Analytic Hierarchy Process-Based Analysis to Determine the Barriers to Implementing a Material Efficiency Strategy for Supply Chain Management in Dairy Industry

[1]Amar Neog, [2]Krishna Kumar Sharma, [3]G.S. Kesharwani
[1]M.Tech-student, [2&3]Assistant Professor
[1]Mechanical Engineering Department
[1]Subharti Institute of Technology & Engineering, Meerut-250005, India

Abstract

Material efficiency is one of the most important strategies for helping manufacturing units to achieve sustainability in their production activities. Though, there are many hurdles to the implementation of efficiency material handling strategies in the production processes and overall business operations specially in dairy industry. The real challenge before Indian managers is to establish priorities among potential GSCM techniques to achieve best possible advantage of GSCM implementation in Indian dairies. In this study I try to evaluate the relative importance of decision parameters in the hierarchy for a dairy industry given herein.

The present work describes a multiattribute decision model using analyticalhierarchy proce ss for the justification of GSCM for Indian dairies. It has been focused to justify the GSCM benefits i.e. improved quality, improved market share, reduced energy cost, improved brand image, enhanced public relations etc. in the dairy industry by using AHP method i.e. a MADM technique. The results achieved are quantified in descending order, i.e. increased market share 1.9%, reduced energy cost (16.5%), enhanced brand image (23.6%), improved market share (29.7%) and enhanced public relation (18.3%). Finally, it has been concluded that the technique of GSCM plays an important role 2 for the overall growth of a dairy or to achieve the described benefits.

Keywords: analytic hierarchy process; Dairy industry; material efficiency; multi-criteria decision-making; green manufacturing.

1. Introduction

The Green Supply Chain Management (GSM) as environmental concerns into the inter-organizational practices of SCM including reverse There nine on the principle of GSCM: complexity, ecological Modernization, information, institutional resource based view, Resource dependency, social networks, stakeholder and transaction costs Economics. They form the basis for GSCM implementation & provides insights for research extensions GSCM.

Sustainability refers to integration of environment, society etc to operations of the firm minimizing the impact of the waste generated on the well being of the inhabitants of mother earth aims to alignment of profit realization activities along with environmental considerations. The triple bottom

line concept emphasizes giving equal weight Companies and the economy, people's future success and long term future of the planet.

3. Objective of the Work

Investigate the practice and implementation of green supply chain management in Indian dairy industry. Also find out the benefits of the GSCM and justify them with the help of MADM technique. TECHNIQUES USED > Analytic Hierarchy Process (AHP) Multiple Attribute Decision-making (MADM) Method.

4. Various MADM methods are: Simple Additive Weighting (SAW) Method. This is also called the weighted sum method (Fish bum, 1967) and is the simplest and still the widest used MADM method. Here, each attribute is given a weight, and the sum of all weights must be 1. Each alternative is assessed with regard to every attribute. The overall or composite performance score of an alternative is given by Equation:

5. Survey Method

5.1 Random Survey

Phase III data acquisition via postal mail survey with follow up telephone call was an administration. This stage was a random survey. From all sectors in India due to difficulties in data collection, random survey pharmaceuticals, our study of the four targeted industries related to the number of manufacturers was conducted in a typical pharmaceuticals industry. The defendant previously identified target companies were drawn from a list of drug manufacturers. Of the 500 questionnaires mailed, a total of 128 usable manufacturing enterprises organizational responses were received.

6. Result and Conclusion

Green supply chain management system benefits are manifold to an organization but some of the major benefits of GSCM for Indian industries are quantified in descending order, i.e. enhanced brand image, increased market share, reduced energy cost, enhanced public relations and improved quality (see decision index Table 4.10). The prioritization of GSCM attributes/elements can often be facilitated for any of the benefits sought by assessing the Figures (4.1 to 4.5). Results presented are attributed to show the richness of AHP applicability in decision makmg, with reference dairy industry.

Table 4.1: Pair wise comparison matrix for level II

	RWM	GM	IEM	GR
RWM	1	1/2	1/3	1/5
GM	2	1	1/3	1/2
IEM	3	3	1	1/3
GR	5	2	3	1
SUM	11	6.5	4.667	2.0333

Table 4.2: Normalized comparison matrix

	RWM	GM	IEM	GR	SUM	Principle Vector
RWM	0.0909	0.0769	0.0714	0.094	0.3375	0.0844
GM	0.1818	0.1538	0.0714	0.2459	0.6529	0.1632
IEM	0.2727	0.4615	0.2142	0.169	0.1123	0.2781
GR	0.4545	0.3077	0.6428	0.4918	1.8968	0.4742

Consistency index (CI) = 0.0838; Consistency ratio (CR) = 0.0092

Table 4.3: RWM Sub criteria Analyses Matrix

	ROW	WMT	RMM	Principle Vector
ROW	1	1/5	1/2	.1149
WMT	5	1	5	.7028
RMM	2	1/5	1	.1822
SUM	8	1.40	6.5	1

Consistency index (CI) = 0.045; Consistency ratio (CR) = 0.0725

Table 4.4: GM sub criteria Analyses Matrix

	ATC	UFK	CEE	Principle Vector
ATC	1	1/3	1/2	.170
UFK	3	1	1	.443
CEE	2	1	1	.387

Consistency index (CI) = 0.03; Consistency ratio (CR) = 0.051

Table 4.5: IEM sub criteria Analyses Matrix

	ISO	GAS	EERM	Principle Vector
ISO	1	1/3	5	.2828
GAS	3	1	7	.6434
ERM	1/5	1/7	1	.0738

Consistency index (CI) = 0.04; Consistency ratio (CR) = 0.0833

Table 4.6: GR Sub criteria Analyses

	IRR	UNS	OUR	Principle Vector
IRR	1	1/2	1/2	0.199
UNS	2	1	2	0.490
OUR	2	1/2	1	0.311

Consistency index (CI) = 0.03; Consistency ratio (CR) = 0.0517

Table 4.7: Recycling of Waste (ROW) Alternative analyses

	IQ	REC	IMS	EBI	EPR	Principle Vector
IQ	1	1/2	1/2	3	1/3	0.126
REC	2	1	1	5	1	0.257
IMS	2	1	1	5	2	0.302
EBI	1/3	1/5	1/5	1	1/7	0.047
EPR	3	1	1/2	7	1	0.269

Consistency index (CI) = 0.0323; Consistency ratio (CR) = 0.0288

Table 4.8: Weight of attributes

Sub criteria	Weight of Sub criteria Level 3	Criteria Level 2	IQ	REC	IMS	EBI	EPR
ROW	0.1149	0.0843	0.126	0.257	0.302	0.047	0.269
WMT	0.7028	0.0843	0.15	0.387	0.26	0.121	0.083
RMM	0.1822	0.0843	0.177	0.37	0.276	0.11	0.067
ATC	0.17	0.1632	0.082	0.173	0.221	0.082	0.442
UTK	0.443	0.1632	0.098	0.242	0.315	0.098	0.248
CEE	0.387	0.1632	0.076	0.076	0.409	0.22	0.22
ISO	0.2828	2780	0.136	0.055	0.241	0.512	0.055
GAS	0.6434	0.278	0.149	0.082	0.438	0.25	0.082
ERM	0.0738	0.278	0.149	0.435	0.255	0.115	0.046
IRR	0.199	0.4742	0.082	0.25	0.438	0.082	0.149
UNS	0.49	0.4742	0.135	0.074	0.241	0.414	0.135
OUR	0.311	0.4742	0.082	0.25	0.149	0.082	0.438

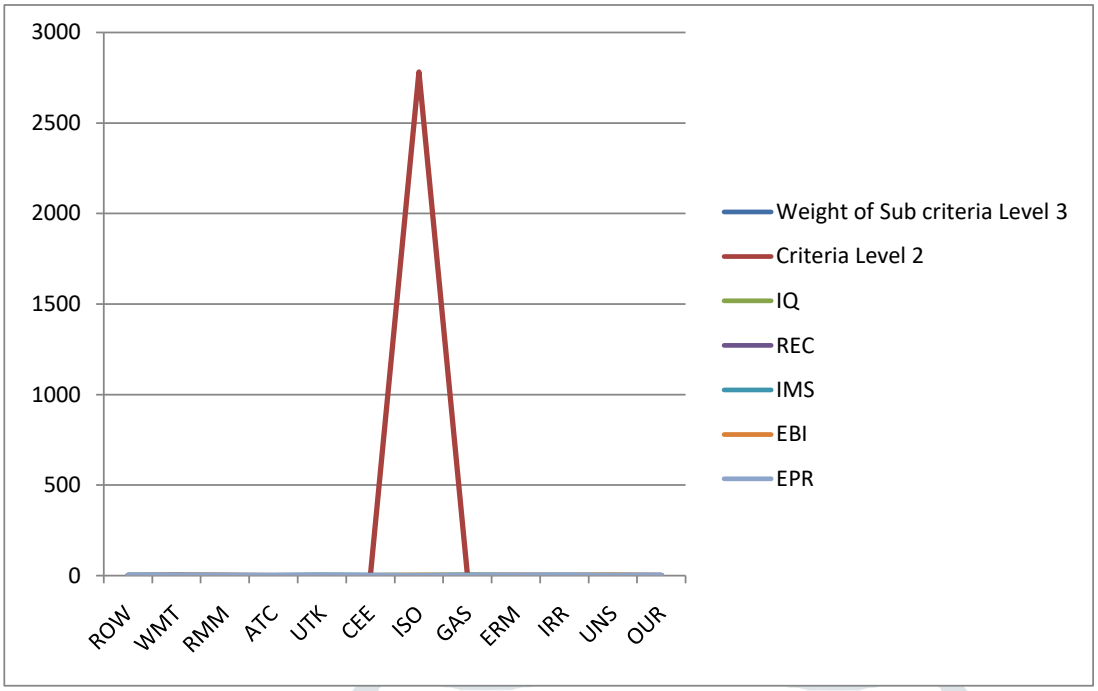

Table 4.8: Weight of attributes

IQ	REC	IMS	EBI	EPR	Weight
0.001	0.002	0.003	0.001	0.003	0.01
0.009	0.024	0.015	0.007	0.005	0.123
0.003	0.006	0.004	0.003	0.001	0.016
0.002	0.004	0.006	0.002	0.012	0.026
0.007	0.017	0.022	0.007	0.018	0.061
0.004	0.004	0.025	0.012	0.013	0.062
0.011	0.004	0.019	0.041	0.004	0.114
0.027	0.015	0.078	0.045	0.015	0.18
0.003	0.011	0.005	0.002	0.001	0.021
0.008	0.024	0.042	0.008	0.014	0.014
0.032	0.017	0.056	0.096	0.031	0.231
0.013	0.037	0.022	0.012	0.065	0.148

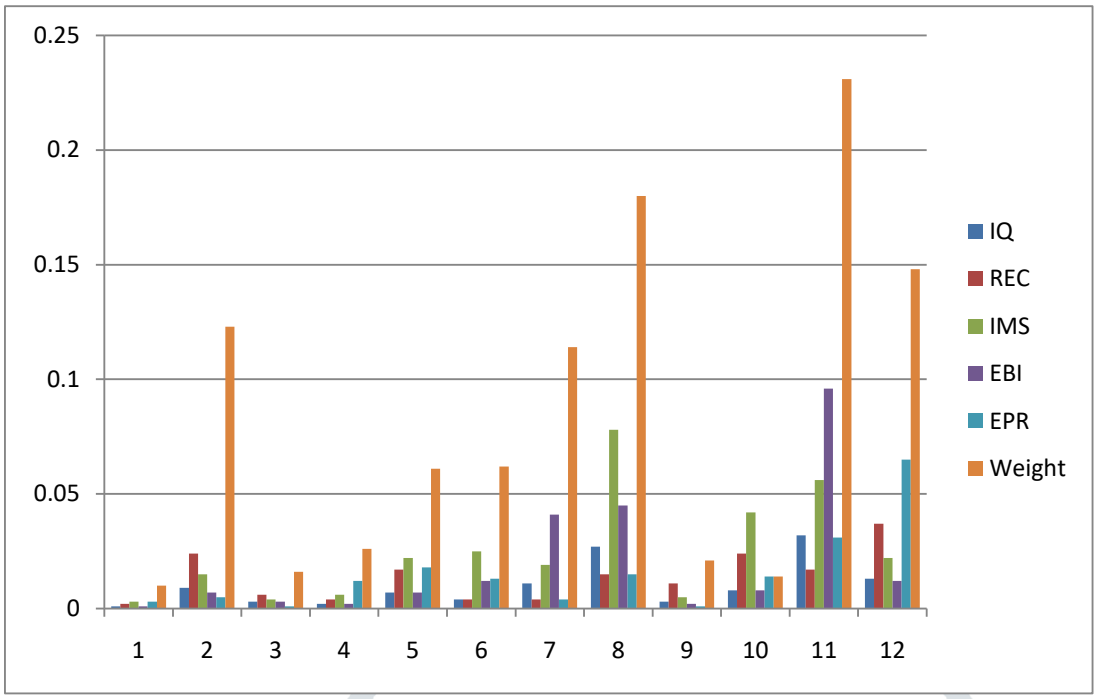

Table 4.10: Decision index for the desirability of each alternative

GSCM BENEFITS	DECISION INDEX
IQ	.119
REC	.165
IMS	.297
EBI	.236
EPR	.183

REFERENCES

1. A. A. Hervani, M. M. Helms, and J. Sarkis, "Performance measurement for green supply chain management," Benchmarking: An International Journal, vol. 12, no. 4, 2005, pp. 330-353.

2. Alvarez Gil M.J., Jimenez J.B. and Lorente, J.C. (2001), "An analysis of environmental management, organizational context and performance of Spanish hotels", Omega: International Journal of Management Science, Vol. 29 No. 6, pp. 457–471.

3. Andries F. Hof1, Michel G. J. den Elzen2 and Detlef P. van Vuuren2. "Environmental effectiveness and economic consequences of fragmented versus universal regimes: what can we learn from model studies?" International Environmental Agreements: Politics, Law and Economics (2009): 39-62.

4. Anger, N. "Emissions trading beyond Europe: Linking schemes in a post-Kyoto world." Energy Economics (2008): 2028-2049.

5. Antony, J.; Leung, K.; Knowles, G.; Gosh, S., (2002). Critical success factors of TQM investigation in Hong Kong industrials. Int. J. Qual. Reliab. Manage., 19 (5), 551-566.

6. Arimura, T., N. Darnall and H. Katayama. "Is ISO 14001 a Gateway to More Advanced Voluntary Action? A Case for Green Supply Chain Management.

7. Ashish Kumar Bhateja, Rajesh Babbar, Sarbjit Singh, Anish Sachdeva Study of Green Supply Chain Management in the Indian Manufacturing Industries: A Literature Review cum an Analytical Approach for the measurement of performance International Journal of Computational Engineering & Management, ISSN (Online): 2230-7893Vol. 13, July 2011 pp. 84 – 99.

8. Ashley S. (1993), "Designing for the environment", Mechanical Engineering, Vol.115 No. 3, pp.52–55.

9. Aragon-Correa, A., Sharma, S., 2003. A contingent natural-resource based view of the firm. Academy of Management Review 28 (1), 1–17.

10. Armstrong, J., Overton, T.S., 1977. Estimating non response bias in mail surveys. Journal of Marketing Research 14 (3), 396–402.

11. Azzone, G., & Noci, G. (1998). Identifying effective PMSs for the deployment of "green" manufacturing strategies. International Journal of Operations & Production Management, 18(4), 308-335.

12. Bai, C. and Sarkis, J. (2010). Green supplier development: Analytical evaluation using rough set theory. Journal of Cleaner Production.

13. Badri, M. A.; Davis, D., (1995). A study of measuring the critical factors of quality management. Inter. J. Qual. Reliab. Manage. 12 (2), 36-53.

14. Bagozzi, R. P.; Yi, Y., (1998). On the evaluation of structure equation models. Acad. Mark. Sci., 16 (1), 76-94.

15. Baumann, H., F. Boons and A. Bragd. "Mapping the green product development field: engineering, policy and business perspectives." Journal of Cleaner Production (2002): 409-425.