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# THE USE OF SELECTED GREEN LEAN INSTRUMENTS TO IMPROVE CATERING SERVICES

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**Abstract:** The Green Lean approach focuses on identifying and eliminating the green waste by using the selected Lean instruments. The study presents the application of selected Green Lean instruments in improving the catering services. The aim of work is to present how the selected instruments such as Kaizen, 5S, Standardization, Visual Management, Kanban, 5Why, Benchmarking, JiT (Just-in-Time), diagram Spaghetti are used in improving catering services by identifying and eliminating green waste. The Green Lean approach can be used in catering services as a way to identify the process sites in gastronomic production that contribute to green waste and prevent it from happening.

**Keywords:** Green Lean, catering services, improvement.

## 1. Introduction to Green Lean

The concept of Green Lean is also described in literature as "Lean and Green" (Garza-Reyes, 2015; Lisiecka, and Burka, 2016; Averill, 2011; Ng, Sze Choong Low, and Song, 2015; Gupta, Narayanamurthy, and Acharya, 2018, p. 286) or "Lean-Green" (Abreu, Alves, and Moreira, 2017, p. 846). This approach in management comes from the integration of the Lean concept with best environmental management practices and it is concentrated on eliminating green waste, bringing about resources efficiency, reducing costs and supplying value to the customer (Lisiecka, and Burka, 2016; Averill, 2011, p. 167; Winston, 2009, p. 50; Friend, 2009, p. 54; Ng, Sze Choong Low, and Song, 2015, p. 242; Garza-Reyes, 2015, p. 18).

The aim of this work is to present how selected instruments such as Kaizen, 5S, Standardization, Visual Management, Kanban, 5Why, Benchmarking, JiT (Just-in-Time), diagram Spaghetti can be used in improving catering services by identifying and eliminating green waste. The methods that are applied in the research are: observations and direct interviews

with 42 employees of catering facilities. The employees that took part in this study participated in special courses, the "chef's profession" and "cook's assistant", that were organized by one of the Work Training Centers in Pomorskie Voivodeship in Poland. The research was carried in catering facilities in Pomorskie Voivodeship during the school year 2018/2019.

## 2. Green waste and selected Green Lean instruments

Green waste is an environmental waste that is generated in the area of energy, materials, garbage, water, emissions, land contamination, discharges to water, noise and nuisance, transportation, lost potential of people and biodiversity (Table 1). Environmental waste may be also hidden in lean wastes that come about due to: overproduction, inventory, over-processing, defects, waiting, transportation, lost potential of people and biodiversity (Gupta, Narayanamurthy, and Acharya, 2018, p. 291; Pampanelli, Found, and Bernardes, 2014, p. 27). The specific examples of green waste in catering services are presented in Table 1.

**Table 1.**
*The types of Green waste in catering services and ways to minimize*

| The type | Description | Examples in catering services |
|---|---|---|
| Energy | Energy consumption in catering services | Energy saving educational programs for employees, investments in new energy efficient equipment, using energy from renewable sources, green office programs, energy management programs and initiatives |
| Materials | Materials used during catering services process | Recycling and reuse of the materials, lowering the usage of non-recyclable materials |
| Garbage | Physical wastes generated during catering process | Garbage selection educational programs for employees, garbage selection during food preparation process, minimizing the amount of garbage |
| Water | Water used during catering services process | Reduction of the water consumption in catering services, in the office, water saving programs for the employees, new technologies supporting more effective water consumption |
| Emissions | Emissions to air | Reduction of the emissions to air by implementing innovate technologies, investing in new equipment |
| Land contamination | Land contamination | Reduction land contamination by implementing innovate technologies, investing in new equipment |
| Discharges to water | Discharges to water during catering services process | Reusing the water, using eco-friendly detergents, implementing the water saving programs for employees and instructions for customers |
| Noise and nuisance | Noise and nuisance during catering services process | Implementing innovate technologies, investing in new equipment and monitoring system |
| Transportation | Transportation of food products/components, transport of the employees, transportation of meals (take away/take out) | Implementing eco-driving programs for employees, investing in lower emissions programs for trucks and cars, car-sharing initiatives, green lean supply chain management programs, using local suppliers |

Cont. table 1.

| | | |
|---|---|---|
| Lost potential of people | Misused employees' potential and knowledge in the field of the protection of the environment | Employees' involvement programs, trainings, kaizen teams and initiatives |
| Biodiversity | The diversity of fauna and flora in catering facility and in its environment | Green building initiatives, supporting the green areas near company's facilities, planting the trees, supporting local environment programs, supporting local farms and gardens, investing in green facilities such as gardens or beehives |

Source: Lisiecka, and Burka, 2016; Winston, 2009, pp. 45-81; Zokaei, et al., 2013, pp. 45; Wills, 2009, pp. 3-9; Fercoq, et al., 2016, pp. 570-571; Bachman, 2009, p. 165-183; Fahimnia, Sarkis, and Eshragh, 2015, p. 173; Banaeian, et al., 2018, p. 337.

**Table 2.**
*Selected Green Lean instruments of potential use in catering services*

| The instrument | Description |
|---|---|
| 5S | Seiri (from Japanese "selection"), seiton (from Japanese "systematics, set in order"), seiso (from Japanese"shine"), seiketsu (from Japanese "standardization"), shituke (from Japanese "self-discipline, sustain"), five steps to sustain the order in the workplace. |
| 5 Why | Solving the problem by getting to its source by asking five times "why". |
| Visual Management | Using visualization to present actions, problems, messages. An easy way to explain problems to employees and make them follow the instructions. |
| Standardization | Documenting the best way of performing the activity. |
| Kaizen | The philosophy of continuous improvement, according which the lean actions are taken in the company (the creation of kaizen teams, suggestion system, team work, motivation of the employees to make changes). |
| Value Stream Mapping (VSM) | Visual presentation of the value stream, showing the status before and after the improvement. |
| Benchmarking | The technique that allows to implement good practices and solutions based on experiences of other companies. |
| Just in time (JiT) | A production system based on minimum inventory/stocks and on time delivery. |
| Kanban | The communication tool in the Just in time (JiT) system, providing information, among others, about the stock level. |
| Diagram Spaghetti | A diagram approach to showing employee movement in the work place, thus helping in identifying wasteful activity |
| Ishikawa diagram | A diagram outlining the causes of the problem in order to help in finding a solution |

Source: Lisiecka, and Burka, 2016, pp.123-124; Wisniewska, and Malinowska, 2011, p. 300, 312-314; Walentynowicz, 2014, 270.

The selected Green Lean instruments, presented in Table 2, may be very useful in identifying and reducing green waste and minimalizing the negative impact on environment.

## 3. Green Lean in gastronomic production and catering services – own study

Gastronomic production and catering services activity is based on following specific routines. Above all, it is necessary to suggest a production value and provide supplies in such quantity that the process does not cause any waste. The next steps of gastronomic production are the consequences of orders from the customers.

The research presents the analysis of observations and of direct interviews with 42 employees of catering facilities that participated in the professional development courses 'Chef's Profession" (knowledge and skills improvement training) and "Cook's Assistant" (knowledge and skills complementary training), organized by one of the Work Training Centers in Pomorskie Voivodeship in Poland. The working experience of the researched employees in catering services was between 3 and 8 years. The research was carried in catering facilities in Pomorskie Voivodeship during the school year 2018/2019.

As presented in Table 3, practically every step of the gastronomic production process can cause waste and green waste. Gastronomic processes generate solid waste, wastewater, noise, emissions to the air (Table 4). Moreover, energy is used in the forms of: electricity, gas, coal, petroleum derivatives. However, some activities may enhance energy consumption and higher emissions and contamination. Most often this is related to employee activity either in operating in ignorance, or in an irresponsible manner.

**Table 3.**
*The types of waste in the gastronomic production process and ways of prevention*

| The steps of the process | The examples of waste | Corrective actions |
|---|---|---|
| (1) Supply | Ordering too small/too large batches of goods (a, f)<br>mistakes during orders, accepting non-compliant raw materials – (not fresh vegetables, not fresh meat, broken eggs, etc.) (c),<br>waiting time for the next delivery/resupply,<br>wastes from collective packaging (c), | Order in accordance with the real demand,<br>qualitative and quantitative control on receipt,<br>combining deliveries to several facilities,<br>ordering goods in eco-packaging,<br>reuse and recycling of packaging,<br>training for suppliers,<br>training for employees, |
| (2) Storage | Storage of too large amount of raw materials, semi-finished products (a),<br>the wastes from single and collective packaging (d),<br>products that are not complying with customer requirements – expiry date of a product, natural processes that are taking place in storage – ripening of a product, over-ripening, drying of a product (d),<br>inadequate storage conditions (too high, low storage temperature) (d),<br>failures of devices, for example, cooling devices, refrigerators (a, d),<br>manipulation activities leading to damage of raw material, semi-finished product (d),<br>waiting time for the stock to be supplied, | The control of expiry date of a product,<br>control of packaging,<br>control of freshness of raw materials (for example; fruit and vegetables),<br>replacement of devices for example; cooling devices on more energy efficient ones,<br>storage of products according to requirements of its producers – saving energy that is required for keeping the correct temperature, air circulation,<br>reuse and recycling of packaging,<br>correct (according to FIFO rule) and ergonomic way of placing the products in storage area,<br>training for employees, |

Cont. table 3.

| | | |
|---|---|---|
| (3) Main technological process pre-treatment (clean, dirty) and thermal | Preparation of higher amount of semi-finished products than it is in orders from the customers (a, b, c, d),<br>mistakes (easy to correct) – wrong preparation of raw materials (too much), or caused by failures of machinery and equipment (a, b, c, d),<br>improper use of machinery and equipment (a, e),<br>mistakes (unable to correct) – cased by wrong manipulation activities or by failures of machinery and equipment – resulting in products that are not for consumption (a, b, c, d),<br>re-doing the activity, that is the result of correcting the mistakes (a, b, c, d),<br>incorrect planning of single activities of the process (a, b, c, d), | Changing employees' behavior - concentrating on quantitative orders – energy and water savings, reduction of waste water,<br>use of energy efficient equipment,<br>use of elements of semi-finished products to prepare other products,<br>delivery of post-production fats to specially qualified companies,<br>delivery of food wastes to support organic farming,<br>use of organic raw materials, |
| (4) Food expedition (portioning, dispensing and cleaning up after the meal) | Wrong grammage of meals (too little, too much) (c),<br>incorrect ingredients in meals (internal mistakes of employees, failure to comply with customer requirements) (c),<br>re-expedition of meals – unnecessary movement of employees in the kitchen,<br>waiting for correct meal (a, b, c, d),<br>incorrect planning of the work of waiters,<br>use of non-biodegradable disposable dishes and cutlery, | Delivery of food wastes to support the organic farming,<br>use of biodegradable dishes and cutlery,<br>use of reusable dishes and cutlery,<br>training for employees, |
| (5) Washing and scalding of dishes | Use of too little of water, detergents – dirty dishes, repetition of the process (a, b, d),<br>use of too much of water, detergents (b, d),<br>the dishwashing machinery and equipment are not fully loaded with dishes (a, b, d, e),<br>the dishwashing machinery and equipment are too much loaded with the dishes – the need to repeat the process of dishwashing (a, b, c, d, e), | Use of organic detergents for dishwashing and disinfection,<br>dishwashing machinery and equipment are fully and properly loaded with the dishes – the correct number of dishes in dishwasher,<br>following the detergents' producers' instructions on using the correct amount of detergents, |
| (6) General hygiene activities | The use of too concentrated detergents for dishwashing, washing and disinfection (a, b, c, d),<br>use of too much of water (b, d),<br>the lack of continuity of dishwashing, washing and disinfection process – repeating the process (a, b, c, d). | The use of organic detergents for dishwashing and disinfection,<br>following the detergents' producers' instructions on using the correct amount of detergents and the sequence of actions to provide proper hygiene of rooms and equipment,<br>correct use of paper towels, disposable packaging, recycling of packaging,<br>raising employee's awareness. |

Explanations: a – consumption of energy carriers, b – water consumption, c – waste generation (garbage), d – wastewater production, e – noise production, f – emission of pollutants into the air.

Source: own source.

Moreover, adverse events may occur, such as: power failures, black-outs, machine and device faults, that beyond human control. On the other hand, proper, professional employee behavior may minimalize waste, especially green waste. Thus, systematic training of the employees is very important in the gastronomic industry. Training has the highest influence on

process, in keeping its regular and without deviations. Furthermore, management has to listen to the voice of the employees, especially from the operational level. They are directly engaged in individual stages of the process and therefore they are better experienced and have higher views on the implementation of any improvement activities. A set of interesting lean instruments can be advanced for this purpose and are very helpful in establishing activities that can eliminate and reduce waste and green waste (see Table 4).

**Table 4.**
*The use of selected Green Lean instruments in gastronomic production*

<table>
<tr><td colspan="8">Waste generated during gastronomic process:</td></tr>
<tr><td>Transport<br>1</td><td>Movement<br>2, 3, 4, 6</td><td>Waiting<br>1, 2, 3, 4, 5</td><td>Wastes<br>1, 2, 3, 4, 5, 6</td><td>Defects<br>1, 2, 3, 4, 5, 6</td><td>Inventory<br>2</td><td>Overproduction<br>3</td><td>Over-processing<br>3, 4, 5, 6</td></tr>
<tr><td colspan="8">Lost potential of people (1-6)</td></tr>
<tr><td colspan="4">Consumption of a large amount of (increased)</td><td colspan="4">Creation of a large amount (increased):</td></tr>
<tr><td colspan="4">Water</td><td colspan="4">Waste</td></tr>
<tr><td colspan="4">Energy carriers</td><td colspan="4">Wastewater</td></tr>
<tr><td colspan="4">Groceries</td><td colspan="4">Noise</td></tr>
<tr><td colspan="4"></td><td colspan="4">Emissions to the air</td></tr>
<tr><td colspan="8">Instruments that are helpful in green waste elimination:</td></tr>
<tr><td>At the operational level</td><td>Kanban<br>1, 2, 3, 4</td><td>5S<br>1, 2, 3, 4, 5, 6</td><td>Standardization<br>1, 2, 3, 4, 5, 6</td><td>Diagram Spaghetti<br>3</td><td>JiT<br>1, 2</td><td colspan="2">VM<br>2, 3, 4,</td></tr>
<tr><td>At the strategic level (they cover all steps of gastronomic production)</td><td colspan="2">Kaizen<br>1-6</td><td colspan="2">Benchmarking<br>1-6</td><td colspan="3">5Why, Diagram Ishikawa<br>1-6</td></tr>
<tr><td colspan="8">Training for employees</td></tr>
</table>

Source: own source.

The goal of reducing green waste can be reached incrementally by choosing the approach wisely. Looking through the prism of strategic decision-making, Kaizen and Benchmarking may be the most appropriate approaches to apply in organizing individual activities within the gastronomic industry. Moreover, Visual Management (VM) may be very helpful to make malactivity and its effects stand out. Ishikawa diagram and 5Why may also be used to identify bottle-necks and wasteful practices, hence to enhance the green culture. After their identification, corrective and preventive actions should be undertaking, and employee training should be provided. Employees who are aware of different, more eco-friendly approaches should be made able to contribute towards improving the situation of the catering and gastronomic facility, for example; production can be streamlined (via applying Kanban and JiT principles), raw material flow, semi-finished product and finished product output can be enhanced (diagram Spaghetti), and stock control practices improved (though the application of Kanban, JiT). In addition, by using standardization and work order (5S), the catering and gastronomic facility can enhance the overall efficiency of operations, which will certainly have an impact on reducing the amount of environmental burdens in the form of consumption of increased amount of energy, water, wastewater and garbage.

## Summary

Gastronomic production involves the use of environmental resources in the form of energy, water, emissions to the air, water and soil. It is not possible to produce food without negative side effects for the environment. However, as the study shows, catering and gastronomic facilities can limit their contribution by using selected Green Lean instruments to identify the places in the process where the green waste is created so that effort can then be applied to minimize it. The research that we undertook underlines the fact that the employees of catering facilities are the key factor in implementing the changes: They are very significant in identifying green waste and reducing it. That is why, as the study presents, it is very important to provide correct training for the employees in catering facilities, and to maintain two-way communication with them regarding applying ideas that could improve their work. Green lean is certainly applicable. Of note, it can be useful in advertising too, as more and more people are becoming green-aware.

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