

The Impact of Air Pollution on Obajana Community, Kogi State, Nigeria

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ABSTRACT

The quest for survival of man has led to industrial revolution and in turn is considered an important factor to contaminate the environment. The activities of man in the industries such as excavation and the processing of raw materials into usable products, release of effluent or other gaseous wastes results to industrial pollution and imposes heavy cost on human health and safety. Despite the socio-economic advantages, the Dangote Cement factory located in western part of Kogi State, a major polluting industry in Obajana community has contributed to more than half of the environmental pollution in its host community. The graveyard health consequence of industrial pollution on the Obajana community calls for research for controlled and prevention. The research has revealed that the industrial activities has led some of the buildings weaken its structure, shorten service lifespan of electrical poles, exposed the community to cancerous causative agent and most important to accumulation of static electricity that is unhealthy to electrical and electronic appliances, inhibit the processes of solar electricity. The objective of this research work is to explore the impact of air pollution from the cement plant on its host community and neighbouring community. To develop an understanding of environmental degradation, the study discusses the impact of air pollution on the performance of electric contact material surface where extensive solar panel, a case study was exposed for up to three months. The research undertakes to determine material degradation as a function of time and environment. The air pollutants collected was measured using techniques developed specifically for this research. The results obtained are presented, and preliminary correlations are drawn.

KEYWORDS: Obajana, Air Pollution, Kogi State, Nigeria

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I. INTRODUCTION

Concentration of population density over a region is a result of the application of science to the problems of economic production. This economic production is related with technological innovation where socio-economic development encourages industrialization, urbanization and standard of living. Consequently, a high premium is placed on the development of the industrial sector of developed economies. Quite often, it is argued that the developed countries of the world attain this level of development because of the technology that increases the number of industries within their economies (Perkins et al., 2001). Due to rapid economic development, environmental pollution has escalated over the last few decades. It is mainly due to manufacturing and industrial sectors, which is the backbone of a country's economy. Statistics show that about 50% of pollution is due to industries and manufacturing units (Sunday A. O, 2004). The biotic and a-biotic factors of the environment are severely affected due to industrial pollution. It also threatens the people's safety, their lives and wealth, and causes many interrelated social problems. Industrial pollution causes many changes in the environment like energy patterns, radiation, chemical and physical constituents of the environment. These factors alter water supply, which affect agricultural output directly or indirectly. It is necessary to consider industrial waste in order to lessen or eradicate pollution from the environment. Major industrial pollutants include chemical compounds, concrete, dirt, ammonia gas, nitrogen compounds, gravel, scrap metal, oil and heavy metals. It accounts for wide ranging environmental damages. It includes pollution (land, water, and air), noise control, and waste disposal, health, and safety aspects. This irreversible destruction which includes waste production, degrading soil, water bodies pollution, is a serious challenge to the natural ecosystem and human health. There is a great need to create mass awareness for environmental degradation and its implications. The economic importance of mineral exploration play significant role on the social and economic development countries as job opportunities and infrastructural facility are dividend from it (Akande and Idris, 2008). The impact of industrialization on socio-economic development cannot be overemphasized (Aribigbola et al., 2012). Exploitation of mineral resources has assumed prime importance in several developing countries including Nigeria. Niger

is endowed with abundant mineral resources which have contributed immensely to the national wealth with associated socio-economic benefits. Mineral resources are important sources of wealth formation but before they are harnessed, they have to pass through the stages of exploration, mining and processing (Ajakaiye, 1985; Adekoya, 2003).

Air pollutants have serious negative effects on the health and welfare of man. This effect has been understudied to determine the cause-and-effect relationships between the air pollutants and electrical contact performance. Studies have shown that under certain condition, electrical contact materials are more sensitive in terms of electrical properties to air pollutant due to accumulation of electrostatic discharge. Specifically, solar panel directed to trap radiant energy from the solar system and utilizes it for electricity dependent upon surface conditions is more susceptible. The specialized tools developed for this research work are as follows:

- (1) Obajana Cement factory is chosen as appropriate field site for the work by means of preliminary survey of both pollutant levels and the extent of reaction of the environment with the surface of silver.
- (2) The preparation of test tool for the site
- (3) Painstaking preparation of material installation in the test cabinet
- (4) Installation of cabinet at the site and bi-weekly visit thereafter for measurement of particular air pollutants

The process of cement manufacturing starting from raw material down to the finished material is accompanied by the release of particulate and petroleum combustion of by-products. This particulate consists of non-dissolved oxide of metals such as oxide of silicon, lead, aluminium, calcium, iron, potassium, magnesium, and sulphur. Controlling particulates emissions from sources other than the kiln usually entails capturing the dust using a hood or other partial enclosure and transporting it through a series of dust devices to the collectors. The type of dust collector used is based on factors such as particle size, dust loading, flow rate, moisture content, and gas temperature (Reinhold, 1992). During cement production, fine particulate were emitting which posed negative effects to health and also covering of conductive electrical contact surface. Long range transport also occurs with fine particulates from natural sources and may even span over several kilometres and these would have a negative impacts not only on the host community but on the neighbouring towns and villages, states and the nation in general.

II. METHODOLOGY

Investigation Survey

Preliminary assessment visits to the site field chosen ‘Obajana community and its neighboring village’ to collect data for the set objective of the study was done. Prepared questionnaire were administered to the host community of Obajana cement factory and information collected from respondents. The responds from responders were collected, analyzed and drawn appreciable data.

Table 1: Environmental Pollution

Impact	Frequency	Percentage, %
Negative impact	20	20
High Negative impact	25	25
Very high Negative impact	55	55
Total	100	100

Table 2: Dust Particles released

Impact	Frequency	Percentage, %
Negative Impact	16	16
High Negative Impact	34	34
Very high Negative Impact	53	53
Total	100	100

Air measurement procedures

- (1) *Gaseous Pollutant Field Test Apparatus*: The concentration of gaseous pollutants was measured by specific colorimetric wet analytical procedures as described by the respective field of technique. Pollutants such as NH₃, Cl₂, O₃, SO₂, NO₂, HCHO, and HF were sampled for measurement and completed within two hours.
- (2) Lead acetate paper tape sampler calibrated for one, two, three and four sampling period was used to measure the presence of hydrogen sulphide.
- (3) Volume of air dust was collected and measure with air sampler.
- (4) Daily measurement of temperature and humidity recorded and averaged for weekly record.

Techniques for Evaluating Environmental Effects on Electrical Materials

Presence of impurity (dust) reduces the electrical conductivity of material. Although there are several techniques to determine and evaluate the contact resistance data that includes X-ray diffraction, Electron diffraction, Electrolytic reduction, Optical microscope and uses of sensitive probe. All the techniques are somewhat expensive except the use of probe relatively less expensive and very friendly. Owing to its friendly nature, sensitive probe was employed for the experiment. The techniques deployed to evaluate the environmental effect on materials was to measure the electrical contact resistance by summing all the constrictions of lines of current flow at the interface between two contacting metals (W.B. Ittner and P.J Magill, 1957). A sensitive probe was used to measure the contact resistance of film-covered metals as a function of pressure being built up on the contact surface thus voltage. Setting the probe on pressure mode of operation, the contact resistance dependent on wipe distance is measured by lowering the tip of the gold probe onto a flat metal specimen and the load while increases the hydraulic system. Then, the contact resistance as a function load between the probe tip and the specimens is recorded at the interval of time period.

III. Research Findings

The findings of the research based on the Table 1 reveals how air pollution has adverse impact on the environmental biotic and a-biotic factors. The respondent's observation indicated the study region closer to the factory is seriously affected with air pollution. Particulate matter such as dust from the quarry activities and cement processes that are exhaust from plants around the study zone has resulted to severe health threat which include respiratory related disease – cough, asthma, lung cancer, digestive disorder - fever, and nervous related issue – eye impairment, headache, water-borne diseases – diarrhea, stomach issue and dermis disorder.

The negative impact of air pollution from the industrial activities of cement production in the study zone caused serious degradation of the environment owing to exploitation of limestone for cement.

Workers that are directly exposed to the ultra-heat radiation would likely have genetic mutation and with high chance of cancerous disease especially those in rotary kiln section. Community nearness to the factory and the worker are likely to developed ear impairment and probably may become temperamental in their life dealings. Photosynthetic plant processes as the major source of plant growth is inhibited with the particulate matter of the quarry activities. It is also observed that in transporting the bulky raw materials from quarry to various market outlets, the available motorable road have been destroyed due to overuse especially by heavy duty vehicles (Hyellai et al., 2021).

From Table 2 shows how significant amount of dust particles and Hydrogen sulfide are produced and released into the environment. The extent of air pollution which results from these is the outcomes of the level of respondents' perception. The outcomes show that 53%, 34% and 16% is highly polluted with dust particles. The level of dust particles measured to be 1040 microgramme/cubic meter and 540 microgramme/cubic during cement production in dry season and wet season respectively. However the health of the residents is at stake, and the particles settle on their buildings thereby forming extra dirt and also all the electrical contact metals are at dangerously electrostatic charges detrimental during the stormy period. There exist the outdoor temperature and humidity in the region.

IV. CONCLUSION

The presence of harmful substance like chemical and pollutants in the research zone has vastly negative impact on the life of human and the electrical contact metal. The sensitive probe to measure the contact resistance is most accurate as compare to other techniques which include X-ray diffraction, electron diffraction, and mass spectrometer. Out of the techniques, sensitive probe system was deployed for its low cost and user friendly. This technique is so sensitive to detect sharp differences in formation of films on metal contact in study zone. The correlation of some of the effects observed between metal contacts with the environment evidently established about the nature particulate matter. The environments selected represents a realistic potential exposure for electronic equipment, whereas some earlier tests were far too severe to observe differences in material performance that could be related to specific characteristics of the test environments.

The emergent of conceptualization of Industrialization of industry in a region owing to the natural resource calls suitable technologies. This industrialization of industry determines the economic status of country. It is worthwhile to note that the industrialization is a critical key to economic growth that calls for improvement in systems, technologies and processes that utilizes natural resources more effectively. Therefore, emphasis on the technology to employ on the development of industrial sector should be utmost concerned for national productivity. The geometrical rise of population is a function of social infrastructural that includes good access road network, schools, communication network and localization of industries. Thus, Obajana cement factory sited in Obajana community has brought with it different people from all over the country to settle there. In this regards, many

businesses strive and boom thereby creating jobs for the working class of people to earn their livelihood. The residents also make their living from their engagement in different profitable activities such as loading of cement trucks, brick laying, farming, building etc in both the factory and outside the factory. The population influx has also become a source of market for farmers who used to transport their agricultural produce elsewhere for sale. Prices of properties, accommodation, land, agricultural goods etc have increased. All these have improved the income of the people of Obajana thereby improving their standard of living. However, industrialization of industries in Obajana brought other sub-industries has caused rises of employment and productivities and as well causes destruction to the community socially and environmentally.

Recommendation

The state of Nigeria's environment is at a critical stage, which can have more health risks that can affect an extended period beyond the present condition if not mitigated. Thus, the need to develop training for cleaner and pollution-free production should prioritize to increase life expectancy in Obajana Community.

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