Environmental Safeguard Through Implementation of CREP

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Abstract

Environmental Protection is no longer a new issue now. Right from Govt. up to the common public environmental degradation has become and issue of concern. Of late, Central Pollution Control Board has issued another directive in the form of Corporate Responsibility on Environmental Protection (CREP) to 17 major polluting industries including Paper industry. To keep pace with the changed concept, Nagaon Paper Mill (NPM), one of the major Paper Mill in the North Eastern region has already implemented or in the process of implementation of some of the points included in CREP. under Environmental Management System (ISO 14001), which is in force. AOX, considered to be one of the major toxic chlorinated compounds, is within the present stipulated norms in outgoing treated effluent. The proposed conversion of existing bleaching sequence of elemental chlorine and hypochlorite with oxygen and chlorine dioxide sequence in near future is expected to reduce the release of chlorine compounds to the stipulated limit as per the directive. The effluent generation per tonne of paper produced is also in decreasing trend due to number of recycle schemes introduced in many areas. The treated wastewater being discharged is extensively used by the local farmers for irrigation throughout the entire stretch of disposal route. Solid waste management system in NPM is being handled effectively by utilizing fly ash, bottom ash, bamboo dust, hypo sludge etc. and it will be further improved once the proposed Lime sludge reburning plant is commissioned by March'05. Mercury being one of the major environmental pollutants in caustic and chlorine operation, time targeted action plans like recycling of mercury bearing liquid Effluent, mercury distillation unit, reduction of mercury in caustic and hydrogen etc. have been chalked out to contain it in the plant itself to achieve the permissible limits. CREP, which is considered to be a major tool in dealing effectively in the protection of environment, is in different stages of implementation at NPM.

INTRODUCTION

Environmental Management System (EMS) adopted in industrial units covers all sorts of pollutant, waste materials, ecology, recycling of rejected products, noise, odours and other visual amenity. It also embraces energy, land, conservation of natural resources and heritage. Naturally any environment friendly industrial plant is bound to respond to these problems positively. However, in all cases prevention of pollution demands the maximum attention. In fact, as an after math of two successive world wars, the focus of all developed countries were concentrated towards production of industrial goods and employment only with least attention towards impact of industrial activities on the environment. The voices of the pressure groups, if at all existent, were not loud enough to pass on warning signal to the patrons of industries. The topic had come for discussion in organized form only in 1972 when the United Nation held a conference on Human Environment in Stockholm to reassess the impact of industrial development on the environment. By that time the present groups had started criticizing the carefree attitudes of governments and industrialist towards protection of environment. On the backdrop of

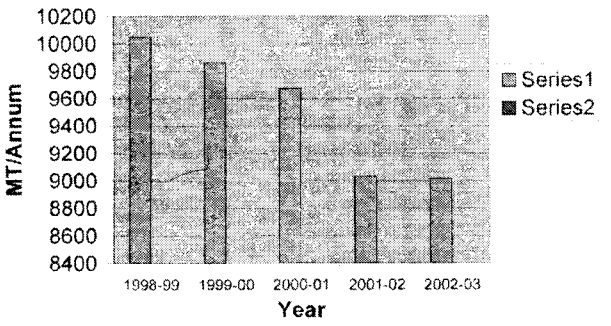


Fig. 1 Total chlorine consumption

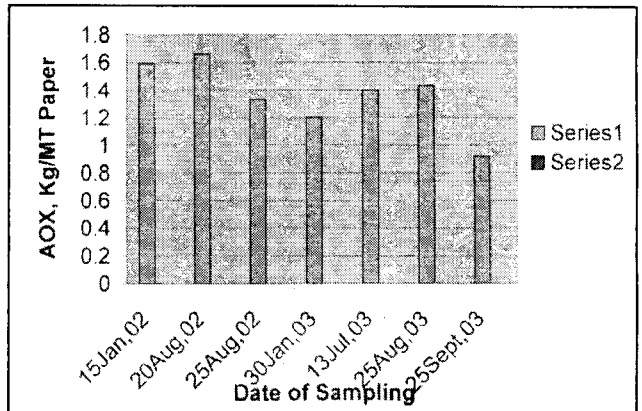


Fig. 2 AOX level in Treated effluent.

Stockholm conference, these criticisms had become an eye opener to all the member countries resulting in enactment of rules and regulations for protection of environment. In India too, subsequent to the Stockholm conference of U.N.O, lot of legislation incorporating additional rules from time to time had been framed and as a latest directive by the Central Pollution Control Board (CPCB), Corporate Responsibility on Environmental Protection (CREP) is imposed on the 17 major polluting industries in India. In this paper, activities taken up in Nagaon Paper Mill (NPM) towards environmental protection, in the line with CREP is discussed.

Environmental Management Programmes

NPM in its endeavor to protect environment, has undertaken number of measures, which are in various stages of implementation to improve its environmental performance. Some of them are discussed below in brief.

AOX in treated wastewater

Release of AOX in treated discharge wastewater is now a stringent parameter, which was even unheard earlier. The CPCB under CREP has fixed the norm at 1.5 Kg/mt of paper-produced up to March 2005 and it is 1.0 Kg/mt for next 2 years. In NPM, steps taken to bring down the AOX level in bleaching plant effluent are:

Re-circulating a portion of chlorine backwater in unbleached dilution tower.

Recirculations of hypo back water.

Neutralization of chlorine backwater by alkali extraction backwater.

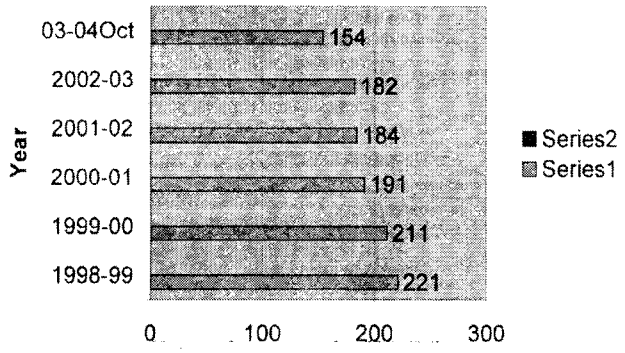
Low Kappa cooking in Digester. The present AOX level in treated wastewater, (as per analysis report of CPPRI, Saharanpur), given in Fig-2 also shows a positive trend. To bring it down further to the revised norms given in CREP, it has been decided to change the bleaching sequence to D/C E_{op}DED and preliminary evolution for the changed sequence is already completed.

Installation of lime kiln

Solid waste is often called third pollution after air and water pollution. Chemical process industries generate a variety of wastes, both organic and inorganic. Organic wastes can be easily used for producing energy, but the inorganic part is difficult to manage. Lime mud is one of the major solid waste generated in integrated paper mill. Unless recalcined and used back, it is a major source of pollution. However, in the present day scenario, with sky rocketing cost of Fuel oil, recalcination of lime mud is not an economic solution unless alternative fuel like bio-gas, producer gas etc. is used. Incidentally, NPM is yet to go for lime mud reburning plant due to easy availability of unslacked lime from the near by area. Even then, due to Environmental compulsion, NPM has initiated action for installation of lime kiln with a target date of commissioning by March'05. Action plan includes generation and use of producer gas from the bamboo dust as well as NCG from evaporator and Digester area.

Wastewater discharge

Water consumption in NPM is comparatively high and present Specific Consumption is 15.4 kl/mt of paper. It required lot of effort to bring down to the present level from the original design parameter of 235 kl/mt paper. On the other hand,



Water consumption Cu.m/mt paper

Fig. 3 Water consumption pattern

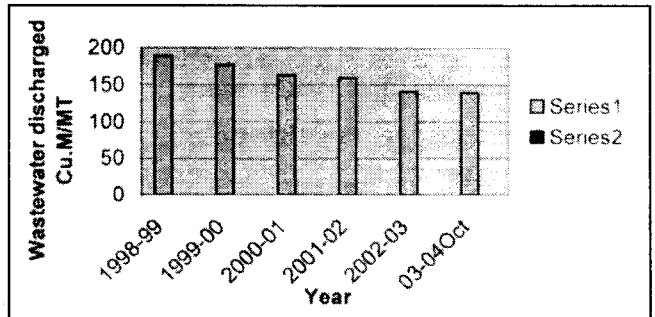


Fig. 4 Waste water discharge per mt paper

CPCB has revised its norms to 140 m^3/mt paper produced for next two years i.e., up to March 2005 and then to 120m^3 for next 3 years. In view of this revision, NPM has to explore further means of reducing water consumption and taken numbers of steps like:

• Conversion of wet fly ash handling system to dry ash handling system which saves about 10m^3 fresh water per tonne.

• Recirculation of bleach filtrates, wherever feasible without affecting the runnability of the plant.

• Recirculation of sealing cooling water of Utility and Soda Recovery plants.

• Reuse of excess foul condensate of evaporators in pulp mill areas.

• Use of wastewater in Chipper house grit chamber / bamboo conveying.

• Use of evaporator condenser water in Pulp Mill unbleached pulp dilution.

These steps are resulting in decreasing trend in Mill water consumption. Fig. 3 reveals the decreasing trend in water consumption since 1998-99 till date. Corresponding decrease in discharged waste water is shown in Fig. 4. For further reduction in water consumption and wastewater discharge, the following actions are being planned:

• Installation of NASH type cooling tower with high efficiency separator for recirculation of paper machine vacuum flume back water.

• Installation of single centrifugal compressor in place of existing three nos. of reciprocating compressors.

• Up-gradation of bleaching plant with complete recirculation of filtrate excepting 1st extraction stage.

• Recovery and reuse of underflow from raw water clarifloculator through settling basins.

After completion of above steps, water consumption should be well within the revised norms of 120 m^3/mt paper set by CPCB.

Use of treated effluent

Land application of Pulp and Paper mill wastewater for growing a variety of crops has been reported from several parts of the world (1). The studies carried out by NEERI on the use of this water have demonstrated that a productive crop irrigation programme can be integrated with wastewater disposal facility yielding revenue and reducing waste treatment costs. In one such study by NEERI in a large Pulp and Paper mill in the country revealed that - the wastewater can be successfully used for crop irrigation on the textured soils to raise salt tolerant crops like maize, wheat, sugar cane etc. and also some varieties of rice. Soil also retained colour and removed COD in wastewater.

In NPM, the treated discharged wastewater is extensively used by the local farmers throughout the entire stretch of 25 Km disposal route during lean period using 150 to 200 DG Pump sets.

The recent study conducted by the Guwahati University on this disposal route revealed no adverse impact on the quality of soil in this area even after using the treated effluent for more than a decade period. Further, the IIT, Guwahati and the Assam Agricultural University has also

been requested to carry out studies on this route and its surrounding areas to ascertain the quality of soil, crops and total ecosystem.

Colour removal from effluent

Though lignins have no reported toxic and health related problems, the colour imparted by them on the receiving waters is aesthetically unpleasant. The colour reduces light penetration into water, decreasing the efficiency of photosynthesis in aquatic plants, thereby having adverse impact on their growth. The inadequacy of biological treatment to remove colour from Pulp and Paper mill effluent has led to the development of methods such as coagulation with various coagulating agents (2, 3) and sorption with a number of sorbents. In NPM, hypo sludge is being utilized as a coagulating agent for removal of colour in Pulp mill effluent. However, a detail study on colour removal from effluent is to be carried out by the IPMA/CPPRI, for proven result. After successful completion of this project, the necessary steps shall be initiated accordingly.

Solid wastes management

The principal sources of solid wastes are domestic, commercial, industrial and agricultural activities. Industrial activities alone generate about 85% of the total solid wastes. Larger industries are generally located outside the cities and the disposal of their wastes is primarily the responsibility of the industries themselves. The disposal problem is getting many folded day by day, mainly due to stringent laws formulated by the legal authorities. It is encouraging that, to -day some of the industrial wastes are utilized and recycled while others can be used as energy source. Energy can be recovered from solid wastes by number of thermal routes as well as by biochemical conversion. An effective Solid Waste Management Plan has been prepared at NPM as per EMS as well as as per the directives from the Ministry of Environment and Forest (MoEF) to deal with the problems arising out of huge generation of solid wastes like Lime mud, Bamboo dust, Coal ash etc.

Coal ash management

Coal based thermal power stations are the principal source of power generation in the country. They also produce a large amount of ash to the tune of about 50 million tonnes per annum (4). It is unfortunate that only 4 % of it is utilized for generating energy and other purposes against world average of 33 %.

About 120 - 130 mt of total coal ash is being generated at NPM which is at present being utilized for road building in nearby areas, filling low lying areas, supplying to railways on request etc. and a small portion of the fly ash is being lifted by local Cement and brick manufacturers free of cost as per the directives of MoEF notification, dated 14th Sept., 1999. Wet disposal system of boiler ash has been converted to dry

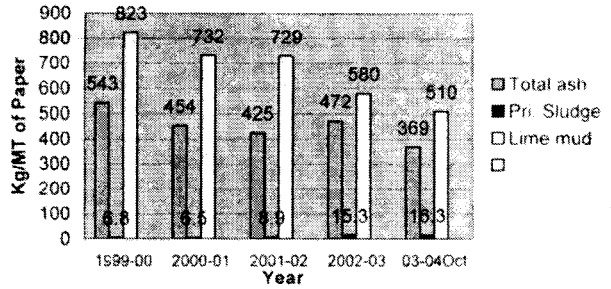


Fig. 5 Solid wastes generation per mt product

disposal for easy lifting of material by the end users. A detail action plan has been prepared as per the directives from MoEF and submitted for total utilization of these ashes by the year 2008. NPM is planning to install a FBC Boiler with ESP to burn mill wastes including fly ash along with coal fines. In this case the entire dry fly ash, having high unburnt coal, will be burnt in FBC Boiler along with bamboo dust. The ash generated from the FBC Boiler having low unburnt coal and has pozzolanic properties for which it can be used in Cement industry. In the mean time, with close monitoring and better operation and control, ash generation per mt of paper produced could be gradually brought down compared to earlier years as shown in Fig. 5. The total ash generation in 1998-99 was 542 Kg/mt Paper as against 369 Kg up to Oct. 2003. The steps taken were:

- The specific coal consumption got reduced from 2.21 mt coal per mt paper produced in 1999-2000 to 1.9 mt in 2002-03.
- Reduction of process steam consumption.
- Increase in capacity utilization of the mill.
- Increase in thermal efficiency of coal-fired

boiler by extension of economizer to tap the waste heat from flue gas.

• Installation of FF Evaporator to increase firing black liquor concentration from 63% to 70%, thereby reducing steam consumption in Evaporator and increasing steam generation in Recovery boiler.

• The overall result is reflected in the specific Energy consumption pattern which has a continuous downward trend as may be seen in Fig 6. Fig. 5 shows Lime mud generation per mt of product for the period. On the other hand,

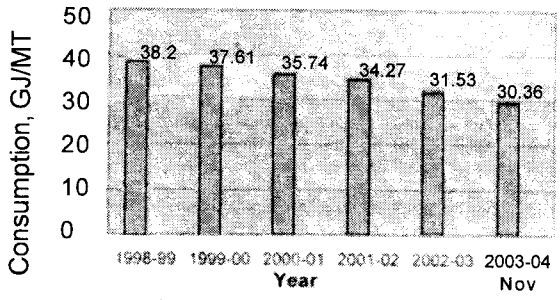


Fig. 6 Specific Energy Consumption

to reduce carry-over of effluent sludge to aeration stage the quantity of primary sludge retained by Sludge dewatering unit has been increased since 1999-2000.

Bamboo dust management

Bamboo dust is having a very high energy potential which can be recovered by converting it to other fuel form or by incineration. Incineration involves the burning of solid wastes at high temperature. If incineration is to become an economical method for solid waste disposal, useful material and energy must also be recovered by the process. The heat or energy so recovered can be utilized for generating other energy in other form or for reduction of inputs.

Keeping this in view, we approached Indian Institute of Science, Bangalore, for consultancy service so that a project can be initiated for recovery of energy from bamboo dust. At present the dust is sold at very nominal price to a local party who is using this for making particle board and also as domestic fuel. Besides, a FBC boiler of 50 T/hr. capacity for utilizing entire organic wastes as fuel is on the anvil.

Environmental management in Chloro-Alkali Plant

Mercury being a major nondegradable potent environmental pollutant, its elimination by treatment is not feasible unless it is arrested in the source itself. In Japan and other developed countries Mercury cell plant operates at much lower rate of its consumption per tonne of the product. Steps in the following line are taken at NPM to arrest the loss of mercury.

Complete recycling of mercury bearing effluent

• Mercury bearing effluent is collected in a common pit and it is circulated through the Mercury removal plant, working on the principle of Activated carbon adsorption to a level of 0.05 mg/l in the effluent.

• It is then circulated through hypo sludge washing unit.

• Once 100 % recycling of Mercury bearing effluent is achieved, installation of on line Mercury Analyzer can be done away with.

Treatment of cell room ventilation gas

• No direct escape route of Hg.

• Covered outlet and inlet box of cell are connected to Hypo tower (absorption tower)

De-mercurization of caustic soda

• Installation and commissioning of Caustic coolers in series.

• Use of Caustic lye filter.

Hydrogen De-mercurization

• Cooling of hydrogen stream through chilled water to bring down the temperature.

• Adsorption of hydrogen gas stream through activated carbon filter.

Measures on the anvil

• Double stage hydrogen chiller to be procured to get temperature below 5°C.

• Installation of additional hydrogen de-mercurization unit, based on activated carbon bed.

Capping of existing mercury bearing brine sludge disposal site

• The specially designed pits, lined with LDPE both side brick soling is not yet filled up. Necessary capping will be done in due course.

Installation of mercury distillation unit

• To reduce the Mercury content in the solid waste a mercury distillation plant of adequate size is under procurement.

• Recovery of Mercury will also have a positive impact on the its specific consumption.

Technology transfer from mercury cell to membrane

• After installation and commissioning of proposed ECF bleaching sequence, chlorine requirement will come down to 13 Kg/mt of paper, accordingly Chloralkali plant will be down sized and change over to Membrane cell mill be planned. The scheme is included in 5 years upgradation plan of the corporation.

Treated effluent quality

Several treatment and control technologies have been developed to reduce wastewater or pollutant discharge to natural watercourse. The two major technology approaches are:

• Production process controls aimed at reducing wastewater volume and pollutant load discharge from the mill.

• Wastewater treatment technology or end-of-pipe treatment systems aimed at reducing discharge of pollutants contained in the wastewater.

Both these approaches are adopted all over the world, however, the process control system is widely accepted so that, the pollutants generated can be reduced at the point of generation itself. NPM has an effluent treatment plant with about 2200m^3/hr. flow capacity, attached with an aerated Lagoon. The treated effluent after meeting the laid down permissible limits is discharged to a natural watercourse.

The reduction of COD and BOD values over years revealed that the facilities available are utilized properly. The continual improvement towards the closure system in processes is also reflected in Fig. 7.

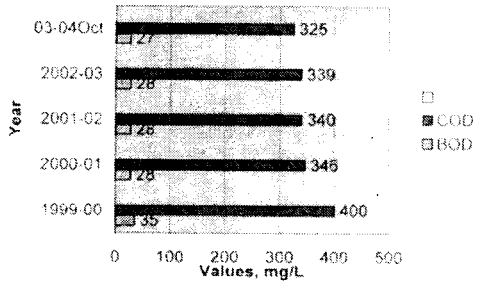


Fig. 7 BOD and COD reduction trend

CONCLUSION

Industrial growth is no doubt necessary to meet our requirement but it must not be at the cost of degradation of environment, to the extent that makes the world unfit for human habitation.Therefore, all the polluting industries has a moral responsibility not to harm or to undo the harm coused to the surrounding by its activities.

The investment made in environment protection may not pay tensibly but benefits derived out of such investment can be relised in terms of fulfilment of social obligation which is more important for servival of any industry. In this context CREP have a lasting positive impact on protection of environment.

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REFERENCES

1. Subramanyam.P.V.R, IAEM Journal, Vol. 17, 79-94 (1990)
2. Springer A.M., Industrial Env. Control- Pulp and Paper Industry, John Willey, New York p. 340-510 (1986).
3. Naik B.N, Pollution Mgt. In Industries, Env. Publication, Karad, Maharastra 520, (1989).
4. Bhattacharya K.G and Sarma N, IJEP, 13 (12),917-920 (1993).