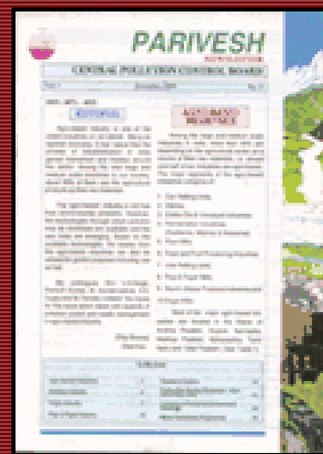
Parivesh

A News Letter from ENVIS Centre - Central Pollution Control Board

Editorial


PARIVESH

CENTRAL POLLUTION CONTROL BOARD

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Agro-based industry is one of the oldest industries on our planet. Being an agrarian economy it was natural that the process of industrialisation in India gained momentum and impetus around this sector. Among the total large and medium scale industries in our country, about 45% of them use the agricultural products as their raw materials

The 'agro-based', industry is not free for environmental problems. However, the technologies through which pollution may be minimised are available and the new one are emerging. Based on the available technologies, the wastes from the agro-based industries can also be utilised for gainful purpose including use as fuel.

My colleagues Shri. U.N. Singh, Paritosh Kumar, M. Sundarvadivel, S.K. Gupta and M. Pandey collated the inputs for this issue which deals with aspects of pollution control and waste management in agro-based industry.

Dilip Biswas
Chairman, CPCB

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AGRO - BASED INDUSTRIES :

Among the large and medium scale industries In India, more than 45% are depending on the agricultural sector as a source of their raw materials, i.e. almost one-half of our industries are agro-based. The major segments of the agro-based industries comprise of :

1. Coir Retting Units
2. Dairies;
3. Edible Oils & Vanaspati Industries
4. Fermentation Industries. (Distilleries, Maltries & Breweries)
5. Flour Mills
6. Food and Fruit Processing Industries
7. Jute Rettlng Units;
8. Pulp & Paper Mill
9. Starch (Maize Products)Industrie
10. Sugar Mills

Most of the major agro-based ind- are located in the States of Andhra Pradesh, Gujarat, Karnataka,) Madhya Pradesh, Maharashtra, Tamil Chairman Nadu and Uttar Pradesh (See Table 1).

Table 1 : Number and Locations of Agro-based industries

S. No.	Industry Segment	Total No. of Units	Annual Processing/ Production Capacity	Locations
1.	Dairy	96	5.5 x 10.6^{6} Kilolitre	Uttar Pradesh, Maharashtra, Gujarat, Tamil Nadu, Rajasthan
2.	Edible Oils & Vanaspati	725	4.5 x 10^{6} tonne	Maharashtra, Andhra Pradesdh, Gujarat, Madhya Pradesh, Uttar Pradesh
3.	Fermentation	225	2 X 10^{6} Kilolitre	Uttar Pradesh, Maharashtra, Andhra Pradesdh, Madhya Pradesh, Karnataka, Tamil Nadu
4.	Food & Fruit Processing	204	-	Maharashtra, Tamil Nadu, Andhra Pradesdh, Karnataka, West Bengal
5.	Pulp & Paper	89	1 x 10^{6} tonne	Uttar Pradesh, Maharashtra, Andhra Pradesdh,
6.	Starch (Maize Products)	11	0.2 X 10^{6} tonne	Gujarat, Andhra Pradesdh, Uttar Pradesh, Haryana
7.	Sugar	400	10 x 10^{6} tonne	Maharashtra, Uttar Pradesh, Andhra Pradesdh,Gujarat, Karnataka, Tamil Nadu

Water Consumption

The agro-based industry is characterised by its water intensive nature. The industry consumes considerable quantities of water for their processes. Apart from process water requirements, large volumes of water are use for cleaning and washing purposes. Volumes of water consumed vary widely from plant to. plant within the segments of the agro-based industry. There are significant variations between these segments (Table 2) also.

Table 2: Water Consumption, Wastewater.Generation and Organic Pollution Load in Agro-based Industrie

S. No.	Industry	Specific Water Consumption (Cubic meters)	Waste Water generation, Cubic Metre	Pollution load (in terms of Kg of BOD)
1.	Dairy (Integrated) (per kilo litre of milk)	8.7	6.0	11.0
2.	Edible Oils & Vanaspati (per tonne oil)	3.0	2.0	7.5
3.	Fermentation (i) Brewery (per Kilo litre of beer) (ii) Distillery (per kilo litre of alcohal) (iii) Maltry (per tonne of grain)	11.5 130.0 8.5	9.5 90.0 3.5	24.0 600.0 2.0
4.	Pulp & Paper (per tonne of Paper)	300.0	250.0	375.0
5.	Stratch (Maize Products) (per tonne of maize)	8.0	5.5	44.0
6.	Sugar (Per tonne of cane crushed)	2.0	0.4	0.5

* Figrue are per unit of processing/production

Pollution Problems

Pollution Problems in agro- based industry are caused mainly due to the wastewater and solid wastes generated during their manufacturing processes (refer Table 2). Air pollution problems are caused by such industriesduring the material handling and combustion processes.

Water Pollution

Concomitant with water consumption, agro- based industry generates large volumes of effluents. The agro-based industry, is the second largest generators of pollution due to organic matters in the cQuntry, standing next only to the domestic sewage. However, the effluents are bio-degradable because they contain mainly organic pollutants and are devoid of any toxic material, thereby making them amenable to biological treatment.

Solid Wastes

Sizeable quantities of hulls, shells, stalks, steeps etc. are produced during the processing of raw materials and refining the products, Frequently, these materials can be utilised as animal feed or manure or further refined to based produce useful and marketable products.

Air Pollution

Steam and heat are used in large quantities in agro-based industry , and burning fuels results in particulate emissions. Particulate emissions also occur during handling of raw materials before processing and in the handling and use of wastes after processing.

Apart from particulate emissions, odour is one of the major problems In agro-based Industry. In most of the cases, the, mal-odorous conditions are due to poor handling and the management of wastes generated

Management of Wastes

The wastes of agro-based Industry are relatively easy to manage because of the following factors:

1. In most of the cases, the discarded materials from one segment may be a by-product and can be used as raw material for other segments, For example, the molasses and the bagasse are discards from a sugar mill; but, they are the raw materials in distilleries and pulp & paper mills respectively
2.) By building auxilliary units to process all the byproducts, like the one explained above, the agro-based industry could be made Materials "environmentally compatible", as the environmental impact of excess materials in the form of discards, will be reduced. This will also help better utilisation of all materials resulting in greater benefit to the economy by elimination of the import of raw materials and transport of materials from one place to another
3. When coupled with good by-product recovery process, a considerable proportion of the cost of waste treatment

can be offset.
4. A large segment of the agro- industry is in rural/agricultural setting, where the availability of land for treatment as well as Air Pollution disposal is not a limiting criterion;

Waste Minimisation

Environmental management in industries has so far been focused mainly on pollution control through 'end-of-pipe' treatment technologies, which is a curative approach for pollution problems. By adopting appropriate preventive measures, generation of wastes can be minimised, This will help in two ways; firstly, it will reduce the cost of treatment, and secondar, it will conserve a raw materials by way of reducing their wasteful usages.

The three golden principles of , waste minimisation are :

1. What can be measured, can be managed
2. Nothing comes from nowhere {Cor.: Everything comes from somewhere)
3. Nothing goes away nowhere {Cor.: Everything goes somewhere)

In case of agro-based industry the following "waste-minimisation" practices may be adopted.

1. Accounting and Balancing of Raw and Other Resources:
   By proper record keeping of quantities of raw materials and other resources used for various unit operations and analysing the fate of all the throughputs, a check on the excess use of these resources can be made, This will also help in identifying the gaps in the stoichiometric and the actual requirements of the required inputs and hence the (in) efficiency of a particular unit operation/process.
2. Characterlsatlon of process water and wastewater:
   A careful survey of water usage and waste generation points in various processes and measurement of their quantities and characteristics will help identifying any possibility for the recycle of discarded waters, such as cooling water, condensate water etc. An excellent example for this case is the sugar industry. A lot of hot condensate water is generated in a sugar mill during the manufacturing processes which can be recycled as boiler feed and imbibitions water for the better extraction of juice from sugarcane.
3. Segregation of Waste Streams :
   It is better to segregate less or mildly polluted streams from highly polluted ones. For example, black liquor from the pulping process In a paper mill should be segregated for recovory of lignin, and then It could be mixed wIth other streams to make the combined waste easily amenable for further biological treatment.
4. Combining the Compatible Waste Streams:
   Characterlsation of various waste streams will help in identifying compatible streams. By combining such streams, cost of their . treatment can be minimised. For example, acidic stream from the juicing section in a fruit processing industry can be combined with the alkaline streams from the other sections to neutralise both the streams and save cost on chemicals.
   With the waste minimisation practices, generation of wastewaters from almost all the agro- based industries can be reduced to a large extent. There are some examples already existing in cases of sugar mills, where the II} wastewater generation has been reduced b more than 50% and the pollution load by over 70%.

Effiuent Treatment Technologies

Biodegradability of the effluents from agro-based industry makes it relatively easier to treat the wastewater. Almost all the conventional biological treatment systems employed in sewage treatment, such as anaerobic/aerobic lagoons, activated sludge processes, trickling filter, septic tanks, land treatment systems etc., are applicable to agro-based industrial effluents as well.

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DISTILLERY INDUSTRY :

The main source of pollution from distilleries is the spentwash. Spentwash is a non-toxic, biodegradable effluent with the following characteristics (Table-3) :

Table 3: Characterstics of Distileery Effluent		
S.No.	**Parameter**	**Range***
1.	pH	4.3-5.3
2.	Total Suspended Solids	12,000-14,000
3.	Total Dissolved Solids	45,000-75,000
4.	B.O.D., 20 C, 5 days	40,000-50,000
5.	C.O.D.	80,000-1,00,000

* Values are in mg/l except for pH.

Technologies for Treatment of Spentwash:

During the 80's following technologies were developed and adopted by distilleries to treat the spentwash:

1. Anaerobic Digestion with bio-gas recovery (Bio- methanation)
2. Composting; and
3. Incineration

Biomethanation

Biomethanation is the process involving decomposition of organic matters (and to some extent inorganic matters) in the absence of molecular oxygen. Bio-conversion of the wastes results in methane rich gas.

The advantages of biomethanation in case of spentwash are:

1. generation of bio-gas which can meet more than 60% of the fuel requirements of the distillery and,
2. About 80-90% of BOD is removed from spentwash

Over the years, a number of distilleries in the country have adopted bio-methanation for treatment of spentwash. The investment made in this system is paid back within 4-5 years. No doubt, the distilleries which adopted bio-methanation are reaping, the environmental and economic dividend.

Table 4: Pollution Prevention Pays (For a 30 kl/day alcohal producing distillery)	
Spentwash generation	: 450 kl
Bio-gas production during bio-methanation	: 25-30 Nm3/kl
Average total biogas production	:12000 Nm3/day
Based on the net calorific value, Therefore, Coal saving	:12 tonnes/day
Saving @Rs. 2000/tonne of coal	:Rs. 24,000 /day
Total saving through biogas in one year	: Rs. 72 lakh

Composting

In this process, the spentwash is mixed with filler materials, such as press mud, rice husk, wood chips, bagasse pith etc. The mixture . is seeded with cowdung or specially developed micro-organisms to hasten the process. The process takes 12-14 weeks to be completed and results in black compost, which can be used as manure.

Incineration

This process is base on the principal that the spentwash, when concentrate to 60% W/W, develops sufficient calorific value and can burn by itself without any external input of energy. This process results in potash rich ash which can be used as a fertilizer.

More recently the Vasantdada Sugar , Pune, has developed a process called DIEG (Drying Incineration and Energy Generation) , where coke like material is obtained and used as fuel in boiler to produce steam and energy. M/s. Zucker Gassification & Co-generation Ltd., Pune also has developed a process based on gasification of mixture of spentwash and bagasse to produce gas which can be used to drive gas turbines to generate power . There is one more process developed m/s. Consafe Science Ltd., Pune, in which the spentwash is thermally hydrolysed unde pressure to generate coke which in turn can be used in generation of steam.

However, the above processes are yet to .be tried on a wider side.

Efforts of CPCB in Evolving Standards for Distillery

Recognising the problem of treating distillery effluent to a level suitable for disposal) into the river/land, the Central Board constituted an expert group way back in 1980 to evolve Standards (MINAS) developed by the CPCB The MINAS are:

BOD,(200C, 5 days)	: 30 mg/ I for disposal into inland surface water
	:100 mg/I for disposal on land for irrigation

Based on the MINAS developed by CPCB, Ministry of Environment & Forests, through the EPA Notification, dated January 8, 1990, specified effluent standards according to the disposal conditions, i,e, the recipient environment, The BOD (200, C, 5 days) standards so specified are as follows :

Disposal on stream/river	: 30 mg/I
Disposal on land	:100 mg/I
Disposal on land when land is considred as a treatment medium (land treatment)	: 500 mg/I
Land treatment with effective monitoring systems for ground water quality	: 700 mg/I

The standards also include stipulations regarding net additional contribution to ground water quality in terms of BOD not to exceed 3 mg/1 and nitrate not to exceed 10 mg/l,

The method of land treatment, involves designing of the hydraulic loading, nutrient loading, crop pattern etc" after considering the porosity/permeability of the soil.

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SUGAR INDUSTRY :

India is the largest producer of sugar in the World and per capita consumption of sugar in the country is 13,4 kilograms per annum, There are about 400 operating sugar mills, located mainly in the states of Uttar Pradesh Maharastra Andhra Pradesh, Karnataka and Tamil Nadu, During 1993-94, these industries have produced 98 Iakh tonnes of sugar. It is a seasonal industry and operates for about 6 months in a year, normally from October to March.

Pollution Problems

sugar mills consume around 1,500-2,000 litres of water and generate about 1,000 litres of wastewater for per tonne of cane crushed, the effluent is mainly floor washing wastewater and condensate water, Leakage in valves and glands of the pipeline add sugarcane juice, syrup and molasses in the effluent, The sugar mill effluent has a BOD of 1,000-1,500 mg/litre, but appears relatively clean initially, However after stagnating for sometime, it turns black and start emitting foul odour, If untreated effluent is discharged,in water courses, It depletes dissolved oxygen In water and makes the environment unfit for aquatic life. If untreated effluent is discharged on land, decaying organic solids and oil and grease clog the soil pores.

Most of the use bagasse as a Sugar mills fuel in boilers, which produces particulate matter, oxides of nitrogen, carbon, sulphur and water The vapours, The particulate matter, usually referred to as fly ash, consists of ash, unburnt bagasse and carbon practicles. Fly ash is very light therefore, if pollution control equipments are not Installed, it escapes in the atmosphere through chimney and travels long distances. In such conditions, nearby population suffer from dizziness and irritation in eyes, nose, throat and lungs. The heavier particles, if settle on vegetation then it damages them Among the solid waste generated by sugar mills, lime sludge and press mud are important. For purifying the sugarcane juice from organic matter, dirt and other impurities, milk of lime is In generates lime sludge. The impurities from the sugarcane juice is either vacuum filtered or press have filtered and removed as press mud. In addition to these, solid wastes are also generated from the pollution control facilities, like ETP sludge and flyash collected from the dusting devices.

Pollution Standards

The pollution standards stipulate that BOD of effluent should be less than 30 mg/lltre for disposal into inland surface waters and less than 100 mg / litre for disposal on land. BOD can be 500 mg / litre, in case land application effluent is envisaged as a secondary treatment system for further removal of BOD.

Regardlng water consumption and effluent generation, specified standards are 1 ,000 Iltres and 400 litres respectively for per tonne of cane crushed.

As per general emission standards, particulate matter is required to be within 150 mg/Normal cubic metre. In case of horse shoe/pulsating grate and spreader stroker bagasse fired boilers, the particulate matter emission is required to be within 500 mg/ Normal cubic metre and 800 mg/ Normal cubic metre respectively

Pollution Control

There is scope of recycling and reuse of water in sugar mills thereby minimising water consumption and ultimately effluent quantity. The recycling and reuse of hot condensate water can reduce the water consumption to as low as. 100-200 litres, as against 1,500-2,000 litres per tonne of cane crushed. Proper housekeeping, periodic checking and maintenance of pipe joints, valves and glands further reduces the water consumption and effluent quantity .The effluents from the sugar industry can be treated added. The preparation of milk of the lime by conventional biological treatment systems. general, anaerobic biological processes (oxidation ponds and biomethanation) several advantages over aerobic processes (aerated lagoons, activated sludge process). Anaerobic processes are easier to control and operate, produce a lower quantity of sludge and their costs are lower. Anaerobic processes decompose the organic compounds in an atmosphere free of oxygen and consequently require significantly less energy as compared to aerobic processes.

Among the air pollution control of treated equipments; wet collectors and multi-cyclones, can reduce particulate matter in boiler emissions by 90% or more. These equipments can reduce ..the concentration of particulate matter to 450 mg/ Normal cubic metre.

Double Sulphitation Process, already adopted by most of the sugar industries, reduces the quantity of lime sludge and press mud to a I great extent. The lime sludge is usually dumped in low lying areas, whereas press mud is sold to farmers as it can be used as manure. Bagasse is either used as fuel or sold to pulp and paper industry which use them as raw materials.. Molasses produced in sugar industry is raw materials for fermentation industries.

The table 7 reveals that a sugar mill requires only ariund 180 litre of water per tonne of cane as against the stipulate limit of 1,000 litres, if the condensate water is properly utilised and cooling water is recycled.

Table 7 : Water Balance Sheet for Sugar Industry

S.No.	Water Available/Required	Credit	Use (per tonne of cane crushed)	Balance
1.	Quantity of water available as hot condensate (after accounting for all losses in bagass, molassess, press mud etc.	0.5 m^3	-	-
2.	Water required at various sections of the mill,			
	(i) imbibition	--	0.20 m^3	--
	(ii) Lime preparation	--	0.02 m^3	--
	(iii) Evaporator pans	--	0.05 m^3	--
	(iv) Boiler feed	--	0.01 m^3	--
	(v) Cooling water *	--	0.04 m^3	--
	Sub Total	**0.05 m^3**	**0.68 m^3**	--
3.	Extra Water Required			

* With closed loop cooling water system for recycling.

Biogas from Press Mud

Press mud, which is discarded as a solid waste from sugar mills and used as a manure or as a landfill, is found to be an useful substrate for biogas production. Based on the studies conducted by the Department of Agriculture of the Annamalai University, Tamil Nadu, the Ministry of Non-Conventional Energy Sources, Govt. of India, selected M/S Ugar Sugar Works ltd., Karnataka for a demonstration plant including biogas distribution system to 120 families residing in the factory complex.

The results indicated biogas production upto 80 Nm3/tonne of fresh press mud. The effluent slurry is also useful as a nutrient rich fertilizer.

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PULP & PAPER INDUSTRY :

In India, there are 36 large and 314 small scale paper mills. Large paper mills have individual production capacity greater than 24,000 TPA (65 tpd) and almost all have got soda recovery units. These mills mostly use bamboo/hardwood as raw material. Among the small scale mills, 100 units are agro-residue based and the rests are waste paper based or purchased pulp based or a Combination of these two.

Large Scale Units

All the large scale pulp & paper industries have effluent treatment facilities, they have installed the chemical recovery system and are recovering the valuable chemicals from the black liquor. However, the following are the problems still unsolved.

Colour

Colour problem exists with this category of industry despite adequate treatment facilities. The problem of colour could be overcome by changing over to cleaner processes, i.e. the use of oxygen/hydrogen peroxide bleaching in place of conventional Hypo-chlorite bleaching.

Quantum of effluent discharge

The standards in terms of effluent volumes per tonne of paper (Annexure-l) are not usually met by majority of the paper mills. The implementation of inplant control measures is necessary to bring down the fresh water poses consumption as well as the quantity of the effluent discharged.

Total Organic Chloride (TOCI)

This pollutant contributes to toxicity due to organo-chlorine compounds in the effluent arising out of use of chlorine in bleaching process. Therefore, compliance of standards of TOCI could be possible, only if industry adopts other methods of bleaching, such as oxygen bleaching or peroxide bleaching As such it will require process change.

There are a considerable number of large scale pulp & paper industries which are using their treated effluent for irrigation in captive two. plantation. However, its impact on soil quality is yet to be studied scientifically.

Small Scale Units

the principal raw ma erla or small-scale pulp & paper Industry are agricultural residues (baggasse, rice straw, wheats straw, elephanta grass, etc.) and waste paper. The problems of pollution are more predominent in small scale agro-based units due to non-adoption of chemical recovery process in view of high cost.

The BOD standard of 30 mg/1 for discharge on inland surface water & 100 mg/1 for land disposal has been notified under the Environment (Protection) Rules. The industry is advised to segregate the black liquor and store it separately and treat the rest of the effluent. The Quantum or emuent discharge stored black liquor, is required to be discharged during the rainy season only when sufficient dilution is available.

Problems of chemical recovery process

The presence of silica in black liquor a problem in the development of suitable chemical recovery process for agro-based paper industries. Suitable economically viable Total Organic Chloride (TOCI) chemical recovery process is yet to be developed to suit the requirement of small-scale pulp & paper industries

In the mills, where no chemical recovery is adopted, the discharge of black liquor in effluent stream makes it difficult to treat, The presence of high contents of sodium even after treatment, makes the effluent unfit for irrigation and forestry use.

Status or R&D on Cleaner Technologies in Pulp & Paper Industries

Several institutions and industries are engaged in developing suitable technology and process to reduce/ elimjnate the pollutants in the of paper production. Following are some of the findings of the research work carried out so far.

M/s Amrit Papers ltd.
This industry has implemented the chemical recovery process successfully on a pilot scale which takes care of the silica problem, Efforts are on to implement this process on a commercia scale.

Central Pulp & Paper Research Institute
The institute is doing research on ferrite chemical recovery process for agricultural residue-based pulping. Success has been made to adopt the process on full scale for economic implementation on a commercial basis.

M/s Pudumjee Pulp & Paper Mills
This industry has deve~oped a pulping Mother Pulping process based on solvent (mixture of ethanol and water) for agricultural residue (baggas,se) as raw material, It has been successfully trled on pilot scale, The solvent used in pulping is recovered from the waste by distillation process. Negligible quantity of effluent is generated and lignin is recovered as a by- product. Pulping plant of 50 tpd is proposed to be installed based on this process.

Common Chemical Recovery (CCR)
The chemical recovery is economically viable in case of large mills, but it is not so in case of small scale mills on an individual basis. However, if it is tried collectively the recovery may become economically viable.

Common Chemical Recovery (CCR) Plant ..may be the solution for the mills located at one place in a cluster. In this system, black liquor from the small agro-based paper mills at any particular area can be collected and brought to one place for the common chemical recovery . The cluster of paper units may form all Association for the installation and operation the Common Chemical Recovery Plant. In, Muzaffarnagar, U.P. there are about 30 small agro based pulp and paper mills, and this may M/s. Amrit Papers Itd. be a suitable place for implementing the idea of CCR.

The highlights of CCR process are laid down as follows :

1. Economic benefit by way of chemical (Caustic Soda) recovery
2. Energy saving
3. Less Pollution laod (in both quantity and quality)
4. Less cost of waste water treatment

CPCB is studying the techno-. feasibility of the system

Mother Pulping
Mother Pulping could be one of the solutions for small agro-based units in clusters, The mother pulping means setting up of a common (big) pulping plant and distribution of pulp after separation of black liquor among the. mills for further washing and paper manufacturing. Due to the large size of the mother pulping on this process. plant, the chemical recovery plant will be techno economically viable, The installation and Common Chemical Recovery (CCR) operation of the mother pulping plant can be done by the association of the paper units, This will help in lesser pollution and treatment at lower cost along with the recovery of valuable chemicals.

Solvent based cleaner pulping process

Alkaline Sulphite Anthraquinon Methanol (ASAM) Pulping
The wood chips are presteamed for 15 minutes before the cooking liquor is added. The typical liquor consists of up to 25% inorganics, calculated as NaoH based on dry wood, where 20% are Na2SO3 and the remaining one added as NaoH or Na2 CO3 or a combination thereof 10 -20% methanol and around 0.1% of anthraquinon (AQ) as a catalyst.

- The ASAM pulp has very low lignin content, almost no extractives and considerable initial brightness. Chlorine free bleaching is possible.
- No reduced sulphur compounds are made during the ASAM process and methanol is kept in closed cycle system.
- ASAM pulp can be bleached to high brightness in Chlorine free sequences and as a result there are no toxic and difficult to degrade organic chlorine compounds in the effluent

- No poisonous and oxygen consuming element in effluent.

Sulphur and Chlorine free Oxgen - Alkali Cooking Process

- The process uses oxygen-alkali cooking of chips. The alkaline agents may be caustic soda, sodium carbonate or ammonium hydroxide.
- It produces sulphur and chlorine free Pulp. The untreated effluent is totally non-toxic.
- There is a 0.5 TPD Pilot Plant at the Sjas Mill near St. Petersburg, Russia. Semi- Solvent based cleaner pulping process industrial size plant of 35,000 ton per annum is under construction and will be commissioned in Russia.

ALCELL Process (Organosolv, Pulping Process)

- It uses aqueous ethanol as pulping liquor.
- Process is odourless and is free from total reduced sulphur and methyl-. mercaptan. Chlorine - Free bleaching is possible.
- The. bleach plant effluent contain no f dioxins, furans and very low level of AOx.

A demonstration plant of 15 tpd is working and a.commercial scale mill with an appropriate. capacity of 300 tonne/day In planned to be designed.

Oraganocell Pulping

- The wood chips preheated with a mixture of ethanol/methanol and water followed by their cooking with alkali and anthraquinon.
- The process produces sulphur-free pulp as well as sulphur -free lignin.
- It does not involve use of chlorine - compounds in bleaching of pulp hence leaves no TOCI & AOx in effluent

M/s. Bayrische Zellstoff Gmbh at Kelhein Germany is going to adopt Organocell process. - However, a pilot plant has been operated since 1987 in Munchen, Germany without any. objectionable impact on the sorroundings.

Punec Pulping Process

- Process involves delignification of , lignocellulosic material in the absence of polluting sulphur and chlorine compounds
- Involves use of ethanol-water mixture as solvent in the presence of catalytic amount of NaOH for a neutral pH
- Provides a means of recovery of the chemicals used.
- Recovery of useful byproducts like lignin and hemicellulose
- It does not c.ause generation of AOx and the process IS free from the total reduced, sulphur.
- This process is not yet commercialized. It has been tested on pilot scale. M/S, Pudumjee Pulp & Paper Ltd. proposes to set up 50 tpd pulp plant based on - technology in India.

ZONE-WISE INSTALLED CAPACITY FOR MANUFACTURING PAPER AND PAPER BOARD

	Forest based		Agro based		Others		Total	
Zone	**No. of Units**	**I.C.(000'T)**	**No. of Units**	**I.C.(000'T)**	**No. of Units**	**I.C.(000'T)**	**No. of Units**	**I.C.(000'T)**
East	13	644	8	101	16	45	37	790
North	3	126	38	347	85	351	126	824
South	10	524	19	239	29	153	58	916
West	3	191	24	287	92	455	119	933

(I.C. = Installed Capacity)

PROJECTED RAW MATERIALS REQUIREMENTS FOR PULP & PAPER INDUSTRY (2000-01 TO 2010 - 11)

S.No.	Raw Materials	Quantities in Million Tonnes in the Year		
		1990-91	2000-01	2010-11
1.	Bamboo/Ochlandra reeds	1.36	4.18	6.70
2.	Hardware including eucalyptus	1.77	4.40	7.07
3.	Cereal straws and bagasse	1.20	5.72	9.53
4.	Waste Paper	0.87	1.06	1.87

5.	Market pulp	0.32	0.47	0.72
6.	Others including grasses etc.	0.33	0.27	0.27
	Total	**5.85**	**16.10**	**26.16**

Soda Recovery

There are 275 mills of smaller capacity ranging from 1,000 to 20,000 TPA in our country. About 70% of these mills are based on soda chemical pulping of agro-residues and do not have any facility for the recovery of chemicals.non -recovery of chemicals is the largest single factor for crippling the economy of the paper industry based on agro-residues. It is estimated that the small-scale paper industry of about 50 TPD discharges waste soda liquor equivalent to Rs. 30,0 millions and Rs, 3,3 million as thermal energy annually, at the same time releasing pollution load equivalent to a 100 tpd mills equipped with a recovery unit, The energy loss also accounts for 12000 MW per annum at the national level, assuming the energy consumption as 2000 kwh per tonne of caustic production as envisaged by any caustic plant.

Studies on chemical recovery/cogeneration have established the justification on techno-viablllty , While the benefit to the individual enterprise may be due to substantially improved operative costs, this would make a comulative impact on the economy of the country as a whole. The pollution control laws have made it mandatory to regulate the quality of effluent discharged by the agro-based mills, At present, black liquor generated in pulp mill goes to effluent plant with very high BOD load, Therefore, installation of suitable chemical recovery would not only help in recovering the valuable chemical but also lead to the reduction of organic load in effluents.

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

READER'S COLUMN :

- SUSAN KOSHY, Industrial Development Bank of India, Bombay
  'Recently I had the opportunity of reading the September edition of the captioned issue of your esteemed Board and I would like to convey my appreciation of its contents, which I found informative and educative'

- V.V. PANDE, Heavy Water Plant, Dept, of Atomic Energy, Kota
  'We found that the News Letter published by you are very technical and useful for us'

- Dr. GULSHAN SINGH, Dept. of Applied Sciences, College of Engg. & Technology, Bhathinda
  'I am pleased to read this valuable and knowledgeable publication'

- Dr. J.K, MAHESHWARI, All India Coordinated Research Project on Ethnobiology, Lucknow
  'Heartiest congratulations for bringing out an excellent and very impressive newsletter for the I benefit of scientists and researchers engaged in environmental protection and conservation. We I would very much like to utilise this valuable newsletter in the formulation of some projects and programs'

- S. SUNDARESAN, Mechanical Engineering Research and Development Organisation, Madras.
  'It was very informative and useful in R & D work'

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PUBLICATION DURING DECEMBER, 1993 - NOVEMBER, 1994* :

1. Cost Benefit Analysis of Dust Control on Equipment in Cement Industry
2. Action Points for Pollution Control in Problem Areas
3. Water Quality Atlas of India
4. Comprehensive Industry Document on Edible Oil & Vanaspati Industry
5. Comprehensive Industry Document on Lime Kiln Industry
6. Pesticide Industry: Status
7. Comprehensive Industry Document on Starch and Glucose (Maize Processing)
8. Waste Water Management in Industry
9. Report of the Expert Group on Utilization of Fly Ash in Cement Industry
10. Basin & Sub-basin Inventory of Water Pollution- Narmada Basin
11. Basin & Sub-basin Inventory of Water -Tapi Basin
12. Comprehensive Industry Document on Dairy Industry
13. Guidelines for Establishment, Evaluation and Gradation of Environmental Laboratories
14. Comprehensive Industry Document Fertiliser Industry
15. Technologies for Control of NOx Emissions
16. Comparative Evaluation of Treatment Technology for Cement Industry
17. Comprehensive Industry document on Ceramic Industry
18. Chlor- Alkali Industry (Hindi version)
19. Industry -Specific Pollution Control Status in Problem Areas -Vol II (Manali and Digboi)
20. Inventory of Large & Medium Water Industry Polluting Industries of Madhya Pradesh, , Vol-II
21. Status of Hazardous Waste Generation Treatment & Disposal in Himachal Pradesh
22. Inventory of Large & Medium Wat~r Polluting Industries Vol-11 (Gujrat)
23. Industry -specific Pollution Control Status in Problem Areas, Vol. -I (Korba, Chambur , AngulI Talcher and Vishakhapatnam)
24. Environmental Audit, NOCI -Agrochemicals
25. Retting of Jute Fibre -its Impact on Environment
26. Environmental Auditing in Polluting Industries

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CALENDAR OF SELECTED ENVIRONMENT MEETINGS :

April 3-6	: Sixth Global Warming International Conference and Expo, San Francisco,California,USA Contact: Sinyan Shen, Global Warming International Centre, SUPCON International, 7501 Lemont Road, Woodridge, IL 60517-0275, USA; tel:(1 708)9101551 ; fax: 91 01561.
April 11-28	: Third session of the Commission on Sustainable Development, New York, USA Contact: Commission on sustainable Developement, DPCSD, Room DC2-2270, United Nations, New York, NY 10017, USA; tel: (1 212) 9630902; fax: 9631712; email: dpcsd@igc.apc.org.
May 3-5	: Global Environment Facility Council Meeting, Washington, DC, USA Contact: Maria Subiza, GEF Secretartiat, 1818 H Street, NW, Washington, DC 20433, USA; tel: (1 202) 4738324; fax: 5223240.
May 8-10	: International Conference on Energy and Environment, Shanghai, China Contact: Zhi-Hang Chen, Shanghai Institute of Mechanical Engineering, P .0. Box 482, Shanghai 200093.

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MASS AWARENESS PROGRAMME :

A debate and painting competition was organised by the Central Board at Queen Mary's School, Tis Hazari, Delhi on September 2, 1994. The students from six different schools participated in the competition. Topic for the debate was 'Environmental degradation is natural outcome of Poverty", matching with the theme -'Poverty and Environmnet'.

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