Environmental Management Through Implementation Of CREP At Nagaon Paper Mill

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Key words : CREP, AOX, Lime Kiln, odour, demercurization, bleaching sequence

Environmental management in an industry is an on going process and it has become an essential part for its survival. Preservation and protection of the environment is no longer a new issue now. Right from Govt. up to the common public are concerned about the process of environmental degradation. Of late, Ministry of Environment & Forest (MoEF) introduced a time targeted action plan, 'Corporate Responsibility on Environmental Protection' (CREP) to 17 major polluting industries including Paper industry in the month of March 2003 through the Central Pollution Control Board (CPCB). Nagaon Paper Mill (NPM) has already implemented and completed a major portion of the conditions laid down and few of them are in the process of implementation. Adsorbable Organic Halides (AOX), which has been considered as one of the major toxic chlorinated compounds, is within the present stipulated norm in outgoing treated effluent. The conversion of existing bleaching sequence to Elemental Chlorine Free (ECF) system shall further reduce this toxic parameter. Due to adoption of many promising steps, water consumption as well as wastewater discharge rate has shown a drastic reduction trend. Utility of treated wastewater for irrigating fields has also been encouraging. Eco friendly schemes implemented in Chlor- alkali plant, including 85% that of the CREP conditions so far, has shown a positive trend towards reduction in mercury emission, consumption, solid waste generation, etc. NPM is an ISO 14001, ISO 9001 and OHSAS 18001 company, and as such it is committed towards continual improvement of the environmental performances. It is needless to say that the CREP has also become a major tool and rather helpful in dealing with the situations for the interest of the industry in particular and for the society as a whole.

INTRODUCTION

Environmental Management System (EMS) adopted in many industrial units, the term environment covers pollution, waste materials, ecology, recycling of rejected products, noise, odour, visual amenity and 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. This is to be noted that, as an after math of two successive world wars, the focus of the Governments, production of industrial goods and employment only with least attention towards impact of industrial activities on the environment. The voice 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. On the backdrop of 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. However, subsequent to the Stockholm conference of U.N.O, lot of legislation incorporating additional rules from time to time. The above initiatives were further strengthen at Kyoto Protocol in 1997, in view of dramatic global climate change, wherein the nations of the world agreed that the industrialized countries would reduce their aggregate emission by 5.2% below 1990 level by 2008 2012. And as a latest directive by the Central Pollution Control Board (CPCB), Corporate Responsibility on Environmental Protection (CREP) is

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imposed on 17 major polluting industries in India with some time-targeted conditions to be implemented.

In this paper, activities taken up at NPM towards implementation of CREP and its impact on preservation and protection of environment are discussed.

ENVIRONMENTAL MANAGEMENT PROGRAMMES

NPM in its endeavor to protect environment, has under taken many measures and many are under different stages of implementation, to improve its environmental performances. Some of them are discussed below in brief.

AOX in treated wastewater

Release of AOX in treated wastewater being discharged 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 February 2008 and it is 1.0 Kg/MT from March 2008. In NPM few steps have been initiated to keep the AOX level at lower side by recirculating a portion of chlorine back water in unbleached dilution tower, recirculation of hypo back water etc. Neutralization of chlorine backwater by alkali extraction backwater is also an important step adopted at NPM. The present AOX level in treated wastewater, being analyzed at mill as well as at CPPRI, Saharanpur, shows value far below the limit. Proposed ECF ($D E_p D E D$) bleaching will ensure meeting AOX target of 1.0 kg/MT of paper by 2008 apart from enhancing pulp brightness of 88% ISO. This apart, the proposed changes in the mill will facilitate to improve air emission, liquid effluent discharges and solid wastes discharges.

Installation of Lime Kiln

Solid waste, often called third pollution after air and water pollution. Chemical process industries generate a variety of wastes, both organic and inorganic. Organic wastes are easily used for producing energy, however it is seen that the inorganic part is creating disposal problem to a large extent. Lime mud, which is an inorganic waste, is being generated by all large paper plants with no exception to NPM. It is about 350 MT as such with an average consumption of 150 MT of lime per day. Actions have already been initiated to install a Lime re-burning plant, so that lime mud disposal problem is reduced to minimum along with a minimum utilization of natural resources. Civil work to install the Kiln already started and expected commissioning by February 2007. It is also proposed that once the plant is commissioned, provisions will be there for burning non-combustible odour creating gases (NCG) in the Kiln.

Wastewater discharge

Water use is high in paper industry and its requirement varies from 150 250 M^3/ tonne of paper produced, which also depends on the type of raw material used, process used, product being manufactured, recycling system etc. But fortunately now a day all paper manufacturers are well aware and its use in papermaking is gradually being reduced. As such wastewater discharge rate is also getting reduced. The CREP has its time-targeted norms of 140 M^3/MT paper produced for two years i.e., up to March 2005 and 120 M^3 for next 3 years. This target is already achieved at NPM way back in April 2004 by generating less than 120 M^3 wastewater per MT paper produced. The present discharged rate stands at 89 M^3 per MT of Paper.

It was possible because of some measures taken in the line with close-cycle concept. Recycling was the major factor in achieving the target. However this reduction trend will be further accentuated once the action plans in process modification especially in pulp mill is completed. Some of the major steps, which are already in place are mentioned below :

- Conversion of wet fly ash handling system to dry ash handling system, which saves about 90 M^3 fresh water per tone.
- Recirculation of bleach filtrates.
- Recirculation of sealing cooling water of Utility and Soda Recovery plants.
- Reuse of excess foul condensate of evaporators.
- Use of wastewater in Chipper house bamboo carrying flume as well as in chips washing plant.
- Use of ETP sludge filter wire mesh washings in chips washing plant
- Use of evaporator condenser water in Pulp Mill unbleached pulp dilution.
- Reuse of Paper Machine flume water from cooling tower that saves about 30 M^3 per MT of paper.
- Replacement of reciprocating compressor by centrifugal compressor, which saves 30 M^3 water per hour.
- After implementation of new bleaching sequence with recirculation of filtrates for spray etc., another 400 M^3 per hour of water is expected to be reduced.
- Recovery and reuse of water through settling of Water Treatment Plant Clarifier underflow, about 60 M^3 water per hour shall be able to save.

These promising steps have resulted a decreasing trend in Mill water consumption too per MT of paper. Fig.1 revealed that in 2000 - 01, the water consumption was as high as 191 M^3/MT of paper produced and to day it is 108 M^3'(up to August 2006). As a result the wastewater-discharged quantity is also getting reduced, which is shown in Fig.2. The water consumption and the wastewater discharge quantity shall be reduced further once the time targeted action plans, mainly on Pulp Mill upgradation are completed.

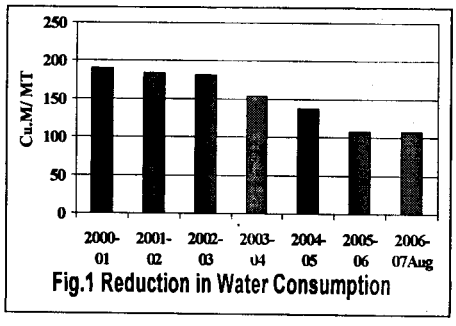

Fig.1 Reduction in Water Consumption

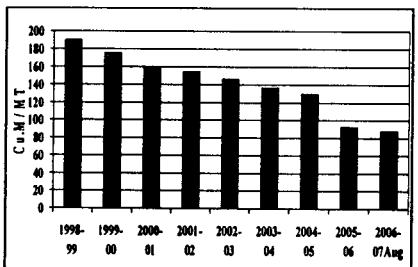

Fig.2 Reduction in Wastewater Discharge

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. 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 (1). Studies carried by the NEERI in one of the 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 retain 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 treated effluent disposal route to river, during lean period. It is seen that about 150 to 200 DG Pump sets are pressed into service by the farmers to use this water. We sponsored several studies by renowned Institutions to ascertain whether there is any adverse impact on soil and crop quality because of continuous use of this water since last more than 20 years. But a study conducted by the Gauhati University in 1998, on this disposal route revealed no such adverse impact on the quality of soil in this area, after using the treated effluent for more than a decade period. Recently, another study by ex-soil scientists of Assam Agricultural University, completed in the month of November 2005, revealed that the water or soil collected from the disposal route does not show any major abnormality as far as environmental parameters are concerned. The scientists of the state expressed their satisfaction as the entire stretch shows good yield of crops with less requirement of fertilizers. The average production of crops, when used treated effluent for irrigation, showed yield 5 - 6 MT per Ha against a state average of 3.5 MT. For crop cutting experiment, they chosen six different villages near the treated effluent disposal route, starting from near treatment plant (Ghunusha Vill) to near river confluence (Itilapar vill) for comparative study between the yield obtained by irrigating with fresh water and with treated effluent water. Fig.3 shows the comparison between the yield with no much difference. The Satellite imagery picture submitted by the experts also revealed healthy crop growth in the area.

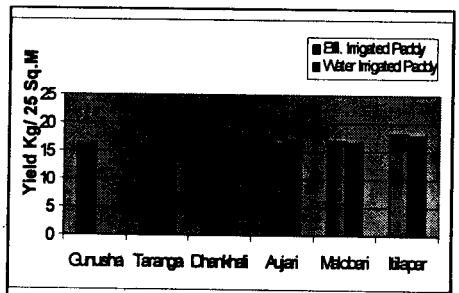

Fig.3 Comparison of Yield Between Effluent Irrigated & Water Irrigated Paddy

Colour removal from effluent

Though lignin have no reported toxic and health related problems, but 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 and sorption with a number of sorbents.

In NPM, hypo sludge is being utilized successfully as a coagulating agent for removal of colour in Pulp mill effluent. However, a detail study on colour removal from effluent is being carried out by the IPMA/ CPPRI, and after successful completion of this project, the necessary steps shall be initiated accordingly.

ENVIRONMENTAL MANAGEMENT IN CHLOR-ALKALI PLANT

Mercury is a non-degradable potent environmental pollutant that has been engaging our vigil attention and we have been looking for developing several methods with latest technology for total containment in the plant itself within permissible limits. In Europe, Japan and other developing countries, Mercury cell plants operate at consumption rate far below per tonne of Caustic than Indian Chlor-alkali plants. However, at NPM, steps are taken in phase wise to implement many eco-friendly processes to prevent the mercury release to the environment by some schemes other than time-targeted conditions mentioned in CREP.

- Uninterrupted power supply from captive generation
- Closed end boxes
- Less opening of cells
- Good house keeping practices
- Mercury balance and continuous monitoring
- Recovery and reuse of hypo sludge washings, etc.

Complete recycling of Mercury bearing effluent

- Mercury bearing effluent is collected in a common pit and it is circulated through the Mercury removal plant, based on Activated carbon adsorption, to maximum value of 0.05 mg/l as Hg.
- It is then circulated through hypo sludge washing unit.
- 100 % recycling of Mercury bearing effluent already done.

Continuous monitoring of mercury content is carried out.

Treatment of cell room ventilation gas

◆ Natural adequate ventilation existed.

◆ Cover outlet box and inlet box of cell are connected to Hypo tower (absorption tower)

◆ All the leaky secondary were renewed, like epoxy coating on cell house ground floor, drains and civil structures to contain Mercury concentration within norms.

De-mercerization of Caustic Soda

◆ Caustic cooler taken into operation.

◆ To bring down further carryover of mercury in Caustic lye, Lye filter based on activated carbon adsorption installed.

◆ Mercury consumption trend is decreasing.

Hydrogen De-mercerization

◆ Cooling of hydrogen stream through chilled water to 5 ^{0}C to avoid carryover.

◆ Adsorption of hydrogen gas stream through activated carbon filter.

Salt Washery System

◆ Conditions of getting washed salt incorporated in purchased orders. Good quality of salt is being received.

◆ Quantity of sludge generation is getting reduced. The decreasing trend of sludge generation is shown in Fig.4

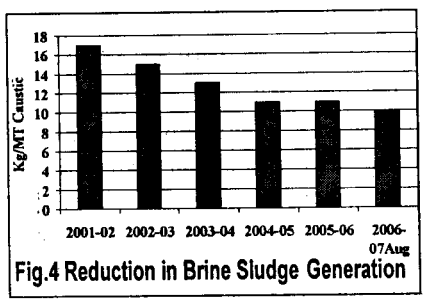

Fig.4 Reduction in Brine Sludge Generation

Capping of old secured landfill

◆ Old secured landfill of brine sludge shall be capped after completion of construction of new landfill as per guidelines of CPCB. Civil work already started.

Mercury Distillation unit

◆ Already commissioned and recovering at the rate of 650 kg to 750 kg per annum.

◆ Mercury not procured from February 2003 onwards.

Brine Sludge Treatment & Water Leachable Mercury Content

◆ Brine sludge is treated in rotary vacuum drum filter to get maximum recovery of water leachable mercury content in brine before disposal. For better reduction of water leach able mercury, a new vacuum drum filter of improved design is installed. Mercury content before disposal to secured landfill is found below 0.1 mg/l after stabilization and treatment with sodium sulphide/lime.

Reduction in Mercury Consumption to less than 50 gm/MT of Caustic

◆ Achieved mercury consumption level of less than 50 g/MT of product (present achieved value of mercury consumption is 49.4 up to August 2006). It was possible because of the completion of action plans already mentioned above. This figure is expected to be reduced further after stabilization of the recently installed caustic filter. Mercury consumption trend is shown in Fig.5

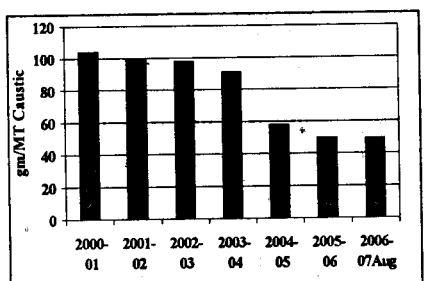

Fig.5 Reduction in Mercury Consumption

Total mercury emission less than 2.0 gm/ MT product

◆ To achieve the Hg emission level, action plans already implemented as mentioned above. The level is less than the norm after installation of additional chiller along with demercurization unit of hydrogen product, mercury distillation unit, and recently caustic filter as well as close monitoring of cell room gas on regular basis.

Switch over to membrane cell technology

◆ With proposed modification of bleaching sequence to ECF, elemental Chlorine & hypo requirement will be eliminated. Chlor-alkali plant will be downsized accordingly andchangeoverto membrane cell technology is planned by 2009.

ENVIRONMENT FRIENDLY SCHEMES IMPLEMENTED AND UNDER IMPLEMENTION (OTHER THAN CREP)

As per EMS, as committed towards continual improvement of environmental performances, NPM has under taken many measures and many are under implementation. Some of them are discussed below in brief:

◆ In order to increase the efficiency of Chemical Recovery Boiler, a Free Flow Falling Film Evaporator has been installed in the year 2001. This has reduced the release of pollutants into the water, steam consumption, efficient chemical recovery etc. Further, the Electrostatic Precipitator (ESP), which is fitted in the Recovery Boiler to remove the carry over Suspended Particulate Matters (SPM) along with the flue gas, is revamped recently to enhance the efficiency that is to reduce the SPM in ambient air.

◆ Modern version of Disc Save all was recently installed in our Paper Machine. This has reduces the Suspended Solids in outgoing treated effluent.

◆ Four numbers of Floating Aerators, in addition to existing 20 numbers of oxyaerators in aerated lagoon already commissioned. This device has already enhanced the dissolved oxygen content in effluent for better treatment.

- Recovery Boiler Chimney height is increased from existing 50 m to 60 m. This will further improve the ambient air quality in and around mill premises.
- Pulp Mill Screen room upgradation completed in January 2005, to improve Pulp quality as well as to conserve natural resources.
- One additional Primary Clarifier is being installed in ETP to improve the performance of clarification of raw effluent as well as the efficiency of forwarding treatment stages.
- An AFBC boiler is being installed where mill's organic wastes will be used as fuel
- Bamboo dust gasification plant is under civil construction and expected commissioning by September 2006.

CONCLUSION

Legislation alone can't bring about a change in environmental conditions of the surroundings unless there is positive attitude of the working group. No doubt, CREP or similar legislation definitely has a positive impact and remained as a tool in operational control in maintaining the environmental aspects intact. NPM has under taken many steps to reduce consumption or use of resources including adoption of eco friendly steps, much before the CREP was introduced. Though in many areas NPM achieved the CREP requirements, but it is planned to continue with new efforts so that with minimum use of resources, minimum emission of pollutants are achieved. However, these types of legislations are considered to be the major tool for the prevention and control of pollution. Moreover, the 'Modernization and Technological Upgradation Plan' (MTUP) of the mill, other than CREP conditions, which is aimed at value addition of product, conservation of energy as well as further reduction in all types of emissions, is being implemented phase wise. NPM is certified with Quality Management System, ISO 9001: 2000, Environmental Management System, ISO 14001: 2004 and OHSAS 18001: 1999. We realize that prevention of pollution and protection of environment is an ongoing process and we are committed for continual improvement as per Environmental Management System, which is in force, by application of modern eco-friendly practices.

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