

# **The Emissions From Copper Coated Spark Ignition Engine With Methanol Blended Gasoline With Catalytic Converter**

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Carbon monoxide (CO) and unburnt hydrocarbons (UBC), major pollutants emitted from spark ignition engine, are hazardous and cause problems not only to human beings but also environment and hence control of these pollutants call for immediate attention. Experiments are carried out for controlling of these pollutants from a variable-compression ratio, copper coated spark ignition engine (copper of thickness 300 micron is coated over piston crown and inside portion of the cylinder head) run with methanol-blended gasoline (20% methanol and 80% gasoline by volume) fitted with catalytic converter containing manganese ore as catalyst. The influence of parameters, such as void ratio, amount of air injected into the catalytic converter, temperature of injected air on these emissions at different speeds and compression ratios of the engine are studied. The speed of the engine has marginal effect, while load and compression ratio have strong influence on reduction of pollutants. Air injection drastically decreased the pollutants, which is further pronounced with the rise of temperature of injected air. Copper coated spark ignition engine with methanol-blended gasoline decreased the exhaust emissions considerably when compared to conventional engine with pure gasoline operation.

## **KEYWORD**

Catalytic coating, Spark ignition engine, Pollutants, Catalytic converter, Air injection.

# Distribution Patterns of Coarse, Fine and Ultra-fine Atmospheric Aerosol Particulate Matters in Major Cities of Chhattisgarh

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This work was initiated for a comparative study of the prevailing air quality in the 5 major cities of a central state, namely Chhattisgarh in India in terms of  $PM_{10}$ ,  $PM_{2.5}$  and  $PM_1$ . The five selected cities, geographically from north to south, were Ambikapur (non-industrial city), Jagdalpur (non-industrial city), Raipur (industrial city), Bilaspur (industrial city) and Korba (industrial city). Total 60 24 hr samples were collected to measure the mass concentration of  $PM_{10}$ ,  $PM_{2.5}$  and  $PM_1$  during April 2005 to March 2006 at these locations. According to the results, the  $PM_{10}$ ,  $PM_{2.5}$  and  $PM_1$  mass concentrations varied from 210.0 to 231.2  $\mu\text{g}/\text{m}^3$ , 82.7 to 113.8  $\mu\text{g}/\text{m}^3$  and 40.5 to 69.2  $\mu\text{g}/\text{m}^3$ , respectively. The mean  $PM_{2.5}/PM_{10}$  ratios of all samples were 0.42, indicating almost a 50% contribution from  $PM_{2.5}$  particles in the state overall. The  $PM_{10}$ ,  $PM_{2.5}$  and  $PM_1$  mass concentration in different cities falling under non-industrial and industrial categories were 215.5, 86.9, 44.4 and 227.2, 99.6, 58.1  $\mu\text{g}/\text{m}^3$ , respectively. The concentration of particulate matter ( $PM_{10}$ ,  $PM_{2.5}$  and  $PM_1$ ) was highest at Korba (231.2  $\mu\text{g}/\text{m}^3$  for  $PM_{10}$ , 113.8  $\mu\text{g}/\text{m}^3$  for  $PM_{2.5}$  and 69.2  $\mu\text{g}/\text{m}^3$  for  $PM_1$ ) followed by Bilaspur and Raipur. The study concluded that the overall air quality in the city of Chhattisgarh was much inferior to other cities in India and abroad and there is a need to address the issue of  $PM_{2.5}$  and  $PM_1$  monitoring and control.

## KEYWORD

Coarse, Fine and ultrafine particles; Mass concentration; Industrial city; Non-industrial city.

# **A Study of Air Pollution Load Assessment Around Opencast Coal Project in India**

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Opencast mining technology results in the release of a huge amount of air borne dust. The air borne dust peculiarly below 100 micron in size, are environmentally nuisance and cause health hazards. Total suspended particulate matter (TSPM) and respiratory particulate matter (PM<sub>10</sub>) are the major pollutants in the air environment of opencast coal mines. Therefore, dust generation, its dispersion and pollution load assessment have been found to be major concerns in air quality modeling of opencast coal mines. The present paper focuses on the quantification of sourcewise emission inventory for different point, area and line sources considering the background dust concentration at one of opencast coal project (OCP), namely Hindustan Lalpet of Western Coalfields Limited (WCL). The 24 hr average concentrations of TSPM and PM<sub>10</sub> were monitored at three monitoring stations during winter season. On an average the PM<sub>10</sub> concentration in the ambient air constituted 17.00 to 60.03 % of TSPM concentration. TSPM concentration ranged from 313.11 to 565.57 µg/m<sub>3</sub> and 79.48 to 270.61 µg/m<sub>3</sub>.

## **KEYWORD**

Air borne dust, Total suspended particulate matter, Respiratory particulate matter, Dust emission, Dispersion, Emission rates, Open cast coal mine.

# **Ambient Air Quality Monitoring in and Around Solid Waste Disposal Site**

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The accumulation of solid wastes is a growing problem that threatens the environment of entire globe due to increasing population and industrial development. Landfilling continues to be the most economic method of disposal worldwide for municipal solid waste (MSW) disposal. The environmental problems created by landfills are multi-dimensional as they affect all the three media, namely air, water and land. In the present study, an attempt has been made to monitor the ambient air in and around the municipal solid waste disposal site. Major air pollutants, such as SPM, RPM SO<sub>2</sub> and NO<sub>x</sub> were monitored in the study area. Results showed that the air quality parameters tested are well within the standards prescribed by National Ambient Air Quality Standards (NAAQS). It concludes that there is no serious problem of air pollution from the above tested air pollutants in the vicinity of disposal site and is not a cause of concern to public health as no adverse impacts is expected at the present state.

## **KEYWORD**

Municipal solid waste, Landfilling, Respi- rable dust sampler. Ambient air, Particulate matter, Sulphur dioxide.

# **Waste to Wealth : Flyash**

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Building industry, a fast growing sector is one of the key areas of infrastructure development. To cater to the requirements of building materials, we depend heavily on natural resources. There is a limit to which natural resources can be exploited. It is imperative to find alternate substitute materials. Use of industrial wastes for this purpose is beneficial in two ways; it conserves the natural resources, which would have been exploited otherwise on one hand and gives solution to safe disposal of industrial waste on the other hand. Flyash is one of such industrial wastes (resource material if understood properly), which is causing environmental pollution. Large stretches of land, which can otherwise be used for shelter, agriculture or some other productive purposes, are being wasted for disposal of flyash. The water, in which flyash falls, becomes unfit for drinking. The land on which it falls becomes infertile. The air becomes polluted since it spreads into atmosphere and causes lung problems. The present generation of flyash is around 150 million tonne per year in the country. Such a huge generation of flyash causes a considerable impact on the environment/eco systems. Flyash has many valuable applications in building industry. Flyash building components are competitive to conventional material components and provide enormous indirect benefits. The country can gain a lot by gainful utilisation of flyash resulting in conservation of natural resources as well as protection of environment. Researches in India and abroad have established that the otherwise waste material, like flyash can be converted into meaningful wealth as a new construction material. In this paper an attempt has been made to study the structural behaviour of flyash concrete by conducting various tests on standard specimens, containing 20% flyash. The experimental work is based on mix design procedure for M15, M20, M25 and M30 to study the properties of flyash concrete, like compressive strength and bond stress. In this work, the factors are, gradation of aggregates, fineness modulus, size of aggregates, water content, concrete mixing method, flyash content, compaction factor, curing conditions, etc., are considered.

# **Dispersion Pattern of Sulphur Dioxide in the Neighbourhood of Thermal Power Stations at Neyveli**

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The present study deals with the pattern of pollutant dispersion in the neighbourhood of Thermal Power Station in Neyveli, 200 km south west of Chennai. To estimate probable air quality, the meteorological data gathered for a period of one year and is used for predictions. The ground level concentration of SO<sub>2</sub> was computed at a distance of 500 m in 16 directions over a 25 km<sub>2</sub> area around the Power Station. This study involved computations of long-term averages of SO<sub>2</sub> concentrations at downwind locations under various computations of wind speed and atmospheric stability classes. The SO<sub>2</sub> isopleths indicated the probable zones of maximum concentration of sulphur dioxide over township, industrial and agricultural rural areas.

## **KEYWORD**

Sulphur dioxide, Dispersion pattern, Isopleths.

# Determination of Air Quality Index for Lucknow Metropolitan City

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The inadequate mass transport services, increased use of personalized motor vehicles and subsequently vehicular pollution in metropolitan cities, not only leads to deterioration of environmental conditions but also have adverse effects on the health of people. India is one of the most environmentally degraded countries in the world and is paying heavy price for it. Vehicular air pollution is a major cause of concern in metropolitan cities of India. Before applying mitigative measures it is necessary to determine the possible hazard to human health which may be assessed from air quality index. The scope of this technical paper is confined to determination of vehicular air pollution level and air quality index (AQI). Lucknow city, the capital of the most populated state (Uttar Pradesh) of India is selected as study area for this project. Concentration of primary air pollutants, that is SO<sub>x</sub>, NO<sub>x</sub> and SPM were monitored along the road-sides in urban areas and collected data was analyzed to find out air quality index using the standard procedure recommended by the Central Pollution Control Board (CPCB), New Delhi. Finally the AQI values were compared with the rating scale to assess the degree of pollution in the ambient air. It was found that hourly AQI values varied from 91 to 456 for various land usages indicating moderate to hazardous degree of air pollution in entire city. Suitable mitigative measures have been suggested based on the analysis of data.

## **KEYWORD**

Vehicular environmental pollution in metropolitan city, Air quality index (AQI), Primary pollutants, Rating scale.

# Hexabromocyclododecane in the Environment - Issues and Challenges

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The brominated flame retardant, hexabromocyclododecane (HBCD) is extensively used in Europe and to smaller extent in India, has become of increasing concern to scientists over the past decade. HBCD is not produced in India and the current industrial use is moderate. Possible emission sources of this chemical in India were identified through a systematic analysis of the use in a life cycle perspective. The information on the environmental concentrations of HBCD is scarce. Environmental studies conducted primarily in Europe, Japan and North America indicates that HBCDs are ubiquitous in sediment and biota. The levels of HBCD seem to be increasing and several trends indicate that this increase may be rapid. The relatively high concentrations detected in herring and foodstuffs provide evidence for bioaccumulation of HBCD. The presence of HBCD in remote background air implies that HBCD has potential for long-range atmospheric transport. The occurrence of high concentrations of HBCD may be sufficient to elicit adverse effects in some wildlife. There is also concern that levels of HBCD could cause adverse effects in sensitive human populations, such as young children, indigenous peoples and fish consumers. However, our knowledge about these chemicals, their sources, environmental behaviour and toxicity is limited, making risk assessment difficult. In this paper, the current state of knowledge about HBCD is reviewed and areas for further research recommended for improving future monitoring and risk assessment efforts.

## KEYWORD

Hexabromocyclododecane, Brominated flame retardants, Hexachlorocyclohexane.



# **Nanotechnology Based Ambient Air Carbon Emission Investigation-Challenges Ahead**

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Nanotechnology could provide a solution to the soaring air pollution caused by automobile carbon emissions worldwide. Research showed that nano-treatment of engines could cut down toxic gas emissions. Also, use of nanotechnology-based systems increases the rate of pre-emission carbon trapping considerably. Nanocatalysts made from nanoparticles have a greater surface area to interact with the reacting chemicals than catalysts made from larger particles. Nanostructured membranes, on the other hand, are being developed to separate carbon dioxide from industrial plant exhaust streams. Also, it will create a method that can be implemented in any power plant without expensive retrofitting. This paper elucidates the use of carbon gas sensors for detecting carbon emission under deleterious conditions. The sensors used for detecting air pollutants are usually produced by coating a sensing metal oxide layer on a substrate with two electrodes. The general mechanism for a metal oxide sensor is a change in the resistance or conductance of the sensor when it is exposed to pollutant gas, relative to the sensor resistance in the ambient air. Internet geographical information system software applications can be generated by huge databases of spatial information from all relevant sources.

## **KEYWORD**

Ambient air, Nanosturcture, Carbon nano- tube, Catalyst.