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Research article

MASS RATE OF DISPERSION MODEL TO PREDICT ACCUMULATION AND MIGRATION OF BENZINE IN PHREATIC ZONE AT ELEME, RIVERS STATE, NIGERIA

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Abstract

Mass rate of benzene were found to have deposited in Eleme Niger delta of Nigeria, the study were carried to monitor the rate such carcinogenic substance in soil and water environments, high rate of dispersion and accumulation in lateritic and silty formation were observed in the study area, the deposition of substances in lateritic and silty formation was as a results of low deposition of permeability in those region of the formation, the observation was through investigation carried out from lithology of the formation, more observation were carried out where high concentration of benzene has deposited in Phreatic zone, several method has been applied to monitor the rate of deposition and migration but could not produced better result, development of mathematical model were found to be a better solution to monitor and evaluate the depositional rate of benzene in the study location, these conceptual setting were applied to generate the expressed model for the study, experts will definitely applied these concept as a useful tools in monitoring and evaluation of this contaminant in the study area.

Keywords: mass rate, dispersion, accumulation, benzene and Phreatic zone

1. Introduction

Investigating the physicochemical parameters as well as the characteristics of ground water quality is very important to understand the role of crude oil exploration and exploitation in the various unsaturated and saturated zone of the water phase contamination. The modern civilization accompanied by the rapid growth of industrialization has created the situation of huge amount of waste generation in their operational areas. (Vishwanath & Anantha, 2002, Ukpaka, 2012). The leachate is generated from the breakdown and sequencing of the wastes and by water that has entered into a pond system from external sources. It carries a number of impurities as it moves down through the wastes. (Ukpaka & Ikenyiri, 2004; Akinsola & Obuzor, 2004; Banerjee, Bajwa, & Behal, 2004; Bhattacharyya & Sarma, 2001; Bala, Milliali, Yaji, & Shrihari, 2005; Kumaravel, Gopalasamy, & Kanakasabai, 2003 ; Utpal & Sarma, 2007 ; Ravinder, Ch. & Vijaya, 2005; Teinaku, Shaik, & Srinivasa, 2002; Ukpaka, & Ikenyiri, 2004). Various actions connected to oil exploration and exploitation in Eleme area of Rivers State in particular and Niger Delta in universal has tended to impact seriously on the ground water quality either positively or negatively (Ukpaka, 2004; Akpan, 2005 & Effiong, 2004). Eleme is part of the Niger Delta, which is at the Southern end of Nigeria bordering Atlantic ocean and extends from about Longitude 3'.9oE and Latitude 4'30-5o 20N. Eleme part of the Niger Delta Environment that developed from the Moto Delta in the Northern part Basin during the companion transgression and ended with the Palaeocene transgression. Tai Eleme is generated from the Niger Delta modern formation during the Eocene. It has three major depositions just like every other part of the Deltaic Environment. The three major formations are Benin, Agbada and Akata formation. It was estimated that one million cubic meter of sand are carried towards mahin every year, while the Niger-Benue system brings a sediment load of 0.2kilometrecubic/year which is deposited on top of the Delta (Kogbe, 1989). Benin formation ie ground water is predominant in Tai Eleme Area of Rivers State disintegrating to sombrero that transit at the creeks at about 100ft or more. The geologic history of Tai Eleme is predominated by the deposited formation. According to Eluozo, (2006) the strategraphic of Tai Eleme Area of Rivers State are deposited by lacustrine and alluvial, including off lap sediments, the lacustrine deposit in the area is Heterogeneous predominant while alluvial deposits are homogenous predominant. The coastal areas are off lap by sediments including tidal channels at 60ft and 800ft respectively. The deposit disintegrating from Benin formation are known to be the highest yield formation i.e. unconfined aquifer, Tai Eleme area of Rivers State, predominantly 90% of cobble coarse and gravel and 5% of sand stone and sedimentary deposit including montmonorite clay. The minerals that are deposited in the area are hazardous chemical from manmade activities and natural origin, e.g. iron oxide in some communities like other communities around Eleme It has an average static water table of 7.5m water table. While in most coastal environment, it has an average of 1.5m water table (Eluozo, 2006). The study by Eluozo, (2006) also confirms that a good aquiferous zone has an average depth of 36m in the upland area, while in the coastal area it is 12-15metres deep. Finally the Porosity of the soil was confirmed to be very high at an average of 0.2-0.4 percent.

2. Theoretical background

The deposition of benzene in Eleme Rivers has been a serious threat to ground water deposition, high rate of the contaminant were found on the formation through quality investigation in some part of the study location, high rate of accumulation were found in lateritic and silty formation due to low permeability of the formation, ground water exploitation were examined, the results shows high deposition of these substances in Phreatic zone, the deltaic influences no doubt will definitely pressured the migration and deposition of benzene in the study area, environmental influences from hydrocarbon exploration and exploitation has generated lots of the carcinogenic

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substances as it has affected human in several dimension. Furthermore, short term (acute) hazards of lighter, more explosive and water soluble aromatic compounds (such as benzenes, toluene, and xylenes) comprise prospective acute toxicity to aquatic life in the water column (especially in relatively confined areas) as well as potential inhalation hazards. Long term (chronic) potential hazards of lighter, more volatile and water soluble aromatic compounds include contamination of groundwater. Chronic effects of benzene, toluene, and xylene include changes in the liver and harmful effects on the kidneys, heart, lungs, and nervous system. Except for short term hazards from concentrated spills BTEX compounds have been more frequently associated with risk to humans than with risk to non-human species such as fish and wildlife. This is partly because only very small amounts are taken up by plants, fish, and birds and because this volatile compound tends to fade away into the atmosphere rather than persisting in surface waters or soils. Nevertheless, volatiles such as BTEX compounds can pose a drinking water hazard when they accumulate in ground water. Indicator compounds (such as BTEX) are usually defined as those compounds which are along with the most acutely toxic and the most mobile in soil and groundwater. Indicator compounds (such as BTEX) are typically defined as those compounds which are along with the most acutely toxic and the most mobile in soil and groundwater. A positive connection was documented between significant rainfall events and increased concentrations of slightly soluble organic compounds in the monitoring wells of the site. Infiltrated water was resolute to have transported organic constituents of the residual oil; specifically benzene, toluene, ethylbenzene, and ortho-xylene (BTEX), into the ground water beneath the water table, elevating the aqueous concentrations of these constituents in the saturated zone Mark et al 1997.

3. Governing Equation

$$V\frac{\partial q}{\partial t} = D(x)\frac{\partial^2 q}{\partial x^2} - V\frac{\partial q}{\partial x} - \frac{\partial q\mu(x)}{\partial t} \qquad \text{.................................} \qquad (1)$$

The development of these model were base on the mass rate of benzene accumulation found to deposit at lateritic and silty formation, the rate of these accumulation has lots of implication on the stratification of the formation, such expression generated several carcinogenic substance in ground water aquifers, such deltaic formation will for certain increase high concentration benzene in the study location. Several parameters were investigate before developing the governing equation

Nomenclature

q = Mass Rate of benzene Transport [ML^{-1}]

D = Dispersion coefficient in longitudinal location (MT^{-1})

μ(x) = Loss coefficient at location of x LT^{-I}

V = Void Ratio [-]

T = Time [T]

X = Distance [M]

V = Void ratio [-]

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$$V\frac{\partial^2 q_1}{\partial t} = D(x)\frac{\partial^2 q_1}{\partial x^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

$$\left.\begin{array}{l} t = 0 \\ x = 0 \\ C_{(o)} = 0 \\ \left.\frac{\partial C}{\partial t}\right|_{t = 0, B} = 0 \end{array}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

$$V\frac{\partial q_2}{\partial t} = V(x)\frac{\partial q^2}{\partial x} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

$$\left.\begin{array}{l} t = 0 \\ x = 0 \\ q_{(o)} = 0 \\ \left.\frac{\partial q}{\partial t}\right|_{t = 0, B} \end{array}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

$$V\frac{\partial q_3}{\partial t} = -\frac{\partial q_3 \mu(x)}{\partial t} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

$$\left.\begin{array}{l} t = 0 \\ C_{(o)} = 0 \end{array}\right\} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

$$\left.\frac{\partial q_3}{\partial t}\right|_{t = 0, B} = 0$$

$$V\frac{\partial q_4}{\partial x} - \frac{\partial q_4 \mu c}{\partial t} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

$x = 0$

$t = 0$

$C_{(o)} = 0 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$

$$\left.\frac{\partial q_4}{\partial x}\right|_{x = 0, B} = 0$$

$$D(x)\frac{\partial^2 q_5}{\partial x^2} - V\frac{\partial q_5}{\partial x} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (10)$$

$x = 0$

$q_{(o)} = 0$ .... (11)

$$\left.\frac{\partial q_5}{\partial x}\right| \quad x = 0, \; B$$

Applying direct integration on (2)

$$V\frac{\partial q_1}{\partial t} = D(x)q + K_1 \qquad (12)$$

Again, integrate equation (12) directly yield

$$VC = D(x)qt + Kt + K_2 \qquad (13)$$

Subject to equation (3), we have

$$Vq_o = K_2 \qquad (14)$$

And subjecting equation (12) to (3) we have

At $\left.\frac{\partial q_1}{\partial t}\right|_{t = 0} = 0 \quad q(o) = qo$

Yield

$$0 = D(x)q_o + K_2$$

$$\Rightarrow V_1 = D(x)q_o = K_2 \qquad (15)$$

So that we put (13) and (14) into (13), we have

$$Vq_1 = D(x)q_{1t} - D(x)qox\, Vqo \qquad (16)$$

$$RC_1 - D(x)q_{1x} = Vq_o - D(x)qox \qquad (17)$$

$$q_1 = q_o \qquad (18)$$

Hence equation (18) entails that at any given distance x, we have constant concentration of the contaminant in the system.

The deposition of benzene are known to be accumulating in where there low permeability in the formation, but on the process of migration, some region of the strata where there are uniformities in the deposition, it some instances the velocity of flow will be influences by the deposition of the formation, constant concentration of benzene will be experienced in those formation, the developed model at this stage consider those conditions as it is expressed the derived solution of [18].

$$V\frac{\partial q_2}{\partial t} = -V\frac{\partial q^2}{\partial x} \qquad (4)$$

We approach the system, by using the Bernoulli's method of separation of variables

$$q_2 = XT \qquad \text{(19)}$$

i.e. $$V\frac{\partial q_2}{\partial t} = XT^1 \qquad \text{(20)}$$

$$V\frac{\partial q_2}{\partial x} = X^1T \qquad \text{(21)}$$

Put (20) and (21) into (19), so that we have

$$VXT^1 = -VX^1T \qquad \text{(22)}$$

i.e. $$V\frac{T^1}{T} = V\frac{X^1}{X} = -\lambda^2 \qquad \text{(23)}$$

Hence $$V\frac{T^1}{T} + \lambda^2 = 0 \qquad \text{(24)}$$

i.e. $$X^1 + \frac{\lambda}{R}x = 0 \qquad \text{(25)}$$

$$VX^1 + \lambda^2 X = 0 \qquad \text{(26)}$$

From (25), $$X = ACos\frac{\lambda}{R}X + BSin\frac{\lambda}{\sqrt{R}}X \qquad \text{(27)}$$

And (20) gives

$$T = C\ell^{\frac{-\lambda^2}{V}t} \qquad \text{(28)}$$

And (20) gives

$$C_2 = \left(ACos\frac{\lambda}{V}t + BSin\frac{\lambda}{\sqrt{V}}t\right)C\ell^{\frac{-\lambda^2}{V}x} \qquad \text{(29)}$$

Subject to equation (29) to conditions in (5), so that we have

$$q_o = AC \qquad \text{(30)}$$

Equation (30) becomes

$$q_2 = q_o\ell^{\frac{-\lambda^2}{V}x}\ Cos\frac{\lambda}{\sqrt{V}}{}^{t} \qquad \text{(31)}$$

Again, at

$$\left.\frac{\partial q_2}{\partial t}\right|_{t = 0,\ B} = 0,\ x = 0$$

Equation (31) becomes

$$\frac{\partial q_2}{\partial t} = \frac{\lambda}{\sqrt{V}} q_o \ell^{\frac{-\lambda}{V}x} \ Sin \frac{\lambda}{\sqrt{V}} t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (32)$$

i.e. $0 = -\frac{qo\lambda}{\sqrt{V}} \ Sin \frac{\lambda}{V} 0$

$Co\frac{\lambda}{V} \neq 0$ Considering NKP

Which is the substrate utilization for microbial growth (population) so that

$$0 = qo\frac{\lambda}{\sqrt{V}} \ Sin \frac{\lambda}{\sqrt{V}} B \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (33)$$

$$\Rightarrow \frac{\lambda}{R} = \frac{n\pi}{2} n, 1, 2, 3 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (34)$$

$$\Rightarrow \lambda = \frac{\lambda}{V} = \frac{n\pi\sqrt{R}}{2} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (35)$$

So that equation (31) becomes

$$\Rightarrow q_2 = qo \ell \frac{-n^2\pi^2 R}{2} t \ Cos \frac{n\pi\sqrt{R}}{2\sqrt{R}} x \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (36)$$

$$\Rightarrow q_2 = qo \ell \frac{-n^2\pi^2 R}{2} t \ Cos \frac{n\pi}{2} x \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (37)$$

The migration of the substances in some region may also experiences predominant exponential phase on the transport process, therefore the behaviuor of the substances in terms migration will be pressured by porosity influences whereby exponential phase may be observed, the derived model consider this condition through the derived solution as it expressed in [37].

Now, we consider equation (7), we have the same similar condition with respect to the behaviour

$$v\frac{\partial q_3}{\partial t} = -\frac{\partial q_3 \mu(x) q}{\partial t} \qquad \text{……………………} \qquad (6)$$

$$q_3 = XT^1 \qquad \text{…………………………..} \qquad (38)$$

$$\frac{\partial q_3}{\partial t} = XT^1 \qquad \text{…………………………..} \qquad (39)$$

i.e. $V\frac{\partial q_3}{\partial t} = XT^1$ ………………………….. (40)

Put (20) and (21) into (19), so that we have

$$VXT^1 = -XT^1 \mu(x) q \qquad \text{…………………………..} \qquad (41)$$

i.e. $V\frac{T^1}{T} = -\frac{T^1}{T}\mu(x) q - \lambda^2$ ………………………….. (42)

$$V\frac{T^1}{T} + \lambda^2 = 0 \qquad \text{…………………………..} \qquad (43)$$

$$X^1 + -\frac{\lambda}{V}t = 0 \qquad \text{…………………………..} \qquad (44)$$

And $VT^1 + \lambda^2 t = 0$ ………………………….. (45)

From (44), $t = ACos\frac{\lambda}{V}t + BSin\frac{\lambda}{\sqrt{V}}t$ ………………….. (46)

and (39) give

$$\boxed{T = C\ell\,\frac{-\lambda^2}{\mu(x)q}t} \qquad \text{…………………………..} \qquad (47)$$

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By substituting (46) and (47) into (38), we get

$$C_3 = \left(A\,Cos\,\frac{\lambda}{V}t + B\,Sin\frac{\lambda}{\sqrt{V}}t \right) C\,\ell\,\frac{-\lambda^2}{\mu(x)q}t$$ ……………… (48)

Subject equation (48) to conditions in (7), so that we have

$$qo = AC$$ ………………………….. (49)

Equation (49) becomes

$$q_3 = qo\,\ell\,\frac{-\lambda^2}{\mu(x)q}t\;Cos\,\frac{\lambda}{q}t$$ ………………………….. (49)

Again, at $\left.\frac{\partial q_3}{\partial t}\right|_{t\,=\,0,B}^{=\,0\;\;t\,=\,0}$

Equation (50) becomes

$$\frac{\partial q_3}{\partial t} = \frac{\lambda}{V}\,Co\,\ell\,\frac{-\lambda}{\mu(x)q}t\;Sin\,\frac{\lambda}{V}t$$ …………………… (51)

i.e. $0 = qo\frac{\lambda}{V}\;Sin\,\frac{\lambda}{V}0$

$qo\frac{\lambda}{V} \neq 0$ Considering NKP again

Due to the rate of growth, which is known to be the substrate utilization of the microbes we have

$$0 = -qo\frac{\lambda}{\sqrt{V}}\;Sin\,\frac{\lambda}{\sqrt{V}}B$$ ………………………….. (52)

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$$\Rightarrow \frac{\lambda}{V} = \frac{n\pi}{2} n, 1, 2, 3 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (53)$$

$$\Rightarrow \lambda = \frac{n\pi\sqrt{R}}{2} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (54)$$

So that equation (50) becomes

$$q_3 = qo\,\ell\,\frac{-n^2\pi^2 R}{2\mu(x)q} t\ Cos \frac{n\pi}{2} t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (55)$$

Benzene may be predominant in the formation, but slight region of the strata may deposit microelements, the rate such micronutrient may inhibit the substances, there the deposition of micronutrient were considered in the derived solution, the behaviour of the concentration of the contaminant may be affected slightly base on the deposition of microelement, the derived model at these phase consider these condition as it is expressed in [55].

Now, we consider equation (8), we have

$$V \frac{\partial q_4}{\partial x} - \frac{\partial q_4 \mu(x) q}{\partial x} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (8)$$

Using Bernoulli's method, we have

$$C_4 = XT \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (56)$$

$$\frac{\partial q_4}{\partial x} = X^1 T \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (57)$$

$$\frac{\partial C_4}{\partial t} = X^1 T \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (58)$$

Put (57) and (58) into (56), so that we have

$$VX^1 T = -X^1 T\ \mu(x) X^1 T \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (59)$$

i.e. $V\frac{X^{1}}{X} = -\frac{X^{1}}{X}\mu(x)$ …………………… (60)

$$V\frac{X^{1}}{X} = \varphi \quad \text{……………………….. (61)}$$

$$\frac{X^{1}}{X}\mu(x)q = \varphi \quad \text{…………………………. (62)}$$

$$X = A\,\ell\,\frac{\varphi}{V}x \quad \text{……………………….. (63)}$$

Put (62) and (63) into (56), gives

$$C_4 = A\,\ell\,\frac{\varphi}{\mu(x)} \bullet B\,\ell\,\frac{-\varphi}{\mu(x)}x \quad \text{……………………….. (64)}$$

$$C_4 = AB\,\ell^{(t-x)}\frac{\varphi}{\mu(x)} \quad \text{……………………….. (65)}$$

Subject equation (66) to (8)

$$q_4\;(o) = qo \quad \text{……………………….. (66)}$$

So that equation (67) becomes

$$\boxed{q_4 = qo\,\ell^{(t-x)}\frac{\varphi}{\mu(x)q}} \quad \text{……………………….. (67)}$$

Considering equation (10), we have

$$D(x)\frac{\partial^2 q_5}{\partial x^2} - V\frac{\partial q_5}{\partial x} \quad \text{………………… (10)}$$

$$q_5 = X^{11}T \quad \text{……………………….. (68)}$$

$$\frac{\partial^2 C_5}{\partial x^2} \; + \; X^{11}T \qquad \text{..............................} \qquad (69)$$

$$\frac{\partial q_5}{\partial x} \; + \; X^{1}T \qquad \text{..............................} \qquad (70)$$

Put (69) and (70), so that we have

$$D(x)X^{11}T \; - \; VX^{1}T \qquad \text{..............................} \qquad (71)$$

$$D(x)\frac{X^{11}}{X}T \; - \; V\frac{X^{1}}{X} \qquad \text{..............................} \qquad (72)$$

$$D(x)\frac{X^{11}}{X} \; = \; \varphi \qquad \text{..............................} \qquad (73)$$

$$V\frac{X^{1}}{X} \; = \; \varphi \qquad \text{..............................} \qquad (74)$$

$$X^{1} \; = \; A\ell\,\frac{\varphi}{D(x)}x \qquad \text{..............................} \qquad (75)$$

Put (74) and (75) into (68), gives

$$q_5 \; = \; A\ell\,\frac{\varphi}{V} \bullet B\ell\,\frac{-\varphi}{V}x \qquad \text{..............................} \qquad (76)$$

$$q_5 \; = \; AB\ell^{\,(x-x)}\frac{\varphi}{V} \qquad \text{..............................} \qquad (77)$$

Subject (76) to (10)

$$q_5 \;\; (o) = \; Co \qquad \text{..............................} \qquad (78)$$

So that equation (78) becomes

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$$q_5 = qo\,\ell^{(x-x)}\frac{\varphi}{V} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (79)$$

The expressed model at these phase of the transport process has show the rate of velocity influences on the transport system, the expressed model establish the relationship between the velocity of fluid of solute and rate of concentration in the formation, whereby the rate of velocity determined the concentration level of benzene at some region of the strata, the expressed model monitor the rate of concentration under the influences of velocity of fluid pressure or solute in the deposited strata.

Now, assuming that at the steady flow, there is no NKP for substrate utilization, our concentration here is zero, so that equation (79) becomes

$$q_5 = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (80)$$

Therefore, $C_1 + C_2 + C_3 + C_4 + C_5$ ………………….. (81)

We now substitute (18), (37), (55), (67) into (81) so that we have the model of the form

$$q = qo + qo\,\ell\,\frac{-n^2\pi^2 R}{2V}x\ Cos\frac{n\pi}{2}t \bullet Co\,\ell\,\frac{-n^2\pi^2 R}{2\mu(x)}t\ Cos\frac{n\pi}{2}t +$$

$$qo\,\ell^{(t-x)}\frac{\varphi}{\mu C} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (82)$$

$$\Rightarrow q = qo + 1 + \ell\,\frac{n^2\pi^2 V}{2V}x\ Cos\frac{n\pi}{2} \bullet Co\,\ell\,\frac{-n^2\pi^2 V}{2\mu(x)}t\ Cos\frac{n\pi}{2}t +$$

$$Co\,\ell^{(t-x)}\frac{\varphi}{\mu(x)} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \qquad (83)$$

The derivation of benzene deposition through the developed system has established different model. These are base on various condition of the formation including other environmental influences, the study has express the behaviour of benzene deposition in the various strata of the study area, such condition are defined through the rate of accumulation of the contaminant in the study area as the migration process are determined by the deposition of the strata, geological influences from deposition of formation characteristics played predominant role in the transport process of benzene at Eleme, the study has definitely express various dimension that migration at various structural stratification influences the deposition and migration of benzene in the study location.

4. Conclusion

The behaviuor of benzene in the study location has express the level of carcinogenic level impact on human through its deposition in the study area. The rate concentration of benzene were experiences through investigation carried out using ground water sampling, such condition were paramount in the environment as groundwater degradation increase every day base on rapid rate of migration to Phreatic zone, the generation of benzene was through high industrialized activities that are practice in the environment, it was through such sources that the deposition of benzene accumulated between the lateritic and silty to Phreatic zone. Development of mathematical equation were necessary, because several application has be used but could not thoroughly investigate the rate of accumulation thus evaluating the carcinogenic rate in the study area, these implies that modeling the deposition and migration process will be better, so that the accumulation rate and migration process can be monitored, this will definitely assist the prevention and other methods of engineering the contaminant out in other to solve the issue of pollution from benzene in the study area.

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