



# Journal of Environmental Science and Engineering

(<http://www.neeri.res.in>)

ISSN 0367-827 X

Volume 55

No. 2

April 2013

## CONTENTS

### *Environmental monitoring*

- \* **Emission Estimates of Particulate Matter and Heavy Metals from Mobile Sources in Delhi (India)** ...127-142  
Ragini Kumari, Arun K. Attri, Luc Int Panis and B. R. Gurjar
- \* **Temporal Variation of Atmospheric Pollutants: A Case Study of Allahabad City (India)** ...143-152  
Deepa Srivastava and R.C. Vaishya
- \* **Assessment and Quantification of Plastics Waste Generation in Major 60 Cities of India** ...153-166  
Nalini R, B. Srinivasulu, Subhas C. Shit, Suneel Kumar Nigam, A. B. Akolkar and R. K. Dwivedi
- \* **Foliar Nitrogen, Phosphorus and Potassium Content in Trees in Environmentally Toxic Plastic Industry Area** ...167-174  
Rupnarayan Sett and Bhawna Soni
- \* **Assessment of Radium and Radon Exhalation Rate in Soil and Building Material Samples Using LR-115 Plastic Track Detectors** ...175-180  
Rohit Mehra, Komal Badhan and Pankaj Bala
- \* **Identification of Hot Spot Area of Sediment Contamination in a Lake System Using Texture Characteristics** ...181-188  
Sheela A. M., J. Letha, Sabu Joseph and Jobin Thomas
- \* **Assessment and Management of Water Quality of Kshipra River in Ujjain City (Madhya Pradesh), India** ...189-196  
R.C. Gupta, Ajay K. Gupta and R.K. Shrivastava
- \* **Evaluation and Analysis of Noise Levels at Traffic Intersections of Nagpur City, India** ...197-206  
Ritesh Vijay, Rishabh Popat, Mayur Pisode, Asheesh Sharma, Manoj Kumar, T. Chakrabarti and Rajesh Gupta
- \* **Noise Monitoring During Festivals in Aurangabad (India)** ...207-218  
K. B. Patange, A. R. Khan, S. H. Behere and Y. H. Shaikh

## ***Environmental Systems Design Modelling and Optimization***

- \* **Simultaneous Adsorption and Desorption of Tetracycline and Cadmium on Alluvial Soil of Aligarh (India)**

O. P. Bansal

...21

## ***Environmental Biotechnology***

- \* **Isolation and Characterization of Chlorpyrifos Degrading Soil Bacteria of Environmental and Agronomic Significance**

Divya Bhatia and Deepak Kumar Malik

...22

- \* **Studies of Acid Resistance Characteristics in Multiple Drug Resistant *Salmonella species* Isolated from Tomatoes**

Naushad Z, Mishra S.H, Musaddiq M and Ali Y. A.

...23

## ***Review***

- \* **Application of Horizontal Spiral Coil Heat Exchanger for Volatile Organic Compounds (VOC) Emission Control**

P. M. Deshpande and S. D. Dawande

...24

- \* **A Review on Methods of Recovery of Acid(s) from Spent Pickle Liquor of Steel Industry**

N. Y. Ghare, K.S. Wani and V. S. Patil

...25

**The journal is covered by the following leading abstracting, indexing and current awareness service**

- |  |   |
|--|---|
| ♦ Chemical Abstracts Service   | ♦ Indian Science Abstracts                          |
| ♦ Sci-Search - A Cited Reference Science Database                    | ♦ BIOBASE   |
| ♦ Engineering Index  | ♦ BAILSTEIN   |
| ♦ Current Contents   | ♦ IARAS   |
| ♦ Research Alert   | ♦ Compendex   |
| ♦ Cambridge Scientific Abstracts                                     | ♦ ACM   |
| ♦ INSPEC   | ♦ Ulrich's  |
| ♦ Biotechnology and Bioengineering Abstracts                         | ♦ National Library of the Netherlands               |
| ♦ Biological Abstracts   | ♦ French National Library                           |
| ♦ EMBASE   | ♦ British Council Library                           |
| ♦ Scopus   | ♦ British Council Libraries                         |
| ♦ IC Journals  | ♦ German National Library of Science and Technology |
| ♦ CAB Abstracts  | ♦ National Library                                  |
| ♦ Elsevier Biobase - Current Awareness in Biological Sciences (CABS) |   |



## Emission Estimates of Particulate Matter and Heavy Metals from Mobile Sources in Delhi (India)

RAGINI KUMARI<sup>1,2+</sup>, ARUN K. ATTRI<sup>1</sup>, LUC INT PANIS<sup>2</sup> AND B. R. GURJAR<sup>3</sup>

An attempt has been made to make a comprehensive emission inventory of particulate matter (PM) of various size fractions and also of heavy metals (HMs) emitted from mobile sources (both exhaust and non-exhaust) from the road transport of Delhi, India (1991-2006). COPERT-III and 4 models were mainly used to estimate these emissions. Results show that the annual exhaust emission of PM of size upto 2.5 micrometer ( $PM_{2.5}$ ) has increased from 3Gg to 4.5Gg during 1991-2006 irrespective of improvement in vehicle-technology and fuel use. PM emission from exhaust and non-exhaust sources in general has increased. Heavy commercial vehicles need attention to control particulate emission as it emerged as a predominant source of PM emissions. Among non-exhaust emissions of total suspended particulate matter (TSP), road-surface wear (~49%) has the prime contribution. As a result of introduction of unleaded gasoline Pb has significantly reduced (~8 fold) whereas share of Cu and Zn are still considerable. Among non-exhaust sources, Pb release was the most significant one from tyre-wear whereas from break-wear, Cu release was found to be the most significant followed by Pb and Cr + Zn. Because of public health concerns further policies need to be developed to reduce emissions of PM and HMs from the road transport of megacity Delhi.

**Key words :** *Heavy metals, non-exhaust, particulate matter, road transport emissions, megacity, Delhi*

### Introduction

Road transport is one of the major sources of particulate matter (PM) in urban areas (Gertler et al., 2000)<sup>1</sup>. Transport generated PM may vary in size, shape and chemical composition. For example, it can be constituted of different size fractions [e.g.,  $PM_{2.5}$ ,  $PM_{10}$  and total suspended particulate matter (TSP)] and chemical signatures (like heavy metals) depending upon the source (exhaust or non-exhaust), vehicle category, activity and/or fuel used (Furusjo et al., 2006)<sup>2</sup>. Heavy metals (HMs), too, are emitted not only from exhaust but also from non-exhaust sources like tyre-wear, road surface wear, brake wear, etc.

Importance of emission estimation of PM and HMs in an urban area is many fold, e.g. health risk, pollution to ecosystem, soil and change in local to global climate. Personal exposure from transport related air pollution is more because of level of inhalation matches with tailpipe emissions (Kunzli et al., 2000)<sup>3</sup>. Inhalation of urban respirable PM is detrimental to human health not only because of its size but also due to chemical composition (Dahl et al., 2006)<sup>4</sup>. HMs emitted from transport, e.g., lead (Pb), nickel (Ni), chromium (Cr), and cadmium (Cd) cause serious health problems (WHO, 2000)<sup>5</sup>. That is the reason India's Central Pollution Control Board (CPCB) has recently introduced ambient air quality standards (AAQS) of Nickel (Ni), Vanadium (V), Mercury (Hg), and Arsenic (As) in addition to the existing AAQS of Pb.

<sup>1</sup>School of Environmental Sciences, Jawaharlal Nehru University (JNU), New Delhi-110 067, India  
<sup>2</sup>Flemish Institute for Technological Research (VITO) 200- Boeretang, 2400 Mol, Belgium  
<sup>3</sup>Department of Civil Engineering, Indian Institute of Technology Roorkee, Roorkee-247 667, India  
Corresponding author: Dr. Ragini Kumari, Senior Programme Officer, Toxics Link, H2, Jungpura Ext., New Delhi-110 014, Phone : 011-24328006, Fax: 011-24321747; e-mail : raginivito@gmail.com



# Temporal Variation of Atmospheric Pollutants A Case Study of Allahabad City (India)

DEEPA SRIVASTAVA AND R.C. VAISHYA\*

This paper presents monitoring results of atmospheric concentrations of  $\text{SO}_2$ ,  $\text{NO}_2$ ,  $\text{PM}_{10}$  and SPM of an Indian city, Allahabad at two stations from June 2008 to May 2009. The objective of this work was to estimate seasonal and spatial variations of these pollutants on urban air quality levels using simple statistics. The monitoring sites were selected based on the dominant activities of the area. The correlation between these primary pollutants and some meteorological parameters were also established during the study. The monthly average concentrations of  $\text{PM}_{10}$ , SPM,  $\text{SO}_2$  and  $\text{NO}_2$  were found in the range 87–298  $\mu\text{g}/\text{m}^3$ , 270–744  $\mu\text{g}/\text{m}^3$ , 3.64–6.86  $\mu\text{g}/\text{m}^3$  and 20.47–73  $\mu\text{g}/\text{m}^3$  for mixed station (Katra) whereas, 46–252  $\mu\text{g}/\text{m}^3$ , 82–404  $\mu\text{g}/\text{m}^3$ , 1.72–4.82  $\mu\text{g}/\text{m}^3$  and 9.87–42.3  $\mu\text{g}/\text{m}^3$  for residential station (near Circuit House) respectively. The maximum frequency of  $\text{PM}_{10}$  appears in the range of 100–200  $\mu\text{g}/\text{m}^3$  for mixed areas whereas 0–150  $\mu\text{g}/\text{m}^3$  for residential area. SPM is higher in the range of 400–500  $\mu\text{g}/\text{m}^3$  for mixed area and 300–400  $\mu\text{g}/\text{m}^3$  for residential area. The linear regressions between  $\text{PM}_{10}$  and SPM for both the area were developed. It has been observed that total SPM concentration has inverse correlation with temperature and humidity. The average concentrations for  $\text{SO}_2$  and  $\text{NO}_2$  are lower and  $\text{PM}_{10}$  and SPM are higher than the NAAQ guideline values. At residential area 57%  $\text{PM}_{10}$  and 66% SPM and at mixed area 60% of  $\text{PM}_{10}$  and 44% of SPM exceeded the standards according to NAAQS, 1998 (CPCB, New Delhi) while according to NAAQS, 2009 (CPCB, New Delhi) 57% of  $\text{PM}_{10}$  of residential area and 81% of  $\text{PM}_{10}$  of mixed area exceeded the standards.

**Key words:** *Urban air quality, correlation, linear regressions, meteorological parameters,  $\text{SO}_2$ ,  $\text{NO}_2$ ,  $\text{PM}_{10}$ , SPM*

## Introduction

Air pollution is an extremely significant issue that should be focused on all around the globe, as it affects human health, ecosystems and the environment, harms materials, buildings, and in turn the economy<sup>1</sup>. Urbanization, industrialization and economic growth resulted in profound deterioration of urban air quality<sup>2</sup>.

Urban air pollution is dispersed non-uniformly throughout a city and increased concentrations of pollutants are frequently observed near high density areas due to the increase in motorized traffic<sup>3</sup>.

Particulate matters, i.e. suspended particulate matter (SPM) and respirable suspended particulate matter (RSPM), have emerged as the most critical

Research Scholar, Department of Civil Engineering, Motilal Nehru National Institute of Technology, Allahabad-211 004 (India)  
\*Professor, Department of Civil Engineering, Motilal Nehru National Institute of Technology, Allahabad-211 004 (India)  
Corresponding author: e-mail: rcvaishya@yahoo.com



# Assessment and Quantification of Plastics Waste Generation in Major 60 Cities of India

NALINI R<sup>a</sup>, B. SRINIVASULU<sup>a</sup>, SUBHAS C. SHIT<sup>a\*</sup>,  
SUNEEL KUMAR NIGAM<sup>b</sup>, A. B. AKOLKAR<sup>b</sup> AND R. K. DWIVEDI<sup>c</sup>

Polymers or plastics materials registered rapid growth in 1970s, 1980s and 1990s at the rate of 2-2.5 times the GDP growth in India. The demand for plastic raw material got more than doubled from 3.3 Million Metric Ton to 6.8 Million Metric Tons in 2010 attributed mainly to rapid urbanization, spread of retail chains, plastics based packaging from grocery to food and vegetable products to cosmetics and consumer items. Plastics packages have its merits over many of conventional materials in the related sector but unless they are collected back effectively after their use to go into recycling process, they become an eyesore in the stream of Municipal Solid Waste (MSW) due to high visibility. As the synthetic and conventional plastics are non-biodegradable in nature, these remain in the dump yards/ landfills for several years, if not collected properly. Due to non-biodegradability, plastics waste remains in the environment for several years, if not collected and disposing plastics wastes at landfills are unsafe since toxic chemicals leach out into the soil and as they contaminate soil and underground water quality. The municipal solid waste also increasing day-by-day due to the inefficient source collection, segregation and transmission of plastics waste for recycling and reusing. In order to find out the realistic plastics waste generation, a study on assessment and quantification of plastics waste has been carried out by CPCB in collaboration with CIPET on selected 60 major cities of India.

**Key words:** *PW (Plastic Waste), MSW (Municipal Solid Waste), DSC (Differential Scanning Calorimeter)*

## Introduction

Municipal solid waste (MSW) contains organic as well as inorganic matter, the total quantity of waste generated depends upon the rapid population, composition of waste and the technology adapted to reduce the waste. The organic matter in MSW in

developing countries is much higher than the wastes in developed countries. The mixed mass of waste which originates from household, commercial, industrial or agricultural activities has been discarded. Waste generation in urban India is increasing in terms of quantum of generation and percentage of plastics. By 2015, India is also projected to be one among largest

<sup>a</sup>Central Institute of Plastics Engineering & Technology (CIPET), Ahmedabad (India)

<sup>b</sup>Central Pollution Control Board (CPCB), New Delhi, India

<sup>c</sup>Lohia Starlinger Ltd, Kanpur (India)

\*Corresponding author



## Foliar Nitrogen, Phosphorus and Potassium Content in Trees in Environmentally Toxic Plastic Industry Area

RUPNARAYAN SETT\*+ AND BHAWNA SONI\*

In plants, nitrogen deficiency causes stunted growth and chlorosis or yellowing of the leaves due to decreased levels of chlorophyll, while excess nitrogen uptake may cause dark green overly vigorous foliage which may have increased susceptibility to disease and insect attacks. Phosphorus is an important nutrient in crop production, since many soils in their native state do not have sufficient available phosphorus to maximize crop yield. Potassium deficiency may cause necrosis or interveinal chlorosis. Plastics are synthetic or semi-synthetic moldable organic solids that are organic polymers of high molecular mass, most commonly derived from petrochemicals; these polymers are based on chains of carbon atoms alone or with oxygen, sulfur, or nitrogen. Plastic is a non-biodegradable major toxic pollutant. It pollutes earth and leads to air pollution and water pollution. Merely there is any safe way to dispose the hazardous plastic wastes. The study was targeted to estimate foliar level of NPK content of three plant species, viz. *Cassia tora* (Herb), *Ailanthus excelsa* (Tree) and *Dalbergia sissoo* (Tree) from polluted areas associated to polythene-industries as well as control areas having least pollution, where all the parameters were found to be higher than the control experiments.

**Key words:** *Foliar NPK, pollution, plastic, tree species*

### Introduction

A plastic is a polymer or a large molecule made of repeating structural units called monomers. It is quite easy to customize plastics and design them to serve specific purposes; for instance, shopping bags, utensil handles, electrical equipment, computer keyboards are all plastics, but synthesized in different ways by using different monomers. Apart from the scope of high level customization, most plastics are chemically inert, meaning they can store virtually anything without reacting. Because of all these properties, plastic is widely used. Plastic bags, plastic thin sheets and plastic waste are a major source of pollution.

Plastic is a non-biodegradable major toxic pollutants of modern time. Plastic pollutes earth and leads to air and water pollution and there is no safe way to dispose this waste. Plastic causes serious damage to environment during its process of production and disposal. Some of the constituents of plastic like benzene and vinyl chloride are carcinogenic, and other gases and liquid hydrocarbons spoil earth and air<sup>1</sup>. The noxious substances emitted during the production of plastic are synthetic chemicals like ethylene oxide, benzene and xylene. Besides hitting hard the ecosystem which is already fragile, these chemicals can cause an array of maladies ranging from birth defects to cancer, damage the nervous and the immune system and also adversely affect the blood and the



# Assessment of Radium and Radon Exhalation Rate in Soil and Building Material Samples Using LR-115 Plastic Track Detectors

ROHIT MEHRA<sup>1\*</sup>, KOMAL BADHAN<sup>1</sup> AND PANKAJ BALA<sup>1</sup>

Solid state nuclear track detectors (LR-115 TYPE-II) were used to determine the concentration of radium and radon exhalation rate in soil samples collected from the different areas of Dharamshala, Himachal Pradesh (India) and in building material samples viz. cement, bricks and white marble collected from different locations of India. The radium concentration for the soil samples and building materials varied from 16.22 Bqkg<sup>-1</sup> to 25.44 Bqkg<sup>-1</sup> and 32.33 Bqkg<sup>-1</sup> to 52.26 Bqkg<sup>-1</sup> with an average value of 22.03 Bqkg<sup>-1</sup> and 39.12 Bqkg<sup>-1</sup> respectively. The calculated average values of radon exhalation rate in terms of mass ( $E_m$ ) and area ( $E_A$ ) for soil samples and building material samples are (8.59 mBqkg<sup>-1</sup>h<sup>-1</sup> and 310.6 mBqm<sup>-2</sup>h<sup>-1</sup>) and (15.26 mBqkg<sup>-1</sup>h<sup>-1</sup> and 551.6 mBqm<sup>-2</sup>h<sup>-1</sup>) respectively.

**Key words:** *Radium, radon exhalation rate, track detector, building material*

## 1. Introduction

Over the last few decades there has been increased concern about public exposures associated with the enhanced natural radiation environment. Cosmic rays, cosmogenic radio nuclides, primordial radio nuclides, nuclear fallouts etc. are the main sources of environmental radioactivity. The most commonly encountered primordial radio nuclides are <sup>238</sup>U, <sup>232</sup>Th, their decay products and <sup>40</sup>K. The presence of these primordial radio nuclides in soil, rocks and building materials, which in turn depend on the local geology of each region in the world reported by Radhakrishna et al.<sup>1</sup>, Quindos et al.<sup>2</sup>, Mehra et al.<sup>3</sup>. External exposure is caused by the gamma activity of

the radionuclides in the ground and construction materials, whereas inhalation and ingestion of naturally occurring radionuclides (NORMs) in air and diet cause internal exposure. The important source of internal exposure is a noble gas <sup>222</sup>Rn which is the decay product of radium (<sup>226</sup>Ra) in the naturally occurring uranium (<sup>238</sup>U) series, is a radioactive inert gas and is responsible for about half of the radiation dose received by general population<sup>4</sup>. Being a noble gas and having relatively long half life (3.82 days), radon can easily manage to enter the environment in which we breathe. Radon isotopes can isolate themselves and migrate away from the parent mineral due to the diffusion process through the soil and enter the atmosphere. As most individuals spend 80% time indoor so the average

Department of Physics, Dr.B.R.Ambedkar National Institute of Technology, Jalandhar-144 011 (India)  
Corresponding author: e-mail: rohit\_mimit@reddiffmail.com



## Identification of Hot Spot Area of Sediment Contamination in a Lake System Using Texture Characteristics

SHEELA A. M.<sup>\*</sup>, J. LETHA<sup>\*\*</sup>, SABU JOSEPH<sup>\*\*\*</sup> AND JOBIN THOMAS<sup>\*\*\*</sup>

Texture plays an important role in the identification of polluted stretch in a lake system. The organic matter as well as toxic elements get accumulated in the finer sediments. The aim of the work is to show the spatio-temporal distribution of texture of the lake sediment (Akkulam-Veli lake, Kerala) and to identify the hot spot areas of contamination. Hot spot areas vary with seasons. During PRM, (premonsoon), the upstream portion of the Akkulam lake is the hot spot. During MON (monsoon), the downstream portion of the Akkulam lake and the upstream portion of the Veli lake are the hot spots. During POM (postmonsoon), hot spot area is the downstream portion of the Akkulam lake. This methodology can be used for the quick identification of hot spots in water bodies.

**Key words:** *Texture, sediment quality, Akkulam-Veli lake, Kerala*

### Introduction

Lake sediments are long term sinks of various pollutants. The mobility of these pollutants depends on the texture and geochemistry of the sediment. Hence its study helps to identify the sources of pollution, distribution of various pollutants, and to evaluate the environmental status of the lake system. The polluted stretch of a lake system can easily be identified using texture analysis. High concentration of available phosphorus and toxic elements is usually found in sediments with fine grained silt and clay size particles enriched with organic matter. The distribution pattern of sediment texture identifies the contaminated sites. Restoration measures can accordingly be adopted. There

are so many works on the textural analysis in the sediments<sup>1-10</sup>. In this study, the spatio-temporal variation of texture in the Akkulam-Veli lake is determined. Sediment type is ascertained using Ternary diagram after Shepard, 1954. Thus hot spot area of contamination in the different seasons is located.

### Study area

The Akkulam-Veli lake (AV lake) is located at the north-western portion of Thiruvananthapuram along the SW coast of India (Fig.1). The AV lake has an area of about 0.76 km<sup>2</sup>, and is situated between 8°31'14" and 8°31'52" north latitudes, and 76°53'12" and 76°54'6" east longitudes. It is a shore

<sup>\*</sup>Kerala State Pollution Control Board, Head Office, Pattom P. O., Thiruvananthapuram, Kerala, India (sheela.a.m@gmail.com)

<sup>\*\*</sup>College of Engineering, Sreekariam, Thiruvananthapuram (akglet2001@yahoo.com)

<sup>\*\*\*</sup>Department of Environmental Sciences, University of Kerala, Kariavattom P. O., Thiruvananthapuram, Kerala, India (jsabu2000@yahoo.co.in, thomasjobin@yahoo.com)

<sup>\*</sup>Corresponding author



# Assessment and Management of Water Quality of Kshipra River in Ujjain City (Madhya Pradesh), India

R.C. GUPTA<sup>1\*</sup>, AJAY K. GUPTA<sup>2</sup> AND R.K.SHRIVASTAVA<sup>3</sup>

This paper shows the water quality status and its assessment through Water Quality Index (WQI), various sources of pollution in the river and the possible strategies to restore the water quality of River Kshipra to its pristine status. The data procured from M.P. Pollution Control Board and WQI reveals that its water quality ranges from medium to bad. The study reveals that Khan River water is a major source of pollution to the River Kshipra. Implementation of sustainable management plan along with proper sewerage planning, watershed management and maintaining sufficient dilution flow will control the pollution in the River Kshipra.

**Key words:** *Water quality status, water quality index (WQI), Kshipra river, Khan river*

## Introduction

Rivers have been an integral part of human settlements right since the dawn of civilization. Rivers are rightly termed as life line of the people. Nowadays, in view of increasing population, urbanization and industrialization, the rivers and streams are often being treated as a convenient disposal site for various municipal and industrial wastes causing greatest detriment to the health of the rivers. The present concern for river water quality has made it necessary for engineers and planners to study the impact of different kind of pollutants discharged into the rivers and then adopt appropriate methodology to manage the water quality so that it does not degrade below a prescribed standard<sup>12</sup>. Therefore, restoring the health of the rivers which have become polluted is very important. Realizing the consequences of this pollution, the Govt. of India undertook a highly ambitious project to clean the River Ganga known as 'Ganga Action Plan' (GAP).<sup>2,13</sup> River Kshipra, the ancient "Avanti Nadi" flows through Ujjain city of western Madhya Pradesh. It originates from Kokri Bardi hills (747metres high) about 11 km east of Indore<sup>1, 15</sup>. In the initial stages its tributaries namely River Jijavanti and Ashamati nallah

join it near village Dakhnakhe and village Vyaskhedi respectively. Its basin is of dandratic pattern which stores maximum water in it<sup>7</sup>. After travelling a distance of 70 km through Indore district, it enters Ujjain district. It receives its major tributaries River Khan just upstream of Ujjain and River Gambhir near Mehidpur d/s of Ujjain before merging with River Chambal (Fig1).

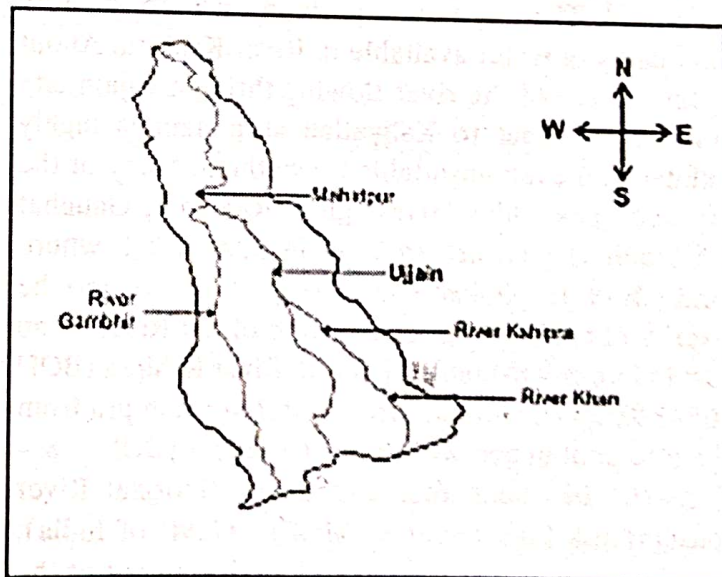


Fig. 1: Course of River Kshipra and its tributaries

<sup>1</sup>Head of Department, Civil Engineering, Govt. Polytechnic College, Ujjain (M.P.), India  
<sup>2</sup>Associate Professor, Civil Engineering, Govt. Engineering College, Ujjain (M.P.), India  
<sup>3</sup>Professor, Civil Engineering, S.G.S. Institute of Technology and Science, Indore (M.P.), India  
Corresponding author : e-mail. : guptarc62@gmail.com



## Evaluation and Analysis of Noise Levels at Traffic Intersections of Nagpur City, India

RITESH VIJAY<sup>1\*</sup>, RISHABH POPAT<sup>2</sup>, MAYUR PISODE<sup>2</sup>, ASHEESH SHARMA<sup>1</sup>,  
MANOJ KUMAR<sup>1</sup>, T. CHAKRABARTI<sup>1</sup> AND RAJESH GUPTA<sup>2</sup>

The objective of the present study was to monitor and assess the noise levels at traffic intersections in Nagpur city under heterogenic traffic activities. For this, traffic volume and noise level were measured at intersections on highways, major roads and ring road during morning and evening peak hours. Traffic volume was categorized in light, medium and heavy vehicles while noise levels were measured for  $L_{min}$ ,  $L_{max}$ ,  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$ . Equivalent noise was observed in the range of 71.3 to 79.3 dB(A) at the traffic intersections. Due to heterogenic traffic conditions and activities at the intersection like honking, idling, gear noise, bearing noise, breaking noise, tyre-road noise and exhaust noise, no correlation was established between traffic volume and observed noise levels except West High Court road. A strong correlation was found at West High Court road due to controlled traffic flow and less impact of heavy vehicles. Impact of noisy vehicles on general traffic was also assessed at the traffic intersections based on noise pollution levels and traffic noise index. The study suggests that control measures are required at the traffic intersections to minimize noise pollution levels.

**Key words:** *Noise pollution, traffic volume, traffic intersection, traffic noise index*

### Introduction

The increase in the population and in the number of circulating vehicles has led to an increase in noise pollution, but noise pollution has been less priority than other pollution due to contaminants in the environment<sup>1</sup>. Many researchers have been reported that road traffic is the predominant and most generalized noise source in urban areas<sup>2,3,4</sup>. Noise levels at traffic intersections are even very high due to interrupted traffic flow and activities such as honking, idling, gear noise, bearing noise, brake noise, tyre-

road noise and exhaust noise at the intersections<sup>5</sup>. For example, noise levels at traffic intersections in Delhi have become three-fold. The increase in the level of pollution in the capital of India may be known from the fact that annual per capita oil consumption for personal mobility in Delhi is higher than any other city in the country<sup>6</sup>. Based on the above, the objective of the present study was to evaluate and analyse the noise level at traffic intersections of Nagpur under heterogenic traffic activities.

<sup>1</sup>CSIR-National Environmental Engineering Research Institute (CSIR - NEERI), Nehru Marg, Nagpur - 440 020 (India)

<sup>2</sup>Civil Engineering Department, Visvesvaraya National Institute of Technology (VNIT), South Ambazari Road, Nagpur - 440 010 (India)

\*Corresponding author: r\_vijay@neeri.res.in



## Noise Monitoring During Festivals in Aurangabad (India)

K. B. PATANGE\*, A. R. KHAN<sup>@</sup>, S. H. BEHERE<sup>s</sup> AND Y.H. SHAIKH<sup>#</sup>

Noise from different sources is supposed to be a major concern to the quality of human life. Attempts are made to quantify the noise levels and set standards to regulate noise and keep it under acceptable limits. It is observed that the noise levels during huge public gathering and festivals tend to exceed permissible limits. We studied noise during different festivals, namely Diwali, Durga Puja and Ganesh festival in Aurangabad city of India. Data was collected from thirteen different locations in the town over a period of four years for Ganesh festival and noise levels were compared. Noise conditions during festivals were compared with general noise conditions during normal days. The results revealed a variation in the range of 14 to 28 dB. Exposure Levels and Dose Time Limit are also presented in this paper.

**Key words:** *Noise monitoring, festivals, exposure level, Aurangabad, India*

### Introduction

Noise is a disturbance to the human environment that is escalating at such a high rate that will become a major threat to the quality of human lives. In the past thirty years, noise in all areas, specially in urban areas, has been increasing rapidly<sup>1</sup>. The influence of noise on the human body can be due to the direct effects upon the auditory system, on non-auditory physiological processes and on purely psychological mechanisms<sup>2</sup>. Noise effects include various impacts on mental and physical health and disturbance of daily activities (may affect sleeping, conversation, lead to perception of annoyance, cause hearing loss and cardiovascular problems as well as it

affects task performing)<sup>3-5</sup>. Permanent hearing loss by long-term exposure to noise has been reported by Nelson<sup>6</sup>. Noise is one of the major environmental hazards of modern world originating from a wide variety of sources, including traffic (air, road, rail), industrial facilities, or social activities<sup>7-8</sup>.

It is known that exposure to loud sound causes progressive irreversible hearing loss and it is also known that hearing deteriorates with age (presbycusis). In order to assess the damaging power of a day of exposure to noise levels, the idea of a noise dose has been evolved. The damage risk level is a subject of much controversy for higher levels of sound, the same dose of sound energy can be tolerated for a shorter

\*Department of Physics, Deogiri College, Aurangabad - 431 005, Maharashtra, India  
(e-mail: patange\_123@yahoo.com)

<sup>@</sup>Department of Bio-informatics, Maulana Azad College, Aurangabad, India (e-mail: ark5230@yahoo.com)

<sup>s</sup>Department of Physics, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India  
(e-mail: subhash\_behera@yahoo.com)

<sup>#</sup>Department of Physics, Shivaji College, Kannad, Aurangabad, India (e-mail: shaikhyh@gmail.com)

Corresponding author



## Simultaneous Adsorption and Desorption of Tetracycline and Cadmium on Alluvial Soil of Aligarh (India)

O.P. BANSAL

Interaction of Cadmium (Cd) and a widely-used veterinary antibiotic tetracycline (TC), on the basis of their adsorption and desorption on alluvial soil, was studied using the batch experiments. The results indicated that adsorption and desorption isotherms of Cd and TC on the soils were well fitted with the Freundlich equation. There was an apparent sorption-desorption hysteresis of Cd and TC in soil, which will probably pose a threat to soil-environmental quality and human health. The adsorption of Cadmium or tetracycline in the combined form was more than individual. This can be attributed to increasing Cd adsorption via the bridge of TC, or stronger affinity of the TC-Cd complex to soil minerals than Cd or TC. The presence of Cd enhanced the hysteresis effect of TC sorption-desorption ( $H=0.886-0.904$ ). Similarly, the hysteresis effect of Cd sorption-desorption in presence of TC was more than Cd alone ( $H=0.882-0.925$ ). The hysteresis effect was more for Cd in presence of TC than for TC in presence of Cd, denoting binding of Cd on soil surface was stronger in presence of TC than Cd alone. It is thus important to consider the interaction between Cd and TC while studying on the fate of Cd and TC in soil environment.

**Key words:** *Tetracycline, cadmium, soil contamination, adsorption, desorption, alluvial soil*

### Introduction

Tons of pharmacologically active substances are used annually in human and animal medicines for treatment as well as prevention of illness<sup>1,2</sup>. Antibiotics are specifically designed to control bacteria in human and animals and help to protect their health. Tetracyclines are broad spectrum antibiotics widely used as growth promoters in modern animal husbandry. Tetracycline administered in humans and animals undergo minimal or no metabolism and are excreted in urine and manure in an either unaltered or as metabolites some of which are still bioactive<sup>3</sup>, which makes them potentially hazardous to bacteria and other organisms in the environment. These antibiotics are

released in the terrestrial environment via the application of animal manure and biosolids containing excreted antibiotics to agricultural land as fertilizer<sup>3,4</sup>. Antibiotics can also be introduced to the agricultural land through irrigation with sewage waste water<sup>5,6</sup>. Therefore, it is necessary to investigate the fate of tetracycline in manure and the soil environment. Sorption of tetracycline in soil is strongly influenced by soil properties<sup>7</sup> viz. clay content, pH, CEC etc.

Heavy metal contamination of soil is one of the most important environmental problems throughout the world<sup>8,9</sup>. The ability of heavy metals to accumulate and cause toxicity in biological systems- humans, animals, microorganisms and plants has been reported<sup>10</sup>.



## Isolation and Characterization of Chlorpyrifos Degrading Soil Bacteria of Environmental and Agronomic Significance

DIVYA BHATIA\* AND DEEPAK KUMAR MALIK\*\*

Chlorpyrifos is being used globally as an agriculture based pesticide. Microbial degradation of chlorpyrifos pesticide is of particular interest because of high mammalian toxicity. Six bacterial cultures were isolated from chlorpyrifos contaminated soil by using enrichment technique. All the isolates showed good growth in basal salt medium containing chlorpyrifos and suggested their ability to utilize chlorpyrifos as sole carbon and energy source. All the six bacterial cultures were examined for various plant growth promoting properties, out of six only one bacterial culture *Pseudomonas aeruginosa* DKC2 was found to be positive for various plant growth promoting activities (phosphate solubilization, protease activity, IAA production and antagonistic properties against plant pathogenic fungi). The resting cell study confirmed that the bacterial strain DKC2 degrade chlorpyrifos by 71 % within 2 days. Isolated bacterial culture can be used successfully for the removal of chlorpyrifos from contaminated soil along with plant growth promotion, but further research is required before commercial utilization of this isolate in removing chlorpyrifos from contaminated soil.

**Key words:** *Chlorpyrifos, basal salt, indole acetic acid, DKC2, plant growth*

### Introduction

Chlorpyrifos (O, O-diethyl O-(3, 5, 6-trichloro-2-pyridyl) phosphorothioate) is one of the most widely used insecticides effective against a broad spectrum of insect pests of economically important crops<sup>1-3</sup>. Currently, over 850 registered chlorpyrifos products are in the market<sup>4</sup>. Chlorpyrifos is characterized by a P-O-C linkage as in other organophosphate pesticides, such as diazinon, parathion and methylparathion. Chlorpyrifos is toxic to a variety

of beneficial arthropods, including bees, ladybird beetles and parasitic wasps. It kills fishes at very low concentration as a few parts per trillion. Birds are also susceptible with effects ranging from reduced weight of nestlings, deformities and death. It interferes with the normal functioning of the central nervous system, including the brain. Various studies indicate that chlorpyrifos may also affect endocrine system<sup>5-6</sup>. Specifically, a few studies have suggested that chlorpyrifos may target thyroid and adrenal gland homeostasis both in human and animal models<sup>5,7</sup>.

Department of Biotechnology, U.I.E.T., Kurukshetra University, Kurukshetra, Haryana-136 119 (India)  
Corresponding author: Assistant Professor, Department of Biotechnology, U.I.E.T, Kurukshetra University, Kurukshetra, Haryana-136 119, India; e-mail: deepmolbio@rediffmail.com;  
Tel.: +91-1744-239155; Fax: +91-1744-238967



## Studies of Acid Resistance Characteristics in Multiple Drug Resistant *Salmonella* species Isolated from Tomatoes

NAUSHAD Z\*, MISHRA S.H\*, MUSADDIQ M\* AND ALI Y. A.\*\*

*Salmonella* species found to have a great potential of causing a variety of diseases ranging from gastroenteritis to enteric fever. *Salmonella* have been isolated from all food, animals and also found in the vegetables such as tomatoes, spinach etc. Several outbreaks of Salmonellosis have been associated with the consumption of raw tomatoes. This is because of the fact that *Salmonella* attaches to the surface of tomatoes and also present in the interior part due to geotropic transmission via contaminated soil irrigated with contaminated water. During the life cycle, *Salmonella* encounters the various environments such as acidic environment (low pH). To overcome such factors, *Salmonella* has certain adaptable mechanisms. In present study total 200 samples of tomatoes were analyzed out of which 10 samples were found to contain *Salmonella*. All the 10 isolates were then subjected to the antibiotic susceptibility testing and were found to be resistant against several antibiotics. These were subjected to acid resistant tolerance study.

Key words: *Salmonella*, tomato, multidrug resistance, acid resistance

### Introduction

Several outbreaks of Salmonellosis have been associated with the consumption of raw tomatoes. *Salmonella* is Gram negative bacilli, either motile or non motile, nonsporing all ferment glucose with or without gas production, many are intestinal pathogens few are found in soil and water. It causes enteric fever, gastroenteritis, septicemia, food poisoning etc. which is collectively known as Salmonellosis. Generally it is assumed that the inner tissues of fruit and vegetable

are sterile however bacterial endophytes are known to reside in wide range of plant <sup>1, 2</sup>. Association of *Salmonella* with plants was reported <sup>3</sup>. It has also been demonstrated that *Salmonella* can exist as endophyte due to the uptake of *Salmonella* by roots <sup>4</sup>. Hence in case of tomato cultivated in polluted soil and water induced the high frequency of *Salmonella* and they may get resistant to the acidic environment of pH less than 4 that exist inside the tomatoes. The acid resistance of *Salmonella* is also found related with its pathogenicity <sup>5</sup>. It was demonstrated that virulent

\*P.G. Department of Microbiology, Shri Shivaji College of Arts, Commerce and Science, Akola - 444 001 (M.S.) India

\*\*Faculty of Applied Medical Sciences, Jazaan University, Aljazaan Kingdom, Saudi Arabia.

Corresponding author: Dr. M. Musaddiq, Professor & Head, Department of Microbiology, Shri Shivaji College of Arts, Commerce and Science, Akola - 444 001 (M.S.) India, ; e-mail: dr\_m.musaddiq@rediffmail.com



# Application of Horizontal Spiral Coil Heat Exchanger for Volatile Organic Compounds (VOC) Emission Control

P. M. DESHPANDE\*+ AND S. D. DAWANDE\*\*

The petroleum products have wide range of volatility and are required to be stored in bulk. The evaporation losses are significant and it is a economic as well as environmental concern, since evaporative losses of petroleum products cause increased VOC in ambient air. Control of these losses poses a major problem for the storage tank designers. Ever rising cost of petroleum products further adds to the gravity of the problem. Condensation is one of the technologies for reducing volatile organic compounds emissions. Condensation is effected by condenser, which is basically a heat exchanger and the heat exchanger configuration plays an important role. The horizontal spiral coil heat exchanger is a promising configuration that finds an application in VOC control. This paper attempts to understand underlying causes of emissions and analyse the option of horizontal spiral coil heat exchanger as vent condenser.

**Key words :** *Horizontal spiral coil heat exchanger, volatile organic compounds*

## 1.0 Introduction

The large storage vessels for the storage of organic liquids are essential components of petrochemical and petroleum industries. Depending on the quantity, nature and properties of the liquid to be stored, pressure vessel or tank is employed for the purpose. The organic liquid storage vessel can be of any one of the following six types as mentioned below.<sup>7</sup>

1. Fixed roof (vertical and horizontal); 2. External floating roof; 3. Domed external (or covered ) floating roof; 4. Internal floating roof; 5. Variable vapour space; and 6. Pressure vessel (high and low).

The emissions of VOC from these storage vessels/tanks depend on the properties of stored liquid, quantity, and operating pressure. The non-condensable gases are also discharged along with these VOCs. The

petroleum product loss is categorised as either storage loss or working loss.

- Storage loss is the expulsion of vapour from tank through vapour expansion and contraction which are result of changes in temperature and barometric pressure. This loss occurs without any liquid level change in tank and can be controlled to some extent by pressure-vacuum valves, but still there are emissions due to release of vapours to environment.
- Combined loss of product/liquid owing to filling and emptying of the storage tank, is referred as working loss. The evaporation during filling is a result of an increase in liquid level in tank which results in increased pressure in the vapour space and vapours may be expelled from the tank.

\*Sr. Associate Professor, National Institute of Construction Management and Research (NICMAR), Pune - 411 045 (India)

\*\*Associate Professor, Laxminarayan Institute of Technology (L.I.T.), Amravati Road, Nagpur-440 033 (India)

+Corresponding author



## A Review on Methods of Recovery of Acid(s) from Spent Pickle Liquor of Steel Industry

N. Y. GHARE<sup>+</sup>, K.S. WANI<sup>\*\*</sup> AND V. S. PATIL<sup>\*\*\*</sup>

Pickling is the process of removal of oxide layer and rust formed on metal surface. It also removes sand and corrosion products from the surface of metal. Acids such as sulfuric acid, hydrochloric acid are used for pickling. Hydrofluoric acid-Nitric acid mixture is used for stainless steel pickling. Pickling solutions are spent when acid concentration in pickling solutions decreases by 75-85%, which also has metal content up to 150-250 g/dm<sup>3</sup>. Spent pickling liquor (SPL) should be dumped because the efficiency of pickling decreases with increasing content of dissolved metal in the bath. The SPL content depends on the plant of origin and the pickling method applied there. SPL from steel pickling in hot-dip galvanizing plants contains zinc(II), iron, traces of lead, chromium and other heavy metals (max. 500 mg/dm<sup>3</sup>) and hydrochloric acid. Zinc(II) passes to the spent solution after dissolution of this metal from zinc(II)-covered racks, chains and baskets used for transportation of galvanized elements. Unevenly covered zinc layers are usually removed in another pickling bath. Due to this, zinc(II) concentration increases even up to 110 g/dm<sup>3</sup>, while iron content may reach or exceed even 80 g/dm<sup>3</sup> in the same solution. This review presents an overview on different aspects of generation and treatment of SPL with recourse to recovery of acid for recycling. Different processes are described in this review and higher weightage is given to membrane processes.

**Key words :** *Pickling, steel pickle liquor, hydrochloric acid, acid recovery, membrane processes, hydrofluoric acid, nitric acid*

### Introduction

### Composition of SPL from steel industries

Spent pickling solutions come from pickling of various surfaces of steel. The composition of pickling bath depends on the composition and thickness of the surface. Generally SPL can be divided into two groups: solutions left after mild steel pickling in hot-dip galvanizing plants; and solutions left after stainless steel pickling in rolling mills. The first group consists of hydrochloric acid, iron and zinc ions, while the

second group contains a mixture of hydrofluoric and nitric acid or sulfuric acid. Composition varies from industry to industry as the data is from steel rolling mills, hot dip galvanizing plants and electroplating units. Sometimes sulfuric acid may be used instead of nitric acid in pickling baths for stainless steel treatment so that the bath becomes less aggressive. In the past, sulfuric acid was used for pickling, however, nowadays in most cases it is replaced by HCl as the latter ensures better surface quality and a superior finish, faster pickling resulting in increase in steel throughputs and more economical HCl regeneration<sup>1</sup>. In USA, 500

<sup>+</sup>Assistant Professor, SSBT's College of Engineering & Technology, Bambhori, Jalgaon - 425 001 (India)

<sup>\*\*</sup>Principal, SSBT's College of Engineering & Technology, Bambhori, Jalgaon - 425 001 (India)

<sup>\*\*\*</sup>Professor, University Institute of Chemical Technology, North Maharashtra University, Jalgaon - 425 001 (India)

Corresponding author: e-mail: nikhil.ghare@rediffmail.com