Energy management in pulp and paper industry

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Energy is a basic natural resource for development of any nation. In developing countries like ours, the role of energy has been assuming increasing significance as the availability and reliability of energy resources, both in term of quality and quantity are deteriorating.

Energy conservation has wide scope and is multifaceted. It covers the entire spectrum ranging from important house-keeping practices to retrofitting of energy recovery devices to radically new energy technology. Strategies for achieving effective energy conservation are based on thermo-dynamic and thermo-economic considerations and hence it is of utmost important for energy experts to come to grips with the thermo-dynamics of energy conservation process and the economic evolution of the different technological options.

Energy Management Scenario in Indian Pulp and Paper Industries:

pulp and Paper Mills in India constitute one of the major portions of industrial sector and these are basically power intensive, consuming about 15-25% of the production cost. Most of the Indian Pulp and Paper Mills have old and obsolete technology due to many constraints. Updating of process technology has not been taken care of in India to the desired extent and as such the specific energy consumption is more than developed countries. To oite an example, an average integrated pulp and paper mill in India consume 6 5 - 9 5 giga calories/tonne of finished paper against Swedish pulp and paper industries of 4.5 — 6.0 giga calories/tonne. Hence, it becomes imperative and need of the hour to make vigorous efforts on energy conservation. As energy in India is costly and availability is difficult, any saving on this account means direct profit.

There is less effort on this front due to protected market, lack of awareness, lack of funds, etc. The government of India has taken a few measures to promote energy conservation such as providing custom duty reduction/exemption, 100% depreciation allowance on energy saving equipments, soft loans, setting up energy conservation funds and statutory provision for projection of energy conservation measures in company's balance sheet. There have been various training programmes, seminars, workshops, etc.to create an awareness in the concerned people. The government bears a part of energy audit expenditure if carried out by recognised agencies.

Measures to Promote Energy Management :

Pulp and Paper Mills lack in 'Energy Professionals' and as such there is no systematic approach and all efforts are made haphazardly. In most of the cases, there is no energy auditing, no energy conservation department and no definite management policy on energy conservation. We feel that the following measures will promote energy conservation drive.

i) Awareness :

There is no or very little energy conservation awareness in pulp and paper mills, specially in small and medium size mills. Experts are also not available with them to assess the pattern of energy consumptions and to take suitable measures to reduce energy consumption. Even in many large mills, energy conservation approach is in primitive stage and needs radical change in management policy. Therefore, all efforts should be made in bringing awareness among the people at all levels.

ii) Educational Programmes in Schools and Colleges :

(a) In syllabus of professional courses at IIT'S,

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Engineering College, Institute of Paper Technology, Polytechnics, etc., energy conservation must be included as a compulsory course and sufficient knowledge should be given on this subject.

(b) Seminars, training programmes,correspondence courses, workshops, etc., must be arranged for different level of employees. Management must encourage their employees to participate in these programmes, and see that suitable opportunities are given to them on return to conceive new ideas and implement them in the best interest of the organization.

iii) Policy Formulation for Energy Conservation

Government of India or Apex Body of the industry must arrange meetings and seminars with policy makers like managing directors, bank authorities, pollution control agencies and concerned authority of government to formulate policies in this re pect.

iv) Publications :

Circulation of books, articles, magazines, literatures, etc., published in this regard should be carried out extensively.

v) Publicity :

Promotional publicity campaigns such as slogans posters, essay competitions, rewards and incentives, suggestion schemes, quality circles, etc., should also be carried out.

vi) Specialised Man-Power in Energy :

Recruitment of specialised man-power for energy conservation should be done with specific responsibility.

vii) Research and Development :

Promotional activities through research & development, higher studies etc., should also be started.

viii) Energy Culture:

To motivate energy culture amongst the employees, which will help not only implementation of energy conservation schemes, but they may also come out with new schemes, and will take steps to stop wastage of energy.

Action Required to Implement Energy managment :

Energy Management can be successfully implemented only when the mission of the company is well defined and the energy management system works directly under the Chief Executive of the mill. A separate "Energy Management and Conservation Cell" must be created in each mill, headed by an experienced engineer. The main activities of this department should be :—

i) To analyse, set targets and monitor power consumption figures on daily basis and to report to the Chief Executive of any abnormalities.

ii) To check inefficient use of energy in the mill.

iii) To check wastages of energy by taking remedial measures with regard to steam traps, steam valves, steam joints, insulations, unburnt coal in ash' idle running of equipments, less capacity utilisation, power factor, etc.

iv) To prepare energy conservation projects and implement them in time.

v) To implement projects and suggestions given by external energy auditors.

vi) To arrange seminars, lectures, literatures, etc. from outside experts.

vii) To help quality circles and suggestion schemes for energy conservation schemes and co-ordinate activities of sub-committees of departmental energy conservation cells.

viii) To forecast energy requirements from State Electricity Boards from time to time.

Energy Management means that the operating personnel should be able to monitor and control energy generation and consumption in the mill efficiently The Energy Audit is the key to systematic approach for decision-making in the area of Energy Management. It attempts to balance the total energy inputs with its use. Its basic functions are planning, decision-making, organising, controlling, substituting with cheaper energy, energy costing and ultimately reduction in production cost due to reduction in energy consumption. Maintenance procedures should be reviewed and introduction of energy monitoring instruments should be encouraged.

Energy Management Activities at J. K Paper Mills :

There is an Energy Conservation Cell headed by a senior and experienced engineer, who directly reports to the Chief Executive. The main activities of this cell are as follow :—

i) To apprise daily regarding plant working with reference to steam and power generation and their consumption, inclunding plant stoppages, equipment break-downs, etc.

ii) To make energy consumption projects and ensure their implementation.

iii) To follow up integrated energy management system of M/s. Sagric process Analysist.

iv) To implement the Audit Report submitted by M/s. Balmer Lawrie & Co. Ltd.

v) To analyse and assess performance of C.F. Boilers as per the report of Tata Energy Research Institute.

vi) To synchronise power generation from T.G. Sets in such a manner that power generation from D.G. Set is minimised and power consumption from Grid is maintained as per allocated load by Orissa State Electricity Board.

vii) To keep track of energy consumption i.e. power, steam, coal and fuel oil.

viii) To point out idle running of equipments to save energy.

ix) To point out follow-up jobs relating to steam leakages, condensate leakages, insulations, etc., with various departments.

x) To forecast power requirements from State Electricity Board.

xi) To arrange energy conservation seminars, special lectures etc.

xii) To co-ordinate energy conservation sub-committee meetings and to take steps to implement suggested projects.

xiii) To help quality circle members in energy conservation schemes.

xiv) To point out and follow-up regarding steam and condensate flow meters, Co_2 meters, energy meters, etc.

Besides the above Energy Conservation Cell, there aer 5 sub-committees in various plants. A senior person from process the respective area is the Convener of the sub-committee and there are members from electrical. mechanical, process and all concerned departments. The members meet once in a month and minutes are made, which are sent to the Chief Executive for his perusal. The co-ordination of activities of these committees is the responsibility of Energy Conservation Cell. Progress on energy conservation and new proposals are sent to the Director every month with estimated expenditure and savings and probable time schedule of completion.

Achievements on Energy Consumption :

Some of the energy consumption figures of our mills are as follow :—

1) Cost of total energy is 12.35% of the total cost of production for the year 1991-'92 (Annexure IA, IB, IC).

2) Cost of energy has reduced from 14.51% in 1989-90 to 13.93% in 1990-'91 to 12.35%in 1991-'92. in spite of rise in coal price, increase in transportation and electricity tarsiff (Annexure IA,IC).

3) Total process steam used/Ton of finished paper is 7.697 Tons of steam, equivalent to 5 58 G'ga Calories in 1991-'92 (Annexure 2A).

4) Steam used for co-generation is 2.45 Tons/Tonne of finished paper which is about 1.76 Giga Calories in 1991-'92 (Annexure 2A).

5) Total steam used/Tonne of finished paper including co-generation is 10.15 Tonne, equivalent to 7.35 Giga Calories (Annexure 2A).

6) Purchased power used is 479 KWH/Tonne of finished paper in 1991-'92, equivalent to 0.412 Giga Calories (Annexure 2A).

7) Co-generation is about 70% of total electrical consumption and 30% electrical energy is purchased from State Electricity Board.

8) Total Heat energy consumed including co-generation and internal fuel generation like black liquor is 11.62 Giga Calories/Tonne of finished paper in 1991-'92 (Annexure 3A, 3B).

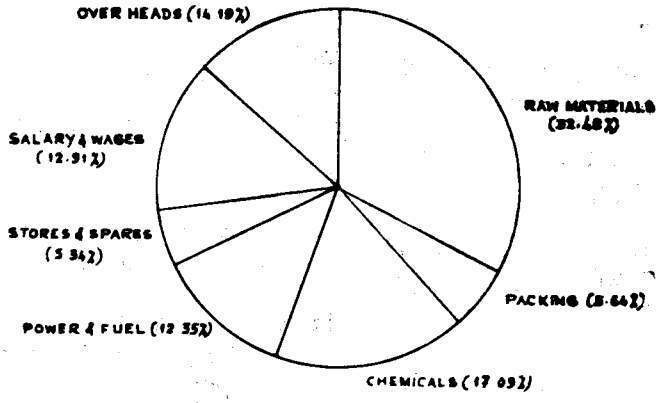
ANNEXTURE-1A

BREAK-UP TO TOTAL COST OF PRODUCTION

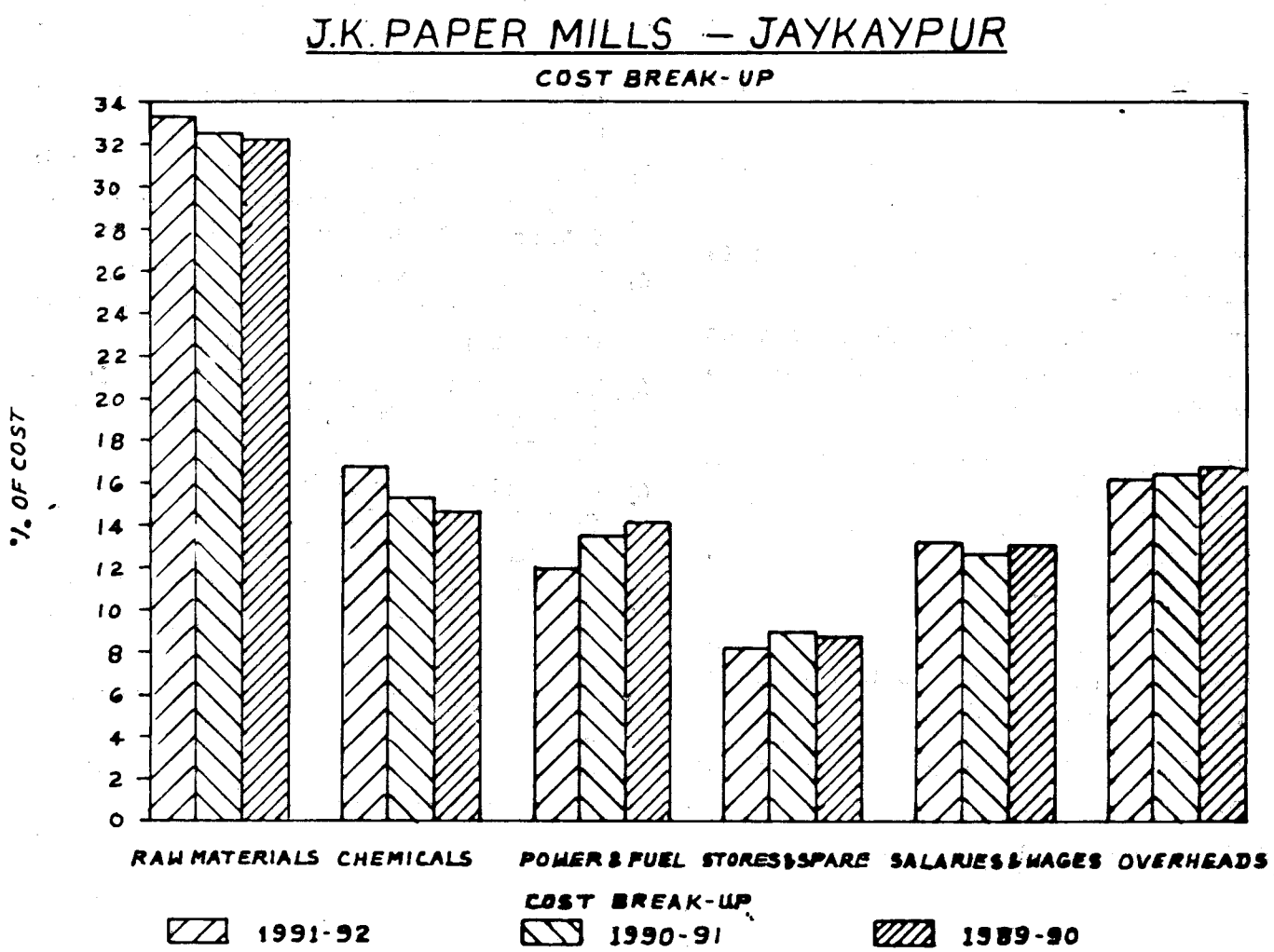
Sl. No.	PARTICULARS	% ON TOTAL COST		
		1991-92	1990-91	1989-90
1	RAW MATERIAL	32.48	33.32	32.59
2	CHEMICALS	17.09	15.76	14.96
3	POWER & FUEL	12.35	13.93	14.51
4	STORES & SPARES	5.34	5.34	5.17
5	SALARIES & WAGES	12.91	11.51	11.87
6	OVER HEADS	14.19	14.75	15.48
7	PACKING COST	5.64	5.39	5.42
8	TOTAL COST OF PRODUCTION	100.00	100.00	100.00

ANNEXTURE-1B

J.K.PAPER MILLS -JAYKAYPU
COST BREAK-UP FOR 1991-92



Annexure IC



ANNEXTURE 3A

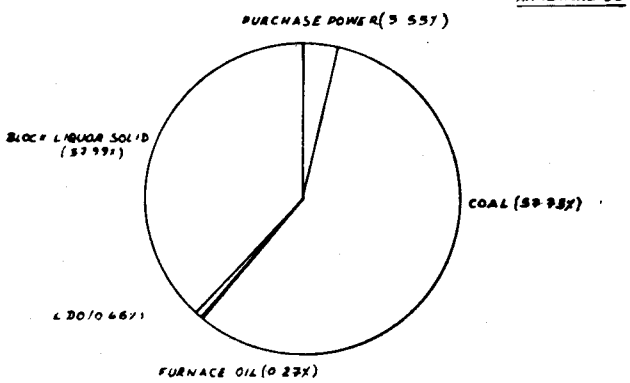
JK PAPER MILLS JAYKAYPUR

TOTAL ENERGY INPUT/KG OF FINISHED PAPER

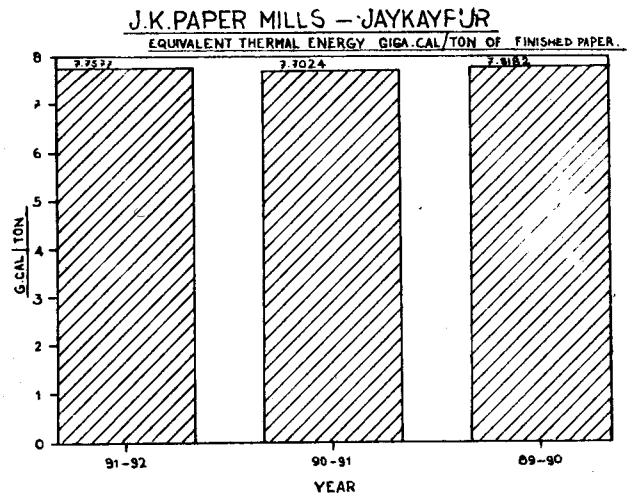
S.No	PARTICULARS	89 90		90 91		91 92	
		K CAL	%	K CAL	%	K CAL	%
1	PURCHASE POWER	398	3 20	431	3 54	412	3 55
2	COAL (STEAM+ SELF GEN)	7629	61 38	7276	59 76	6709	57 73
3	FURNACE OIL	52	0 42	60	0 49	51	0 27
4	L DO	160	1 29	99	0 82	54	0 46
	SUB TOTAL	8239	66 29	7866	64 61	7206	62 01
5	BLOCK LIQUOR SOLID	4190	33 71	4309	35 39	4415	37 99
	GRAND TOTAL	12429	100-00	12195	100-00	11621	100-00

ENERGY INPUT/KG OF FINISHED PAPER

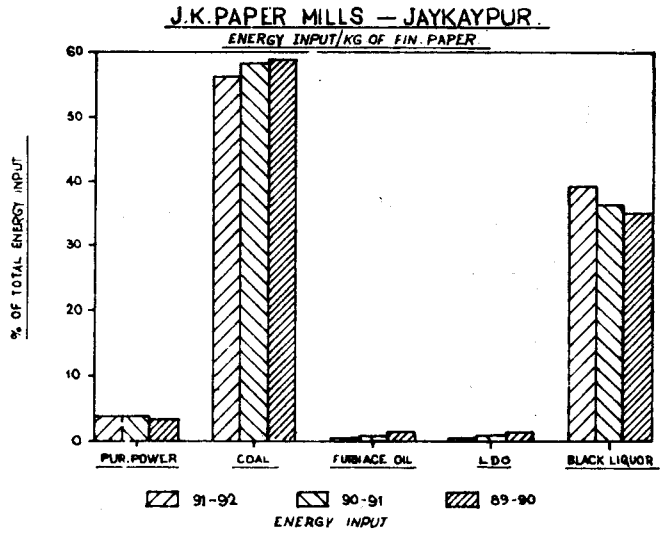
ANNEXTURE 3C



Annexure 2B



Annexure 3B



9) Heat energy available from internal fuel like black liquor is 38.0% of total heat required in 1991-'92 (Annexure 3A, 3B).

Energy consumption figures plantwise are given in Annexure 2A. There is a constant effotr to reduce energy consumption and management is putting their effort to create awareness among the employees at all levels and many energy saving schemes are in hand such as conversion of chain sroker boilers into FBC boilers, replacement of inefficient pumps and motors, application of energy saving equipments, etc.

Conclusion :

Almost all the mills in India have plenty of scope for energy conservation. It is a matter of management policy to focus on this subject. The targets and goals are to be defined. Both operating and maintenance employees must be motivated. The new technology has to be adopted.

House-keeping has to be upgraded. Each mill should employ energy experts or should take help from outside agencies. The economical pay-back period for most of the energy conservation schemes are within 2-3 years. We feel that with earnest effort good results can always be attained.

Annexure –2A

TOTAL ENERGY USED FOR PRODUCTION

SL. NO.	PARTICULARS	91-92		90-91.		89-90	
		H.P. STEAM/ TON OF FIN. PRODN.	EQ.THER-MAL ENERGY G.CAL/T	H.P. STEAM/ TON OF FIN. PRODN.	EQ. THER-MAL ENERGY G.CAL/T	H.P. STEAM/ TON OF FIN. PRODN.	EQ.THER-MAL ENERGY G.CAL/T
		TON	G.CAL	TON	G.CAL	TON	G.CAL
1	Pulp Mill, including Digester	1.1700	0.8424	1.1700	0.8424	1.1340	0.8160
2	Evaporators	1.5500	1.1600	1.6370	1.1780	1.7330	1.2480
3	Causticizers	0.4400	0.3170	0.4100	0.2950	0.4600	0.3310
4	P M I	1.3530	0.9740	1.4080	1.0140	1.3540	0.9750
	II	0.3195	0.2300	0.2810	0.2020	0.2610	0.1880
	III	0.8921	0.6423	0.9040	0.6510	0.8640	0.6220
	IV	0.3429	0.2470	0.3621	0.2610	0.4620	0.3330
5	C.F.Boilers (Int. consumption)	0.7700	0.5500	0.7660	0.5510	0.7820	0.5630
6	L.F.Boilers (Int. consumption)	0.8600	0.6190	0.7490	0.5390	0.7690	0.5540
7	Total Process Steam	7.6975	5.5817	7.6871	5.5334	7.8190	5.6300
8	Power House (Co-generation)	2.4500	1.7640	2.4180	1.7410	2.4860	1.7900
9	Sub-Total	10.1475	7.3457	10.1051	7.2744	10.3050	7.4200
*10	Purchased Power(kWH)	479	0.4120	501	0.4310	463	0.3982
11	Total G.Cal		7.7577		7.7054		7.8182

* Excluding Colony, P.D. Plant and Coating Plant.

BASIS : 1 Kg. H.P. Steam = 720 K.Cal (50 K.Cal considered for condensate).

1 kWH = 860 K.Cal.
