Parivesh

A News Letter from ENVIS Centre - Central Pollution Control Board

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Editorial

Pulp and paper industry in our country is one of the core industries. Indian paper mills were originally designed for processing bamboo. As the supplies dwindled, mills were forced to use hardwood. Later on, to reduce the pressure on forest -based raw material,large scale use of non-wood raw material was promoted. Now, India is the second largest manufacturer of non-wood pulp-based paper and paper industry particularly in the pulp making process has become an area of serious concern. The problem is more acute in case of small scale units.

The Regional Office of Asia and Pacific (ROAP)of the United Nations Environment Programme (UNEP) is helping to promote the concept of sustainable industrial production in the region. As the part of its Swedish-funded Network for industrial Environmental Management (NIEM). (ROAP) is promoting cleaner Production (CP) options in pulp and paper industry in India. The central Pollution Control Board (CPCB)has been involved in the NIEM project and its achievements, along with an overview of the pulp and paper industry in India is presented in this issue of PARIVESH.

We hope the contents of this issue will promote cleaner production in the industrial sector in the country. My colleagues, Sh.Upendra Nath Singh , and Sh.Mahendra Pandey have collated and compiled the information for this issue.

(Dilip Biswas)
Chairman, CPCB

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CLEANER PRODUCTION OPTIONS FOR PULP AND PAPER INDUSTRY

PULP & PAPER INDUSTRY IN INDIA :

Although paper has many uses, its most important contribution to modern civilization is its use as a medium to record knowledge. Paper represents the perfect adjustment of a basic material to any use and purpose. Its use is increasing, as it is constantly being substituted for another material and it does the job more efficiently and economically. Paper is believed to have been first made in China from rags, bark fibers and bamboo as early as 105 AD. The Chinese soaked pieces of bamboo for more than a hundred days and boiled in milk of lime for eight days and nights to release fibre.

The industry is primarily dependent upon forest-based raw materials. Large scale mechanized technology of papermaking was introduced as early as 1905. The Indian pulp and paper industry at present is very well developed and established. In 1951, there were 17 paper mills, which increased to 75 during 1975, and at present there are 380 units.

Zone-wise Capacity of Paper & Paper Board Units

Zone/States	No. of Units	Annual Installed Capacity (tones)
North Zone	62	3,32,265
Uttar Pradesh	16	1,50,910
Haryna	19	1,68,980
Punjab	08	38,850
Rajasthan	15	68,800
Himchal Pradesh	01	3,000
Chandigarh	01	3,300
Jammu & Kashmir	19	4,34,120
South Zone	14	2,02,370
Andhra pradesh	21	2,22,372
Karnataka	03	39,350
Tamil Nadu	01	9,000
Kerala	50	3,24,579
Pondicherry	53	5,77,320
West Zone	16	1,77,600
	21	2,63,830

Gujarat	08	91,500
Maharashtra	07	2,21,572
Madhya Pradesh	04	1,88,000
East Zone	01	33,000
West Bengal		
Bihar		
Orissa		
Assam		
Nagaland		

The first paper mill in India was set up at Sreerampur, West Bengal, in the year 1812. It was based on grasses and jute as raw material. Since then the raw material for the paper industry underwent a number of changes and over a period of time, besides wood and bamboo, other non-conventional raw materials have been developed for use in the papermaking. Now, the paper industry is categorized as forest-based, agro-based and others (waste paper secondary fibre, bast fibers and market pulp). Their contribution in the manufacturing sector is 42.9, 28.1 and 29.0 per cent respectively.

The pulp & paper industries in India have been categoriesed into large-scale and small-scale. The large-scale paper industries, having capacity above 24,000 tonnes per annum, have installed capacity of 2.0 million tones. The rest falls under the small-scale category with an approximate installed capacity of 1.95 million tones.

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ENVIRONMENTAL PROBLEMS AND CLEANER PRODUCTION OPTIONS :

The socio-economic importance of paper has its own value to the country's development at it is directly related to the industrial and economic growth of the country. The per capital consumption in India is 2.5 kg. per year, while the Asian average itself is 18 kg. At present in our country, the 380 pulps and paper industries have an aggregate capacity of 3.95 million tones.

Looking into the serious nature of pollution, the pulp and paper industry in India has been brought under the 17 categories of highly polluting industries. The paper industries, under this category having capacity above 30 tonnes per day, are 96 in number. Out of these, 62 units have the required facilities to comply with the effluent/emission standards while 19 units do not have adequate treatment facilities. 15 units have been closed down.

The small units using agro-residue as a raw material are a threat to the environment. In India, the total installed capacity of small pulp and paper industry is about 1.95 million tones per year. These units discharge the black liquor along with unrecovered chemicals, which is difficult to treat since lignin in the black liquor is not easily biodegradable. The presence of caustic in black liquor results in increase in dissolved solids in wastewater streams. The sodium concentration renders sodium toxicity if the effluent is discharged on soil for irrigation. The discharge of untreated black liquor also results in the loss of valuable chemicals. It has been estimated that discharge from a 30 tonnes per day agro-based paper mill is equivalent to the pollution load from a 100 tonnes per day mill with chemical recovery. The major problem is the lack of economically feasible methods of chemical recovery from the black liquor of the small pulp and paper mills.

The presence of silica and small fibers make the task of recovery difficult. Another problem is low concentration of the black liquor from the agricultural residues. The agro-based paper mill should either upgrade the scale of operation for the economic affordability of the process or for the clusters of such mills a mother pulping and common chemical recovery plant should be set up on lines of the common effluent treatment plants. The Hindustan Newsprint Limited, Kerala, has developed the process of desilication, to remove silica, through selective precipitation and carbonization. The black liquor from rice straw may contain 11-14% of silica as dry mass, while that of wheat straw contains 4-8% . The Uttar Pradesh based M/s Amrit Papers Limited, has also developed a chemical recovery technology, best suited for bamboo, bagasse, and straw and reeds-based paper mills. In the process, black liquor is concentrated and then mixed with solid fuel and precipitated sludge. It is burnt to a semi-solid mass, which is leached and as a result green liquor is formed. It is later carbonized to precipitate the silica. This silica is of high purity and may be used for other purposes. This process has been successfully displayed on a pilot scale, but its economy for small-scale agro-based paper mill is still to be assessed.

Direct alkali recovery system has been developed by the Central Pulp & Paper Research Institute (CPPRI). The process involves combustion of semi-concentrated soda black liquor admixed with ferric oxide in a fluidized bed boiler. The sodium ferrite granules are further hydrolyzed for the recovery of sodium hydroxide and ferric oxide. The ferric oxide is used again in the fluidized bed boiler. This process is yet to be tried in small paper mills.

By adopting the cleaner pulping process, the generation of black liquor can be restricted. An attempt in this direction has been made by M/s Pudumjee Pulp & Paper Mills Limited, Pune, by developing and operating clcohol-based pulping. The process is still in the pilot scale. In this process, after pulping of the agro-residues, the solvent is recovered through distillation and pure lignin is recovered as a byproduct. Most agro-based pulp & paper industries belong to small sector, producing as low as 5 tonnes per year of paper. The installation of the chemical recovery system is difficult for them due to high initial cost and a prolonged payback system. The concept of the common chemical recovery can be a solution for such industries situated in a cluster. The black liquor can be suitably collected from each of the units and processed at common chemical recovery plant. There are at least four such sites in the country having number of paper industries in the vicinity.

Traditionally, the bleaching of pulp is performed with the help of elemental chlorine. The bleaching is essential for the improvement in brightness, cleanliness and removing impurities. The advantages of chlorination are that it is most effective delignifying agent and at the same time least expensive of all the bleaching chemicals. It is also excellent for the shive and dirt removal. But, in the recent years, chlorine is viewed as enemy of the environment, as it destroys the stratospheric ozone layer, and produces dioxin and organic chlorides. Its low consistency produces a large volume of acidic effluent, which has to be neutralized before waste treatment. It degrades pulp to some extent and is corrosive in nature.

These days, chlorine is gradually being replaced with several other chemicals, such as chlorine dioxide, oxygen, ozone and hydrogen peroxide. Oxygen was first applied successful for bleaching of dissolved pulp by Russian scientists, V M Nikitin and GL Akin, in the fifties. Since installation of the first oxygen- bleaching plant in South Africa in 1969, this technology found its importance, as reflected by over 12,000 tonne per day of oxygen bleached pulp production per day worldwide. While reducing the pollution load remains the incentive for the first oxygen-bleach plant, later on, other benefits such as lower operating costs and savings of bleach chemicals in subsequent stages, can be realized. Moreover, oxygen is non-toxic and non-corrosive. The only disadvantage with this system is that it needs high temperature and pressure, and increases load to recovery system. In the oxygen bleaching, in addition to delignification, significant brightness is also gained, while in chlorination there is no improvement in pulp brightness.

The use of chloride dioxide as bleaching agent assures very high and stable brightness. It is best for shive and dirt removal, and is highly selective in nature, for which there is little degradation to pulp. It produces less organic chlorine than either chlorine or chlorates. The problems associated with the use of chlorine dioxide is that it is highly explosive, corrosive and toxic. There is possibility to use hypo chlorite for bleaching in the pulp mills, which is less expensive than chlorine dioxide, and also good for shive and dirt removal. It is easy to generate and handle. The disadvantages with hypo chlorite is that if proper pH of the medium is not maintained, it causes severe degradation to pulp, and during the process, chloroform, a toxic gas, is produced. Now a day, hydrogen peroxide and ozone is also used for bleaching. For a better result, many industries use a controlled sequence of chlorination, alkaline extraction, chlorine dioxide, oxygen, hypo chlorite, peroxide and ozone treatment for the pulp bleaching.

Pollution Prevention Opportunities in Pulp Bleaching

- Installing chemical controls to optimize chemical consumption and to minimize chlorinated compounds formation;
- Installation of advanced chemical mixing equipment to optimize the chemical consumption;
- Chlorine dioxide substitution to reduce molecular chlorine consumption and formation of chlorinated compounds;
- Enhanced extraction to improve caustic extraction and improve delignification;
- Replacement of hypo chlorite with chlorine dioxide to reduce chloroform formation significantly;
- Ozone bleaching to eliminate chlorine-bearing chemical consumption; and
- Managing the washing sequence to reduce bleach plant wastewater flow and water and energy consumption

Ever-rising energy costs and unrelenting environmental pressures are going to govern not only the bleaching technology but also the course of all other technologies in future. The cost of chlorine and chlorine-based chemicals, the main bleaching chemicals, depends more on the energy cost as compared to oxygen. Also, the chlorine-based chemicals are mainly responsible for the formation of pollutants, in particular of toxic compounds. These two factors tilt the balance in favour of oxygen and its derivatives as the bleaching chemicals of tomorrow. Mixing of oxygen into the extraction stage of existing bleach plants (Eostage) is already practiced by many European and North Americal pulp mills. It is claimed that use of an Eostage can reduce the stages in a bleach plant by one, without sacrificing the pulp quality and with significant savings in operating costs. This approach represents a low-cost alternative to significantly reduce the discharge of the pollutants. Besides oxygen and hydrogen peroxide bleaching, which are well-established techniques, ozone delignification and bleaching are also in the developmental stage.

The paper machines usually employed in the small-scale industries are getting outdated. Productivity-linked approach is being adopted by improving the efficiency of the existing machines and by installing machines of higher capacity with more automation. The new efficient machines save energy and reduce the overall pollution load. The effluent from paper mill section is rich in chemicals and fibers, which can be used in the process. Small-scale paper units either do not have fiber-recovery system or have a low efficiency one. The use of floatation-based units, which clarify the effluent in a better way, recover the suspended fibers more efficiently while simultaneously showing an efficiency range in excess of 90 per cent has been proved to be beneficial. The clarified water can be used for the process, for

dilution and for cleaning.

Improved house-keeping, adoption of better pollution abatement technology, development of recycling system and recovery of useful products from waste, and proper training of concerned persons, will certainly help the pulp and paper industry to maintain a cleaner environment.

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NIEM (UNEP) AND PULP & PAPER MILLS :

The Network for industrial Environmental management (NIEM), is the programme of the United Nations Environment Programme (UNEP) which is co-coordinated by its Regional Office for Asia and Pacific (ROAP) at Bangkok.

Environmental Management in Pulp & Paper Industry in seven countries of Asia had been taken up as a priority sector under NIEM activities. India is one of the participating countries since the inception of the NIEM programme in 1987. Phase I and Phase II of the programme is already completed. Phase III, initiated in 1996 is under way. During the NIEM Phase I programme, the technical literature on discharge characterization, impact on environment etc., were prepared and approach of the NIEM activities was finalized

From India, the Central Pollution Control Board (CPCB) has been involved in the NIEM activities since the beginning. During the NIEM Phase II activities, two training-cum-workshops on the Discharge Characterization, Improved Mill Management, Receiving Water and Receiving Land Quality Evaluation and Assessment of Environmental Effects were organized by CPCB in Delhi and Bangalore CPCB had been retained as the nodal agency for the NIEM activities by the UNEP, ROAP.

The NIEM Phase III activities in India envisage the promotion of cleaner production (CP) in pulp and paper mills in the country. The approach was to carry out in-depth study for identification of CP options and to implement them. The implementation of these CP options not only yield in reduction in waste generation but also provide economic benefits by6 reducing the raw material and other resource consumption in terms of per unit of pulp or paper produced.

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PAPER FROM NON-WOOD FIBRE :

Non-wood fibers have a long history as a raw material for papermaking. Hemp, ramie, cotton and rag fibers have been used for almost 2,000 years and wood only started to replace them when paper usage began accelerating about 200 years ago and textile fibers out-priced themselves. Paper was first made in China in as early as 105 AD. It was produced from old rags, fishing nets, mulberry bark and grass. For the following 1700 years paper was made exclusively from non wood fiber. It was in 1857 that the process for pulping wood fibers and forming them into a paper web was invented. Wood was quickly established as the primary source of fiber for papermaking, and today provides some 90% of the fibrous raw material used in the process.

In 1970, the total worldwide capacity for production of non-wood plant fiber papermaking pulp was only 76,22,000 metric tones out of a total papermaking pulp capacity amounting to 11,35,32,000 metric tones. This amount represented only 6.7% of the total. However, since that time, there has been a dramatic increase in non-wood plant fiber pulping capacity. In 1993, total papermaking pulp capacity based on utilizing non-wood plant fibers amounted to 2,07,36,000 metric tones, or 10.6 per cent of the total. By 1998, it is projected that non-wood papermaking pulp capacity will reach 2,33,71,000 metric tones, or 11.2 per cent of the total. During the period from 1988-93, non-wood papermaking pulp capacity gained an average of 6% annually, or three times as fast as papermaking wood pulp capacity at 2% annually.

China currently produces half of the world's non-wood pulp, while Europe, Latin America and North America are still relatively small players. Nonwood sources for pulping are rags, bagasse, hemp, esparto grass, rye grass, ramie, bamboo, flax, wheat straw, kenaf, reed, rice straw and cotton linters. There is a lot of potential to upgrade what is presently considered state-of-art technology in straw pulping. It is now known that the raw material must be as clean and uniform as possible and the residue should be used to generate energy. For medium and linerboard production, an alkaline process, sodium hydroxide possibly with oxygen to improve yield, seems feasible. A mixture of recycled fiber and straw will most certainly be the main raw material for all corrugated medium production in future. For high quality linerboard up to 25% straw pulp, has proved to be acceptable.

Bleached nonwood fibers are an excellent raw material for printing papers, providing up to 50% of the fiber furnish, and can also be used for tissue and board production. Since wheat straw or similar crops do not have an ideal fiber composition compared to wood fibers for papermaking, these fibers are still regarded as filler pulp. Other annual fibers are superior for yielding differing qualities. In Central Europe, elephant grass has a high yield when planted on agricultural land, and elephant grass and popular plantations are being seen as a future raw material for pulp & paper production. Professor Rudolf Patt at the University of Hamburg has clearly shown that elephant grass is the best nonwood raw material known today for papermaking fiber. Its pulping response is found to be excellent and its papermaking properties match those of fast-growing hybrid aspen.

Researchers have proved that any grade of paper, paperboard or reconstituted panel board can be produced by properly selecting the appropriate mixture of non-wood plant fibers and the appropriate pulping processes. If circumstances demand, all grades can be produced without any addition of wood pulp. In fact, some grades are already being produced with 100% non-wood plant fibers. On a global basis, the future use of renewable non-wood plant fibers for production of papermaking is a reality indeed. With more than 90 million metric tones of cereal straw being available, more than 4 million tones of bagasse, 1 million tones of seed grass straw, 28 million tonne of grain sorghum stalks, and the exciting potential for kenaf, certainly these raw materials should be considered, at least as supplementary raw materials for paper-making pulp, especially in such areas where the cost of wood has seen a rather steep escalation.

By a wide margin, the leading non-wood plant fiber presently in use is straw, followed by bagasse and bamboo. During 1993, total capacity of producing straw pulp worldwide was 9.566 million tones, with China having a share 88 per cent, followed by India with 3 per cent share. In the same year, worldwide bagasse pulping capacity was 2.984

million tones. China was again leading the table with 18.9% share, followed by Indian share of 12.16%. The worldwide bamboo pulping capacity in 1993 were 1.483 million tones, India being the leading country with 44.76% share, pushing China to second place with 27.74% share. However, both China and Thailand are increasing their bamboo pulp production at a rapid rate. Perhaps the greatest relative untapped bamboo forests are in Myanmar, but presently only 20,000 tonnes of bamboo pulp are being made there annually. Therefore, the potential for long fiber pulp production in Myanmar is very great. Since the country is opening to foreign investment, we may see some major activities there in the future. The largest capacity for producing pulp from miscellaneous non-wood plant fibers is also concentrated in China with more than 85% of total world capacity.

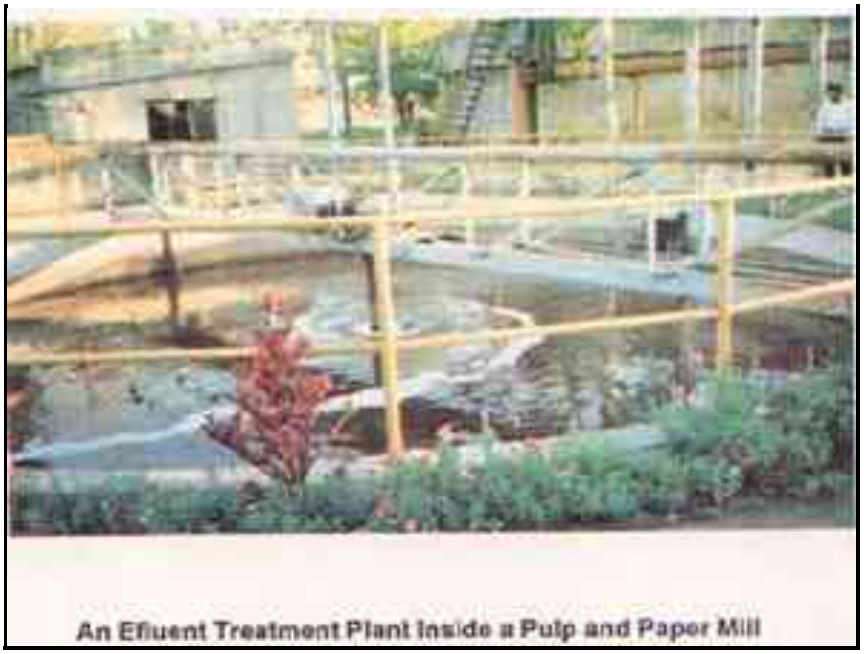
Major World Producers of Non-wood Pulp

Country	**Capacity (Million tones)**	**% of total**
China	15.2	71%
India	2.0	9%
Mexico	0.3	1%
Peru	0.3	1%
Philippines	0.3	1%
Indonesia	0.3	1%
USA	0.2	1%
Thailand	0.2	1%
Colombia	0.2	1%
Brazil	0.2	1%
10- Country Total	**19.2**	**90%**
Total World	**21.3**	**100%**

Although, India was not the first to use bagasse as a source of paper-making raw materials, the Tamil Nadu Newsprint and Papers Limited (TNPL) is held up as an example to the world, as to what can be achieved using 80-100 % annual fibers to make commercial grades of paper. Earlier last year, TNPL succeeded in making 100% bagasse-based newsprint. The most common non-wood fiber used in papermaking is straw accounting for some 47% of total production in 1993. Next largest source was bagasse at 12% and bamboo at 6%.

A View of the Training Workshop on 'Cleaner Production in Pulp and Paper Mills' held on April 25 and 26, 1997

Manicured Lawn of M/s Khateema Fibres Limited Irrigated with Water from its Effluent Treatment Plant



An Effluent Treatment Plant inside a Pulp and Paper Mill

A Flotation Type Fibre Removal Facility in a Paper Mill

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ACTIVITIES UNDER NIEM PHASE III IN INDIA :

Four pulp and paper mills from different parts of the country are participating under the NIEM cleaner production project. They are M/s Simplex Mills Co. Ltd. Gondia, Maharashtra; M/s Rollatainers Ltd., Kundli Haryana; M/s Rohit Pulp & Paper Mills Ltd., Valsad, Gujarat; and M/s Khateema Fibres Limited, Shakarpur, Delhi.

The approach for implementation of CP options in these mills are as follows:

- Identification of cleaner production option after carrying out in-depth study at the mills;
- Implementation of the identified cleaner production options; and
- Assessment of the benefits of the cleaner production in terms of both pollution control and economics.

These four participating mills are designated to serve as demonstration units, so that the other pulp and paper mills in the country can see the benefits of cleaner production and, thereafter, feel motivated for cleaner production in their mills also.

The special features of this UNEP programme is that most of the work has been carried out by the mills themselves. The mills personnel from floor level workers to the top were involved in the CP options implementation. The United Nations Environment Programme (UNEP), Bangkok office and CPCB provided only the guidance, literature and expertise to these mills in pursuance of CP.

Major determinates of success in conducting the programme, factors that contributed to the success of programme, are:

1. Willingness of the mill for implementing the identified cleaner production options;
2. Co-ordination of participating official at mills by the mills management;
3. Developing technical expertise at mill level;
4. Availability of fund;
5. Providing technical expertise to the mill by national/international body/bodies; and
6. Evaluating the pay back period of implementation of CP options.

The help of other concerned institutions like the National Productivity Council (NPC), New Delhi, Central Pulp & Paper Research Institute (CPPRI), Saharanpur and Institution of Papers Technology (IPT), Saharanpur have been received for achieving the objectives of this project.

A document on cleaner production in small-scale agro-based pulp and paper mills was distributed to each participating mill. The experts of NPC gave a detailed presentation of how to carry out the cleaner production assessment and implement CP options as mentioned in the NPC document.

Necessary information from all the mills in two separate formats as provided by the NIEM office, Bangkok, were obtained, and visits to mills were made by CPCB officials for verification of the information provided by the mills and finalization of CP options to be adopted in the mills. Visit of UNEP expert in the participating mills was made in the November 1996. Some efforts were made by the mills for the implementation of CP options. Core participating mills at the NIEM workshop at Bangkok organized by the UNEP became aware of NIEM project in totality and also about works going on in other countries under the NIEM programmes. The participating mills have prepared the detailed papers about the cleaner production measures implemented in their mills for presentation in the workshop. It is accepted that all the participants of these workshops will be benefited by the experience.

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ACHIEVEMENT OF THE PROGRAMME :

The cleaner production approach has been well accepted in the mills participating in the NIEW Programme as a self-regulatory mechanism for improvement of production process so as to minimize waste. This programme has been successful in creating awareness for the cleaner production in pulp and paper mills. The Impact cre4ated by this programme for C.P. will continue and it is expected that the pulp and paper mills will be further motivated for the cleaner production. Sincere efforts should be made in further adoption of the CP opt5ions as t6he production culture but only in pulp & paper mills but also in other industries.

Financial Gains by the Participating Mills after Adopting Cleaner Production Options

Name of the mill	No. of Schemes Implemented	Saving in million Rs./yr
Rohit Mills, Valsad	08	39.50
Simplex Mills, Gondia	12	8.16
Rollatainers, Kundli	05	5.75
Khateema Fibres, Delhi	04	8.72
Total Annual Savings by 4 mills		**62.13**

Total annual savings could have been much higher, investment involved and technological changes demanded.

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WORKSHOPS UNDER THE PROGRAMME :

Two workshops were organized jointly by UNEP and CPCB on 'Cleaner Production in Pulp & Paper Mills' in Delhi and Hyderabad as a part of the NIEM Phase III Programme during April 25-26, 1997 and April 29-30, 1997. It is hopped that all the participating mills will be benefited by sharing the experiences of the core participating mills, under NIEM Phase III activities, and feel motivated for promoting cleaner production in their own mills too. The major topics of discussions as summarized below were very relevant:

- Cleaner production with special reference to the conceptual approach;
- Financing of cleaner projects and various Government policies existing to motivate the concept of C.P. in pulp and paper mills;
- Cleaner technologies available in terms of better processes which have an impact on waste generation reduction and are considered as better technological options in place of existing technologies; and
- Waste minimization through the cleaner production. This session covered possibilities of cleaner production in the pulp and paper mills with better operation and house keeping in the existing process technology.

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RECOMMENDATIONS DURING THE WORKSHOP :

- The workshop recognizes 'Cleaner Production (CP) Approach' as the right way for improved mill management with economic gains and environmental advantages.
- Cleaner production should be a self-driven industry-motivated approach. It requires the motivated/committed management. The role of the Central Pollution Control Board is catalytic and proactive.
- There is a need for conducting CP audits and implementing CP options. Towards this end, it is necessary to organize a brainstorming session for senior executives on the CP approach. Simultaneously, intensive CP workshop stressing on practical details on how to conduct the CP audits through exercise is essential to initiate mill personnel including operators/Pollution Control Authorities.
- CPCB may take initiative to document CP experiences with details and disseminate such information through Industry Associations. The Industry Associations should catalyze mutual transfer of knowledge among member mills through these dissemination exercises.
- Industry Associations may be requested to prepare information relating to:
  - different sources of funding/finance for CP implementations;
  - expertise available on providing support for CP audits/monitoring/screening; and
  - agencies which can offer equipment/technologies for CP
- CPCB may identify in consultation with Industry Associations such CP options which need 'associated technology development' and such identified activities can be entrusted to CPPRI and other laboratories and agencies pre-qualified for taking up projects within a defined time-frame.
- Organizations, like CPPRI, besides other agencies, in association with individual mills, can conduct CP audits, select CP options and help monitor/evaluate the CP efforts.
- In order to ensure continued involvement in CP culture, each industrial unit associated with pulp and paper production should submit annual CP reports highlighting its achievements. The Industry Associations may take the lead in making it compulsory for individual members mills to submit such reports.
- Participant mills in CP efforts will conduct one workshop for the operators of the mills in surrounding areas.
- CPCB/ Industry Associations may form a core group to evaluate/review such 'Cleaner Production' report and come out with their on suggestions.
- Suitable awards may be constituted jointly be CPCB/Industry Associations for best performing mills.
- CPCB may consider taking up the issue of scaling up of lignin separation and utilization with Council of Scientific and Industrial Research funding in national interest.

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ACTIVITIES FOR FUTURE :

Sincere efforts should be made in future to make cleaner production the production culture not only in the pulp and paper mills but in other industries as well. In India, the other industrial sectors, such as sugar, textile and tannery, are also facing considerable problems related to pollution. It is necessary that the UNEP should take up these industrial sectors on priority for implementation of cleaner production concepts in India and other NIEM participating countries. However, some of the cleaner production measures require huge funds for implementation and, therefore, for implementing such CP options, assistance in the form of grant of soft loan through agencies like the Asian Development Bank, the World Bank among others will further serve the cause of cleaner production in industries and environmental protection.

Details of Participating Mills Regarding Their Type, Production Capacity, Raw materials, Number of Employees, Environmental Characteristics Mills' Detials (Capacity, Raw Material and Utility)

Mill Code	Product & Capacity (tpa)	Raw Material & Consumption, (tpa)	Pulping (Soda/Kraft/Hydra-pulping and bleach Sequence	Utility		
				Water (m^3/t	Power (KWH/t)	Steam (tpa)
Secondary Fibre-based Paper Industries						
A.	Duplex Board and	WP-10947	Hydra-pulping	95	450	2.5
B.	Kraft Paper-10800 Duplex Board-9900	PP-1219 SC-1021 CS-27 WP-9000 PP-1500 Rosin-60 Alum-350 Tale-250	Hydra-pulping	120	490	2.5
Agro-based Paper Industries						
C.	Quality Bleached	Baggase-11306	Soda pulping, CEH-bleaching	135	990	3.0
D.	Paper-11454 Writing & Printing Paper-8000, Duplex Board-	WS-7385 RS-1809 Jute-202 WP-2078	Soda pulping, CEH-bleaching	110	800	2.6

	18000, Art & Chromo Paper-4500	PP-3481 CS-2100 Filter-1900 Rosin-75 Chlorine-750 Baggase-14000 RS-22000 WP-14000 PP-35000 CS-3100 Chlorine-850 Filter-2400 SC-250				

Abbreviations: *PP-Purchased Pulp; WP-Waste Paper; RS-Rice Straw, WS-Wheat Straw; CS-Caustic Soda; SC-Sizing Chemical*

Details of Major Source of the Waste Generation and Their Quantification

Mill Code	Major Source of Waste Generation	Liquid Waste and its Characteristics		ETP Details	Air Pollu-tion Control Details	Solid Waste (Kg. per tone)
		In-effluent	Effluent			
A. B. C. D.	1. Centri-screens 2. Centi-cleaners 3. Deckers 4. Moulds of paper machines 1. Centri-cleaners 2. Deckers 3. Paper machine moulds Pulp mill 1. Brown stock washing	Q-100 m^3/t pH-4.9 SS-2058 COD-1952 BOD-788 Q-100 m^3/t SS-1200 COD-600 BOD-300 Q-100 m^3/t SS-800 BOD-350	Q-65 m^3/t PH-6.7 SS-37 COD-68 BOD-27 Q-50 m^3/t SS-200 COD-200 BOD-30 Q-100 m^3/t SS-80 BOD-NA	1. Filter screen 2. Krofta Fibre Recovery System 3. Primary clarifier 4. Secondary clarifier 1. Bar-screen 2. Settling tank 3. Aer. Tank 4. Primary & secondary clarifier	Multi-clone Multi-clone Multi-clone Multi-clone/ Bag filter	Plastic-5.7 Sludge-140 Boiler ash-240 Plastic-70 Sludge-50 Boiler Ash-242 Baggase pith-300 ETP sludge-75 Coal ash-160 Raw Material Preparation-80 Plastic or other

	2. Screening 3. Decker 4. Filters inbleaching 5. Screening (Wastepaper stream) 6. Paper machine filtrate from wire 7. Boiler blow down 8. Leakage of B/1 from pump glands in pulp mill 1. Brown stock washer 2. Cleaning sys. 3. Decker (Unbleached) 4. Bleach filters 5. Cleaning sys. (Wastepaper stream) 6. Paper machine (Wet end) 7. Leakage of B/1 from Pump glands in pulp mill 8. Boiler blow down	DS-850 COD-1800 Q-100 m^3/t SS-1750 BOD-800 DS-1850 COD-2850	DS-800 COD-NA Q-95 m^3/t SS-80 BOD-70 DS-39 COD-500 to 800	(under construction 1. Inclined Screen 2. Anaerobic Tank 3. Pri. Clarifier 4. Aer. Lagoon 5. Settling Tank 6. SDB 1. Save-All 2. Pri. Clarifier I & II 3. Aer. Tank I & II 4. Sec. Clarifier 5. Sludge Dewatering Machine		Material in WP-25 Screening Plant-5 Boiler ash-200

Abbreviations : Q-Flow; CEH-Chlorination, alkali-extraction, hypochlorite

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Parivesh
A News Letter from ENVIS Centre - Central Pollution Control Board

CLEANER PRODUCTION OPTIONS FOR PULP AND PAPER INDUSTRY

Hon'ble Minister Inaugurates the Environmental Information Centre :

The Hon'ble Minister for Environment and Forests, Government of India, Prof. Saifuddin Soz inaugurated the newly built Environmental Information Centre of the Central Pollution Control Board on August 16th, 1997.

Situated on the fifth floor of the Parivesh Bhawan, the Information Centre has global connections through INTERNET. It dissipates the information on air and water quality data and ECOMARK scheme through CPCB's Home Page on INTERNET. The Information Centre will also compile and analyze the data for CPCB's publications.

In his inaugural address, Prof. Soz said that maintaining the air and water quality and controlling industrial wastes alone would not suffice. Stressing on the need to motivate the people, he said environmental protection cannot be achieved by the governmental protection couldn't be achieved by the government alone. Common people too have to remember their duties in this regard.

The Hon'ble Minister for Environment & Forests, Government of India, Prof. Saifuddin Soz inaugurating the Environmental Information Centre at Parivesh Bhawan

CPCB Chairman, Prof. Dilip Biswas and Member Secretary, Dr. S.P. Chakrabarti accompanying the Hon'ble Minister During his Visit

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A News Letter from ENVIS Centre - Central Pollution Control Board

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CPCB PUBLICATIONS DURING June-Aug., 1997 :

1. An Inventory of Major Polluting Industries in Ganga Basin & their Pollution Control Status.
2. Status of Industrial Pollution Control Programme along the River Ganga (Phase-I).
3. Standards for liquid Effluents Gaseous Emissions Automobile Exhaust, noise and Ambient Air Quality.
4. Industry Specific Pollution control Status in Problem Areas, Vol.-III, (Greater Cochin and Bhadravati).
5. Water Quality Statistics of India - 1991.
6. Coastal Water Quality Statistics (1987-1992).
7. Comprehensive Industry Document with Standard Guidelines for Pollution Control in Brick Kilns.
8. Water Quality Atlas of India.
9. Pollution Control Acts, Rules & Notifications Issued Thereunder (Third Edition)- Reprint.
10. National Ambient Air Quality Statistics of India 1993, 1994.
11. Paryavaran Pradushan Vaigyanik Evam takniki lekhon ka sankalan : 1994 (in Hindi).
12. Booklet on Coastal Pollution.
13. Identification of hazardous Waste Generating Industry in Southern States (Andhra Pradesh, Kerala, Karnataka & Tamikl Nadu).
14. Comprehensive Industry Document on Gas based Thermal Power Plant.
15. Inventorisation and Management of Hazardous Waste in Medak District, Andhra Pradesh.
16. National Ambient Air Quality Status of India - 1992.
17. Comprehensive Industry Document on Natural Rubber Processing.
18. Groundwater Quality in Problem Areas (Part-I).
19. Groundwater Quality in Problem Areas (Part-II).
20. Groundwater Quality in Problem Areas (Part-III).
21. Groundwater Quality in Problem Areas (Part-IV).
22. Groundwater Quality in Problem Areas (Part-V).
23. Groundwater Quality in Ten Towns of Uttar pradesh.
24. Groundwater Quality of Flood Affected Areas of Delhi - 1995.
25. Comprehensive Industry Document on Soft Drink Manufacturing Units, Bakeries and Confectioneries.
26. Cleaner Technology - Issues and Options.
27. Proposal for the Ninth Plan.
28. Review of Environmental Statement.
29. Basin Sub-Basin Inventory of Water Pollution - Godavari Basin.
30. Rationale in Evolution of Standards for Industrial Effluents and Emissions.
31. Paryavaran Pradushan Karan Aur Nivaran (in Hindi) - Revised.

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Central Pollution Control Board
Ministry of Environment & Forests, Govt. of India

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