International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE) Volume 1, Issue 2 , June 2016

Ranking Strength And Threats Of Implementing Sustainble Supply Chain Management In Thermal Power Plants Of India By Vikor Analysis

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Abstract: **Now a day the thermal power sector are more focused on sustainability issues, so thermal power industriesare trying their best to modify policies for implimenting sustainble suply chain management. Ssustainable supply chain management(SSCM) practices in Indian thermal power plants is fully dependent on few enablers(Strength) and barriers(threat). So in this paper analysis done to find the most potential and influential factors for SSCM implimentation in Indian thermal power plants. So the drivers and barriers of SSCM are ranked by Vikor analysis for Indian thermal power sector,such that it will provide a framed vision to stake holders and managers to take care of maximuminfluential barriers and drivers.**

***Index Terms*—Thermal power industries, enablers, barriers, vikor analysis**

I. INTRODUCTION

Thermal power industries are in pressure due to certain major ingridients like new economic, energy saving and environmental issues. Sustainable Development (SD) practices are the most desired solution for Thermal power Industries to free them from enviormental bad impact and also helped out societies as well as governments. Sustainable development refers to industrial philosophy that aims at moving out industrial operations in such a manner that consecutively it would support Industries to expand their economical, social and environmental routine. All Though many industries like automobile and manufacturing sectors have implimented SSCM still the thermal power industries working in India are in dilema. So this research tries to find the cause of stumblingg block of SSCM adoption in Indian thermal power industries and also the main enablers of SSCM implimtation. Aawareness of these factors will help the decision makers to plan new policies and take necesary step in implimenting SSCM.

II. LITERATURE REVIEW

Growing realization about environmental and societal issues has triggered one of the greatest revolutions in human deliberation uniting the entire world in a struggle against the emissions which are formed during industrial activities[1]. Mostly the last decade has seen an increased pressure to broaden the accountability of the industries beyond economic performance, for share holders to sustainability performance, for all stake holders[2].Consequently an increased interest was exhibited by organizations in addressing sustainability in their supply chains, which has been described as Sustainable Supply Chains Management(SSCM) that incorporates the triple bottom line of sustainability[3]. The Sustainability Supply chain management not oly meant for Manufacturers/ service providers it is also playing a vital role by providing customer satisfaction to customers and also tries for the improvement of the social and environmental impacts [4].
Green or environmental aspect of SSCM focuses on minimization of the adverse environmental consequences of various activities of supply chains where as the second one, social aspect of SSCM ensures ethical as well as decent working conditions of various stakeholders including the suppliers. The third component of the SSCM, the economic aspects ensures local economic generation through purchasing from local suppliers[3].

III. RESEARCH METHODOLOGY

To find the obstructions and drivers of SSCM in Thermal power Industries,a questionairre is designed that consists of 28 questions for bariers and 25 questions for drivers.Then 200 questionaire are send to experts of diferent Indian Thermal industries by post ,mail and personal contact. The experts /executives are requested to respond each item of the Questionnaire in a five -point Likert-type scale where 1 = totally disagree, 2 = partially disagree, 3 =No opinion, 4 =Partiallyagree, 5 = totaly agree).Among them 146 responces came and the responce

rate is more than 70% or accepted level.Then the responces in terms of numbers (1 to 5)are fed for statistical analysis.

IV. RESULT AND DISCUSION

Statistical analyses like factor analysis and Kaiser–Meyer–Olkin (KMO) test is done for collected data for barriers and drivers of Indian Thermal sector. principal component method is followed in factor analysis by varimax rotation via SPSS17.0 for analysis of 146 responces . After analysis it is found that only 21 items are coming under 10 barriers and 16 items under 9 enablers. The result shows that ppercentage of total variance are 77 % for bariers and 74.3% for drivers.These values are acceptable value for the principal component varimax rotated factor loading method(Johnson and Wichern, 2002). Cronbach's alpha (α) is used to test the internal consistency of the survey data of bariers and drivers shown below in Tables 2 . KMO value is found to test the , sampling adequacy.KMO was found to be 0.65 and 0.57 that is more than minimum acceptable value.It explains that the test is proceeded correctly and no multi colinearlty or singularity is found (Othman and Owen, 2001). Bartlett test of sphericity indicates that the factor analysis processes is accurate and appropriate for testing multidimensionality (Othman and Owen, 2001).The factors coming after factor analysis under barriers of SSCM of thermal power sector are named as Resource Limitations, Performance Management, Internal Population, Operational Issues, Lack of Coordination, Legislative, Supply Chain Partner, Demanding Requirement from NGO's, Global Aspects, Unacquainted Society .

Table.1 Factor Analysis of Drivers of S SCM

Dimension	Item	Factor1	Factor2	Factor3	Factor 4	Factor5	Factor6	Factor7	Factor8	Factor9	Crobanch's alpha
Topmanagement visionand inititative	12	0.939									0.838
	15	0.623									0.804
Employee presure	8		0.829								0.94
	9		0.825								0.861
	17		0.556								0.805
Expected economic benifit	3			0.871							0.883
	1			0.701							0.809
Expected risk of non adoption	5				0.912						0.835
											0.843
	6				0.576						0.893
Government plicies	17					0.521					0.856
	2					0.901					0.804
Academic involvement	11						0.536				0.946
	20						0.887				0.878
Compititor's action	7							0.797			
											0.944
Customer expectation	13								0.876		
											0.777
Stakeholder's pressure	10									0.933	0.881

Management Initiative,Employee Pressure, Expected Economic Benefits, Expected Risks of Non-Adoption, Government Policies, Academic Involvement, Competitors Action, Customer's Expectation . **are the bariers of SSCM**

Then ranking of drivers are shown in Table.2 **VIKOR ANALYSIS**

Table 2. RANKING ACCORDING TO S, R & Q

Enablers	S	R	Q	Ranks
A	1.153845	1.153845	0.384615	5
B	0.461538	0.461538	0.153846	4
C	1.384616	1.384616	0.461539	6
D	2.076923	2.076923	0.692308	8
E	3	3	1	9
F	0	0	0	1
G	2.076923	2.076923	0.692308	7
H	0.461538	0.461538	0.153846	2
I	0.461538	0.461538	0.153846	3

After Factor analysis of Barriersshows that 21 items are coming under 10 dimensions like Resource Limitations, Performance Management, Internal Population, Operational Issues, Lack of Coordination, Legislative, Supply Chain Partner, Demanding Requirement from NGO's, Global Aspects, Unacquainted Society .These dimensions are further priortized by VIkor analysis shown in Table.3.

.After Factor analysis the result is further priortized by Vikor analysis in Table.3. $f^* = \max(f_i) = 4.08$

$f^- = \min(f_i) = 3.72$

$S_i = \sum_{j=1}^{n} w_j(f_j^* - f_{ij})/(f_j^* - f_j^-)$

$S_1 = 3 * (4.08 - 3.88)/(4.08 - 3.72) = 1.153845$

$S_2 = 3 * (4.08 - 4)/(4.08 - 3.72) = 0.461538$

$R_i = \max_{j=1,\dots,n}[w_j(f_j^* - f_{ij})/(f_j^* - f_j^-)]$ (As j=1, so S=R)

$R_1 = S_1 = 1.153845$

$R_2 = S_2 = 0.461538$

$S^* = \min(S_i)$, $S^- = \max(S_i)$

$R^* = \min(R_i)$, $R^- = \max(R_i)$

$Q_i = \{v(S_i - S^*) / (S^- - S^*)\} + \{(1-v)(R_i - R^*) / (R^- - R^*)\}$

(v=0.5)

$Q_1 = \{0.5(1.153845 - 0) / (3 - 0)\} + \{(1-0.5)(1.153845 - 0) / (3 - 0)\} = 0.384615$

$Q_2 = \{0.5(0.461538 - 0) / (3 - 0)\} + \{(1-0.5)(0.461538 - 0) / (3 - 0)\} = 0.153846$

Ranking is done by checking the values of all S, R, Q.

Table.4 VIKOR ANALYSIS
RANKS ACCORDING TO VALUES OF S,R & Q

Barriers	S	R	Q	Ranks
A	2.368421	2.368421	0.789474	7
B	0.631579	0.631579	0.210526	3
C	3	3	1	10
D	0.789474	0.789474	0.263158	4
E	0	0	0	1
F	2.368421	2.368421	0.789474	8
G	2.68421	2.68421	0.894737	9
H	0.157895	0.157895	0.052632	2
I	2.210526	2.210526	0.736842	6
J	0.789474	0.789474	0.263158	5

V. CONCLUSION

The execution of SSCM is a difficult phenomena, owing to its dependency on several factors. These factors are interrelated and their interdependencies need to be understood for effective SSCM implementation. Hence, an attempt has been made in this paper to identify potential factors those influence SSCM implementation either positively(enablers) or negatively(barriers) in the context of thermal power plants operating in India. The enablers internal for an organization is termed as strength and those are external are referred as opportunity. Similarly, the internal and external barriers are referred as weakness and threat respectively in this paper.

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