CHALLENGES AND ACHIEVEMENTS OF PERFORM, ACHIEVE & TRADE (PAT) SCHEME IN INDIAN PULP AND PAPER SECTOR - WAY AHEAD FOR ENERGY EFFICIENCY IMPROVEMENT IN PAT PHASE-2.

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Abstract

The pulp and paper sector has been identified as one of the energy intensive sectors under Perform Achieve & Trade (PAT) scheme by Ministry of Power, Govt. of India. Out of eight energy intensive sectors, 31 pulp and paper mills consuming 30,000 metric tonnes of oil equivalent (TOE) per annum and above were notified as Designated Consumers (DCs) and assigned 1.84% of the total National energy saving target (equivalent to 0.123 million TOE) in the first PAT cycle from 1 April 2012 to 31 March 2015. These 31 pulp and paper DCs have used the PAT-1 scheme as an opportunity to implement measures to improve energy efficiency in order to achieve the assigned specific energy reduction targets. Benefit of Compliance under PAT scheme is issuance of tradable ESCerts (Energy Saving Certificates) per TOE energy saving achieved above the target set for each DC. In PAT-1, 25 pulp and paper DC's achieved savings of around 0.289 MTOE against the target of 0.119 MTOE.

After completion of PAT-1, the energy saving targets for PAT phase-2 were notified for 31 DCs during March 2016. During PAT cycle - II, target of 0.15 MTOE has been assigned to these pulp and paper DC's for the period from April 2016 to March 2019. In present article, achievements of PAT-1 cycle by the pulp and paper DC's along with the challenges ahead for the industry are discussed to achieve the notified national energy savings targets in the PAT-2 cycle.

Introduction

Energy is an essential input contributing 20-30% towards costs of paper manufacture and it is the only variable which is controllable to make the paper industry cost competitive. The pulp and paper sector has been identified as one of the energy intensive sectors which has been notified along with other energy intensive sectors under the Perform Achieve & Trade (PAT) scheme by Ministry of Power specifying energy saving targets to be achieved during specific period. The National Energy Savings target in the first PAT cycle was 6.686 million metric tonne oil equivalent (MTOE) by 478 DCs from eight energy intensive sectors. During the first phase of the PAT cycle 31 notified pulp and paper DCs consuming 30,000 metric tonnes of oil

equivalent (TOE) per annum and above were notified (1). The target assigned for pulp and paper sector is only 1.84% of the total National energy saving target. These 31 DC's during PAT cycle I had reported consumption of 2.09 million tonne oil equivalent (MTOE) and were assigned an energy reduction target of 0.123 million TOE in the first PAT cycle during the period from 1st April 2012 to 31st March 2015. The designated consumers in pulp and paper sector were grouped into different categories based on their raw material usage, pulping process adopted, and the final products manufactured.

The 31 pulp and paper DCs have used the PAT-1 scheme as an opportunity to implement measures to improve energy efficiency in order to achieve the assigned specific energy reduction targets. The first cycle of PAT scheme has encouraged the paper and pulp sector to optimise their processes and to introduce state-of-the-art clean and green technologies thereby enhancing its competitiveness through a market based mechanism (2). Benefit of Compliance under PAT-1 was issuance of tradable ESCerts (energy saving certificates) per TOE energy saving achieved above the target set for each of the DC. During the PAT cycle I, out of 31 pulp and paper DC's, 4 units had closed operation and two mills were reported under BIFR. Rest 25 DC's submitted their energy consumption details in the assessment year, 2015 and the analysis of production and energy consumption data has revealed that these 25 pulp and paper DC's achieved savings of around 0.289 million TOE against the target of 0.119 MTOE million TOE .

Subsequently Ministry of Power notified energy savings targets for PAT cycle II on 31st March 2016. Table -1 indicates the breakup of 621 DC's notified under PAT-2 from various energy intensive sectors (3). During the PAT cycle II the a target of 0.15 MTOE has been assigned to 29 pulp and paper DC's Table -2(A) and 2(B) show summary of overall and pulp & paper sector targets for PAT cycle I and II and the overall and pulp and paper sector's achievements during PAT cycle I.

Table 1 : Designated Consumers notified under PAT-2 showing Energy Consumption and Saving Targets

S.No.	Sector	No. of DC's	Energy Consumption (MTOE)	Energy Savings (MTOE)
1	Thermal Power Plant	144	120.16	3.33
2	Cement	111	21.43	1.12
3	Aluminium	12	10.66	0.57
4	Chlor Alkali	24	1.77	0.101
5	Pulp & Paper	29	2.68	0.15
6	Iron & Steel	71	41.44	2.14
7	Textile	99	1.48	0.087
8	Fertilizer	37	8.25	0.446
9	Refinery	18	18.50	1.10
10	Railways	22	1.39	0.033
11	DISCOMS			
	Total	**621**	**226.76**	**8.869**

Table 2 (A) Summary of PAT-1 and PAT-2 Overall Scenario of Energy Savings Targets and Achievements of PAT-1.

	Target (MTOE)	Achieved (MTOE)
PAT-I	6.626	8.67
PAT-II	8.869	...

Table 2 (B)
Summary of PAT-1 and PAT-2 Pulp & Paper Sector Energy Savings Targets and Achievements of PAT-1.

	Target (MTOE)	Achieved (MTOE)
PAT-I	0.119	0.289
PAT-II	0.15	...

The present article highlights achievements of PAT-1 cycle by the pulp and paper DCs along with the challenges ahead for the industry are discussed to achieve the notified national energy savings targets in the PAT-2 cycle.

Significance of Energy Efficiency Improvements in Pulp and Paper Sector

The paper industry is a high priority one, with links to the cultural, societal and industrial development of the country. The use of paper by a society is often taken as a yardstick of its development. After independence, paper production in India grew rapidly from 1.37 lakh tons per annum to 14 million tons in 2014. Although, India is the seventh largest country in the world and has the second highest population, the production of paper and paperboard in India is only 1.6% of the total world's production. The per capita consumption in India is 11 kg as against 42 kg in China, 22 kg in Indonesia, 25 kg in Malaysia, and 312 kg in the US. This is expected to change in the years to come as the Indian populace adopts an increasingly Westernized life style. The growth of the paper industry is driven by market demand and also depends on the country's overall industrial growth and literacy. A forecast based upon extrapolating the trends in growth of paper consumption predicts that 16.5 million tons of paper will be used in 2016-17, and 25.3 million tons, in 2026-27 (4).

The Indian paper industry has a highly fragmented structure consisting of small, medium and large sized paper mills. The raw materials most commonly used for manufacturing different varieties of paper, paper board and newsprint are wood, agro residues and recycled /waste paper. In order to meet future demand the Indian pulp and paper industry must address issues related to raw material resources, infrastructure, capital, etc. Most small and medium mills use old and obsolete machines/technology, thus making upgradation and energy efficiency major issues to be addressed; these issues lead to high costs of production, environmental problems, inferior quality, and lower economies of scale.

Any improvements in energy efficiency brought about by modernizing processes and upgrading technology are capital intensive; therefore the incentive-based mechanism under the PAT scheme will encourage the adoption of state-of-the-art technologies in PAT cycle II also.

Energy efficiency improvements and challenges the sector faces

There is much scope for both small and large scale measures; while small measures will result in marginal savings, existing technology must be upgraded in different units to achieve the energy efficiency targets. Environmental challenges are one of the most serious consequences of using outdated technology and need to be addressed to fulfil the environmental compliance imposed by Govt. of India in its Charter for Corporate Responsibility.

There have been remarkable technological developments in the paper industry, particularly in the US and Europe. These have resulted in more economic use of cellulosic raw materials and chemicals, reduced pollution, and more cost-effective production. Countries close to India such as China, Malaysia, Indonesia and Thailand have kept pace with technological advancements benefitting their paper industry. In India, improved technologies are required in the following areas of the pulp and paper industry to achieve to targets of energy and environmental compliance (5, 6):

- Raw material handling, pulping, pulp washing and bleaching
- Paper machine
- Chemical recovery
- Power generation
- Effluent load and colour removal
- Solid waste management
- Air pollution control

Indian pulp and paper sector is complex due to variety of raw materials used by the industry, diversity of products, variation in process operations and obsolescence of technology, equipment and process operations. Setting up and appropriation of the energy savings targets for the pulp and paper DCs was therefore a challenge and therefore the Gate-to-Gate concept was adopted to work out the SEC taking into consideration the raw material, products and technological level of the industry. The baseline production and SEC was worked out by collecting the data from industry about their

production and performance over a period of 3 to 5 years. Based on the performance of the DCs, energy savings targets were apportioned and assigned to the individual DC for compliance within a period of 3 years. After completion of 3 years, the production and energy consumption data in final the year (i.e. assessment year) was collected to work out the final SEC achieved by the industry. The assessment year SEC was compared with the baseline year SEC to find out the energy saving and was computed as TOE saved by the industry.

Further considering the dynamic nature of resources availability (raw material, fuel and power), market conditions dictating the demand for different types of papers, technology status, environmental compliances etc, suitable normalisation factors were worked out to compare the assessment year SEC with the baseline SEC. Normalisation factors considered during the PAT cycle I were to used to normalise the energy used to produce various type of products by the industry in the assessment year against the baseline year, fuel used, fuel quality variations, own power generation scenario & use of grid power, environmental protection initiatives taken up by the industry etc. Based on the exhaustive work by Bureau of Energy Efficiency (BEE), GIZ and CPPRI experts, the SEC were normalised for each DC for its assessment and baseline energy consumptions and after working out the savings of energy consumption above the assigned targets, the ESCerts were finalised as rewards. Details of the achievements of the pulp and paper DCs are discussed in the next section.

Achievements of Indian Pulp & Paper Sector in PAT cycle 1

Designated Consumers in the pulp and paper sector have taken up the challenge in PAT cycle 1 to achieve the energy efficiency targets and many mills have made remarkable achievements. The work done by Bureau of Energy Efficiency in implementing the PAT cycle 1 is an unique example and has helped the pulp and paper sector to identify inefficiencies in their processes and initiate plans to increase energy efficiency & adopt measures to improve their overall specific energy consumption (SEC). The results of PAT cycle 1 highlight the efforts made by the industry in achieving the goals under the PAT scheme of National Mission for Enhanced Energy Efficiency (NMEEE).

The 25 pulp and paper mill DC's have achieved 0.289 million TOE energy savings during the PAT-1 phase against the target of 0.119 million TOE. This achievement has been possible due to remarkable measures taken up by mills. The preliminarly analysis of energy saving measures by pulp and paper industries during PAT cycle 1 has indicated that only 10 DC's out of 25 pulp and paper mills have achieved about 85% energy saving target with the remaining 15% being achieved by the other 15 DC's. The highest energy saving achievers have made capital investments involving state-of-art technological inputs and therefore these mills have been able to achieve significant reduction in their Specific energy consumptions (SEC). The achievements of other DC's, however, has been a result of process efficiency improvements involving low capital intensive measures.

Challenges of Indian Pulp & Paper Sector in PAT cycle II

The target assigned in the PAT cycle II for 29 pulp and paper DCs are shown in Table-3. The target of 0.15 million TOE assigned in the PAT cycle II is higher than the target of 0.119 million million TOE provided during PAT cycle I. Industry associations in their representations have shown their concern about the higher target and it is felt that since the target achieved in the PAT-1 was easier due to larger scope, but in PAT cycle II it may not be that easy. Industry associations feel that larger capital investment may be required in PAT cycle II by the DCs to achieve the assigned target. However, the analysis of measures adopted by the DC's in PAT cycle 1 has shown that the larger section of the industries still have scope to adopt State-of –art technologies and therefore there is still a scope for achieving the target savings. In order to meet the challenges to achieve the targets of energy saving in the PAT cycle II, introduction of appropriate technological solutions and expert services are required for the pulp and paper sector.

Table-3 List of Pulp and Paper DCs for PAT cycle II

S.No.	Designated Consumer		Baseline energy consumption norms and standards in metric tonne of oil equivalent (TOE) per unit of product for the baseline year 2014-2015		Energy consumption norms and standards metric tonne of oil equivalent (TOE) per unit of product for target year 2018-2019
(1)	(2)		(3)		(4)
	Name, address and state	Registration number	Specific energy consumption (TOE/tonne of product)	Equivalent Major Product Output (tonnes)	Specific energy consumption (TOE/tonne of product)
1.	BILT Graphic Paper Products Ltd., Village BhadalwadiBhigwan, Talindapur, Dist-Pune, Pin-413105, Maharashtra	PNP0001MH	0.3510	272047	0.3417
2	ITC Limited-PSPD, Unit Bhadrachalam, Andra Pradesh	PNP0002AP	0.5690	556934	0.5379
3	Tamil Nadu News Print and Paper Limited, Kagithapuram, Gram Newsprint, Dist- Karur, Pin-639136, Tamil Nadu	PNP0003TN	0.7680	373259	0.7234
4	Century Pulp and Paper, GyansyamadhamLalkua, Dist. Nainital, Pin 262402, Uttrakhand	PNP0004UK	0.7770	308205	0.7385
5	JK Paper Ltd. , Unit: CPM, PO Central Pulp Mills, Fort Songadh, Dist-Tapi, Pin-394660, Maharashtra	PNP0005GJ	0.7560	178621	0.7195
6	BILT Graphic Paper Products Ltd., P.O. Ballarpur Paper Mills, Dist- Chandrapur, Pin-442901, Maharashtra	PNP0006MH	0.5570	247924	0.5335
7	Star Paper Mills Limited, B.D. Bajoria Road, Saharanpur, Pin-247001, Uttar Pradesh	PNP0007UP	0.3210	75089	0.3106
8	The Andhra Pradesh Paper Mills Limited, Unit APPM, Rajamundry, Pin-533105, Andhra Pradesh	PNP0008AP	0.2520	171335	0.2456
9	The West Coast Paper Mills Ltd., P.B. No. 5, Bangur Nagar, Dandeli, Pin-581325, Karnataka	PNP0009KA	0.5860	303883	0.5512
10	Seshasayee Paper and Boards Limited, Pallipalayam, Erode, Pin-638007, Tamil Nadu	PNP00010TN	0.6400	119573	0.6090
11	JK Paper Mills, At/PO: Jaykaypur, Rayagada, Pin-765017, Odisha	PNP0011OD	0.4620	278527	0.4459
12	Ballarpur Industries Ltd., Unit Sewa, Gagnapur, Jeypore (RS), Dist. Koraput, Pin-764002, Odisha	PNP0012OD	0.9730	66489	0.9014

Table-3 List of Pulp and Paper DCs for PAT cycle II - *Contd...*

13	Ballarpur Industries Ltd., Unit: Shree Gopal- BILT, Yamunanagar, Pin-135001, Haryana	PNP0014HR	0.9270	79344	0.8721
14	Nagaon Paper Mill, PO: KagajnagarJagiroad, Pin-782413, Assam	PNP0015AS	1.1320	92651	1.0351
15	Cachar Paper Mill P.O. Panchagram, Dist-Hailakandi, Pin-788802, Assam	PNP0016AS	0.9890	74670	0.9150
16	Orient Paper Mill, P.O. Amlai Paper Mill, Dist. Shahdol, Pin-484117, Madhya Pradesh	PNP0018MP	1.1560	79762	1.0707
17	ITC Ltd., Tribeni, West Bengal	PNP0019WB	1.0800	31907	0.9918
18	Hindustan Newsprint Limited, Kottayam, Kerala	PNP0020KL	0.6440	101986	0.6126
19	Emami Paper Mills Limited, Balgopalpur, Post Rasulpur, Balasore, Pin-756020, Odisha	PNP0021od	0.4430	132517	0.4199
20	Rama Newsprint and Paper Ltd., Village Barbodhan, TalukaOlpad, Dist-Surat, Pin-395005, Gujrat	PNP0022GJ	0.6160	102641	0.5714
21	ITC Ltd., Kovai, Thekkampatty Village, Mettupalayam, Coimbatore, Pin-641113, Tamilnadu	PNP0024TN	0.2630	101267	0.2549
22	Kuantum Papers (ABC paper Ltd.), Village Sailakhurd, Dist-Hoshiarpur, Punjab	PNP0026PB	0.4240	99550	0.481
23	Delta Paper Mills Ltd., Vendra, PalakoderuMandal, West Godavari Dist, Pin-534210 Andhra Pradesh	PNP0029AP	0.6820	40128	0.6410
24	Trident (Abhishek Industries Ltd.), Mansa Road, Dhaula, Barnala, Punjab	PNP0030PB	0.5700	152996	0.5413
25	Satia Paper mills Ltd., Muktsar-Malout Road, Village-Rupana, Muktsar, Pin-152026, Punjab	PNP0031PB	0.7020	81736	0.6585
26	Ruchira Papers Ltd. Kalaamb, Himachal Pradesh, Pin-173030	PNP0032HP	0.5314	43387	0.5065
27	Yash Papers, faizabad, Uttar Pradesh	PNP0033UP	0.8730	37800	0.8058
28	DevPriya Products, Village-Saini, Meerut, Uttar Pradesh, Pin-250002	PNP0035UP	0.3701	106049	0.3540
29	Sripathi Papers & Boards Ltd., Sivakasi, Tamil Nadu, Pin-626130	PNP0035TN	0.4822	102018	0.4548

The issues and concerns of the industry associations have been discussed on various forums by Bureau of Energy Efficiency. Based on the discussions with industry associations, it has been decided to develop following normalization factors for PAT Cycle – II keeping in view the complexity of the Pulp & Paper Sector.

- GSM	- Biomass as fuel
- Capacity Utilization	- Number of quality changes
- Raw Material Mix	- Grid Consumption
- Multi-quality and grade machine	- Product and Technology Development
- Paper finishing loss	

A Technical Sub-Committee consisting of members from the industry has been constituted to formulate the normalisation factors for the industry by visiting the representative DCs premises and collecting the data in such a manner that it encompasses all varieties of raw materials and products.

Pulp & Paper Industry has acquired various best practices and measures by means of enriched experience during PAT-1 cycle. This enriched experience is unique and has accelerated the energy efficiency drive in the industry initiated by various DCs during PAT cycle 1. In order to provide a common knowledge sharing platform for whole pulp and paper sector and to set up benchmarks for the industry a Technology Audit / benchmarking report of Pulp and Paper sector, containing inputs about on international best abroad is being prepared.

Conclusions

The initiatives taken up by the DC's during PAT cycle 1, to achieve the assigned energy saving targets and over achieving them significantly, has indicated that Indian pulp and paper industry is progressive and geared up to take the challenges being faced amidst the adversities. The achievements of the industry are remarkable and it clearly indicates that industry will meet all the targets assigned for PAT cycle II, as well as the demand forecasted for the paper sector in near future.

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