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Research Article

ENVIRONMENTAL ASPECTS IMPACT ASSESSMENT OF FMCG INDUSTRY: INDIA

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ABSTRACT

Fast moving Consumer Goods (FMCG) offer single-use and disposable products. Insufficient collection system and recovery processes results in the landfill and contribute to pollution. Industries need to control this pollution by identifying the aspects (Products, processes and services) and measuring the impacts on environment. ISO 14001:2015 EMS provides a framework and guidelines, comprises of policies, processes, plans and records and defines rules how company interact with the environment. Before implementing the EMS in premises, organization must do the Aspect Impact assessment as mentioned under EMS clause 6.1.2- Environmental Aspect. In this paper Aspect Impact Assessment has been done for the FMCG sector and the risk ratings are subjective. Total score has been calculated on the basis of Probability, consequences, concern to community and the resource requirements. At the end risk rating criteria has been developed and the impact are categorized into 5 categories as no impact, low impact, moderate impact, high impact and very high impact on environment. Gaps are still there, which the researchers and organizations need to be focused so as to make a more reliable and effective way to find the aspect and impact analysis.

INTRODUCTION

The e largest sector of Indian economy is Fast Moving Consumer Goods (FMCG). Everyday products that are bought and consumed by everyone comes from FMCG (Kuzmina, et al.,2019; Muranko, et al., 2021). These products can be food items, personal care, cosmetics or cleaning products. FMCG sector is characterized by its high volume of sales, low prices and shorter life as compared to durable goods(Robinson, et al.,1985).

FMCG can be classified into two segment- Food segment and near-food segment(Ahrens, 2021) (Fig. 1).

1. Food segment includes food, non-alcoholic and alcoholic beverages and tobacco products

2. Near-food segment again divided into two sub segments-

- Household care
- Personal care

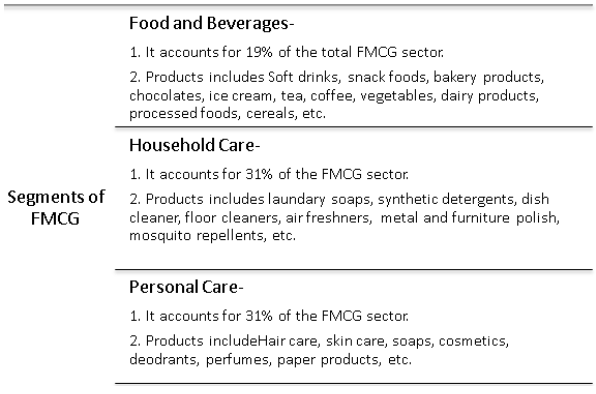

Fig. 1 Fast Moving Consumer Goods (FMCG) segment (Kaiser, 2008; Gangopadhyay, 2007).

The FMCG sector is very substantial resources be-

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cause the material used for packing are not always easy to recycle(Lacy, et al., 2020; Bocken, et al., 2011). Inefficiency and gaps in waste collection and recovery system, makes these packaging material ends up in incineration and landfill which causes air pollution, soil pollution as well as land accumulation(EMF, 2013). It is estimated that every year around ten million tons of plastic waste is dumped into the oceans(Oraman, et al., 2011).

A study has been conducted by exploring the success factors, drivers, and barriers that a FMCG gets while implementing reuse model of business(Bocken, et al., 2022). Reuse process in FMCG involves the operation through which the products can be used again and again by the use of products available in the market (E. Commission, 2008). "One-off" nature of consumption of products of FMCG leads to very little reuse(E. M. Foundation, 2013). However, new emerging reuse models are offered by the circular FMCG like new types of reusable packaging can be again used and are returnable(Coelho, et al., 2020).

Circular economy principles states that the FMCG need to be delineate in such a way that encourages the highest efficacy of resources (Achterberg, et al., 2016). Products need to be formed using the new renewable and sustainable materials which can be reused before recycled (EMAF, 2019). Corporate Sustainablity reports of many FMCG organizations were analyzed by and the three activities related to circular economy are-share of renewable energy increases, recovering the wastes and the improvement of operations (Raphaelle, et al., 2018).

The four main growth drivers for India's FMCG sector as per India Brand Equity Foundation, IBEF are-

1. The market is shifting to the organized sector.

2. Increase in the Food parks leads to increase in market penetration.

3. Consumption of branded products in rural area increases.

4. Easy access due to online grocery stores and online retail stores.

Initiatives taken by the government for the growth of the FMCG Industry in India:

1. Government has invested US $163.73 million to boost Young Entrepreneurs by the Self Employment and Talent Utilization (SETU) scheme.

2. Industrial license is not required for food industries except items such as beer, alcohol, oil and items that are reserved for exclusive manufacture in the small scale sector.

3. The GoI has approved 100% FDI in the cash and carry segment and in single-brand retail and 51% FDI in multi-brand retail (Fig. 2).

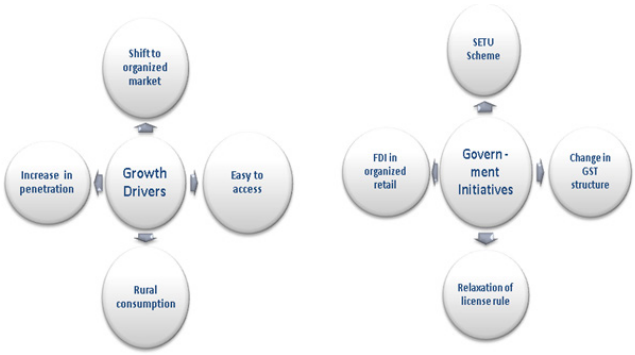

Fig. 2 Government initiatives and Growth drivers.

Tukker and Jansen in their paper estimated that around 20%-30% of the human's total environmental impact is due to the food production (Tukker, et al., 2006). Most of the environmental impact is due to the agricultural production while the processing, packaging and distribution of final product have a lesser environment impact (Nemecek, et al., 2016). Also the transportation of final product from one place to another plays an important role when determining the environmental footprint. Environmental footprint is more when product is transported by airways and have high impact than organic farming (Jungbluth, et al., 2000).

The food system of today's developing world needs to be more sustainable throughout the life cycle from production to consumption (Willett, et al., 2019). The lack of knowledge among the consumers about the environmental impact of foods is the prime factor which paves a barrier towards making consumer behavior environmentally friendly. In early 21st century consumers knew less about the environmental aspect and related impact of food they consumes but now consumer have started considering the impact of their activities and consumption. This positive attitude towards environment and its protection were emphatically related with higher knowledge score (Hartmann, et al., 2021).

ENVIRONMENT MANAGEMENT SYSTEM

Now many companies are moving towards the operation which not only protect the environment but also boost a confidence level among their stakeholders and helps in saving money. Reducing the waste minimizes the time and cost of disposal. Environmental rules and regulations that applies to the organizations have encouraged them to implement ISO 14001:2015 Environment Management System (Seiffert, 2008). In Industries EMS is a systematic process for defining and implementing the environmental Goals, Policies, and responsibilities of concerned persons and regular auditing of all the relevant elements (Culley, 2019; Steger, 2000). Susan Summers Raines in his Paper, done survey on the benefit of ISO 14001 certification on the organization and the findings are as follow (Raines, 2000) (Fig. 3).

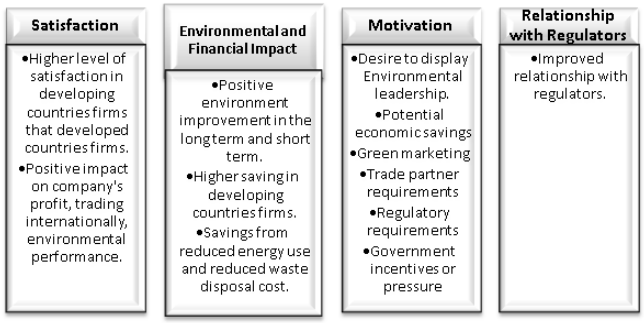

Fig. 3 Benefits of ISO 14001 certification.

ISO 14001:2015 Environment Management System (EMS) is designed to help firms manage their applicable responsibilities related to environmental regulations (ISO, 2015). The first step for a company is to have an Environment Policy, which explains the company's intend related to environment (Ayers, 2010).

EMS is based on the Plan-Do-Check-Act (PDCA) cycle as described below (EPA, 1996):

Plan: It includes identifying the organizations environmental aspects and the goals of the organizations related to environment.

Do: It includes step by step action plans for implementing EMS elements by training and operational controls.

Check: It includes monitoring and corrective actions by conducting internal audits.

Act: It includes progress reviews and actions taken fill the gaps found in EMS audit and other EMS elements.

ENVIRONMENTAL ASPECT AND IMPACT

Implementation of EMS in an organization requires a step by step procedure along with the documents (Стандарт, 2016). Clause- 6.1.2 of ISO 14001:2015 tells about the Environmental Aspects. Organization need to identify and evaluate the different aspects and impacts to the environment from their activities, services or products. Significant impacts are determined during evaluation process.

An environment aspect can be anything that has the potential to impact environment resulting from an organizations activity, service or product whether it's under control or not. Environmental impact is any change occurred in the environment due to the organizations activities, products or services. In simple words environment impact is the result of environment aspect (Fig. 4).

MATERIALS AND METHODS

To identify significant Environmental Aspect, Environment policy, legal and other requirements needs to be considered for establishment of ISO 14001:2015 based EMS. A core committee should develop a methodology for the identification of significant environmental aspects which are due to the FMCG's processes, products or services that can have a significant impact on environment. Analysis of processes, products and services shall be done in a detailed systematic manner. A risk rating matrix shall be developed to rate the aspect (Fig. 5).

Steps for Finding Significant Aspect

• First identify the processes, products and services of the organization.

• Identify the generation of waste from the organization's processes, products and services.

• Quantify the identified wastes in the above processes, products and services.

• Evaluate the waste and its impact on the environment.

• Assign a value for defining the aspect as Significant Environmental Aspect based on the ratings from the risk matrix.

• If there is a legal requirement, then it will definitely come under significant environmental aspect.

While recognizing environmental aspect/impact following factors need to be considered (Tab 1-3):

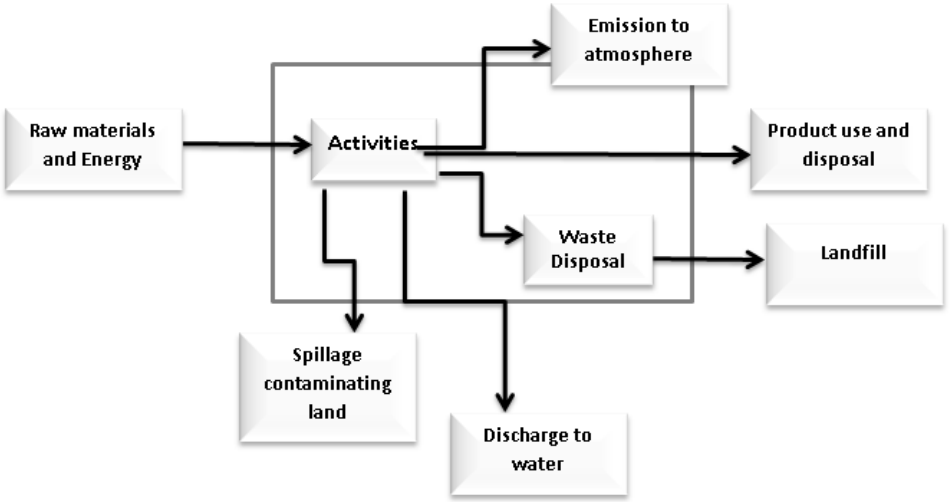

Fig. 4 Overview of raw material input and final product with waste.

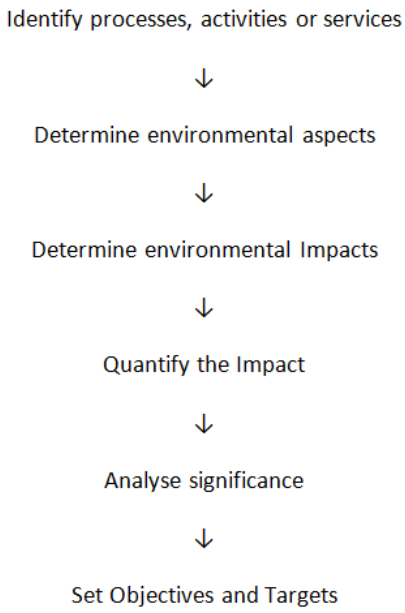

Fig. 5 Methodology for Aspect Impacts Assessment.

Tab 1. Aspect Impact Risk Matrix.

Score	Probability(A)	Consequence(B)	Concern to Community (C)	Resource Requirements(D)
1	Once in a month	No consequences	No concern	Easily controlled
2	Once in a week	Minor effect to air, water or soil	Low concern	Requires some resources to control
3	Once in a day	Controlled effect to air, water or land	Moderate concern	Requires moderate resources to control
4	Several times a day	Uncontrolled effect to water, air or land	High concern	Difficult to control
5	Routine	Severe ecological damage	Extreme concern	Very difficult to control

Tab 2. Aspect Impact Risk Criteria.

Total score	Risk to Environment	Color
Below 10	Aspect poses no threat to the environment	Very Low
11-40	Aspect poses very little threat to the environment	Low
41-100	Aspect controlled and poses moderate threat to the environment	Moderate
101-200	Aspect controlled and poses great threat to the environment. Activity should be reviewed for improvement.	High
Above 201	Aspects are controlled and pose great threat to the environment. Activity should be start after strengthening the control measures.	Very High

Tab 3. Aspect Impact Assessment. **Note:** ( )-Very low; ( )–Low; ( )–Moderate; ( )-High; ( )-Very high.

Process/Activity	Aspect description	Environmental impact	Regulatory Requirement	A	B	C	D	Total score
Material receiving and storage	Spillage of ingredients	Land and water contamination	NA	4	1	1	2	8
	Generation of Jute and poly bags	Land contamination	NA	4	2	2	3	48
	Disposal of floor sweeping	Air Pollution	NA	3	1	1	3	9
Premixing and mixing	Generation of Flour and sugar dust/powder	Land and Air contamination	NA	5	1	4	4	80
	Spillage of sugar solution and invert syrup	Resource depletion	NA	4	2	1	2	16
	Noise at sugar grinder	Noise pollution	Yes	5	2	3	3	90
	Leakage of ammonium bicarbonate	Land and air contamination	NA	4	3	4	2	96
Forming	Spillage of wet dough	Land contamination	NA	4	1	1	2	8
	Leakage of compressed air	Resource depletion	NA	2	1	2	4	16
	Spillage of milk	Land and water contamination	NA	4	1	1	2	8
	Usage of electricity	Resource depletion	NA	5	5	3	5	375
	Generation of fastners, cotton waste, used webs	Land contamination	NA	2	3	1	3	18
Baking	Emission of flue gases	Air Pollution	YES	5	5	4	5	600
	Generation of noise	Noise pollution	YES	5	3	3	2	90
	Consumption of Power	Resource depletion	NA	5	5	3	4	300
	Emission of carbon particles	Air Pollution and land contamination	NA	2	3	3	3	54
	Generation of burnt biscuits	Land contamination	NA	3	1	1	3	9
	Generation of waste fasteners	Land contamination	NA	2	3	1	3	18
Cooling conveyor	Generation of seeped fat	Land and water contamination	NA	3	2	1	2	12
	Loss of energy	Resource depletion	NA	4	2	3	3	72
	Generation of biscuit dust	Land contamination	NA	3	1	1	4	12
	Generation of used canvas	Land contamination	NA	2	2	2	2	16

Packing	Generation of biscuit wastage	Land contamination	NA	4	1	1	2	8
	Generation of CBB	Land contamination	NA	4	3	2	3	72
	Generation of plastic cores	Land contamination	NA	4	3	2	3	72
	Generation of used PVC Tray	Land contamination	NA	1	2	2	2	8
	Generation of ink rolls	Land contamination	NA	3	2	4	2	48
	Generation of Paper cores	Land contamination	NA	4	1	2	3	24
Engineering maintenance		Land contamination	NA	2	3	1	3	18
	Use of gas for welding	Air Pollution	NA	4	3	4	4	192
	Generation of electric cables and broken switches	Land contamination	NA	1	3	3	3	27
	Generation of cotton waste	Land contamination	YES	2	4	3	4	96
	Generation of spent oil	Land and water contamination	YES	1	4	4	4	64
	Spillage of lubrication oil	Water and land contamination	YES	3	3	3	2	54
Transportation	Exhaust emission from vehicles	Air Pollution	YES	5	4	4	5	400
	Spillage of oil	Land contamination	YES	3	2	2	3	36
Quality Lab	Generation of empty reagent bottles	Land contamination	NA	2	2	4	2	32
	Usage of chemicals	Land and water contamination	NA	4	2	4	5	160
	Generation of glass ampoules	Land contamination	NA	1	2	3	2	12
	Generation of waste water	Water contamination	YES	4	2	3	4	96
	Generation of used cotton rags	Land contamination	YES	3	4	2	3	72
Canteen/Kitchen	Generation of Gunny bags and empty boxes	Land contamination	NA	3	2	1	2	12
	Generation of vegetable peels	Land contamination	NA	4	1	1	4	16
	Emission from combustion of LPG	Air Pollution	NA	5	3	4	5	300
	Generation of oil fumes	Air contamination	NA	3	2	2	4	48
	Leakage of CFCs from Refrigerators	GHG effect	NA	1	3	5	5	75
	Usage of water	Resource depletion	NA	5	1	2	2	20

Boiler DG set	Leakage of LPG/PNG from flanges	Air Pollution	YES	1	4	4	4	64
	Emission of CO2	Air Pollution	YES	5	4	4	4	320
	Leakage of water from pump, pipe joints and piston	Resource depletion	NA	3	1	2	2	12
	Generation of Noise	Noise pollution	YES	5	2	3	3	90
	Leakage of steam	Resource depletion	NA	5	1	2	3	30
	Usage of chemical to remove hardness and for pH control	Water contamination	NA	3	2	2	3	36
	Leakage or spillage of HSD	Land and water contamination	YES	2	4	4	3	96
	Emission of CO2, SOx, NOx	Air Pollution	YES	3	4	5	4	240
Compressor	Generation of Noise due to motor running	Noise pollution	YES	5	2	3	3	90
	Cleaning of filter and oil change	Land contamination	NA	2	3	2	2	24
	Leakage of oil during maintenance	Land contamination	NA	2	3	3	3	54
Chiller	Leakage of ammonia from valves, joints	Air Pollution	NA	2	4	4	2	64
	Leakage of CFC used for cooling of ammonia	GHG emission	NA	1	4	5	4	80
	Leakage of water from pipes, joints	Resource depletion	NA	3	1	2	2	12
	Filter cleaning or replacing	Land contamination	NA	2	3	1	2	12

- Contamination through emissions.
- Contamination through effluents.
- Land contamination through spillage and release of waste.
- Noise.
- Use of raw materials and natural resources.
- Applicable legislation.
- Use of Energy.
- Waste.

The rating criterion is easy and subjective. The team should use their knowledge and best approach to identify which category rating they are choosing. FMCGs also need to collect some data from customers and communities where they operate within or outside the organizations boundaries. By doing so, the communities get to know that the company is doing something for the matters related to environment, also team will get the other aspects of how their organization affecting the community nearby.

After the completion of aspect impact register, team will sort out the aspects that have the high or very high impact on the environment. Then the aspects shall be given priority- First to the aspects that have regulatory requirement, then that have very high impact and then high. The questions shall be asked to the top management on how they are going to reduce the impact by taking proper control measures based on the hierarchy of control measures. Impacts could not be reduced all of sudden, it will take time so continual improvements need to be implemented.

Once the priorities are identified, goals must be set which can be recycling, reducing, treatment, process change and substitution. The goals must be SMART (Specific, Measurable, Achievable, Realistic and Timely).

RESULTS

The column chart of 14 activities/processes have been plotted. The chart consists of different aspects of activities/processes with x-axis as aspects and y-axis as total score (Fig. 6).

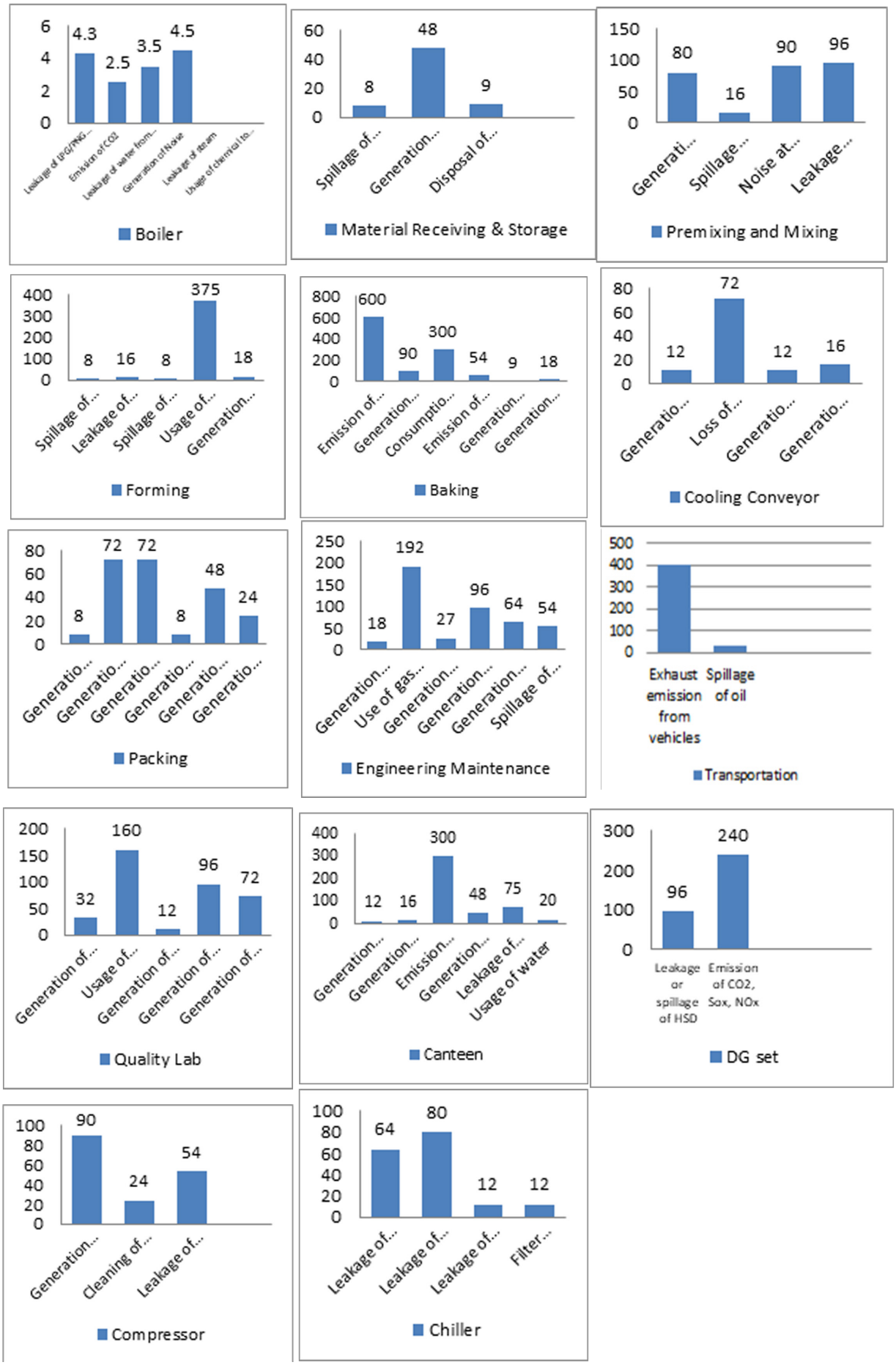

Fig. 6 Column chart of 14 activities/processes have been plotted.

The impact on the environment of the aspects of FMCG industry are plotted in chart below. It is found that 11% impact is very low, 36% impact is low, 39% impact is moderate, 3% impact is high and 11% impact is very high. Organizations must set objective and targets for these high and very high impact posing to the environment (Fig. 7).

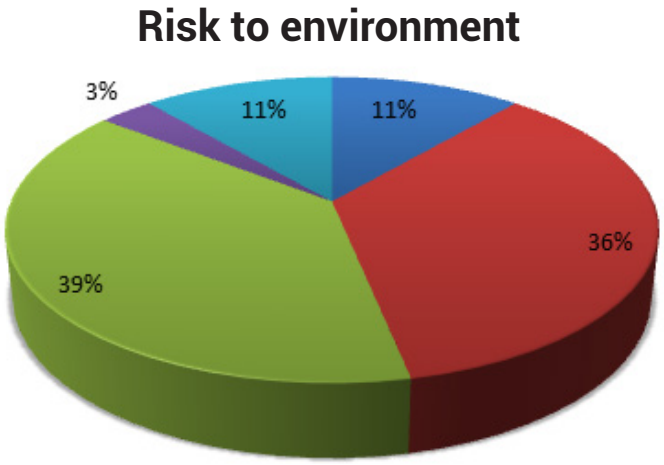

Fig. 7. Risk to Environment. **Note:** (■)-Very low; (■)-Low; (■)-Moderate; (■) -High; (■) -Very high.

The significant environmental aspects are plotted in figure given below along with their total risk rating and the comparison of the significant aspects. The highest impact posing in FMCG is Emission of flue gases during baking of biscuits followed by exhaust emission from the vehicles and usage of electricity in forming (Fig. 8).

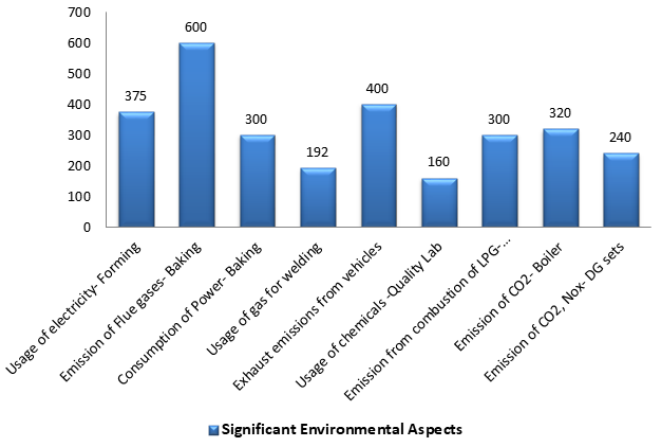

Fig. 8. Total risk rating and the comparison of the significant aspects.

The impact of significant aspects on the environment is plotted in figure below considering land and water contamination, air pollution, resource depletion and noise pollution. The highest impact is on air pollution that is due to the emission of greenhouse gases during the usage of LPG (Fig. 9).

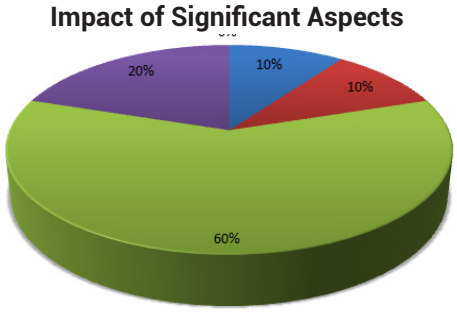

Fig. 9. Impact of significant aspects. **Note:** (■)–Land contamination; (■)-Water contamination; (■)-Air pollution; (■) -Resource depletion; (■)–Noise pollution.

CONCLUSION

Implementation of ISO 14001:2015 EMS has not only increased the company's profit, but also the access to trade internationally and improves the performance of the company with respect to environment. Finding the aspect and impact of those aspects on environment is not a difficult task but proper planning and a competent personnel's team required. Engagement of employees and communities need to be considered. In this paper the aspect impact assessment has been shown for the FMCG industries in India. Organization can do the assessment in their premises before implementing. It is found that 11% impact is very low, 36% impact is low, 39% impact is moderate, 3% impact is high and 11% impact is very high. The impact on different parameters of environment are as - Air pollution (60%), Land contamination (10%), Water contamination (10%), Resource depletion (20%), while noise pollution is not much significant. Industries must take appropriate targets to reduce or minimize these impacts.

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