## DEVELOPMENT OF ENVIRONMENTAL STANDARDS AND GUIDELINES

# Development of Microbiological Quality Standards for Treated Sewage

Ministry of Environment, Govt. of India has constituted a Committee in 1999 to recommend coliform standards for treated sewage discharged into rivers and lakes. The Committee has recommended limits for fecal coliform along with limit for BOD. Subsequently a High Powered Committee appointed by the Hon'ble Supreme Court constituted a sub-committee chaired by Chairman, CPCB to recommend coliform standards in treated sewage discharged into river Yamuna in Delhi Stretch. As a follow up of the recommendations of the two expert committees a project was sponsored by CPCB to study reduction of coliform during treatment with conventional treatment technologies adopted in the country. The study was carried out in collaboration with IIT Roorkee and Anna University, Chennai. This study included various STPs operating with various treatment technologies in North and South India. It was observed by the two institutes that up to 99% reduction in coliform could be achieved by the conventional methods of treatment provided the treatment plants are operated satisfactorily. However, even after 99% reduction in coliform the effluent does not meet the quality specified by WHO & USEPA for its use to irrigate food crops eaten raw or discharged into the rivers having very little or no dilution. The reports have been finalized and the results are proposed to be presented before the Peer & Core Committee of CPCB for finalizing environmental standards.

### WHO Recommended Microbiological Quality Guidelines

| Category | Reuse conditions | Exposed group | Intestinal nematodes (eggs/litre) | Fecal coliforms (cells/litre) | Treatment to achieve the microbiological quality |
|---|---|---|---|---|---|
| A | Irrigation of crops likely to be eaten uncooked, sports fields, public parks | Workers consumers, public | <1 | <1000 | Series of stabilization ponds |
| B | Irrigation of cereal crops, industrial and fodder crops, pasture, trees | Workers | <1 | No standard | 8-10 day retention in stabilization ponds |
| C | Localized irrigation of crops in category B if no human exposure | None | Not applicable | Not applicable | At least primary sedimentation |

**USEPA Typical Guidelines for Effluent Reuse**

| Type of reuse | Reclaimed water quality |
|---|---|
| **Urban reuse**<br>Landscape irrigation<br>Toilet flushing<br>Recreational lakes | pH 6-9, BOD <10mg/l, Turbidity < 2NTU;<br>No fecal coliforms /100ml; 1 mg/l residual chlorine. |
| **Agricultural reuse**<br>Food crops, commercially processed surface irrigation, orchards, vineyards. Non-food crops. | pH 6-9, BOD <30mg/l, SS < 30 mg/l;<br>Fecal coliforms < 200 /100ml; 1 mg/l residual chlorine. |
| **Ground water recharge**<br>Potable aquifers<br>Indirect reuse | pH 6.5-8.5, Turbidity < 2NTU; No fecal coliforms/ 100ml; 1 mg/l residual chlorine; other parameters as potable standards. |

**Summary of Results**

| Treatment Technology | Total Coliform MPN/100 mL in Influent X $10^6$ | Total Coliform MPN/100 mL in Effluent X $10^4$ | Fecal Coliform MPN/100 mL in Influent X $10^6$ | Fecal Coliform MPN/100 mL in Effluent X $10^4$ |
|---|---|---|---|---|
| **Anna University** | | | | |
| AABF | 5 – 500 | 5 - 380 | 2.90 - 500 | 3.7 – 190 |
| ASP | 6.8 - 5,000 | 50 - 6,800 | 5 - 3,700 | 37 - 3,800 |
| Tertiary Treated | 0.68 – 98 | <2 (all but one day) | 1.1 - 68 | <2 (all but one day) |
| OP | 3.8 – 680 | 0.05 - 900 | 0.7 - 98 | 0.038 – 500 |
| TF | 6.8 –500 | 2 - 3,000 | 3.8 - 370 | 2 – 1,100 |
| **IIT, Roorkee** | | | | |
| UASB | 2.3 – 23 | 1.9 - 23 | 0.23 - 15 | 0.023 – 23 |
| UASB | 1.6 - 43 | 1.1 - 23 | 0.39 - 23 | 0.11 – 4.3 |
| OP | 4.3 –930 | 1.5-430 | 0.023 - 230 | 0.15-210 |
| ASP | 1.5 – 4.3 | 9.3 - 930 | 0.21 – 1.5 | 0.15 – 930 |
| Anaerobic Filter | 28 | 450 | 6.8 | 130 |

## Development of Emission Standards for Petrochemical Industries

Petrochemicals are hydrocarbons obtained from naturally occurring raw materials viz petroleum, natural gas, coal etc. The emergence of downstream petrochemical products manufacturing industries (popularly called synthetic organic chemicals manufacturing industries) like high polymers, synthetic fibres, plastic and plasticizers, synthetic rubbers, pesticides, carbon black, detergents, fertilisers and other similar products are outcome of the technological developments in the field of chemicals based on petroleum feedstock. These feedstock's can either be cracked in cracker complexes to produce olefins or reformed in aromatic complexes to produce aromatics. These olefins and aromatics are grouped together as basic petrochemicals & form the major building blocks. Synthetic organic chemicals can also be obtained from other alternative sources like ethyl alcohol (from molasses), acetylene (from calcium carbide) and benzene (from coke oven by products). With the application of new process technology in the field of petrochemicals based on feedstock available from refineries, there is a positive shift towards petroleum feedstock. In general, the manufacturing processes of petrochemicals involve raw materials undergoing one or more chemical reactions followed by different unit operations to separate the product from side products and co-products.

There is a growing concern on hydrocarbon levels in ambient air due to their toxic effects, global warming potential and ability to deplete stratospheric ozone. Considering the high growth rate in the petrochemicals sector and the increasing global concerns on hydrocarbon levels in ambient air due to release of volatile organic compounds (VOCs) into the atmosphere. Thus it is important to understand that the air emission from petrochemical complex cannot be addressed like other chemical production units as it comprises of multiple processing unit at one specific location producing a wide range of synthetic products from feed hydrocarbon and equipment and thus resulting into a complex problem of release of VOCs.

With this objective of protection of health and environment, Central Pollution Control Board has prepared emission standards for the identified priority pollutants from the petrochemicals plant. The emission standards have been approved in 139th Meeting of Central Board meeting.

## Development / Review of Effluent & Emission Standards for Fertilizer Industries

Standards for discharge of effluent and emission from fertilizer industries were notified under the Environment (Protection) Act, 1986 in the years 1987. Since then, various developments with respect of process/pollution control technologies and waste minimization & better management practices have taken place. In view of this, revision of the existing standards was taken up. The base work is completed and the draft recommended standards were discussed in the 19$^{th}$ Peer & Core Committee meeting. These revised standards are being finalized,

which would be placed before the Board for its approval & subsequent discussions by the Expert Committee in MoEF for consideration & notification.

## Control of Offensive Odour Substances with Specific Reference to Selected Industrial Processes

A study on 'Control of Offensive Odour Substances with Specific Reference to Selected Industrial Processes' has been taken up by the Central Pollution Control Board for identification of method of odour detection and control technology for enlisted offensive odour substances and setting norms for control of specific offensive odour substances from selected industrial processes. The study is in progress.

## Development of Guidelines for Design, Operation, Tail Gas Treatment and Emission Standards for Industry Specific Hazardous Waste Incinerators

The wastewaters generated from the chemical industries pose problems to biological treatment whereas partial/full chemical treatment is often costlier and results in generation of large amount of hazardous waste (sludge). Therefore, there is a paradigm shift from end-of-the-pipe-treatment to cleaner technology, segregation of streams and corresponding treatment due to public awareness and constant persuasion of the regulators. This shift led to installation of chemical waste incinerators for handling the toxic/hazardous wastes such as process residues, spent solvents, toxic aqueous waste, toxic & odorous gases etc. The calorific value of the waste is of major significance in operation of the incinerators as low calorific value wastes may require use of auxiliary fuel. The designs of incineration facilities also vary from industry to industry depending on type of waste feed. The various types of incinerators operating in the field are fluidised bed; drum pyrolyser, liquid injection or rotary type.

One of the issues that are of concern to the chemical industries is the waste gas cleaning from the chemical waste incinerators. Central Pollution Control Board has taken up study to develop emission regulations for chemical waste incinerators for framing guidelines / norms for control. The objective of the study is to assess the indigenous existing chemical waste incinerators in respect of design adequacy, operation conditions and tail gas treatment facilities, choice of better practices, improvement in all the concerned aspects and suggesting techno-economically feasible regulatory mechanism. For this the chemical industries such as pesticides, bulk-drugs, basic organic chemicals and dye and dye intermediate have been selected initially. The draft emission standards for pesticide sector have been prepared and the emission standards for bulk drug sector is in progress.

## Development of Technologies for Pollution Control in Paracetamol Units

Paracetamol is an important analgesic and antipyretic drug. A large amount of waste is generated during iron based chemical reduction process in Paracetamol manufacturing. Since, the scale of operation is small and it will be very difficult for small-scale units to dispose even in common hazardous waste disposal site. It will be worthwhile for industrial units to employ catalytic hydrogenation or any other cleaner technology options so that the effluent/emission/hazardous waste generation can be eliminated.

Central Pollution Control Board carried out a study in association with the National Chemical Laboratory (NCL), Pune, to develop cleaner technology i.e. replacement of the present chemical reduction involving use of iron. Out of four processes used for production of paracetamol - Phenol Route, p-nitrochlorobenzene route, 4-hydroxyacetophenone route and Nitrobenzene route – the Nitrobenzene route is more popular since it is less costly and technology is well accustomed in the country. Therefore, NCL decided to upgrade this technology. The study has highlighted the modifications required in the existing process route during upgradation of technology.

## Study on Persistent Organic Pollutants (POPs) Unintentionally Formed in Certain Chemical Processes

India is a signatory to the Stockholm Convention on Persistent Organic Pollutants (POPs), which has been ratified after signing by 50 industries and is going to be in force. CPCB has under taken a study to inventories and determining emission factors for unintentionally formed POPs. Viz. Hexachlorocyclohexane, Chlorophenols, Chlorobenzens, Chlorinated diphenyl ethers resulting from the manufacture of selected products and to develop strategies / technique for minimisation of unintentionally formed POPs.

The product / processes identified for this study are Chlorinated copper phthalocyanies, Aromatic chlorophenols, Endosulphan, Hexachloro cyclohexane (Lindane), Pigment Violet 23, including manufacture of Chloranil, Pigment 1 Red 2, Chlorobenzenes and Cyanuric chloride.

## Preparation of National Chemical Management Profile (NCMP)

National Chemicals Management Profile (NCMP) is being prepared under the Canada-India Environmental Institutional Strengthening Project (CI-EISP). It will help assess the national infrastructure for the management of chemicals in the country to identify the gaps for capacity building and priority areas of concern to improve chemicals management. The final document is under preparation.

## Development of Environmental Guidelines for Control of Fugitive Emissions in Cement Manufacturing

Fugitive emissions are generated at various stages of cement manufacturing. The degree of fugitive emissions and the type of controls adopted varies from

industry to industry. It is generally observed that in most cement industries the control measures adopted for these fugitive emissions are not always satisfactory and as a result substantial quantity of fugitive emissions are generated which spread within and out side the industry premises and causes adverse impacts on human health and environment. Keeping in view the problem of fugitive emissions, a study on "Assessment of fugitive emissions and development of environmental guidelines for control of fugitive emissions during cement manufacturing" was undertaken in association with National Productivity Council, New Delhi and IIT, Kanpur.

The study includes identification of all fugitive emission sources, monitoring of fugitive emission, quantification of fugitive emission, characterization of dust and analysis of the samples for heavy metals. The draft report has been prepared and environmental guidelines to control fugitive emissions from cement industries are being finalized in consultation with the stakeholders.

## Development of Standards for New Cement Kilns and Cement Kilns within Urban Areas

The following emission standards have been notified under the Environment (Protection) Act, 1986 in addition to the emission standards notified earlier for the Cement Industry.

(i) For cement kilns including grinding units located in critically polluted areas with a population of one lakh and above (including 5 km distance out side urban boundary) the particulate matter emission standard shall be100 mg/ $Nm^3$.

(ii) For new cement kilns including grinding units the particulate matter emission standard shall be 50 mg/$Nm^3$.

## Revision of Standards for Asbestos based Industries

The following revised emission standards for asbestos based industries have been notified under the Environment (Protection) Act, 1986.

| Industrial Sector | Pollutants | Emission limit |
|---|---|---|
| All types of asbestos manufacturing units (including all processes involving the use of asbestos) | Pure asbestos material | 0.5 fibre* /cc with effect from 3rd Feb 2006 for one year |
| | Pure asbestos material | 0.2 fibre* /cc with effect from 3rd Feb 2007 |

* Fibre of length more than 5 micrometer and diameter less than 3 micrometre with an aspect ratio of 3 or more.

## Comprehensive Industry Document for Iron Ore Mining

A project “Description of Clean Technology for iron ore mining and development of Environmental Standard and preparation of comprehensive document” was in progress at Central Pollution Control Board in consultation with Steel Authority of India Limited, (EMD), Kolkata. Draft Environmental Standards and Guidelines / Code of Practice for Iron Ore Mines have been finalized after series of discussions / meeting with all concerns. Draft Environmental Standards and Guidelines / Code of Practice for Iron Ore Mines have been approved by the Central Pollution Control Board in its meeting held on November 17, 2006.

## Development of Environmental Standards for Sponge Iron Plants

Environmental Standards and Guidelines / Code of Practice for Pollution Prevention for Sponge Iron Industry have been finalized after a series of meetings / discussions at Central Pollution Control Board and MoEF. The guidelines for setting standards provided in National Environment Policy–2006 of Ministry of Environment & Forests were also taken into consideration while finalizing the Environmental Standards. The comprehensive industry document on Sponge Iron Industry is under publication under series Comprehensive Industry Document Series (COINDS).

## Standards for Steel Melting Shop (BOF) and Blast Furnace of Steel Industry

The Central Pollution Control Board has finalized the Environmental Standards for Steel Melting Shop (BOF) and Blast Furnace of Steel Industry and Guidelines / Code of Practice for Pollution Prevention after a series of meeting with the industry, Ministry of Steel, State Pollution Control Board and all concerns. The findings have been placed in the Peer & Core Group Committee for approval of standards and finally approved by the Committee.

Environmental Standards, Stack Height Regulations and Good Practices for Producer Gas Plants and Biomass Gasifiers

Producer gas is a derived gaseous fuel by gasification of various primary fuels like coal, lignite, wood, agriculture residue and other biomass. Though, the bio-resource base of India is substantial, its contribution to useful energy is low. Producer gas can be employed in thermal application or for power generation. Like any other gaseous fuel, producer gas facilitates much better control over power levels when compared to solid fuel. This also paves the way for more efficient and cleaner operation. However, producer gas can’t be stored.

Coal is the major primary fuel and is also processed and converted into other forms. The producer gas derived from gasification of coal continues to be the main fuel for the refractory industries particularly in the eastern parts of the

country because coal is available in the eastern parts at a cheaper cost. In the western part of the country the refractory industries are using charcoal-derived producer gas for kiln and furnace heating due to availability of charcoal.

In a single location, Morbi (Rajkot district, Gujrat) approximately 80 charcoal based producer gas units are in operation. In Himachal Pradesh, Limekilns are operated using charcoal based producer gas to manufacture lime for pharmaceutical industry. A few rolling mills are being operated with coal-based producer gas in Raipur (Chatisgarh). Producer gas finds application in glass industry, retort heating and boiler heating.

Realizing the relevance of gasification process, Government of India has taken various initiatives to promote the technology in the country. Biomass gasifiers have now found utility in range of industries and power applications across the country through numerous demonstration projects and commercialization activities. Over 1200 gasifiers have been reportedly installed under the Ministry of Non Conventional Energy Sources(MNES), Government of India, subsidy programs, and an estimated number of 400 additional gasifiers have been installed outside the subsidy regime. Few small-scale entrepreneurs are also trying to manufacture and install gasifiers on a commercial basis.

In a view of a large potential of producer gas based applications in the country, there is a need to examine the performance of gasifier-based applications in terms of efficiency and environment performance. At present there are no pollution control norms and no specific standards in place for producer gas plants. Some important industrial safety issues pertaining to exposure to high temperature surfaces, exposure to CO emissions, and prevention (and control) of explosions and backfires. It calls for good design of the insulating system, good instrumentation and control.

The Central Pollution Control Board has taken up this study for formulation of environmental standards for these units in association with The Energy and Resources Institute (TERI), New Delhi. Monitoring of biogasifiers was done for the units utilizing gas for Ceramic industry at Morbi, Gujrat Industrial Carbon Dioxide production at Porbandar, Gujrat demo biogasifier at Savli, Gujarat and rice mill at Burdhwan, West Bengal. Monitoring for producer gas units was carried in re-rolling mills at Raipur, Chattisgarh, refractory industry at Jharasguda, Orissa. limekilns unit at Paonta Sahib, Himachal Pradesh and Dankuni Coal complex in Kolkatta. West Bengal. Producer & biogasifier gas units were monitored for stack emissions (PM, $SO_2$ & CO); ambient air quality (SPM, RSPM, $SO_2$, & $NO_X$); Work station air quality (Dust level, CO); Liquid effluents (pH, temperature, TS,SS,TDS, Oil & Grease, COD, BOD, phenols & Total Cyanide); solid waste (ash & tar) and energy performance. The study has been completed and report is under finalization.

## Revision of Comprehensive Industry Document (COINDS) on Tanneries

The Central Pollution Control Board published “Minimal National Standards (MINAS) for Tanneries, COINDS/35/1991-92” based upon the document “Comprehensive Document on Pollution Control in Tanneries” prepared by CLRI. The objective was to evolve standards for disposal of effluents considering the techno-economic feasibility of the treatment systems. Over a period of time these treatment technologies have changed and better technologies are now available which are either modified version of old technologies or altogether new. In view of above, the revised Comprehensive Industry Document on Tanneries is being prepared with the help of Central Leather Research Institute (CLRI), Chennai. The work has been initiated and likely to be completed in two year time. The objectives for revising and upgrading the Comprehensive Industry Document are

- to provide the information on the status of Tannery industry
- to study the environmental problems
- to assess all four types of pollution viz air, water, soil & noise
- to develop minimal national standards which could be achieved by the industry techno-economically, and
- to identify appropriate pollution control system duly considering the capital and operating costs

Chemical industries create a high risk to environment due to the nature of pollutants released from chemical Industries. Pesticides industry in particular is identified as one of the highly polluting industry in which pollution control needs priority. Over a period of time, treatment technologies have changed and better technologies are now available which are either modified version of old technologies or altogether new. The existing Comprehensive Industrial Document on Pesticide Industry needed upgradation to include new and developing technologies so that pesticide industry could achieve disposal standards for pollutants in liquid effluents, and gaseous emission and also management of solid wastes. The study has been taken up for revision of COINDS, which include production technologies, effluent generation, reduction & recycling of effluents, treatment technologies, by- product recovery/ utilization etc.

## Emission Standards and Stack Height Regulation for Vertical Shaft Brick Kiln

Bull’s Trench Kiln (BTK), Clamp Kilns and Down Draught Kilns are primarily used for brick making in the country. Clamp kilns of various designs are used for brick manufacturing in Peninsular India. BTKs are used mainly in Indo- Gangetic plains and down –draught Kiln are being used for brick manufacturing in

Karnataka. Vertical Shaft Brick Kiln (VSBK), a Chinese technology has been introduced in India in 1996. Vertical Shaft Brick Kiln, a clean technology is an energy efficient technology and can be an alternate technology for replacement of clamp kilns.

The standards for Bull's Trench Brick Kiln are already notified vide notification GSR No. 176 (E); April, 1996 under the Environment (Protection) Rules, 1986. A study entitled "Development of Emission standards and stack Height Regulation for Vertical Shaft Brick Kilns vis-à-vis Pollution Contol Measures" has been undertaken by CPCB in association with The Energy & Resources Institute (TERI), New Delhi. Guidelines covering siting criteria and good practices have been prepared under the study and are being considered for publication.

## Review of Emission Standards for Bull's Trench Brick Kilns:

There are around 1,50,000 kilns engaged in brick production in the country. Different types of kilns i.e. clamp, down draught kilns and bull's trench brick kilns are employed in brick making. However, Bull's trench kilns (BTKs) are prevalent all over the country. Brick making is highly energy intensive process and results in stack and fugitive dust emissions due to inefficient combustion and ash covering and handling of clay. Some of technological developments such as fixed chimney, gravity settling chambers, introduction of vertical shaft brick kilns have resulted in some reduction in pollution and increase in energy efficiency. Ministry of Environment & Forest (MoEF), GOI issued a notification, S.No. 74 GSR No. 176 (E) in 1996 on emission standards for brick kilns. The notification presents maximum concentration limit of SPM and stack height regulation for brick kilns.

These emission standards also banned use of moving chimney. Brick kilns are required to switch over to fixed chimney with stipulated height, individual units need to install gravity settling chamber (GSC), a pollution control system to keep the SPM level below the prescribed standard.

The Punjab State Council for Science & Technology (PSCS&T), Chandigarh; Aligarh Muslim University (AMU), Aligarh; and the Central Building Research Institute (CBRI), Roorkee; have developed their technology and are providing consultancy services to the brick kiln owners to prevent, abate and control air pollution. They have claimed to bring down SPM level below the prescribed limits. Another private firm M/s Sri Malli Hi-Tech Chimney Construction, Chennai has build number of BTKs on turn key basis or provided consultancy in and around Chennai.

The Central Pollution Control Board in association with the Energy & Resources Institute, New Delhi has undertaken performance evaluation of these designs adopted in different regions of the country. The objectives of the project are to study the performance evaluation of modified BTKs (equipped with air pollution control systems); recommendation if required for suitable low cost modifications for better performance; review the existing emission standards; monitor smoke, fluoride and mercury from stack; and monitor fluoride, mercury in groundwater and surface water. The study has been completed and final draft report is under evaluation.

## Environmental Standards and Good Practices for Cashew Seed Processing Industry:

Cashew seeds processing industries exist in few coastal states in India. Even though there is cashew seed cultivation in the country, most of the product demand is met by importing raw cashew seeds from South Africa. The processed cashew kernels are exported to Gulf and European countries. There are about 1500 units, categorised under SSI category, scattered in Nagercoil (Tamilnadu), Cheerla & Palasa (Andhra Pradesh), Kollam, Pathanamthitta & Trivandrum (Kerala) and in Goa. It is a labour intensive industry. Female workers constitute 90% of the work force.

Cashew seeds are processed by two methods viz roasting and cooking process, however, roasting process is preferred by the manufacturers. The cashew seeds roasting process releases thick black smoke from roasting drum through the stack. The smoke has irritating odour and causes nuisance in the neighbourhood. The process also generates wastewater from the quenching operation of the roasted seeds. Though pollution load from individual unit is relatively low but the magnitude of pollution problem from the cluster of units is very high. Keeping in view that industry is mostly in small scale and cottage sector, the Central Pollution Control Board took up a study to develop techno-economically viable environmental standards for cashew seed processing industry in association with Dr. Ambedkar Institute of Productivity- National Productivity Council, (AIP-NPC) Chennai.

The study has been completed and revised draft report have been submitted. The revised draft report were also discussed followed by a technical presentation, made by the AIP-NPC official on 21.9.2006 at Central Pollution Control Board. It was discussed & agreed during technical presentation on revised draft report at CPCB that few of cashew seed processing industry will be monitored by the official of CPCB & AIP-NPC for finalization of the standards for cashew seed industry.

## Emission Standards, Siting Criteria and Good Practices for Hot Mix Plants

There are more than 1000 hot mix plants (HMPs) of different categories operating in different parts of the country. Only a few of them are based on state of-art technology. Most of the plants are of stationary and drum-continuous type. The rated production capacity varies from 6-10 t/hr to 100-120 t/hr. Burning of fuel, feeding of aggregate and heating of bitumen from large number of plants results in `air pollution' i.e. emission of dust, SO2, Nox, $CO_2$ CO and volatile organic compounds (VOC) like BTX and PAH.

The Central Pollution Control Board with the active assistance of CBRI, Roorkee decided to prepare a National Comprehensive Industry Document on hot mix plants in an effort to minimize the adverse environmental impacts by regulating emissions from these plants. Stack monitoring for 10 hot mix plants of various capacities has been carried out for - particulate matter, $SO_2$, $NO_x$, $CO_2$, CO, Hydrocarbon methane group (Aliphatic $C_1$-$C_5$) and benzene soluble hydrocarbon. (Aromatic PAH & BTX). Analysis has been carried out for metal emissions i.e. arsenic, barium, cadmium, total chromium, copper, lead, manganese, mercury, nickel, selenium, zinc, etc. Organic compounds analysis includes: hydrocarbon (non- methane group); and Benzene soluble hydrocarbon (Benzene, Toluene, Xylene + Polyaromatic Hydrocarbon). Wherever air pollution control devices (APCD) are installed, the above monitoring was carried out at inlet and outlet (both) to assess the performance of pollution control device. Monitoring of work environment has been carried out for SPM, total aromatic hydrocarbon (PAH), $SO_2$, NOx, CO & $CO_2$ near fugitive sources. Ambient air quality monitoring has also been carried out for particulate matter, $SO_2$ and NOx.

The Central Pollution Control Board interacted with three leading manufacturers of Hot Mix Plants at international level namely:- M/s Speedcrafts Ltd., M/s Telco Construction Ltd. and M/s Linhoff Technological Pte Ltd., offering state-of –art technology with a claim of particulate matter level as low as 25 mg/$Nm^3$ . The National Highway Authority of India, Delhi PWD, CPWD, Air Port Authority of India, Delhi Municipal Corporation, Municipal Corporation of Delhi, Central Road Research Institute and Central Building Research Institute have been contacted to take part in discussion with these technology providers.

Emission standards, siting criteria and good practices for Hot Mix Plants have been drawn and discussed in the Peer and Core Committee Meeting. Since,

monitoring data for new generation state-of-art hot mix plant are not available, Peer and Core committee resolved to constitute a sub-committee comprising representative from IIT Kanpur, NPC New Delhi and the Central Board to look into proposals. Further, committee desired to collect data on hydrocarbons in emission for new generation HMPs. Leading private and Govt. laboratories have been contacted. Facilities to monitor hydrocarbon in stack are not available with them. Meanwhile, Central Pollution Control Board has upgraded monitoring facilities for hydrocarbon monitoring in stack emission.

## Development of Environmental Standards for Wheat Processing and Flour Mills, Pulse Grinding and Milling, Dry Rice Grinding and Rice Mills

The widely used food grains i.e. whole pulses, wheat and paddy are processed in industries / mills to make desired final products. Number of these mills has grown manifold over last few decades and a great deal of technological advances has taken place, however the environmental management scenario is far from satisfactory in large numbers of these mills. The main pollutant of concern in pulse, wheat & rice milling facilities is particulate matter emission generated from material handling, cleaning, milling or packing operations. The environmental aspects associated with the pulse, wheat and rice mills are air pollution, water pollution and noise etc. The main pollutant of concern in grain storage & handling in grain processing facilities is particulate matter. In grain milling and processing units, the primary pollutants of concern for dry grain milling operations are particulate matter, and PM -10.

The Central Board has taken up a project to evolve environmental standards for these mills with the help of the National Productivity Council, New Delhi. The study has been completed and final report has been received. Environmental Standards adopted in developed countries have been studied and analysed for its suitability to Indian conditions. Environmental standards for Wheat / Rice & Pulse processing industries were evolved keeping in view the information gathered and field study data. Technically and economically viable scheme of pollution control system have been recommended to enable to meet the proposed environmental standards.

## Compilation of Material Safety Data Sheet (MSDS) for the 708 Hazardous Chemicals

Certain chemicals, because of their physico-chemical nature and toxicity, may pose significant effects to anyone not cautious in handling them. Hence, handling emerges as one of the major concern to dwell into when considering the overall safety aspect of the chemicals. Different countries have identified such hazardous/toxic chemicals and prepared safety database. It is necessary to complete a similar database in India to provide first-hand information about handling chemicals with safety.

Material safety data sheet contains information on the potential health effects of exposure and how to work safely with the chemical product. These data sheet include the information about the physical, chemical and toxic properties of the chemical (s). MSDS is widely used by manufacturers, dealers, universities, indenters, laboratories, etc. using various types of hazardous, inflammable and/or even corrosive chemicals.

There is a list of 684 hazardous & toxic Chemicals in Schedule I (Part II) and other list of 30 and 179 chemicals under Schedule 2 and 3 (Part I) respectively under the MHISC Rules,1989. However, another list for 179 chemicals notified as part of the Public Liability Insurance Rules,1991 also exists. So a list of 708 chemicals were prepared to put all the chemicals at one place, and chemicals mentioned in the above schedules were not repeated to avoid the duplication. In total list of 708 chemicals were emerged for which MSDS is being prepared. The aforesaid Project has been taken up by CPCB in association with the National Chemical Laboratory (NCL), Pune. This exercise will result in a base document for the manufacturers, industry, universities etc. The draft final report has been submitted by NCL and has been reviewed by CPCB.

## Performance Evaluation of Turbo Mist Evaporator Technology

With the insistence on achieving zero discharge of distillery spent wash in surface waters by regulatory bodies, a large number of distilleries have resorted to the recommended bio-composting process wherein spent wash is utilized along with sugar mill press mud to make compost. The large area requirement in the compost process has further lead to evolution of a number of concentration techniques such as re-boilers and reverse osmosis process, so that more and more spent wash can be utilized in lesser area. However, some distilleries have recently resorted to adopting another low cost evaporation technique called mist evaporators for concentration of spent wash.

This evaporation technique involves spraying spent wash in the form of mist into atmosphere over large lagoons through a mist evaporator so about 25-30% moisture is evaporated and the rest, along with its salts, falls back into the lagoons. This results in concentration of salts and sludge to levels neither pre-decided nor controllable. Several distilleries intended to adopt this technique even without having bio-compost process or any alternate solution for utilization of concentrated spent wash and accumulated salt and sludge. Evaporation alone by any means, natural or mechanical, cannot be a complete and acceptable solution for utilization of distillery spent wash. Moreover, fall out of this evaporation technique over a very large area was also suspected. Therefore CPCB carried out a performance evaluation study of this evaporation technique at M/s Vindhyachal Distilleries, Pilukhedi, MP during Jan-March 2006 to assess the extent of fallout of the sprayed mist on the surrounding area. Observation made are summarized and concluded below:

- Three numbers of turbo mist evaporators (TME) of 40 HP capacity each were installed during October 2005.
- Effect of the TME on vegetation in the surroundings was assessed by visual observations and by analyzing Chlorophyll-A contents of fresh leaves collected at various distances. The effects were quit prominent at 400 m and 200 m distances from the TME in South and North directions.
- SPM concentrations were remarkably high at 100 m distances from curtains on South and West directions as compared to those at 100 m distances from curtains on North and East direction.
- Comparison of TDS, Potassium, Sodium and Chlorides concentrations of bi-methanated spent wash with those of effluent filled in lagoons indicates that these parameters were concentrated to twice the initial values. However, it is quit obvious that more concentration is possible as neither there is any predetermined maximum level nor any operational procedure is prescribed to control the maximum concentration.
- Considering the extent of fallout of the process, turbo mist evaporator does not appear a suitable concentration technique for distillery effluent. The observations have been discussed in 139$^{th}$ Board Meeting and State Boards were requested not to allow turbo mist evaporator technology in distilleries.

**Results of ambient air monitoring around spent wash lagoons of Vindhyachal Distilleries Ltd**

| Location | SPM, µg/m$^3$ | Colour | Conductivity, µS | COD, mg/l | Potassium, mg/l |
|---|---|---|---|---|---|
| North -100 m from curtain | 247 | Turbid yellow | 367 | 52 | 54 |
| East -100 m from curtain | 156 | Turbid yellow | 251 | 32 | 22 |
| South -100 m from curtain | 562 | Light brown | 784 | 108 | 133 |
| West -100 m from curtain | 582 | Light brown | 514 | 140 | 174 |

Note: SPM collected on filter paper was dissolved in one litre DW for analysis of conductivity COD and K

**Revision of Protocol under CREP for Utilization of Distillery Effluent in Irrigation and Compost Making**

The sugarcane molasses based distilleries are among the most polluting industries and their effluent requires several stages of treatment and dilution before disposal. Some amount of colour still remains after treatment and dilution. Discharge of distillery effluent into surface water, therefore, leads to depletion of

oxygen and water becomes coloured. The effluent of distillery also contains nutrients (Nitrogen, Potassium, Phosphorous) required for the crops.

Keeping above in view, 'Protocol for use of distillery effluent for crop irrigation' was developed in 1997 based on a study by Indian Agricultural Research Institute (a project sponsored by MoEF). Utilization of spent wash in compost making with press mud is another method accepted by CPCB / MoEF for utilization of spent wash. Based on experts' advise, "Requirements for compost making with press mud & spent wash" was adopted in the year 2002. Further, to tackle the pollution problem from distilleries, it was decided under the charter for "Corporate Responsibility for Environmental Protection" (CREP) in 2003 to utilize total spent wash generated by distilleries by December 2005. One-time controlled application on fallow land was also recognized as a method to utilize the spent wash. Based on a study conducted by Tamil Nadu Agricultural University, "Protocol for one time controlled land application of biomethanated spent wash on fallow land " was adopted in 2003.

There are various issues raised from time to time by industries regarding use of treated/ untreated effluent from distilleries for irrigation, compost making, concentration and drying etc. Dr. R. H. Siddiqi, retired professor, Aligarh Muslim University, Aligarh was engaged as a consultant under the GTZ project to review the current practices for achieving zero discharge in surface waters by the distilleries and to revise the protocols formulated for irrigation and compost making as stated above. A report titled "Treatment and Utilization of Spent Wash from Distilleries- A review of current practices for achieving zero discharge in surface waters" was prepared in November 2005. Various concentration techniques (Re-boiler, Reverse Osmosis, Multiple Effect Evaporator, Turbo-mist Evaporator) being adopted were also reviewed during the studies. The conclusions and recommendations of study are presented ahead:

- In order to meet the CREP requirements distilleries are taking action to reduce the SW production by concentrating the SW. Adoption of continuous fermentation process for the production of alcohol also generates a more concentrated SW. In future, continuous fermentation process, which produces a more concentrated SW compared to batch fermentation process, should be adopted for the new distilleries and in the expansion of the existing distilleries.
- The concentration methods, which have been adopted for the first time, are RO, multiple effect evaporator and mist evaporator. More operational data for the mist evaporator is required to establish its efficacy.
- Use of raw SW as feed to RO systems produces permeate or the recovered water of inferior quality, thus restricting options for it reuse. Further it may adversely affect the operation and life of the RO plant.
- Where the traditional methods of utilisation of SW, through irrigation and composting, are restricted due to site-specific constraints, concentration and combustion appears to be an alternative.

- Though planned irrigation has been used with apparent success, the soils are being subjected to extreme conditions of loading of salts. There is an urgent need to evaluate the salt balance from one year to the next or from one crop rotation cycle to the next. Concentration of SW, which is being advocated, may put additional strain on the soil system.
- Studies need to be taken up to evaluate the effect of seasonal temperature variation and concentration of SW on the duration of the composting cycle and the quality of the co The protocols for irrigation and composting issued by CPCB need to be reviewed, taking into account the regional variations in the natural environmental conditions in the country and to remove some anomalies. Monitoring programme of the soil and water environment also need to be modified.
- The protocols for irrigation and composting issued by CPCB need to be reviewed, taking into account the regional variations in the natural environmental conditions in the country and to remove some anomalies. Monitoring programme of the soil and water environment also need to be modified.
- Distilleries install pollution control equipment but have a lackadaisical approach towards its operation and maintenance. In future, expansion proposals of the existing units should not be considered till they have achieved CREP requirements for their present capacity.

**The Central Board has taken following action based on the above recommendations:**

- Detailed study has been carried out to evaluate the mist evaporation technology and it has been concluded that considering the spatial extent of fallout of the process, mist evaporation is not an acceptable concentration technology.
- Detailed study has been planned covering six agro climatic zones to study effects on soil salinity and alkalinity due to utilization of distillery effluent in irrigation. The study will be carried out in association with IARI, New Delhi through four distinguished agricultural institutes.
- Study is being carried out through Vasandada Sugar Institute, Pune for evaluation of various aspects of composting process and options of mixing other agricultural wastes with press mud.

**The prominent features of the revised protocols are:**

i) Total application of the effluent for irrigation during a crop/year to be decided by nitrogen content of the effluent and nitrogen requirement of the crop. (This provision did not exist for ferti-irrigation in the present protocol)

ii) Effluent shall be sufficiently diluted before application for ferti-irrigation to ensure EC, FDS, Chloride, Sulphate, BOD, and SAR with specified limit. (Earlier only BOD and TDS were deciding factors for dilution)

iii) Secondary treatment should ensure BOD reduction to <800 mg/L. (The limit was <500 mg/L in the present protocol)

iv) Maximum storage allowed for ferti-irrigation is one fourth of the average yearly requirement for ferti-irrigation. (Minimum retention time of one month for treated and diluted effluent was prescribed in the present protocol)

v) Maximum one third of the spent wash generated can be utilized for pre-sown irrigation. (No such restriction existed in the present protocol)

vi) Maximum storage allowed for pre-irrigation is one fourth of the average yearly requirement for pre-sown irrigation. (Maximum storage allowed was 30 days in the present protocol)

vii) EC of the saturation extract of the soil sample shall not be allowed to increase beyond 4 mmhos/ cm. EC of the extract of a mixture, by weight, of 2 parts of soil and 5 parts of water shall be analyzed regularly The EC of the saturation extract shall be estimated by multiplying EC of 2:5 extract by 2.5/ratio of water to dry soil in a soil saturated with water.

(The present protocol prescribed that EC of the extract of a mixture of 2 parts of soil with 5 parts of water shall not exceed 4 mmhos/ cm)

viii) The values of BOD and Nitrate-N in groundwater as a result of irrigation with SW shall not exceed maximum limits of 3 mg/L and 10 mg/L and the value of FDS shall not increase by 20% of the background value subject to a maximum increase of 150 mg/L.

(The present protocol prescribed that increase in BOD, TDS and $NO_3$ shall not exceed 3 mg/L, 200 mg/L and 10 mg/L over the initial results)

ix) The maximum 5 composting cycles during a year of 45 to 50 day duration and a 1:2.5 press mud to spent wash ratio are prescribed.

(The present protocol prescribed 5 cycles of 45 day duration with 1:2.5 press mud to spent wash ratio or 4 cycles of 60 day duration with 1:3.5 press mud to spent wash ratio)

The recommendations of the November 2005 report of the observations of Central Pollution Control Board on Mist Evaporator Technology and the revised protocols as above have been approved by the Board in 139$^{th}$ Bard Meeting held on November 17, 2006