investing in the CFL is worth paying the first high cost, and giving a high return on investment (a short payback period).Another point of view is that rather than assuming economic rationality, consumers buying decision is affected by choices of other members of society

The actual sales figures for incandescent bulbs exhibit an average growth rate of 0.6 percent between 1997 and 2002, with the sales rising from 50.6 million in 1997, reaching a peak of 65.4 million in 2000, and falling thereafter (50.3 million in

2002). Except for 1999 and 2000, the other years show a negative growth rate in sales. Sales of CFLs have an upward trend, with an average growth rate of 33.4 percent between 1997 and 2002, with sales rising from 1.45 million in 1997 to 5.35 million in 2002.

CFLs averages 10 000 hours and consume only a quarter of electricity, while a typical standard incandescent may last between 750 to 1 000 hours. This implies that every CFL purchased replaces 10 to 13 incandescent lamps, with improved energy saving and longevity making CFL one the best energy efficient investments available.

"Bachat Lamp Yojana" seeks to utilize the Clean Development Mechanism (CDM) of the Kyoto Protocol to bring-down the price of CFLs. Bureau of Energy Efficiency, Ministry of Power, Govt. of India has developed the programme and registered with UNFCCC. This public-private partnership between the Government of India, Private sector CFL Manufactures /Traders (Project Developers) and State level Electricity Distribution Companies would provide the framework to distribute high quality CFLs at about Rs.15 per piece to the households of the country. Under the scheme 40W, 60 W and 100 W incandescent Lamps have to be replaced with CFLS having same lumen output[5].

Compact fluorescent lights (*CFL's*) in Canada. Allan Wesley and David L. Ryan (2006)

Compact Fluorescent Lights (CFLs) use between one-quarter and one-third as much electricity as incandescent bulbs to provide the same amount of light. According to the most recent (2003) Survey of Household Energy Use , at least one CFL is used in 31.4% of homes in Canada, and in these CFL-using households, an average of 4.38 CFLs are used along with 2.69 halogen lights, 3.08 fluorescent lights, and 20.74 incandescent lights. Remaining households use on average 2.08 fluorescent lights, 2.05 halogen lights, and 20.90 ordinary light bulbs[6]. CFLs utilize electronic ballasts to reduce flicker, improve power usage and reduce the start up time for the light; these electronic ballasts are lighter and quieter than the alternative, magnetic ballasts.

Incandescent lights that are used for more than two to four hours a day are ideally suited for replacement by CFLs. These authors found that the best CFL introduction opportunities occurred where energy consumption is the greatest. Each time a CFL is turned on and off a slight amount of its lighting ability is eroded, so that lights that are turned on and off frequently or those that are only lit for short periods of time, are not ideally suited to the use of CFLs[7]. many compact fluorescent lights are unsuitable for outdoor use in cold climates. Many CFL packages warn that the light should only be used on outdoor fixtures that are enclosed so that the CFL can warm up to a level sufficient for reasonable operation[8].

Disseminating Energy-Efficient Technologies: A Case Study of Compact Fluorescent Lamps (CFLs) in India. Kumar, Jain and Basal (2003).

Kumar, Jain and Basal (2003) examined factors that influenced CFL use in India. They distributed a questionnaire to 900 individuals that asked questions regarding the respondent's age, educational attainment, income, lighting needs, and CFL awareness. Respondents were also asked what measures would improve their acceptance of CFLs. The study found that advertisements regarding CFLs raised awareness of the advantages of CFLs especially among higher income groups. Advertising also increased usage among consumers with high levels of education, although the increase was less than for highly educated groups. Awareness levels were found to be highest with professionals and lowest among the sales professions. Perhaps unsurprisingly, Kumar et al. discovered that those respondents who used more electricity also used more CFLs, indicating that respondents with the most to gain from saving electricity adopted CFLs more readily[9]. Menanteau and Lefebrve (1998) examined the factors that affect CFL adoption in the residential sector. They determined that public policies play an important role in the expansion of niche markets. They recommended that public policies should be implemented to increase product awareness and improve product performance. Specifically, they comment that the

dominant market position of incandescent lights makes it hard for new products such as CFLs to "break into" the lighting market[10].

Objectives

1. To find out market potential for CFL bulbs in household.

2. To find out opinions and various factors regarding CFL bulbs.

3. Awareness about CFL among households.

Research Methodology

The research design is descriptive. The research involves both qualitative and quantitative data (Descriptive research involves gathering data that describe events and then organizes, tabulates, depicts, and describes the data collection (Glass & Hopkins, 1984)). Data for this research consisted of both primary data, collected through a valid questionnaire and the secondary data through literature. The primary data was collected through pen and paper questionnaire by going directly interacting with respondent in their home. Awareness was calculated by the marks scored by the customers in the question. Knowledge is also shared in the process. The research employed was survey method for data collection (Descriptive studies are aimed at finding out "what is," so observational and survey methods are frequently used to collect descriptive data (Borg & Gall, 1989)). The sample design was based on a Quota sampling method. The respondents were general public who stay in a rented or own house. The quotas are split in to LIG, MIG and HIG. The study was carried out in the district of Coimbatore, Tamil Nadu (Geographical frame of the Research A sample size of 200 respondents was taken for the study. A statistical tool SPSS 16 and Anova, correlation, factor analysis, chi-square and frequencies tests were performed to analyze the data.

Analysis and Interpretation

Objective 1: To find out market potential for CFL bulbs in household

Market Potential:

From the survey, it was understood that on an average there are 2 incandescent bulbs in a household. With a calculation

Total population of Coimbatore: 34, 72, 578

Assuming that number of people in a household to be 5

34, 72,578/5= 6, 94,515

Average incandescent bulb in a household: 3

6, 94,515*3= 20, 83,546

We estimate the potential for CFL bulbs to be **20, 83,546 units** approximately.

Objective 2: To find out opinions and various factors regarding CFL bulbs

1. From the research it was identified that income of households does not influence on use CFL bulbs.

2. From research it was also proved that all income groups are willing to buy CFL bulbs when government is providing it under subsidized price.

3. Demographic details of a person does not influence on their hours of usage.

4. Irrespective of education most of the population was not aware of the health hazard in disposal of the bulbs.

5. Most of the people irrespective of their education and salary they don't dispose bulbs by throwing it in street garbage.

6. All income groups are aware that CFL bulbs provide better lighting.

7. From the research it was clearly understood that the awareness about the CFL among the households most of the time has happened through word of mouth.

8. It was also found out that there is not enough awareness about LED bulbs among both Low income group and high income group.

9. Among the households of Coimbatore, people are not aware of the exact amount that they can save from their electricity bill by using CFL bulbs in their house.

Anova:

It is important to consider the fact that the proportion between the CFL bulbs and the incandescent bulbs. Though various factors may influence the proportion of the bulbs, the resulting R-square values were lower so let us cling to the relationship between the two proportions using the correlation. We have got a negative correlation for these two factors around -0.174 which is not a good correlation to be considered between these two bulbs. So let us analyze the independent variables influencing the factor proportion of CFL even though the R-square is around 0.30. Since there is significance in the illustration (0.00<0.05) evident from the **Table 1**, It can be conclude that the proportion of the CFL bulbs are significantly influenced by the three factors. Now we have to consider the main factor influencing the proportion of CFL. It can be found using the following table

Objective 3: Awareness about CFL among households.

Chi-square test

Cross tabulation

The cross tabulation table is the basic technique for examining the relationship between two categorical (nominal or ordinal) variables, possibly controlling for additional layering variables. The Cross tabulation procedure offers tests of independence and measures of association and agreement for nominal and ordinal data. Additionally, we can be obtaining estimates of the relative risk of an event given the presence or absence of a particular characteristic.

Chi-square test

The chi-square test measures the discrepancy between the observed cell counts and what you would expect if the rows and columns were unrelated. The degree of influence of the following independent variables pertaining to the respondents with respect to the factors influencing marketing decisions and market conditions is:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

With Degree of Freedom (D.F.) = (c-1) (r-1) where,

O = Observed frequency,

E = Expected frequency,

c = Number of columns,

r = Number of rows.

Table 2 shows the hypothesis framed in this research to know the awareness and its relationship to with different factors.

Inferences:

H1: The fact that no matter what the earning groups are, most of the respondents prefer to acquire the government schemes and save their expenses.

H2: Awareness among the households is highly related with the purchase decision for CFL bulbs.

H3: There is a contradiction of income and usage level that is the lower income people use it for more hours than the higher income people

H4: Irrespective of the education of the person the respondents have awareness on health hazards caused by the CFL bulbs

H5: Different education groups dispose it in public garbage shows the good level of public education and good awareness on how to dispose the bulb

H6: Education does nothing to do with the thoughts on most lighting bulb which does not need education to analyze the brightest lamp, but only the usage level.

H7: It can be clearly seen that people who think it might cause cancer problems realize that it should be disposed outside the home in public garbage displaying good awareness on disposal method

H8: Age does not make thoughts on powerful lighting by bulbs showing that age has nothing to do with the awareness on CFL bulbs.

H9: People do not use CFL bulbs thinking that of providing better light. Even though most of the people use CFL bulbs for more hours it can be analyzed using only the CFL bulbs

H10: There is association between Eco-friendly and market through mouth exhibiting that people suggest others to buy this product because it is eco-friendly

H11: There is association between education of the person and thoughts that LED is going to rule the future lightings

Limitations

• The survey was taken by going house by house in the streets of Coimbatore so there are chances for the respondent to give a biased data.

• The survey was based on quota sampling, the respondents were grouped based on the income group and collecting their income was a difficult task for the surveyor

Conclusion

To conclude, Energy saving is going to be agenda of any individual or a government in near future at all forms. To save energy for the next generation, households or corporate need to replace incandescent with CFL bulbs. And also it's high time for the market and players to insist people to use CFL through benefit based awareness programs and marketing efforts

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Tables:

Table 1: Anova

5.293	47	163	0.000

Table 2: Hypothesis - Awareness

S.NO	HYPOTHESIS:	ACCEPTED/REJECTED (SIG-VALUE- P VALUE)
1	There is no association between the salary of the person and willingness to buy CFL bulb if Government provides at subsidized price level.	0.655 - Rejected
2	Awareness does not influence purchase behavior on CFL	0.000 - Accepted
3	There is no association between the salary of the person and usage level of CFL bulbs in hours	0.050 - Accepted
4	There is no association between the education of the person and awareness on health problems	0.327 - Rejected
5	There is no association between the education of the person and way of disposal of CFL bulbs	0.09 - Rejected
6	There is no association between the education of the person and thoughts on brightest bulb	0.194 - Rejected
7	There is no association between the awareness on health hazards caused by CFL and the way of disposing it	0.02 -- Accepted
8	There is no association between age of the person and thoughts on bright lighting bulb	0.421 - Rejected
9	There is no association between thoughts on better lighting and usage hours of CFL bulbs	0.149
10	There is no association between the market spread through words from mouth and all these four factors (life span, energy saving bulb, eco-;friendly and usage amount)	0.002
11	There is no association between education of the person and their thoughts on future bulbs	.070