International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 03 | Mar -2017 www.irjet.net p-ISSN: 2395-0072

Implementation of 5S Methodology in a Food & Beverage Industry: A Case Study

Sk. Riad Bin Ashraf[1], Md. Mynur Rashid[2], Dr. A R M Harunur Rashid[3]

[1]*Graduated Student, Islamic University of Technology*
[2]*Graduated Student, Islamic University of Technology*
[3]*Assistant Professor, Dept. of Mechanical& Chemical Engineering,* Islamic University of Technology*, Dhaka, Bangladesh*

Abstract – *Food and beverage industry in Bangladesh is a potential sector and growing rapidly since 2000.This industry alone makes up 22% of the total manufacturing production in the country and around 2.45% of country's total labor force. This sector of Bangladesh is also impacting global market by exporting food and beverage to 90 different countries. Now a day this sector faces challenges to retain its prosperous position due to uprising of new competitors both in the national and international market. So, continuous improvement is required to overcome these challenges. Various lean tools can be used to achieve this improvement. This paper experiments application of 5S approach to a real world production scenario at a food& beverage industry. Initially, the whole system was analyzed and this showed a lot of incongruities in different areas. Improvement proposals were made based on 5S and were implemented over the course of next few months. From the proposed improvement proposal, lots of benefits such as space saving, money saving, increasing productivity, decreasing rejection of components and many more were achieved.*

Key Words: 5s, Productivity, Lean Manufacturing.

1. INTRODUCTION

The level of competition has enormously increased exclusively in the past two decades due to globalization and innovations in technology. Every company needs to reach or exceed the customer expectations at lowest possible prices to stay in the business arena. Improvements and innovation break-throughs have become a necessity to stay in business rather than just mere tools to improve profitability of a company. Hence, concepts like Six Sigma, Lean Manufacturing, Continuous Improvements, Quality Circles (QCs), Just-in-Time (JIT) are gaining popularity these days. Lean Manufacturing is the hymn of survival and success of any organization through minimizing the waste (Mu-da). One of the basic and the most significant tools to implement Lean Manufacturing is 5S methodology. It is a system to regulate the work flow by systemizing the workplace, thus supporting the culture of continuous improvement [1].

One of the most essential and widely applied components of lean philosophy is the 5S process. Its application is simple and involves basic common sense. 5S is a Japanese tool, focused on fostering and sustaining high quality housekeeping. 5S is the beginning of a productive life for everyone, and is a principle to productivity improvement. [2]

Lean thinking which is the most successful approach to the industrialization of office and service processes, originally discovered by Toyota [3].

In the Sri Lankan health sector 5S has been identified as the entry point to promote the service quality in health care provision [4].

Two major challenges are in front of organizations' managers due to the increasing competition in the world. Firstly, in this competitive environment, managers have to make the best judgment and choose the best methods to achieve their target and not to lose very finite opportunities. Secondly, lack of knowledge is one of the most important problems of managers about familiarity with a convenient method to successfully improve the performance of the organization [5]. Service providers must refocus on the production of quality services in order to retain customers' satisfaction and competitive power in the long run [6].

Y. Johana et al. (2014) in their works have shown that 5S methodology can effectively provide a better workplace for the administration staff of a higher learning institution as they feel more comfortable, safe and organized which in the end could assist them to improve the quality of their work. [7] D. S. Uma and A. Kannan (2010) have shown in the implementation of 5S in HRM that the employees of an organization fail to change while the customer demand and the market expectation changes rapidly. [8]

In 2010 a research was conducted on the topic of "Implementation of 5S practices in the manufacturing companies: A case study" (Rahman et al. 2010). The researchers executed 5S rules in two manufacturing companies. 5S checklist was developed for each division for auditing process. Both the companies associated with the research performed an excellent 5S practice. This study proved that 5S is an effective technique in improving housekeeping, health and safety standards in the workplace as well as environmental performance. The study also concluded that effort and participation from top management is a must for proper implementation of 5S. [9]

5S along with some other lean strategies were introduced in a metal structures production system.This resulted in a reduction of lead times, work in progress, transports, deliver

delays, defects and errors in assembly line and production system. [10]

2. MEANING OF 5S

Steps of the 5S process are as follows:

2. 1 Sort (Seiri)

Removing all surplus items from the work center which are not needed for the immediate continual operations is known as sorting. [11] At this stage it is decided what is really needed and what is not. Any item or tool that is unaccounted out of place or unnecessary needs to be clearly documented. A red tag is a document made on red colored paper that is attached to potential junk items in a workplace. The items are stored temporarily until assignable action can be undertaken, it is usually the starting point of a 5S exercise. Items are red tagged with the best description of use or placement recorded on it. All red tagged articles are moved to a temporary holding area, and that area clearly is identified as the red tag or Seiri area. Equipment or anything else that is not of use, should be discarded as refuse to be thrown out [12] To implement the first step of 5S, a production team needs to know what material is used when the material in storage are to used where the required materials are, and what the users requirement are[13]

2. 2 Set in Order (Seiton)

The second step in a 5S launch is taking the stored items and putting them where they best support the function they provide. Workers should be motivated to place items at their point of use and improve the workplace's visual management [14]. Before and after photos should be taken to document progress and explain activity benefits are of key importance at this stage [15]. One important advantage of Set in order is that everything needed for the job is clearly visible. Another objective of this step is to arrange the work in such a manner that missteps can be easily identified and corrected which is one of the main reason why the implementation of visual controls is encouraged during this step. Associates may apply these philosophies by referring to checklists, designing tool boards, parts container and improving workplace design. The practice of shadow boarding can be quickly identify when a piece of equipment is missing from a work station [16]

2. 3 Shine (Seiso)

Once the unneeded is thrown away and sorting and set in order has taken place, it is now time for the sanitize phase [12]. A cross functional team should agree on what the cleaning standards need to be [15]. This is sometimes referred to as shine or sweep stage where teams thoroughly remove clutter and fix equipment or building components [11]. The objective of this phase is to identify and eliminate the root cause of waste, dirt and damage as well as clean up the work station [14]

2. 4 Standardize (Seiketsu)

Allows for control and consistency. Basic housekeeping standards apply everywhere in the facility. Everyone knows exactly what his or her responsibilities are. Housekeeping duties are part of regular work routines. [17] It is assumed that standards should not be implemented only in the typical operational processes e.g. production, movement maintenance, storing, but also in the administrative processes, for example: book-keeping, customer service, human resources management, or secretariat service[18].The challenge is to visually maintain known agreed upon conditions rather than to write work instructions [14]

2. 5 Sustain (Shitsuke)

It refers to maintaining standards and keeping the facility in safe and efficient order day after day, year after year. [17] Implementing the idea of the 5S will demand from workers the compact self-discipline connected with implementing and obeying the rules of regularity in cleaning and sorting. It leads to increasing the consciousness of staff, and decreasing the number of non-conforming products and processes, improvements in the internal communication, and through this to improvement in the human relations. It is also important to understand the need of executing the routine inspections of usage the 5S rule. This inspection is executed by helping of so-called Check List and created on its basis the radar graph of the 5S. [19]

3. PROBLEM STATEMNT

R5 Food & Beverage Ltd is a privately owned company that was incorporated in Asulia, Savar. It is a small-sized company encompasses 5000 square feet with 20 employees. This company produces various Food and beverage items like glass water, juice and lollipop etc. It has started its production from 1st of February, 2016. After some months of productions, it was facing problems in running its operation due to various problems in machine and space availabilities, labor productivity, cleanliness of the factory floor and so forth. From general observation, it can be seen that lack of systematic procedures and knowledge were the main reasons underlying these problems.

4. METHODOLOGY

The steps involved in this research work are shown in figure 1

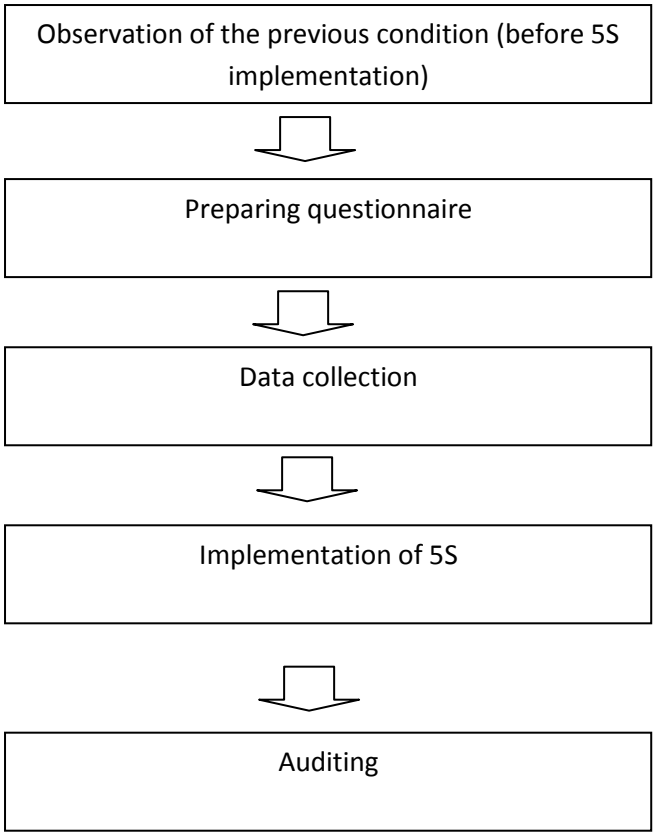

Fig -1: Methodology of the study

The industry was first visited on April, 2016 before 5S implementation. All the areas where 5S would be implemented were visited and the condition of those areas was observed. Then the industry was revisited in accordance with different stages of implementation of 5s during a six months period from August 2016 to January 2017. Data was collected from the previous condition of the industry (before implementation of 5S) and existing condition of the industry (after the implementation of 5S).

5. RESULTS AND DISCUSSION

The results are presented showing the improvements in different parts of the factory by implementing different S of the 5S system on different occasions.

5. 1 Sort

The whole space available was divided into 4 sections and unnecessary items in those sections were identified using red tags. After removing those unwanted items from the sections to a specific quarantine place about 310.1 square feet space was saved. Table 1 shows the improvement in saving space on the factory floor.

Table -1: Section wise Space Saving

Section	Space Saving (square feet)
Section-A	49.1
Section-B	36.5
Section-C	165.8
Section-D	58.7
Total	310.1

From section A and B very small amount of space were saved because small quantities of items were removed from that places which occupied a little space. All store rooms were allocated to section C and D. Most of the unwanted items were found in those store rooms. So, comparatively huge amount of space had been saved from these two sections. This saving space resulted in an additional cost savings of 37305 Taka which is showed in table 2.

Table -2: Section wise Cost Saving

Section	Cost(BDT)
Section-A	2050
Section-B	1800
Section-C	29870
Section-D	3585
Total	37305

5. 2 Set in Order

In juice processing room, set in order was applied to the equipment used. Equipment used in juice processing areas are spoon box, mug, bucket, cylinder, and refractometer. At first, average usage frequency per day was monitored which is shown in figure 2

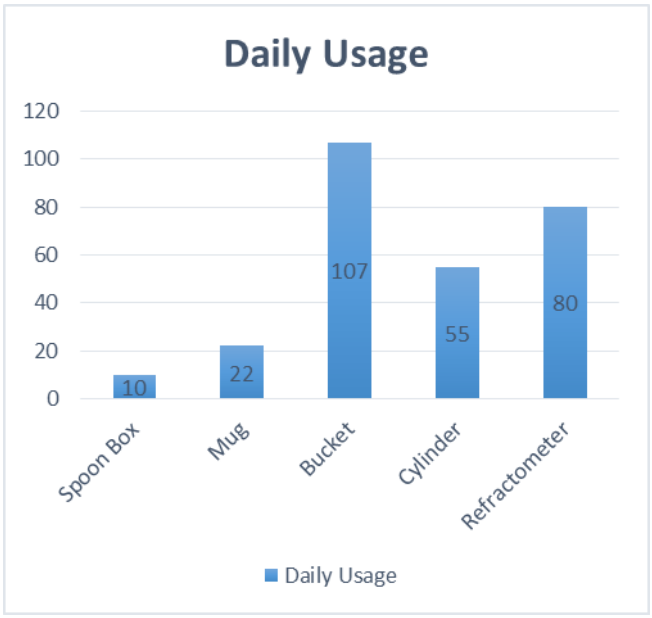

Fig -2: Equipment usage frequency

Based on the findings a new layout for the juice processing room was suggested and implemented in the factory floor which is shown in figure 3

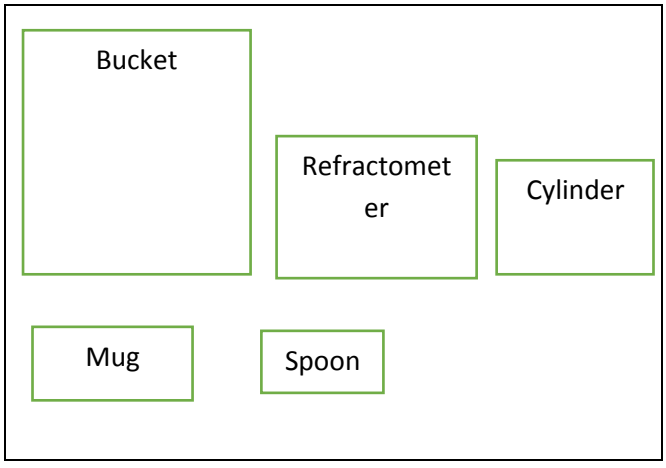

Fig -3: Juice processing room Layout

This new layout resulted in a reduced flow*distance measure of 1686.8 feet from 2450.65 feet per day.

5. 3 Shine

Before 5S implementation there was no particular cleaning schedule. Cleaning was done in an irregular manner. During 5S implementation a cleaning schedule was prepared. The items which required cleaning were identified. A particular time interval was allocated after which these items must be cleaned. The cleaning schedule for all items is given in table 3.

Table -3: Cleaning schedule

Items	Time interval	Frequency In a time interval
Floor	1 Day	9
Floor mat	1 Week	1
Curtains	3 Weeks	1
Waste bin	1 Day	1
Water jar	2 Weeks	1
Toolbox	1 Week	1
Cutter	1 Week	1
Sensor	1 Week	1
Machinery & Equipment	1 Week	1

5. 4 Standardize

It consolidated the work done in the first three steps. A standard 5S Audit Calendar was introduced to simplify the whole 5s process. Maintaining this Calendar had certainly helped to keep the records if all the scheduled task of each 5s components had been completed or not. It was also easier to find out the lacking and then immediate actions required. Hiring of an expert Quality Assurance Manager was suggested. His duty would be monitoring the whole 5s process and also clarifying the workers about the importance of the 5s implementation. Color coding was also introduced. For example: Red color in reject area, green in pass goods area and so on.

5. 5 Sustain

After the implementation of 4S; operators, supervisors and floor managers were asked to continue this process. On December, 2016 the previously implemented 4S areas were inspected to find out the incongruities with the proposed system. A checklist was developed for this purpose and the result had been found to be satisfactory. Some key results are given below:

Table -4: Productivity Comparison

Products Name	Before 5s (pieces)	After 5s (pieces)
Glass water	9000	12782
Juice	13500	19429
Lollipop	20000	28784
Candy	17000	21503
Total	59500	82498

Total Increase in Productivity

= [(82498 – 59500)/59500] %

=38.65%

Table -5: Comparison of Rejection Components percentage

Products Name	Before 5s (%)	After 5s (%)
Glass water	7.8%	5.7%
Juice	5.5%	3.4%
Lollipop	2.9%	1.8%
Candy	3.2%	2.4%
Total	19.4%	13.3%

Total Decrease of Rejection= (19.4-13.3) %

=6.1%

6. CONCLUSION

In this paper, enhancements in various functional areas in a food and beverage industry were demonstrated using 5S techniques. The results showed that 5S methodology can be effectively used in this sector. Various advantages are found which include: Process development by cost reduction, Better usage of workplace, Prevention of losing tools, Process growth, Increasing efficiency, Shortening of time required for searching necessary things, Improvised working conditions for workers, Reduced machine maintenance cost and so on. Though this experiment shows numerous benefits of 5s in a food and beverage industry, it can be applied to any industry.

REFERENCES

[1] Eng. Ana Rotaru, "Implementing Lean Manufacturing", the annals of "dunărea de jos" university of galaţi Fascicle v, technologies in mahine building, 2008.

[2] Y. Yadav, G. Yadav, S. Chauhan, "Implementation of 5S in Banks," International Journal of Research in Commerce, Economics & Management, Volume No: 1 (2011), Issue No. 2 (June).

[3] S. Erdem, K. Aksoy, "Implementing Lean Service Operations: A Case Study from Turkish Banking Industry," İşletme Fakültesi Dergisi, Cilt 10, Sayı 1, 2009, pp. 171-198.

[4] K.W.C.U. Kendangamuwa, S. Sridharan, D R K Herath, R.M.M.K. Ratnayake, "Factors Contributing to the Sustainability of 5S Programmes in Government Hospitals in Regional Director of Health Services Area Kurunegala," International Journal of Scientific & Technology Research, Volume 4, Issue 03, March 2015.

[5] P. Rai, "Effectiveness of 5S Implementation on Organizations Performance," Abhinav International Monthly Refereed Journal of Research in Management & Technology, Volume 5, Issue 1, January, 2016.

[6] D. A. Gürel, "A Conceptual Evaluation of 5S Model in Hotels," African Journal of Business Management, Vol. 7 (30), 14 August, 2013, pp. 3035-3042.

[7] Y. Johana, N. M. Hardi, L. Abdullah, N. Jumadi, W.N.S.W. Mohammad, N. S. Taharuddin, "The Sustainability of QE/5S Implementation in an Administration Office of a Higher Education Institution," 2014, https://www.researchgate.net/publication/278244980

[8] D. S. Uma, A. Kannan, "Implementation of 5S in HRM," Journal of Contemporary Research in Management, October - December, 2010.

[9] Rahman, M,N,A; Khamis ,N,K; Zain, R,M;, Deros, B,M; and Mahmood, W,H,W; "Implementation of 5S Practices in the Manufacturing Companies: A Case Study," American Journal of Applied Sciences 7 (8): 1182-1189, pp.1184-1186, 2010.

[10] Carvalho, R; Alves ,A; and Lopes, I (July 6 - 8, 2011); "Principles and Practices of Lean Production applied in a Metal Structures Production System," Proceedings of the World Congress on Engineering 2011 Vol. I

[11] Hough, Randy. "5S implementation methodology." Management Services 52.2 (2008): 44-45.

[12] Howell, V. W. "5S for Success." Ceramic Industry 159.7 (2009): 17-20.

[13] Hirano, Hiroyuki. Putting 5S to Work: A Practical Step-by-Step Approach. PHP Institute, 1993.

[14] Van Patten, James. "A second look at 5S." Quality progress 39.10 (2006): 55-59.

[15] Samuels,G."5S(Sort/Set/Shine/Standardize/Sustainability)." Converting Magazine 27.12 (2009): 25-26.

[16] Becker, John E. "Implementing 5S: To promote safety & housekeeping." Professional Safety 46.8 (2001): 29.

[17] Yoshio Egami,TPM an Integrated Approaching – Implementing Total Productive Maintenance through Japanese 5S Japan, 2010

[18] M. Dudek-Burlikowska, Quality research methods as a factor of improvement of preproduction sphere, Journal of Achievements in Materials and Manufacturing Engineering 18 (2006) 435-438.

[19] M. Urbaniak, Quality management – theory and practice, Difin, Warsaw, 2009.

BIOGRAPHIES

Sk. Riad Bin Ashraf has received the B.S.C degree in Mechanical Engineering from Islamic university of Technology in 2016.

Md. Mynur Rashid has received the B.S.C degree in Mechanical Engineering from Islamic university of Technology in 2016.

Dr. A R M Harunur Rashid is currently working as an assistant professor in the Mechanical and engineering department of Islamic university of Technology.