

GAS FLARING AND ITS EFFECTS AROUND OGINI FLOW STATION, OZORO, DELTA STATE, NIGERIA

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ABSTRACT

The exploration and exploitation of oil and gas activity are directly linked with economic growth and development of a place, however, its consequential temperature effects from gas flaring on the immediate environment can not be overlooked. Gas flaring and its effects around the Ogini flow station in Ozoro was investigated using temperature as a function of distance along the four cardinal points of the flare site using an HTC2 digital thermometer which is sensitive to changes in environmental temperature at an interval of 50m each from the flare stack fence in all the four cardinal points and a control point was take at a distance of 1500m (1.5km) and 2000m (2.0km) respectively. The results showed that environmental temperature decreased from 55.3-38.2°C, 50.2-44.8°C, 49.3-37.1°C and 52.9-37.8°C as the distance increased from 50-400m due East, 50-250m due North, 50-300m due west, 50-400m due South respectively. These ranges of temperature results showed that at a distance of 50.2-44.8m, the temperature changes are above WHO standard for the normal temperature of 37°C. Similarly at the distance range of 300-800m (North), 350-800m (West) and 450-800 (South) from the flare site, the temperature varied from (39.3-33.1°C, 35.9-32.7°C and 30.3-28.8°C) down to (31.2-29.7)°C, (31.1-30.2)°C and (33.8-28.7)°C at a distance of 850-1300m due North, West and South respectively. The two control points temperature at the distance of 1500m (1.5km) and 2000m (2.0km) are 32.3°C and 38.7°C.

Keyword: Temperature, Gas flaring, Ogini flow station, Nigeria, Environment.

I. INTRODUCTION

Nigeria is a country highly endowed with natural resources among which are oil and gas, these natural resources are harnessed by drilling. The Drilling of crude oil has brought both sustainable economic growth as well as different consequences to countries that are endowed with such resources. Some of the consequences are Oil spillage, communal clashes, gas flaring etc. The total output of crude oil and condensate in Nigeria in 2000 was 2.3 million barrels per day, an increase of 9.1% over the previous year (Ugbanna, 2004), while Crude oil production as a 2016 and at 1,938,543 barrels per day (Wordometer, 2021). According to the NNPC business report, Nigeria has a crude oil production capacity of 2.5million barrels/day (NNPC, 2020), Also in Nigeria the amount of natural gas produced in Nigeria amount to 1.7trillion cubic feet excluding gas flare as at of 2008 (PWC,2019). Consequently, it will be a resultant of a higher exploration effect inclusive of gas flare. A World Bank report shows that the world's annual natural gas burning is estimated to be 15 to 170 billion cubic meters, (Bott, 2012). Gas flaring is the release of hydrocarbons into the environment through a flare stack, t his hydrocarbon been released has a negative impact on the environment which include, increased temperature, low plant yield etc. Flaring is done to act as a safety device to protect vessels or pipes from over pressure due to unplanned upsets (Anomoharan, 2012). According to Oseji, (2007), the size and brightness of the resulting flame depends on the amount of released flammable material. Gas flaring is now a site associated with oil producing communities in the Niger Delta region of the country. This practice of burning off the associated gas when crude oil is processed has continued unabated since the discovery of crude oil in Nigeria. According to the report, approximately 75% of the natural gas produced in Nigeria is burned (Kindzierski, 2000). It is estimated that Nigeria is losing over \$2.5 billion to gas flaring annually and country also accounts for an estimated two billion standard cubic feet of flared gas, which amounts to about 19 percent of gas, flared globally (Nwafor, 2017). Gas flaring causes acid rain which increases soil ph causing infertility and destroys roofing sheets in communities where the gas is flared. The free extraction of natural gas through a stack is a major threat, which can be felt within an average radius of 0.5 km and causes thermal stress.. It is known that gas flaring in Nigeria has raised the average global temperature by about 0.50c (Penner, 1999). This increase in temperature leads to global warning causing migrating of wildlife. Studies have found that in response to warming temperature,

species are moving to higher elevation at an rate of 36 feet per decade and to higher latitudes (Renee, 2015). Authors have made alot of research on the effect of gas flaring on the environment, soil, plants, Micro-organism. Uzoekwe, (2019) studies on the impact of gas flaring on the fertility status of agricultural soil in an oil and gas host community in the Niger Delta region of Nigeria. In his study, soil samples were collected in the four cardinal points at an interval of 200m,400m,600m and 800m at depths (0-15cm and 15-30cm) with a soil auger which was compared with a control samples collected from a botanical garden of Federal University, Otuoke. Soil samples were analyzed for pH, calcium, cation exchange capacity, sodium, potassium, magnesium , electrical conductivity. Results showed significant variation ($p < 0.05$) between the soil characteristics in flared location and the control for the each of the parameters and also noticed a reduction in soil parameters as distance increased. This shows that gas flaring affects soil nutrients. He opined that gas flaring should be stopped to avoid the damages it causes on the environment.

According to Nwaugo, V.O, et. al, (2006) in his research on the effect of gas flaring on soil microbial spectrum in parts of Niger Delta area of Southern Nigeria. He observed that as temperature decreased away from the gas flare, pH values reduced , moisture content increased, total coliform count and Petroleum degrading bacterial count also increased as the distance away from the flare increase. This shows that gas flaring has an adverse effect on ecological and bacterial spectrum on surroundings close to the flare site.

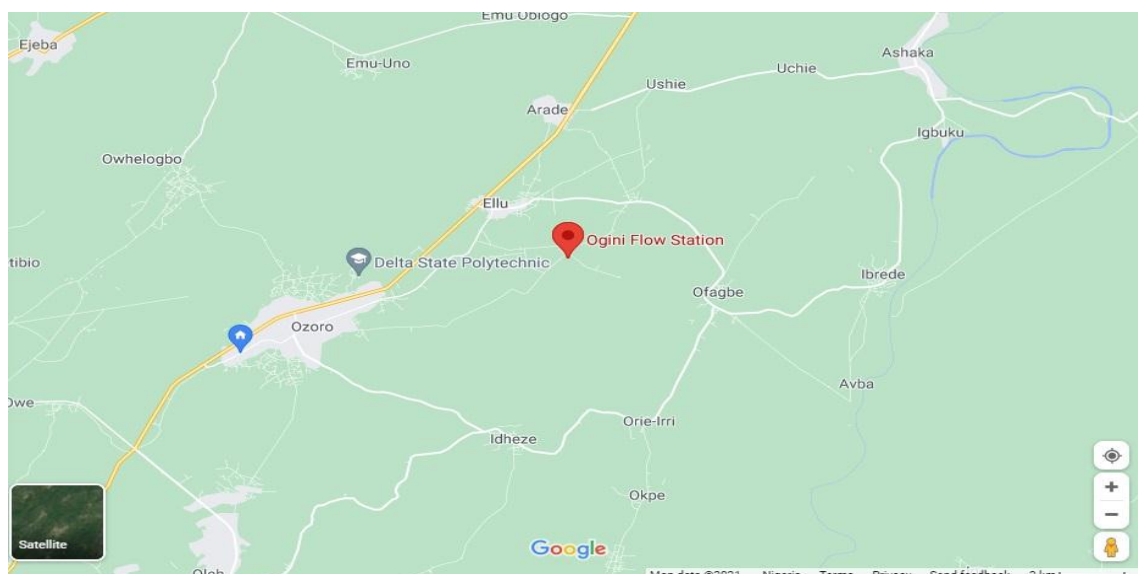
From Anomohanran, (2012) studies on the thermal effect of gas flaring at Ebedei area of Delta State, Nigeria where outdoor temperature measurement was taken in the four cardinal points at distances away from the flare point for 15days during the wet and dry season. He noticed that the average temperature of the environment close to the flare ranged from 27°C to 52°C and 38°C to 57°C during the raining season and dry season results also obtained showed that temperature normalized at distance of 2,150m and 2,060m, during raining season and dry season.

However, alot of research has been done on the impact of gas flaring on the environment but little or no research report are readily available to environmental direct end users mostly Ozoro community(Ogini) in Delta State.

II. MATERIALS AND METHODS

Area of study

This study was carried out at Ogini flow station which is located in Ogini field, OML 26 Ozoro, the headquarters of Isoko North Local Government Area of Delta State.. Ozoro lies between Latitude 5.5892°N and Longitude 6.3043°E (Figure 1). The inhabitants of the community are mainly farmers, fishermen while some of them are public servants.



(Goggle, 2021)

Figure 1: Map showing the study area

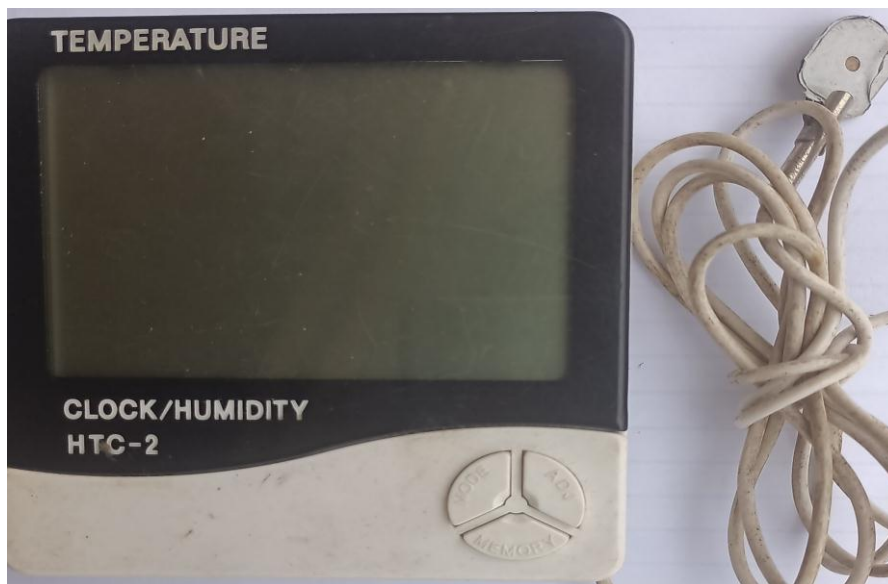


Figure 2: Picture of a digital thermometer

Samples and sampling techniques

26 points each were marked out for the temperature measurement at an interval of fifty meters (50m) each amounting to 1300 meters (1.3km) from the flare stack fence in the all the cardinal points . The control temperatures were taken at a distance of 1500 meters (1.5km) and 2000 meters (2Km) respectively.

Temperature measurement of environment was taken using an HTC2 Digital Thermometer (as shown in figure 2 above) which is sensitive to temperature changes in the environment. Temperature measurements were carried out at a constant height of 1.68m from the ground level and between 9.00hr and 11.00hr GMT to minimize the the effect of vertical temperature gradient and for uniformity of weather conditions respectively (Oseji, 2010).

III. RESULTS AND DISCUSSION

The results for temperature measurement are presented in the graphs below:

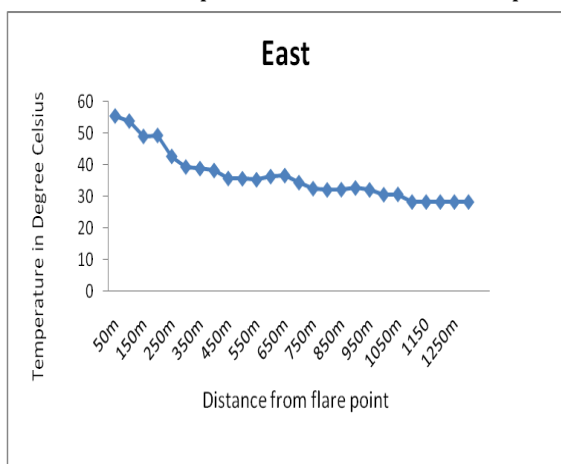


Figure 3: A plot of Temperature with Distance due East.

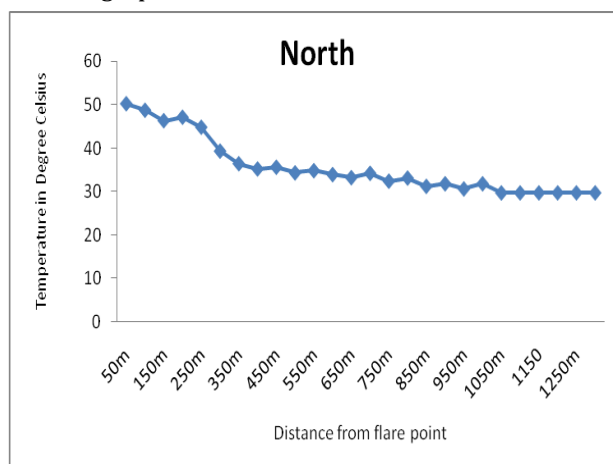


Figure 4: A plot of Temperature with Distance due North.

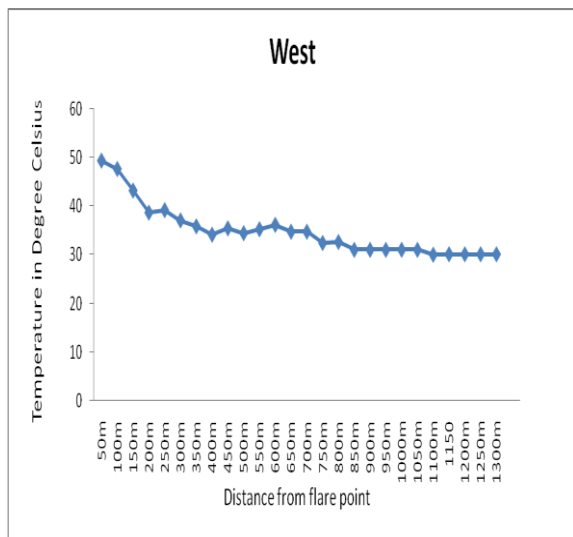


Figure 5: A plot of Temperature with Distance due West.

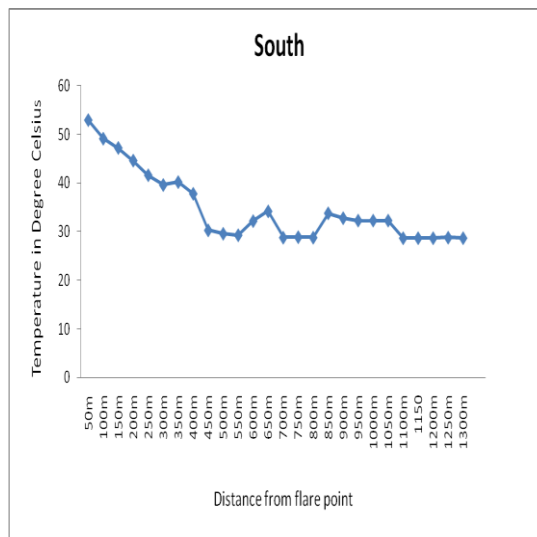


Figure 6: A plot of Temperature with Distance due South

The graph of temperature against distances from the flare point for the four cardinal points of East, North, West and South is as shown in Figures 3, 4, 5 and 6 respectively.

Figure 3 above shows the graph of temperature against distance measured along the East. It was observed from the plot that environmental temperature decreases as distance increased farther away from the flare point. The temperature ranged between the distance of 50-400m from the flare stack ranges from 55.3-38.2°C which is above WHO standard for normal temperature of 37°C, also the distance range of 450-950m from the flare site, the temperature varies from 35.7-32.1°C down to 30.6-28.3°C at a distance of 1000-1300m.

Figure 4,5 and 6 shows the graph of temperature against distance measured along the North, West and South. Also as distance increased, the temperature decreases as you move farther away from the flare stack. At the distance range of 50-250m(due North), 50-300m(due west), 50-400m(due South) from the flare stack, the temperature varied from 50.2-44.8°C, 49.3-37.1°C and 52.9-37.8°C respectively which are above WHO standard for normal temperature of 37°C, also at the distance range of 300-800m(North), 350-800m(West) and 450-800(South) from the flare site, the temperature varies from (39.3-33.1°C, 35.9-32.7 °C and 30.3-28.8°C) down to (31.2-29.7), (31.1-30.2) and (33.8-28.7) at a distance of 850-1300m due North, West and South respectively. The two control point temperature which were taken at a distance of 1500m (1.5km) and 2000m (2.0km) are 32.3°C and 38.7°C.

The observed normalized temperatures which were below that of the control could be as a result of the presence of thick swampy forest characterized by high number of canopy trees around the points of temperature normalization.

It was observed that crops cultivated within the flare environment had yellowish leaves and stunted growth.

IV. CONCLUSION

From results above, gas flaring have direct temperature effect on the environment which is also a direct function of the distance(location), it is however recommended that the enforcement of the established policies should be done effectively and individual/habitants can stay at a minimum distance of (2000m)2Km from the flare.

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