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THE INFLUENCE OF TV AND VIDEO APPLIANCES AND INFORMATION TECHNOLOGY EQUIPMENT ON ENERGY CONSUMPTION IN HOUSEHOLDS

Abstract: Energy efficiency in Serbia is not on an enviable level. Consequently the need to analyse the influence of various appliances on energy consumption in households emerged, especially in the houses of zero consumption.

It is known that when buying electrical appliances the main criteria are the price and their facilities, and less attention is paid to energy consumption.

The aim of this work is to obtain a database about the characteristics of TV, audio, video and IT (information technology) appliances in terms of energy consumption, protection of the environment and economics.

Conclusions about daily and annual energy consumption of the chosen appliances are presented at the end.

Keywords: electrical appliances, data base, energy efficiency

1. INTRODUCTION

One of the characteristics of a big part of housing and other funds in Serbia is irrationally high consumption of all types of energy, primarily for heating, and recently, due to the growth of average temperatures during summer months, for cooling buildings as well. Besides, energy is used for lighting and also for charging electrical appliances in households. Although, at first sight, home appliances do not consume much, with a right choice and a proper way of using, a considerable saving can be made.

Energy consumption in house holds depends on the dynamic of consumption, type and number of home appliances, their condition and energy class.

The problem of high energy consumption is not only characteristic of our country but also of the whole planet. Consequently numerous researchers from the whole world deal with this problem.

In the work [1] a survey was carried

out about owning electrical appliances and their influence on energy consumption in households in Japan. The aim of this research is increasing awareness of the tenants about importance of energy saving. It is expected that these results will be helpful for Japan as well as for Asian developing countries.

The work [2] deals with the studying of energy consumption in households in Great Britain. Average annual consumption of energy increased 4,5 % from the first to the second year of monitoring. Overall growth of energy consumption is ascribed 10,2 % to the increase of consumption of "standby" appliances (such as television sets and IT appliances), and 4,7% to the increase of consumption of "active" appliances. It can be concluded that further research is necessary, in the sense of qualitative and quantitative analysis, in order to understand fully energy consumption in households.

Promotion of using energy efficient

appliances for households is one of important approaches in creating energy efficient societies. The results of the research in the work [3] show that Chinese consumers have relatively high awareness of energy challenges. However, the respondents do not have clear information and knowledge about saving measures, which has to be worked on in future.

2. PROJECTING DATA BASE ABOUT APPLIANCES FOR KNEP ON THE MARKET IN OUR COUNTRY AND OTHER COUNTRIES

A data base is a collection of data organized for a quick search and access. From the user's point of view data are connected in a logical way. It is usually a collection of data concerning one theme, field or purpose.

The data are presented in a uniform way (e.g. like tables), which makes their access and their use by external programmes easier. This means that one data base can be used by a range of different programmes, written in different programme languages. One data base can include several tables.

The technology of data base tends (and succeeds to a large extent) to fulfil the aims such as:

- physical independence of the data,
- logical independence of the data,
- flexibility of the access to the data,
- satisfactory speed of the access,
- possibility of settings and control,

The data base about appliances for KNEP contains data about characteristics of appliances concerning energy [4-5], protection of the environment and economics on the level of life expectancy. The data are collected from the websites of the biggest manufacturers and distributors of home appliances in our country and

other countries (CBT, Tehnomania, Tehnomarket, Samsung, Philips ...), [6-11].



Figure 1. Websites of manufacturers and distributors of home appliances

The analysis includes TV sets, audio, video, photo and IT appliances. The following characteristics were analyzed: the class of energy efficiency, price, consumption of energy (daily, annual, consumption on standby mode), the weight of appliances and nominal power. The data base was made in a software package Microsoft Office Excel 2007.

2.1 Data base – TV sets

This base includes:

- LCD TVs,
- LED LCD TVs,
- PLASMA TVs,
- 3D TVs,
- CRT TVs.

The most famous manufacturers of TV sets were mainly analyzed (Sony, LG, Samsung, Sharp, Philips...). It was interesting to analyze the influence of screen size, so the analysis included screens from 19" to 60". The base contains

data about more than 50 TV sets.

Figure 2. Data base – TV sets in a software package Microsoft Office Excel 2007

Each of the appliances has the manufacturer and the mark stated, and it is presented with a picture which is at the same time a link for a more detailed description on the appropriate website, a short review of some characteristics of a product is given, and in the other columns there is information about the price (in euros), assumed daily and annual energy consumption (kWh), consumption on "standby" mode (W), the weight of an appliance (kg), as well as the nominal power (W), [6-11].

Table 1. Average energy consumption – TV sets

Appliance	Average energy consum. (home mode) (Wh)	Average consumption on standby mode (Wh)	Annual energy consumption (kWh)
LCD TV	97	0,45	74
LED LCD TV	105	0,18	86
Plasma TV	159	0,25	191
3D TV	165	0,23	92
CRT TV	95	0,28	76

Naturally, energy consumption depends on screen size, therefore average values for the given types of appliances are shown in Table 1.

2.2 Data base – audio appliances

In the group of audio appliances which are analyzed in the data base are:

- Mini lines,
- Radio tape recorders,
- Audio components,
- CD players.

The most famous manufacturers of audio appliances are: Grundig, Kenwood, Philips, Sony, Denon, Panasonic, ... This base is mostly concerned with the analysis of product of the listed manufacturers. The base contains data about more than 20 appliances of the listed type. The appearance of the base and the data which can be found in it (the price of the products, energy consumption, consumption on "standby" mode, the weight of appliances, nominal power) completely match the shown base of TV appliances (Figure 1).

Table 2 shows the average values of energy consumption of the listed appliances on operation and on "standby" mode, [6-11].

Table 2. Average energy consumption – audio appliances

Appliances	Average energy consumption on operation (Wh)	Average consumption on standby mode (Wh)
Mini lines	48	1,8
Audio components	217	0,3
CD players	13	-

2.3 Data base – video appliances

In the group of the video appliances, interesting for analysis in this base, are:

- DVD players,
- Blu-ray players,
- DVD recorders,
- Multimedial players,
- Projectors.

The analysis covers the following manufacturers: Ben Q, Canon, LG, Sony, Pioneer, Asus, Samsung. The base contains data about 25 video appliances. The average values of energy consumption of the analyzed appliances on operation and on "standby" mode can be seen in Table 3, [6-11].

Table 3. Average energy consumption – video appliances

Appliances	Average energy consumption on operation (Wh)	Average consumption on standby mode (Wh)
DVD player	10	0,65
Blu-ray players	30	0,19
DVD recorders	30	0,3
Multimedial player	12	-
Projectors	210	0,9

2.4 Data base – IT equipment

This data base covers:

- Monitors,
- Ink Jet printers,
- Laser printers,
- Multifunctional printers,
- Dot – matrix printers,
- Scanners.

The most famous manufacturers of this kind of equipment are: Samsung, Philips, AOC, Canon, Hewlett – Packard. That is why the base contains data about products of these manufacturers. The analysis covers 30 products.

Table 4 shows the average values of energy consumption of it appliances on operation and on "standby" mode, stand out as big consumers.

Table 4. Average energy consumption – IT appliances

Appliances	Average energy consumpti. on operation (Wh)	Average consumption on standby mode (Wh)
Monitors	30	0,7
Ink Jet printers	26	2,0
Laser printers	495	10,0
Multifunctional printers	425	9,5
Dot – matrix printers	23	-
Scanners	8	1,1
Fax machines	222	2,0

An average family in its household certainly has these appliances: television set, mini line, DVD recorder, monitor, printer and scanner. The average energy

consumption of these appliances on operation mode is about 716 Wh (Table 5).

Table 5. Average energy consumption of appliances in households

Appliances	Average energy consumption on operation (Wh)	Average consumption on standby mode (Wh)
LED LCD TV	105	0,18
Mini line	48	1,8
DVD recorder	30	0,3
Monitor	30	0,7
Laser printer	495	10,0
Scanner	8	1,1
Total	716	14,08

On average, about 2 % of the active energy consumption goes on the passive consumption (standby mode). With certain appliances, such as laser and multifunctional printers and fax machines, the consumption on standby mode is from 15 % to 20 % of the average consumption, and even more.

3. CONCLUSION

Energy consumption in households depends not only on the number of appliances which are used, but also on their characteristics, i. e. how energy efficient they actually are. Appliances with the mark "energy star" should be bought because that mark guarantees the lowest energy consumption.

Also, when electronic devices are concerned (computers, printers, DVD recorders, ...), we should not neglect the fact that these appliances on "ready to operate" or "standby" mode still consume energy – sometimes up to 40 % of average consumption. One of the saving measures is that such appliances, if they are not used longer than one day, are completely disconnected.

It can be concluded that, although electronic devices are not individually big energy consumers, having in mind that there are more and more such appliances in households, that they consume energy when operating actively and also on standby mode, we must take care of the way of standing energy.

REFERENCES:

- [1] Genjo, K., Tanabe, S., Matsumoto, S., Hasegawa, K., & Yoshino, H. (2005). Relationship between possession of electric appliances and electricity for lighting and others in Japanese households. *Energy and Buildings*, 37, 259-272.
- [2] Firth, S., Lomas, K., Wright, A., & Wall, R. (2008). Identifying trends in the use of domestic appliances from household electricity consumption measurements. *Energy and Buildings*, 40, 926-936.
- [3] Maa, G., Andrews-Speed, P., & Zhanga, J. D. (2011). Study on Chinese consumer attitudes on energy-saving household appliances and government policies: based on a questionnaire survey of residents in Chongqing, China. *Energy Procedia*, 5, 445-451.
- [4] Wood, G., Newborough, M. (2003). Dynamic energy-consumption indicators for domestic appliances: environment, behaviour and design. *Energy and Buildings*, 35, 821-841.

- [5] Doherty, J., Lyons, S., & Tol, R. S. (2008). Energy-using appliances and energy-saving features: Determinants of ownership in Ireland. *Applied Energy*, 85, 650-662.
- [6] Retrieved March 5, 2013, from: <http://www.tehnomanija.rs/tv-audio-video>
- [7] Retrieved March 15, 2013, from: <http://www.tehnomanija.rs/it-shop>
- [8] Retrieved March 10, 2013, from: <http://www.cbt.rs/#>
- [9] Retrieved March 7, 2013, from: <https://www.samsung.com/rs/consumer/tv-audio-video/televisions/>
- [10] Retrieved March 7, 2013, from: <http://www.lg.com/rs>
- [11] Retrieved March 9, 2013, from: <http://www.eponuda.com//philips>

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