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The Effect of Ambient Air Quality on Surrounding Urban Areas in Foundry Industry

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ABSTRACT
The foundry industry, which is regarded as the world's second oldest industry, India is one of them. It forms the basic underpinning of an industrial society. Its products are used to make 90 percent of all manufactured goods. The Indian Foundry industry produces approx.7 Million MT of castings employing estimated 500,000 persons directly & another 1.5 million indirectly. Foundry is also the one of polluted industry because it emits the harmful gases like SO_2, NOx, Ozone, NO_3, Particulate matter, Benzene etc… it affected on surrounding areas like Human health, Vegetation, Property, Buildings etc…

Keywords: Foundry Industry, Process of Foundry, NAAQS, Effect of Foundry Industry

INTRODUCTION
The foundry industry is dispersed across various geographical clusters, of which the Kolhapur cluster is one of the major ones. Kolhapur was traditionally an agro-based economy. Demand for oil engines and agricultural implements grew with industrialization in the region. This led to the emergence of the foundry industry which evolved around the 1960's. Today Kolhapur is a leading foundry cluster, renowned for manufacturing quality castings. There are approximately 300 foundry units located in the Kolhapur and Sangli districts of the region. The cluster primarily manufactures Ferrous (iron) castings covering both SG iron and Grey-iron castings. The total production of the Kolhapur foundry cluster is estimated to be 600,000 tons per annum. There are several support institutions working in the cluster and assisting foundry industries on different aspects such as technology, raw materials, fabrication, testing, financing, labor, training and capacity building, marketing, grievances, knowledge dissemination, etc…

Foundries manufacture various types of castings which can be divided into the following categories — ferrous, non-ferrous-aluminum alloy, graded cast iron, ductile iron, and steel. Castings are mainly used in automobiles, railways, pumps, compressors and valves, diesel engines, cement industry, electrical industry, textile machinery. Also it has been manufacture the different types of products and by-products. It follows the processes like sand drying, coaring, melting, pouring, cooling etc…This processes emitting different types of air pollutants which are monitored by the air quality monitoring process.

The term "air quality" means the state of the air around us. Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution. Because of the presence of high amount of air pollutants in the ambient air, the health of the population and property is getting adversely affected. The ambient air quality monitoring network involves measurement of a number of air pollutants at number of locations in the country so as to meet objectives of the monitoring. Any air quality monitoring network thus involves selection of pollutants, selection of locations, frequency, duration of sampling, sampling techniques, infrastructural facilities, man power and operation and maintenance costs.

LITRATURE REVIEW
Central Pollution Control Board Ministry of Environment & Forests, 2000 *published the Environmental Standards for ambient Air, Automobiles, Fuels, Industries and Noise. The Central Pollution Control Board (CPCB) has developed National Standards for Effluents and Emission under the statutory powers of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981. These standards have been approved and notified by the Government of India, Ministry of Environment & Forests, under Section 25 of the Environmental (Protection) Act, 1986. Till now, Effluent standards for 37 categories of industries and Emission Standards for 31 categories of industries have been evolved and notified besides standards for ambient air quality, ambient noise, automobile and fuels quality specifications for petrol and diesel. Guidelines have also been developed separately for hospital waste management.*

Environmental protection authority 2002, *was studied the air quality monitoring hot spot on location on the Hensley Foundry, Flinders Park and Netley where Concentrations of common pollutants, including nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone and PM_{10} were all low and below the NEPM standards by*

using the sampling Methods like High volume sampling, Differential optical absorption spectrometry (DOAS), Tapered element oscillating microbalance (TEOM), Non-dispersive infrared (NDIR). And also Concentrations of hazardous air pollutants, including toluene and formaldehyde, were low and below the WHO guidelines. The Department of Human Services advises that health impacts would not be anticipated. The Department of Human Services advises that benzene levels averaged over the two months of monitoring were within the UK Air Quality Standard, which is an annual average. If this monitoring reflects the ambient air values for the entire year, then health risks would be minimal. Higher concentrations of TSP iron at Flinders Park, compared with Netley, suggest that Hensley Foundry is likely to be a source of particles.

National Ambient Air Quality Monitoring Series: NAAQMS, 2003-04*, report outlines the guidelines for carrying out ambient air quality monitoring including selection of monitoring stations, number and distribution of monitoring stations, selection of pollutants, measurement methods, sampling duration and frequency etc. The guidelines have been prepared on the basis of experience gained over the years in ambient air quality monitoring. The report also describes quality assurance and quality control requirements in ambient air quality monitoring. The Ring Test facility developed in CPCB is explained in the report.*

Anil Kumar Singhdeo and Nilamadhab Suna, 2005 *studied that Ambient air quality was assessed using three monitoring stations inside NIT Rourkela campus, the studies have clearly revealed the levels of air pollutants for TSP, PM_{10}, NOx and SO_2.The values of all these pollutants (particulates and gaseous) are observed to be very much below National Ambient Air Quality Standards except the station, that is the residential area, dispensary. This increase in AQI at this site is probably due to the increased transportation on the road in front of it and the school that is responsible for this increase in traffic. The air quality is giving the holistic view of air pollution levels. So from the result, it is evident that for the time being, the ambient air inside NIT Rourkela do not need any attention from the policy makers except the residential area, but may be in the future we need to formulate some ways to counteract the increase in air pollution at specific sites as we may never know when the growing urbanization and the traffic will increase the air pollution level inside the campus much more than the maximum permissible limits.*

Subodh Panchal, (2010) *discussed, the Indian scenario, where the foundry industry is located in India and the allover casting trends such as the productive trend, export trends etc…Significance of Foundry Industry will also be discuss.*

Prakash Mamta and Bassin J.K, (2010)*discussed that, the overall AQI can give clear view about ambient air and the critical pollutant mainly responsible for the quality of air quality which can be easier for a common man to understand. The AQI swere calculated according to Indian Air quality Index (IND-AQI).The AQI study reveals that Suspended particulate matter (SPM) was mainly responsible for maximum times in all sites in Delhi. The majority of AQI values of SPM fell under the category of very poor. Further, the daily average concentration and AQI for particulate matter shows a maximum pollutant concentration during winter months and a general trend of minimum values occurs in monsoon. Measures are being taken by the Delhi government to improve the quality of air. These measures include use of clean fuel CNG by vehicles, closure of industrial units, phasing out of older vehicles and encouraging people to use public transport means like metro rails and high capacity buses.*

M. T. Abedghars, A. Hadji and S. Bouhouchthey, (2011) *discussed the Monitoring of air quality in an iron foundry (Case of NOx, SO2, benzene and dust) in that the control of the quality of the air would have a positive incidence on the health of the workers which would be deteriorated by the air generated by this activity and would make it possible to locate the sectors requiring of the interventions that they are specific to the process or in the form of installation of clean technology. Taking account of all these principles, it is convenient to follow the pollutants SO_2, NO_2, BTX and dust, highlighted after exploitation of various results of investigations. According to the recorded results, it arises that the measured value of benzene is definitely higher than the limiting value of WHO, the concentration of the dioxide of sulfur and of oxides of nitrogen is alarming if we compare it with the limiting value WHO. By decreasing the levels of air pollution, one can help the countries to reduce the world load of ascribable morbidity to the respiratory infections, the cardiopathies and pulmonary cancers.*

Herbert J. Weber (2012) *discussed the article about the informative report of air pollution problems in foundry industry. In report no. 1, effects of air pollution can cause on man, animals, vegetation, and property as well as on*

the surrounding areas. For convenience, pollutants discharged by foundries are as follows; Effluents from dust-producing operations within the plant, Odors and gaseous compounds, Effluents from furnace operations. The problems arising from each type of contaminant and the methods of control of pollution from these types of contaminants vary with the nature of the specific problem. He also included that the effluent of the ferrous and non-ferrous operations of Furness. Where ferrous furnaces used in the foundry industry are like Cupolas, Electric melting furnaces, Air furnaces and Open hearth furnaces. Where nonferrous foundry operations play min or parts in the over-all foundry pollution problem. However, emissions from any given plant, because of local conditions, may create a neighborhood problem. Because of the wide variety in melting equipment for nonferrous alloys, no attempt will be made either to classify furnace types or to treat the specific air pollution problem involved. In report no. 2, the greatest source of air pollution problems and nuisance complaints is the melting operation. Effective control of emissions from melting furnaces is complicated by a number of factors, such as: The great number of ultra-fine particles in stack gases unfortunately makes such gases clearly visible in the form of a plume, even after they have passed through what is normally considered high-efficiency dust collector. In contrast with metal melting operations, other foundry operations do not produce large external volumes of ultra-fine dust particles. High Temperature of furnace-stack gases usually requires the use of refractory-lined or heat-resistant alloy ducts, plus possible additions of water sprays for cooling the gases, before they can be handled satisfactorily by most conventional types of dust collectors. The large volume of furnace-stack gases, whether cooled with water sprays or dilution air, requires large-size dust collectors which would normally be expensive even without other complicating factors such as available space. Use of water-spray equipment for stack-gas cooling frequently presets corrosion problems. These corrosion problems may be trace able to the nature of the available cooling water supply and to the gases absorbed by the spray water. Air pollution control equipment for metal melting operations is an added operating-cost burden, usually without by-products that might reduce operating costs. In report no.3, Problems of the Investment Casting Process and in report no.4 that, Instruments and Techniques for Measuring Foundry Air Pollution Emissions.

Small Industries Development Bank of India (SIDBI) (2012), *discussed the foundry industry is dispersed across various geographical clusters, of which the Kolhapur cluster is one of the major ones. Kolhapur was traditionally an agro-based economy. Demand for oil engines and agricultural implements grew with industrialization in the region. This led to the emergence of the foundry industry which evolved around the 1960s. The World Bank with the support from Global Environmental Facility (GEF) has designed the MSME Energy Efficiency (EE) project as a part of the GEF Programmatic Framework project for Energy Efficiency in India. The objective of this project is to increase demand for energy efficiency investments in target micro, small, and medium enterprise clusters and to build their capacity to access commercial finance. This project is to be co-implemented by Small Industries Development Bank of India (SIDBI) and Bureau of Energy Efficiency (BEE).*

Central Pollution Control Board Ministry of Environment & Forests, 2012, *published National Ambient Air Quality Status & Trends in India-2010. Where Central Pollution Control Board (CPCB) has established the National Ambient Air Quality Monitoring (NAMP) Network, covering 209 cities/towns of the country in compliance with the mandate under the Air (Prevention and Control of Pollution) Act, 1981 to collect compile and disseminate information on air quality. The ambient air quality is monitored collectively by Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs), Pollution Control Committees (PCCs), and National Environmental Engineering Research Institute (NEERI). The data, thus generated, is transmitted to CPCB for scrutiny, analysis, compilation and its publication. This Report contains ambient air quality data for the calendar year 2010 and trend analysis of major urban centers such as metropolitan cities since 2000. Air pollution status of various pollutants is described in terms of Low, Moderate, High and Critical category, vis-a-vis the noticed ambient air standards. The status is depicted in the form of tables and figures as well*

Dhilip.K.M.K and C.Senthil Kumar, 2014*are studied the safe operating procedure for fettling area and the air pollution control in foundry, thus by observing all the working procedure of each operation in the fettling area, all unsafe working procedure was identified and accessed. Then Safe Operating Procedure (SOP) was developed for all fettling operations and implemented. It also provides better working condition in each fettling operations and makes the working environment free from hazards. And air pollution control in foundry,*

implementing the continues air pollution monitoring in all stack emission and scrubbers the sustainability of pollution limit lesser than permissible limit is guaranteed.

Anil J.Sathe ,V.G Mutalik Desai, V.R.Chate , Siddu Hosamani ,2015*are studied then Air Pollution Monitoring & Control at Foundry Clusters in Belgaum-A Case Study where the some locations zones were selected these are divided in three zones like Foundry cluster Zone 1 Udyambag industrial area, Foundry cluster Zone 2 Angol industrial area, Foundry cluster Zone 3 Machhe industrial area. These locations were monitored according to the Central pollution control board (CPCB) the methods prescribed for the pollutant gases and the particulate pollutants are very sensitive ones yet percentage of errors are very less. The methods prescribed for the gases SO_2, NO_2, NH_3 and the particulate pollutants PM_{10} and $PM_{2.5}$ are respectively: Improved West and Gaeke method for SO_2. Modified Jacob and Hochheiser method for NO_2. Indophenol method for NH_3. Gravimetric method for PM_{10} and $PM_{2.5}$.*

SUMMARY OF LITERATURE

After thorough evaluation of the related literature, it can be revealed that, most work of the foundry industry is related to processes of the foundry industry. Mostly in ferrous foundry S.G.iron and Cast iron are used for raw material. Processes are like sand drying, coaring, melting, pouring, cooling, knock out, shot blasting, fettling, painting etc... These processes emit the various air pollutants cause of air pollution like sulphur dioxide (SO_2), Nitrogen dioxide (NOx), Carbon Monoxide (CO), Particulate matter (PM_{10}, $PM_{2.5}$) etc… This air pollution can be measure by using Ambient Air Quality Monitoring Data for different methods. AAQ is one of the air qualities which can measure the quality of outdoor air in our surrounding environment. This data can standardize by using the National Ambient Air Quality Standard (NAAQS) given by Central Pollution Control Board (CPCB). Gases emitting from foundry industry is harmful. They can effect on human health, plants, animals, property, building etc…

CONCLUTION

Above mentioned literature conclude that, Air is a precious resource that most of us take for granted. So, be aware about the air and air pollution by using the Ambient Air Quality Monitoring and such any other related new terms.

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