Assessment of energy savings achieved in tourism industry through innovative management of preparation techniques

To cite this article: G Pasca Pascariu et al 2018 IOP Conf. Ser.: Mater. Sci. Eng. 399 012042

View the article online for updates and enhancements.
Assessment of energy savings achieved in tourism industry through innovative management of preparation techniques

G Pasca Pascariu¹*, V Pădureanu², B Arsene¹ and G Calefariu¹

¹ Department of Engineering and Industrial Management, Transilvania University of Brasov, Brasov, 500174, Romania
² Department Engineering and Management Food and Tourism, Transilvania University of Brasov, Brasov, 500174, Romania

* E-mail: pascariu.gabriela@unitbv.ro

Abstract. With the increase in the income of the population, with the exception of periods of economic crisis, tourism industry continues to grow year after year. An increasing number of people benefit from the products offered by this industry. This observation is valid for Romania as well as for leading states like China. Without innovations in the field, energy consumption in tourism industry will naturally also grow. This paper proposes a management innovation which whose effect will be both the increase of tourism product quality and significant energy savings. It is an innovative way to prepare and serve breakfast. The savings made at the scale of a large five-star hotel, but also in smaller hotels, as well as in tourist boarding houses, will be evaluated. These results will be scaled to the whole of Romania.

1. Introduction
Countries have to cut gas emissions and raise energy-efficiency. It is a requirement that electricity production should be provided more and more from non-fossil renewable energy (such as wind, solar, geothermal, fuel cells, biomass) [1].

High-efficiency systems are associated with low emissions. The installation of combined heat and power schemes replacing less efficient systems leads to economic and environmental benefits, as well as significant optimisation of primary energy consumption [2].

The effects of retrofit strategies, such as cogeneration systems, often integrated with absorption chillers on primary energy saving and pollution reduction have been investigated in several applications characterized by relevant energy demands.

Combined heat and power, also known as cogeneration, offers considerable reduction in greenhouse gas emissions by making use of heat that is otherwise wasted during electricity production. These include improving the efficiency with which energy is produced and reducing emissions from energy. Research and development stimulate climate-friendly technologies. Currently, the desire to alleviate the problem of global warming has resulted in environmental concerns over the reduction of greenhouse emissions from industrial sources. The greenhouse gases include methane (CH₄), carbon dioxide (CO₂), nitrous oxide (N₂O), halogens such as chlorofluorocarbons and hydro fluorocarbons. From among them, CO₂ is the primary contributor to the problem due to its abundance, thus becoming a major target for reduction. Concern over global climate change has led to a need for reducing CO₂ emissions from chemical plants [3].
The tourism sector is changing along with the changes in demand. People have greater interest in experiences and creativity and therefore, the product that the tourism industry is offering is developing from mere services to experiences [4].

It is essential for service providers in hospitality industry to comprehend what customers of various market segments expect from a service firm in order to deliver high quality services. This study aims at measuring and comparing differences in the desired service quality expectations of hotel customers, as well as identifying the service dimensions that matter most to hotel guests.

Food and Energy are the inseparable connection that links these two commodities to the hospitality industry. This project focuses on uncovering points in culinary product processing where tangible steps can be taken to reduce energy consumption. Baseline information allowed to determine alternative actions that would lead to energy reductions. Therefore, this research addresses both the reduction of resources and the economic factors related to it. This research will lead to tangible impacts on the high energy consumption of the food system [5].

This paper presents an innovative method through which 5 star restaurants may modify their breakfast service through the bettering of the finger buffet serving system, by establishing a thermal treatment module in the serving hall, thus limiting the culinary products made in the kitchen.

In tourism industry breakfast service is performed in a planned and systematic manner, ensuring its conformity to the hotel’s class category. Breakfast service is a component of the accommodation service but it can be purchased independently by the hotel non-resident customers.

| Responsible | Operations | Documents |
|-------------|------------|-----------|
| SR          | Setting assortment structures of food produce and beverages served at breakfast | 1. A la carte menu |
| BSR         | Actual bookings (number of tourists) | 2. Buffet breakfast |
| MCSA        | Indicative setting Breakfast component | 3. Weekly provisory bookings list |
| SR          | Issuing merchandise orders | 4. Consumption requirement |
| SRH         | Qualitative/Quantitative reception of merchandise | 5. Orders to suppliers |
| SR          | Number of customers for the following day | 6. Reception notes |
| SRH         | Is breakfast served in buffet system? | 7. Provisory customers list |
| GS          | A la carte services |

**Figure 1.** Scheme regarding actions flow at serving buffet breakfast [6].
Abbreviations used: SR = restaurant head of staff, BSR = restaurant chef, MCSA = quality management responsible, SRH = hotel head receptionist, GS = department administrator, SSR = head waiter.

Regarding servicing, breakfast can be room-serviced, buffet system or at tables; by component, there are two breakfast types: continental (full) and English/American [7-10].

For continental breakfast only non-alcoholic warm drinks are indicated, the rest of the dishes served being fixed: butter, jam, croissants, muffins, rolls, toast. The British breakfast is more consistent than the continental one, including, besides the dishes above, one or more choices of buffet, kitchen, confectionery, pastry or bar types of food [11, 12].

The organization of the traditional breakfast service needs the simultaneous approach of different phases: the providing of necessary equipment (furniture, hardware, serving and work inventories), the preparing of the rooms and sections, the effective accomplishment of the services abiding by the work techniques at the same time. The equipment of the rooms with furniture, hardware, service and work inventory is all right, since it is the same as the one needed for lunch and dinner in all the rooms of the restaurant, this being influenced by the way in which breakfast serving is made [13].

Breakfast service resides in fulfilling planned activities in controlled and documented conditions by: setting breakfast assortment structure, ensuring raw material stock, preparing breakfast service, operations preliminary to breakfast serving, breakfast serving, breakfast closing (figure 1).

1.1. The organizing of breakfast service in finger buffet system
At the moment our finger buffet stand has only equipment for storing food, bakery products, pastry, confectionery products, warm and cold drinks, all of which are made in the departments of the restaurant: kitchen, buffet, bar, cafeteria or confectionery lab and transported to the serving hall of the restaurant.

The equipment used for the finger buffet is: warm display cases (work temperature +30°C to +90°C), cold display cases (work temperature: -1°C to 0°C), multifunctional cart – display and serving (equipped with adjustable thermostat from 0°C to +15°C, hinged board, transparent protective cover, compartments or shelves at the bottom for the transport of the necessary inventory), instant drink dispenser machine, coffee machine, juice, cereal dispenser, toaster, chafing dish, milk thermos, frozen display case (work temperature from -18°C to +5°C), neutral display cases for fruit, bakery and pastry products, jam, confiture, etc., cup warmer, electric boiler for water/tea, coffee filter, display platters with chilling device.

At present, part of the dishes served are made the day before, respectively the slicing of cold meats and cheeses, the preparation of salads, baking of pastry, confectionery and bakery products. These are placed on platters or in salad bowls, covered with clear sheets and labeled and stored in refrigerators. The next day they are put on the display stands at 6:45 a.m.

Ready-to-eat produce requires limited processing prior to consumption and may harbor human pathogens that can present a significant food safety risk [14].

1.2. Setting assortment structure
The assortment structure of produce served at breakfast has to satisfy the customers’ expectations in respect of the accommodation class category. According to the number of customers, breakfast service is organized in buffet or ‘a la carte’ system.

The Breakfast Menu will offer customers the possibility of choosing dishes by preference as well as some pre-set menu options at a fixed price within the budget limits allocated to breakfast from the accommodation costs.

In the case of the buffet breakfast system, a various assortment of dishes will be prepared, culinary, confectionery-pastry and juices to satisfy the customers’ expectations within the costs frame limit determined by the multiplication of the number of customers to the costs allocated to breakfast form the accommodation total sum [15].
The quantities of food products, culinary produce and beverages will be calculated to the number of customers, after the closing of the previous accommodation day in the IT management system, through the Daily breakfast consumption sheet. Possible customer preferences will hereby be registered. Breakfast assortment structure will be designed thematically from one day to another, in order to avoid monotony or a negative perception from the customers on a longer stay.

The extended breakfast structure is set in the Buffet breakfast assortment, which contains non-alcoholic hot beverages, butter, marmalade, jam, honey, meat products, dairy products, egg-produce, fresh vegetables, bakery produce, refreshments, mineral water and which can be served as breakfast, grouped on categories [16].

2. The evolution of trade margin
The evolution of the average mark-up quota for breakfast serving was analysed in a public food service unit the 5*by comparing the months of January 2018 and December 2017.

In the restaurant operational registration, in the month of January, the consumption cost rose up to 58 103.17 lei (with bar produce rising to a total value of 10 015.66 lei and culinary produce of 48 087.57 lei), at the price index (purchase price without VAT). The ratio of bar produce in total consumption was 17.2% and that of culinary produce was 82.8%. A number of 4 769 people were served, out of which: 4 648 people at 45 lei/ person, 66 people at 44 lei/ person, 4 children at 28 lei/ person and 51 people free of charge (guides, drivers, tourism agencies representatives).

By comparing these consumption costs to those of December 2017 we notice a downward trend of the mark-up quota. Compared to the previous month the number of served customers declined to 6.3% and the average mark-up quota fell 6 percent points from 245% to 239% in January 2018. The mark-up quota decline is due to the increase in individual consumption value of bar produce from 1.92 lei/customer to 2.10 lei/customer and of culinary produce from 9.95 lei/customer to 10.08 lei/customer (table 1).

Table 1. Average mark-up quota evolution between December 2017 – January 2018.

| Breakfast Consumption 2017 | December 2017 | January 2018 |
|---------------------------|--------------|--------------|
| Bar Consumption           | 9 779.03     | 10 015.66    |
| Kitchen Consumption       | 50 670.75    | 48 087.51    |
| Total                     | 60 449.78    | 58 103.17    |
| No. of people at breakfast| 5 092.00     | 4 769.00     |
| Bar consumption/person    | 1.92         | 2.10         |
| Kitchen consumption/ person| 9.95       | 10.08        |
| Consumption/person (lei)  | 11.87        | 12.18        |
| Average mark-up quota     | 245%         | 239%         |

Total costs per person were 12.18 lei, exceeding the standard cost. The average revenue per customer was 41.02 lei, with an insignificant variation as compared to December 2017 when the indicator value was 40.96 lei. If the positive aspect of the average revenue increase per customer served at breakfast is the result of the hotel reception service concern, which adjusts the exchange rate to the fluctuations of the exchange market intending to reduce the number of customers free of charge and those who pay in lei, the increase of average consumption per customer served is a negative aspect related to the restaurant operational activity, meaning that the quantity and structure of culinary and bar produce on breakfast stands is not rigorously measured as against the allocated budget.

The number of customers served at breakfast was by 58% larger than the same month in 2016 but the number of customers dynamic was exceeded by the total consumption index (161%). In comparison to the same month, the average consumption per customer served was by 0.17 lei more expensive (+1%), the fluctuation rising in bar produce (+0.27 lei; +15%) and falling in culinary produce (-0.1 lei; -1%), making the total influence over the average mark-up quota insignificant (-1%) (see table 2).
Table 2. Average mark-up quota in January 2018 as compared to January 2016.

| Breakfast Consumption 2018 | January 2017 | January 2018 | Absolute fluctuation | Relative fluctuation |
|----------------------------|--------------|--------------|-----------------------|----------------------|
| Bar consumption            | 5 496.23     | 10 015.66    | 4 519.43              | 182%                 |
| Kitchen consumption        | 30 663.36    | 48 087.51    | 17 424.15             | 157%                 |
| Total                      | 36 159.59    | 58 103.17    | 21 943.58             | 161%                 |
| No. of people at breakfast | 3 011.00     | 4 769.00     | 1 758.00              | 158%                 |
| Bar consumption /pers.     | 1.83         | 2.10         | 0.27                  | 115%                 |
| Kitchen consumption /pers. | 10.18        | 10.08        | -0.10                 | 99%                  |
| Consumption/person (lei)   | 12.01        | 12.18        | 0.17                  | 101%                 |
| Average mark-up quota      | 240%         | 239%         | -1%p                  | 100%                 |

Daily evolution of the number of customers served in January 2018 shows important fluctuation at a maximum of 300 customers on Jan 16th 2018 and Jan 30th 2018 reflected in consistent fluctuation of mark-up quota, from 310% on Jan 1st 2018 (291 customers) to 141% on Jan 30th 2018 (66 customers). Breakfast was served in buffet system every day (figure 2).

From the prior analysis, one may observe the preservation of the decrease tendency of the trade margin obtained due to the increase of the value of individual consumption for bar products and kitchen products. The increase of the consumption is influenced also by the losses recorded by thermally treated culinary products which are prepared and placed on the presentation stand before the customers arrive.

Taking into account the large volume of culinary products within the structure of the buffet, they are prepared an hour before the assembly and arrangement of the presentation stand.

In this situation the following nonconformities may appear: culinary products made of eggs lose their freshness (pancakes, omelets, poached eggs dry and form a crust at the surface) or some culinary products may not be eaten, other items being preferred by customers and those need supplementation.

The products which depreciate, or which are not consumed within 2 hours maximum of their production, are removed from the stand and replaced with the culinary products which have been...
solicited by the customers. Thus, losses are registered because these products can no longer be used, the raw materials consumption used for their preparation increases, along with energetic consumptions.

3. Methodology

Regarding the drawbacks presented above, this paper aims to elaborate an innovative method, through the completion of the buffet stand, which is placed in the serving hall together with an area of thermal preparation.

This system’s purpose is the ability to cook dishes in front of the customers according to their personal preferences. One may be able to cook: minute eggs (omelets with different side ingredients – ham, Swiss cheese, mushrooms, vegetables, herbs etc.) pancakes with different fillings (cottage cheese and cream, jam, Swiss cheese, chocolate, etc.). The customer may also select the ingredients used to prepare these dishes (for example omelet only from egg whites, chocolate filled pancakes without toppings etc.) or the thermic preparation (soft eggs etc.).

The suggested method leads to the decrease of electrical energy consumption through the reduction of the activity in the kitchen section and the selection of high-performance equipment, specific to the breakfast service.

The ability to cook such dishes in the dining hall considerably improves the quality of the products/dishes being served in relation to their freshness, taste and aspect. The customer may verify organoleptically the raw materials used. The transport of the products from the kitchen section through the office to the dining hall is eliminated, and the risk of physical, chemical and microbiological contamination is significantly reduced.

For the selection of the thermal treatment equipment an analysis was made on five different professional equipments for the HoReCa segment (hotel, restaurant, catering), noted with E, respectively: E1 – multi function tilting bratt pan 800, E2 – electric bench cooking stove with 4 hobs, E3 – multi function tilting bratt pan 600, E4 – electric cooking stove with 6 round hobs and E5 – convection oven (self cooking center).

By applying the multi-criteria analysis, the following criteria have been chosen [17]:
1. the costs of equipment acquisition (C);
2. the safety of using the equipment (S);
3. the effect of cooking food in the hall (E);
4. the accessibility of the price for clients (A);
5. the ease with which equipment is used (U);
6. the quality of the products (O);
7. energy consumption (N).

In [18] can be noticed that through multi-criteria analysis (MCA) one obtains rankings of solutions, subjectivism is removed and there is a higher degree of objectivity because the order of criteria is established by comparing each two criteria among themselves.

Step 1. The establishing of the criteria is done as follows: one criterion is more important than the other (=1), just as important (=1/2), less important (=0).

Step 2. Determining the weight parameters (p: the sum of points obtained in line; Δp: the difference between the points of the considered element and the points of the element of the last level; m: the number of the criterion surpassed by the considered element; Ncrt: number of criteria considered; Δp' : the difference between the points of the considered element and the points of the first element).

\[
Y_i = \frac{p + \Delta p + m + 0.5}{-\Delta p' + \frac{Ncrt}{2}}
\]

Step 3. Identifying the implementation variants.
Step 4. Giving a mark (to each variant according to each criterion).
Step 5. Calculating the product of the marks and weight parameters.
Step 6. The matrix of the consequences – determining the sums of the products.
Step 7. Final ranking.

Table 3 and Table 4 show the results of the quality comparison of the importance of criteria in the analysis of the variants/options for improving breakfast serving and the results of the calculation of the Yi weight for analysis criteria.

**Table 3.** The qualitative comparison of the importance of the criteria.

| Criterion | C  | S  | E  | A  | U  | O  | N  | Points | Level | Yi   |
|-----------|----|----|----|----|----|----|----|--------|-------|------|
| C         | 0,5| 1  | 1  | 1  | 1  | 0,5| 6  | 1,5    | 4.714 |
| S         | 0  | 0,5| 1  | 1  | 1  | 0  | 4,5| 3      | 2.500 |
| E         | 0  | 0  | 0,5| 1  | 1  | 0  | 2,5| 5      | 0.930 |
| A         | 0  | 0  | 0  | 0,5| 0,5| 0  | 1  | 6,5    | 0.176 |
| U         | 0  | 0  | 0  | 0,5| 0,5| 0  | 1  | 6,5    | 0.176 |
| O         | 0  | 0  | 1  | 1  | 1  | 0,5| 3,5| 4      | 1.590 |
| N         | 0,5| 1  | 1  | 1  | 1  | 0,5| 6  | 1,5    | 4.714 |

**Table 4.** The results of the importance Yi weight factor.

| Criterion | Points | Level | Δp  | m   | Nert | Δp' | Yi   |
|-----------|--------|-------|-----|-----|------|-----|------|
| C         | 6      | 1,5   | 5   | 5   | 7    | 0   | 4.714|
| S         | 4,5    | 3     | 3,5 | 4   | 7    | -1,5| 2.500|
| E         | 2,5    | 5     | 1,5 | 2   | 7    | -3,5| 0.930|
| A         | 1      | 6,5   | 0   | 0   | 7    | -5  | 0.176|
| U         | 1      | 6,5   | 0   | 0   | 7    | -5  | 0.176|
| O         | 3,5    | 4     | 2,5 | 3   | 7    | -2,5| 1.590|
| N         | 6      | 1,5   | 5   | 5   | 7    | 0   | 4.714|

In table 5 marks are given to the seven variants in compliance with each criterion.

**Table 5.** The mark awarded based on the criterion.

| Alternative/Equipment | The mark awarded based on the criterion |
|-----------------------|----------------------------------------|
|                       | C  | S  | E  | A  | U  | O  | N  |
| E1                    | 10 | 10 | 5  | 2  | 5  | 9  | 9  |
| E2                    | 8  | 9  | 7  | 6  | 7  | 8  | 7  |
| E3                    | 10 | 10 | 8  | 4  | 8  | 10 | 9  |
| E4                    | 7  | 7  | 8  | 4  | 7  | 10 | 7  |
| E5                    | 8  | 7  | 6  | 5  | 6  | 7  | 8  |

In table 6 the matrix of the consequences is presented.
Table 6. Matrix of consequences.

| Alternative | Partial value of the coefficient $F_{ij}$ | Value |
|-------------|-----------------------------------------|-------|
|             | $I=1(C)$ | $I=2(S)$ | $I=3(E)$ | $I=4(A)$ | $I=5(U)$ | $I=6(O)$ | $I=7(N)$ |
| $Y_C$       | $4.714$  | $2.500$  | $0.930$  | $0.176$  | $0.176$  | $1.590$  | $4.714$  |
| $N_jcY_c$   | $47.140$ | $25.000$ | $4.650$  | $0.352$  | $0.880$  | $14.310$ | $42.426$ |
| $N_jsY_s$   | $37.712$ | $22.500$ | $6.510$  | $1.056$  | $1.232$  | $12.720$ | $32.998$ |
| $N_jeY_e$   | $47.140$ | $25.000$ | $7.440$  | $0.704$  | $1.408$  | $15.900$ | $42.426$ |
| $N_juY_u$   | $32.998$ | $17.500$ | $7.440$  | $0.704$  | $1.232$  | $15.900$ | $32.998$ |
| $N_joY_o$   | $37.712$ | $17.500$ | $5.580$  | $0.352$  | $0.880$  | $14.310$ | $42.426$ |
| $N_jnY_n$   | $37.712$ | $17.500$ | $5.580$  | $0.352$  | $0.880$  | $14.310$ | $42.426$ |

Within the analysis regarding the selection of the equipment we took into account the energetic consumption of each item of equipment, respectively their power (kW/h), usage duration (2 hours/day), watts (1kW=1000w) and the consumption per hour, day, month and year. We calculated the consumption and price of electric power, taking into account the average price or 0.6 lei/kWh (table 7).

Table 7. Analysis regarding the selection of the items of equipment according to the energetic consumption.

| (E) | Power (kW/h) | Watt | Energetic consumption (kW/h) | Price (lei) |
|-----|--------------|------|-----------------------------|------------|
|     |              |      | hour | day | month | year | hour | day | month | year |
| E1  | 10.5         | 10 500 | 10.5 | 21  | 638.7 | 7 665 | 6.3  | 12.6 | 383.2 | 4 599 |
| E2  | 10.4         | 10 400 | 10.4 | 20.8 | 632.6 | 7 592 | 6.2  | 12.4 | 379.6 | 4 555.2 |
| E3  | 7            | 7 000  | 7.0  | 14   | 425.8 | 5 110 | 4.2  | 8.4  | 255.5 | 3 066 |
| E4  | 15.6         | 15 600 | 15.6 | 31.2 | 949   | 11 388 | 9.3  | 18.7 | 569.4 | 6 832.8 |
| E5  | 18.6         | 18 600 | 18.6 | 37.2 | 1 131 | 13 578 | 11.1 | 22.3 | 678.9 | 8 146.8 |

The equipment with the lowest energetic consumption is the multi function tilting bratt pan 600 (E3), with an energetic consumption of 7 kW/h, the yearly cost of electrical power being 3 066 lei. At the opposite end we find the convection oven (E5) with an energetic consumption of 18.6 kW/h, the yearly cost of electrical power being 8 146.8 lei. On the second and third places, at a very small distance, we find the electric bench cooking stove with 4 hobs (E2) and the multi function tilting bratt pan 800 (E1), the price of electric power per year being 4 500 lei, for a yearly consumption of 7 600 kW. On the fourth place we find the electric cooking stove with 6 round hobs (E4), with a consumption of 11 388 kW per year, the annual price of the electrical power being 6 832.8 lei.

4. The effects of the application of the solution
From the analysis of the score obtained by each item of equipment we conclude that the most indicated variant is number 3 (figure 3).
Figure 3. Thermal treatment equipment consumption.

This system’s purpose is to prepare an assortment of culinary products in front of the customer according to their options while they can see the ingredients used and the preparation process.

The equipment which is used for preparing a wide range of culinary products in front of the customer, according to their options, is the multi function tilting bratt pan for frying, grilling, boiling and steaming.

The cooking surface is very smooth, for perfect cooking results, with a low thermal radiation and easy to clean even when it is functioning. The special surface for frying heats quickly and the heat distribution is even. The tilting bratt pan is assembled without welding, through casting, with rays that allow efficient cleaning. The depth of the pan does not allow spattering around. The temperature sensors are incorporated in the plate for optimal temperature control and safe manipulation. It also has a large drain plug for the effortless discharge of cooked products in gastronomic recipients placed at its base. The base is similar to a cabinet open at the front part and closed at the other three parts. The tilting bratt pan has the following dimensions: 600 x 800 x 750/900h mm (L x l x H cm); it also has two cooking areas with individual heating, a total power of 7 kW, electric supply: 400V-3N/50Hz, the size of the cooking surface: 530 x 569 x 75 mm, 21 liters capacity, frying/grill surface 530 x 470 mm, temperature: 95-250°C.

For the time being the production process for breakfast products expands on a 4-hour duration between 6:00 and 10:00 a.m. The items of equipment used for the thermal treatment of the culinary products are: electric cooking machine with two hobs (E1) for cooking short orders (8kW power, 4 hour functioning time), convection oven (self cooking center) - E4 – for cooking breadstuff and confectionery products (18.6 kW, 1 hour functioning time), bain-marie with two basins (E3), for keeping food warm (2 kW power, 4 hour functioning time) and rapid salamander (E2), for the gratin (4.8 kW power, 2 hour functioning time).

In table 8 we point out the energetic consumptions and the price of the electric power of the utilized items of equipment during the breakfast service. Thus the total daily energetic consumption is 68.2 kW, 2 074.41 kW per month, 24 893 kW per year and the yearly price of the electric power is 14 936.3 lei.
Table 8. Energetic consumption for the present equipment.

| (E^a) | Power (kW/h) | Watt | Energetic consumption (kW/h) | Price (lei) |
|-------|--------------|------|-----------------------------|-------------|
|       | hour         | day  | month                      | year        |
| E^a1  | 8            | 32   | 973.33                     | 11 680      |
| E^a2  | 4.8          | 9.6  | 292                         | 3 504       |
| E^a3  | 2            | 8    | 243.33                     | 2 920       |
| E^a4  | 18.6         | 18.6 | 565.75                     | 6 789       |

By applying the innovative method proposed in this paper the equipment used for thermal treatment is the convection oven and the multi-functional tilting bratt pan. The total energetic consumption per day is 32.6 kW, per month 991.55 kW, per year 11 899 kW, and the yearly price of the electric power used is 7 139.9 lei. The savings thus realized would be 35.6 kW a day, 1 082.86 kW a month and 12 994 kW a year. (table 9)

Table 9. Energetic consumption of proposed equipment.

| Equipment             | Energetic consumption (kW/h) | Price (lei) |
|-----------------------|-----------------------------|-------------|
|                       | hour | day | month | year | hour | day | month | year |
| Present equipment (E^a) | 33.4 | 68.2 | 2 074.41 | 24 893 | 20.48 | 41.36 | 1 244.65 | 14 936.3 |
| Proposed equipment (E^p) | 25.6 | 32.6 | 991.55 | 11 899 | 15.8 | 20 | 594.95 | 7 139.9 |
| Saving up             | 7.8  | 35.6 | 1 082.86 | 12 994 | 4.68 | 21.36 | 649.7 | 7 796.4 |

In tourism industry the problems of costs, trade margin, sale price and obtained profit represent the basic information for the analysis of activity-based results. The purchase price of raw materials, the addition of the trade margin, energy consumption, the total value or the profitability criteria are elements of managerial decision and therefore must be known.

Sales prices used in catering enterprises must cover all costs and achieve a profit justifying the efficient use of the invested capital [16].

In Romania there are 1 551 functioning hotels, out if which 35 are classified according to the Ministry of Tourism’s Order 65/2013 to 5 stars. By applying the proposed method the results mentioned in figure 4 are obtained.

![Image](image_url)  
**Figure 4.** The energetic consumption at Romania’s scale.
In tourism industry the production of culinary products is a complex activity, due to the variety of the operations which transform edible raw materials and culinary products which are made according to the specifications of the production recipes and menu plans.

Just like in other areas, the efficiency of the processes must be a major concern for the managers; the profit must be an incentive in the execution of the production program, as well as the improvement of the quality and the diversification of the brand. The ways of increasing profit are: reducing production costs without affecting the quality, having a correct correspondence between sale price level and profit, the growth of the volume of the sold products and services as well as the bettering of the quality of the products and services.

By analyzing the energetic consumption at Romania’s scale, one can notice a decrease of 48%. In the present system of cooking and serving breakfast, the annual energetic consumption registered by the thermal treatment equipment used in the kitchen section is 871 255 kW, and through the proposed method the consumption is reduced to the value of 454 790 kW, thus obtaining a saving of 416 465 kW.

5. Conclusions

This paper presents an innovative method through which 5 star restaurants may modify their breakfast service through the bettering of the finger buffet serving system, by establishing a thermal treatment module in the serving hall, thus limiting the culinary products made in the kitchen.

The goal of the effective activities in tourism industry is to provide balanced, nutritional food with aesthetic and hygienic characteristics, at affordable prices and in sufficient quantities, under reducing costs concerning the raw materials, utilities, technological losses through preliminary processing and heat treatment and of the labor cost.

This system’s purpose is to prepare an assortment of culinary products in front of the customer according to their options while they can see the ingredients used and the preparation process.

The preparation of these products in the serving hall improves the quality of the food by making it fresher, with a better aspect and better taste. The customer may check visually and olfactory the raw materials used during the cooking process. The transportation of the product from the kitchen, through the office, to the restaurant hall is eliminated. During the transportation the product may cool and may also become physically, chemically and microbiologically contaminated.

The method’s aim is to reduce the value of the consumed energy through adequate management, using high-performance thermal treatment equipment and reducing the consumption of electric power from 4 hours to 2 hours maximum, by improving the energy efficiency. In order to complete the finger buffet stand professional equipment items for the HoReCa sector have been identified and selected.

The proposed method leads to the decrease of the electric power consumption through the reducing of the activity of the kitchen sector and cooking ready to eat products, eliminating in this way equipment used for maintaining food warm, gratin and re-heating, as well as the selection of high performance thermal treatment equipment specific to the breakfast service.

Through the application of this innovative method at a 5 star restaurant the following advantages ensue: there are important economies in the electric consumption, the losses of non-conformable products are eliminated, because they have not been solicited by the customers or they have not been consumed during the 2 hours after their preparation. The key criteria used to reduce raw materials consumption and electric power were: energetic efficiency, environmental impact, customers’ health and the quality of the products.

References

[1] Davis M L and Cornwell D A 1991 Introduction to environmental engineering: 2nd edn, (McGraw-Hill Inc.)

[2] Chinese D, Meneghetti A and Nardin G 2005 Waste-to-energy based greenhouse heating: exploring viability condition through optimisation models Renewable Energy 1573

[3] Kovac Krali A 2018 Energy-Saving by Adding Vinegar or all Acidity Components in Food, at
the End of Cooking Innov Ener Res 7(1) 183

[4] San Salvador R and Calvo-Soraluze J 2013 Tourism Policy Makers and Managers as Generators of Meaningful Leisure Experiences Knowledge, Skills and Values Needed by the New Professional J Tourism Res Hospitality 126

[5] Wonglorsaichon P and Wiriyakitjar R 2013 Hotel Customer Expectations of Service: A Provincial Analysis of Family Business in Chiangmai, Thailand J Tourism Res Hospitality 123

[6] Pasca Pascariu G and Mărăscu-Klein V 2016 Specific Consumption Efficiency in Tourism Industry Recent- Transilvania University of Brasov 17 577

[7] Jamison C A and Jamison B 2002 Real Amern Breakfast (Harper Collins)

[8] Vollstedt M 2012 The big Book of Breakfast: Serious Comfort Food for Anytime of the day (Chronicle Books)

[9] Duda C 2008 Completely Breakfast (Cedar Fort)

[10] Moos D 2011 The Art of Breakfast (Down East Books)

[11] Lupu N 2005 The Hotel – economics and management (All Beck)

[12] Berechet G 2004 The manager of the restaurant (THR-CG)

[13] Pasca Pascariu G and Mărăscu-Klein V 2017 The optimization of consumption and costs in breakfast services Review of Management and Economic Engineering 64 333

[14] Dewangan AK, Patel AD and Bhadania AG 2015 Stainless Steel for Dairy and Food Industry: A Review J. of Mat. Sci. & Eng. 191

[15] Nicolescu R 1981 Technology of work in the restaurant and bar (Bucuresti:Ed Sport-Turism)

[16] Stavrositu S 2008 The art of services in restaurants and bars, culinary technology, hotel services (Bucuresti: Ed Fundaţia Arta serviciilor în turism)

[17] Bobancu Ş 2015 Analiza multicriteriala avansata Creativity and Innovation (C&I)- Transilvania University of Brasov 10 61

[18] Pasca Pascariu G 2016 Optimization of breakfast service in finger-buffet. System by mult-criteria analysis Creativity and Innovation (C&I)- Transilvania University of Brasov 8 35