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"THEORETICAL PREDICTION AND MODELING OF EFFECT OF CLIMATE CHANGE OVER THERMAL POWER PLANTS USING VIABLE ECOLOGICAL DYNAMICS INCLUDING ENVIRONMENTAL ISSUES TOWARDS BALANCED SUSTAINABLE DEVELOPMENT"

MR.S.V.KIRUBAKARAN/Corresponding Author /Assistant Professor Electrical & Computer Engineering WolaitaSodo University ,Ethiopia.

MR.S.V.VIJAYASUNDARAM/Assistant Professor Electrical & Computer Engineering WolaitaSodo University ,Ethiopia.

DR.G.KALIVARATHAN/Associate Professor /Mechanical Engineering/ WolaitaSodo University ,Ethiopia.

MR.DEGUMENNAELIGO/Head of the Department/Electrical & Computer Engineering WolaitaSodo University ,Ethiopia.

ABSTRACT

In the present scenario, the role of climate change towards nominal sustainable development through viable strategies must be aware of the improve the performance of all the thermal related devices and components in particular. In this context, a detailed investigation is carried out for predicting the impact of climate change on thermal power plants to the maximum possible extend, by accommodating the approaches of two phase heat transfers, role of P-type and N-type semiconductors, compressible and incompressible fluid flow, environmental chemistry and ecological dynamics including reactor design with product yield. However, the massive growth of numbers, sizes and diversity of industrial plants, effluents and waste water requires a modern-approach-one that has flexibility, speed and versatility to match the growing demands for high quality system. On the other hand, a new approach must have a sound theoretical foundation that lays a firm background for further analysis and computer aided design, the later being the main feature of modern industry. Basically environmental issues in its greatest context, is the science of complex interactions that occur amongst the terrestrial, atmospheric, aquatic, living and anthropological systems that composes the earth and surroundings, that may affect the living things and organisms as well. Therefore, it is necessary to predict the importance of environmental fake and transport towards well

KEYWORDS:

climate change,
thermal power plants,
ecological dynamics,
environmental issues,
pollutants,
sustainable development,
chemical fate,
transport,
mathematical modelling,
product yield,
green chemistry,
power and energy.

balanced green chemistry and sustainable development in the case of industries clustering power and energy including power plants. In general, a modest attempt has been made to analyses the chemical fate and transport towards the moment and fate of environmental pollutants due to climate change in power plants are major influencing considerations in determining their impacts.

Author correspondence:

Mr.S.V.Kirubakaran
Assistant Professor
Electrical & Computer Engineering
WolaitaSodo University/Ethiopia.

1. INTRODUCTION

Normally, climate change within the perspective of sustainable development, is grouped and standardized in the purview of natural science, and very recently with other disciplinary subjects of earth sciences and solid sciences too, may address the issues that the upcoming society as well as technology have formed into the existence of modernizing to the maximum possible extend. Basically, there is a difference between “weather” and “climate”, and it is better to address this fact for capturing as well as clustering the technical and scientific issues as well for changes in the climate irrelevantly. Eventhough both “climate” and “weather” are representing the behaviour of atmosphere, actually they are not synonyms. Basically, in fact, weather is the condition of the atmosphere that exhibits at a given amount amt at a given place which is perhaps a certain kilometers distance across, and it may change within days or even hours. And then, it is governed and regulated with a correction to express weather is “sunny” and “warm” in a particular day, and subsequently there may be a possibility for raining as well as change for having cold condition in the next day. The critical and complex nature of weather makes it unpredictable beyond some days, and it is the reason why weather forecasting does not extend beyond a week’s time or so.

Therefore, the future of climate change is uncertain, and this type of uncertainty may be related to changes about the trends in future. Of course, there are many individual cases of climate-change, including combustion of fossil fuels in thermal power plants, captive power plants etc., including deforestation and land usage change, leading to arrange of green house gas emissions of which co_2, methane and nitrous oxide are considered as most important. By keeping all these factors, certain theoretical as well as modelling issues are discussed in this paper for balanced ecology in thermal power plants, completely with due considerations.

2.Climate Change And Its Impact:

In general, the following issues are to be considered reasonably, upto some extend interms of science and technology behind the scenarios of climate change in thermal power plants.

i. In the first level of understanding, the major focused models that have been developed to simulate climate, and how it changes regularly and scientifically with a track record, and how it is predicted to change as well.

ii. Most probably, the mechanism by which, climate change over both more and lesser time intervals.

iii. In particular, considering the concept of feedback in its various dimensions and their importance for analyzing, and efforts to model a viable climatethorougly.

iv. Significantly, the role in the climate change of forcing agents, both natural and those deriving from human activity.

Especially, the earth's climate as being processed by an energy input-output system, which originates with the energy received from the sun focusing thermal power plants.

2. BACKGROUND OF CLIMATE CHANGES:

By 1930's, "global warming" was introduced and investigated already as a reality aspect, although most of the scientists introduced, some of the natural cycle to explain the related consequences of it. Then, Guy Stewart, a British engineer, introduced a linkage between global warming and human induced co_2 including the industrial oxides and pollutants. In the lake 1950's because of the introduction of newer tools such as computers and global warming systems, allowed the scientists

to represent the behaviour of patterns related to climate change issues by launching many programmes' like, conferences, workshops in the level of both national and international. In the last 50 years, their results are at the role of only the awareness. One of the major steps includes issuing of a formal declaration at the "United Earth Summit" for various applications including the issues related to climate change aspects in thermal power plants. In 1992, according to which all the signatories agreed on the climate change conversion, expressing the determination of stabilizing green house gases concentrations at a level of precluding any dangerous "anthropogenic" perturbation of the climate system. Specific measures to implement this declaration were initially adopted in 1977, at Kyoto and entered into the force on February 16th, 2005.

3. Role Of Bio-Sphere And Its Consequence:

Basically, the biosphere is based upon plants photosynthesis, power plants two phase heat transfer including boiling and condensation, which fixes solar energy[$E = hv$], and carbon from atmospheric co_2 in the form of high-energy bio-mass represented as CH_2O. i.e,

$$CO_2 + H_2O \xrightarrow{hv} CH_2O + O_2(g) - - - - - - - - - - (1)$$

In doing so, plants and algae function as an "autotrophic" organism, those that utilize solar or chemical energy to fix elements from simple, non-living, inorganic material into complex life molecular that composes living organisms.

The opposite process, bio-degradation, breakdown bio-map, either in the presence of o_2, i.e., "Azeotropic Respiration".

In the presence of oxygen,

$$CH_2O + O_2(g) \rightarrow CO_2 + H_2O - - - - - - - - - - (2)$$

In the absence of oxygen,

$$2CH_2O \rightarrow CO_2(g) + CH_4(g) - - - - - - - - - - - - (3)$$

Both “aerobic” and “anaerobic” bio-degradation in thermal power plants get rid of bio-mass and it returns co_2 to the atmosphere. The later reaction is the major source of atmospheric methane.

4. Ecotoxicology [Normal trend in power plants]:

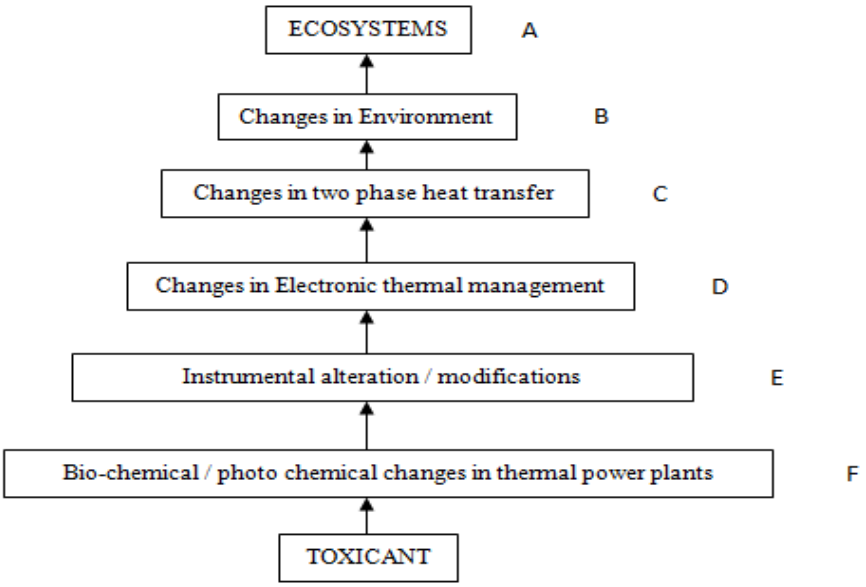

Fig-1

Actual trend

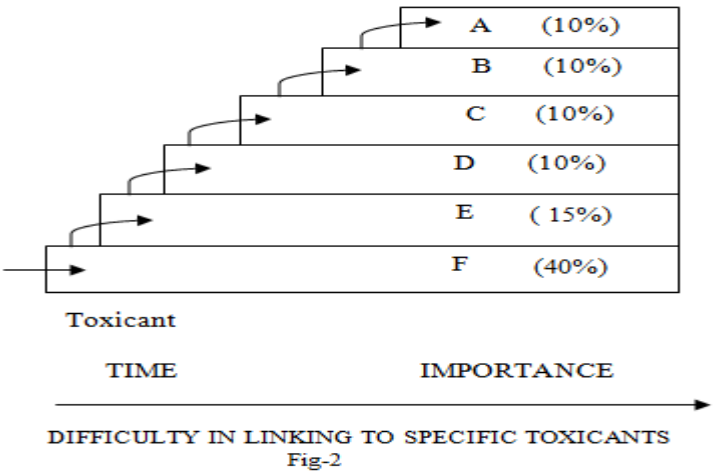

Fig-2

(Responses to toxicants at different levels in life systems of thermal power plants)

5.**Electromagnetic radiation and its effects in thermal power plants:**

In general, it is predicted that the variations in the electromagnetic radiation aspects will influence the high impact of climate change on thermal power plants because of the existence of chemical reaction amongst the species, including two-phase heat

transfer aspects under nuclear boiling and drop wire condensation, environmental related species and pollutants as well.

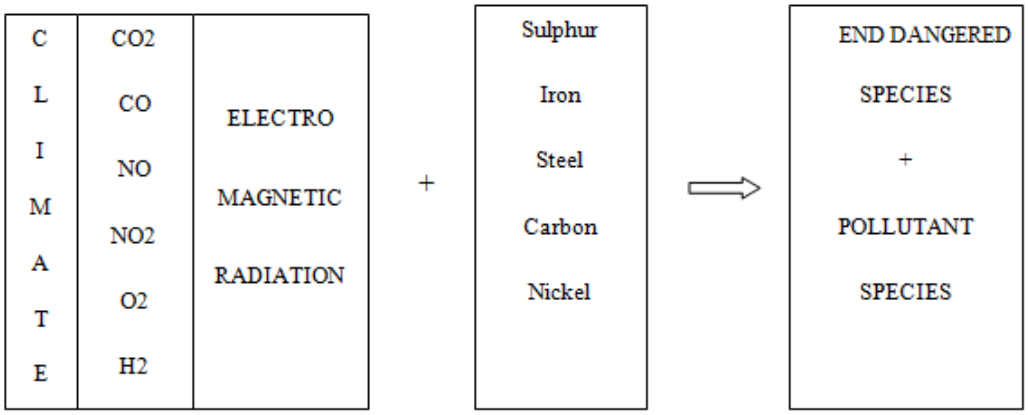

Fig-3 Influence of Electromagnetic radiation in thermal power plant under peak load operations

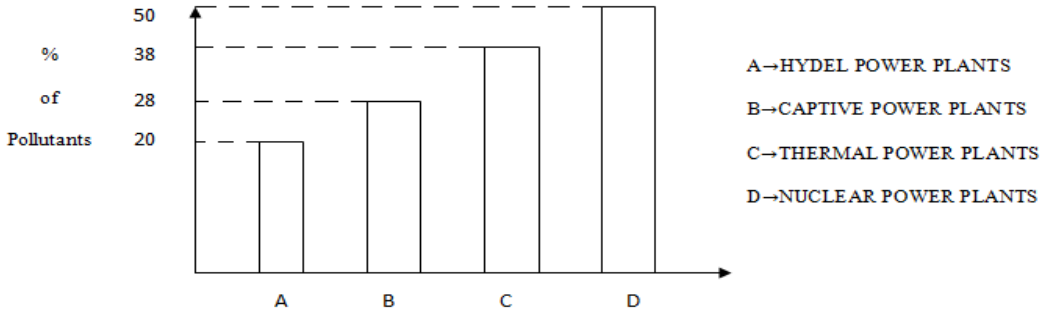

Fig-4 Types of power plants

LEVEL OF POLLUTANTS IN VARIOUS POWER PLANTS

5. Energy Utilization:

During the last two centuries, the growing enormous human impact on energy utilization has resulted in many of the environmental issues as well as problems, and now the humankinds are facing unexpectedly with severe effects. This period has seen a transition from the almost exclusive use of energy clustered under the purviews of photosynthesis, chemical species formation, multiphase heat transfer and utilized as a bio-mass, inclusive of burning the fuel for getting energy and power etc., in the context of usage of fossil fuels, natural gas, and coal for about 90%, and nuclear energy for about 5% of all the energy employed in the case of thermal power plants.

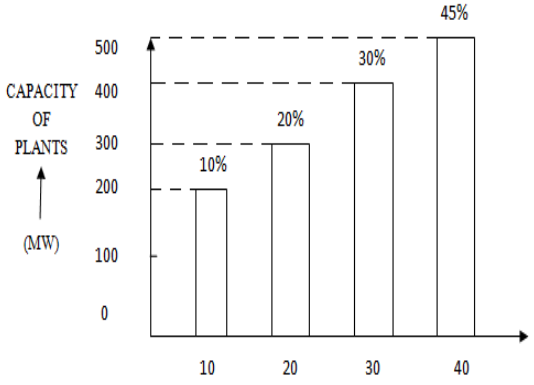

Fig-5 PERCENTAGE OF CHEMICAL DECOMPOSITION

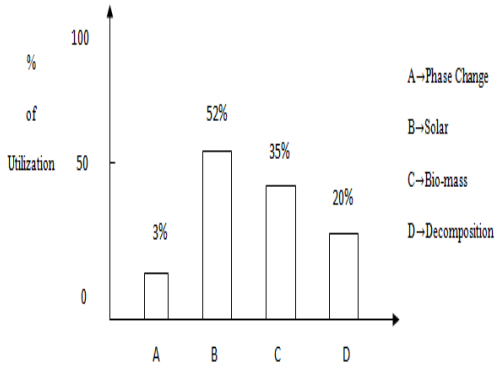

Fig-6

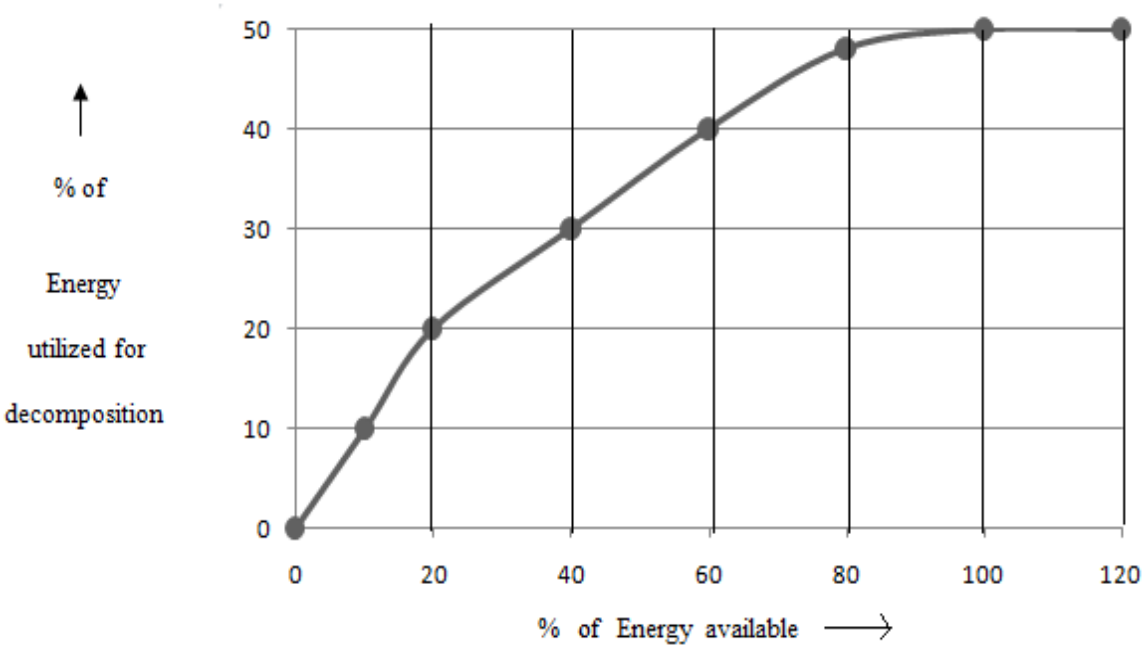

Fig - 7

6. Ecological modelling in thermal power plants:

The ecological modeling in the case of thermal power plants normally includes, choosing the state variables in the first level, deriving balanced equations in the second level, and making model specific assumptions in the third level. The selection of state variables includes both ecological and biological versatilities, since the claim for deterministic model is that focuses on the updated knowledge of present values of these variables are sufficient to determine the future values. For example, if a model makes prediction that are at variance with many observations, one of the model assumptions may be changed, while still retaining the same state

variables and processes in the balanced equations concerning the thermal power plants.

Case (i) Model for open population:-

$$X_{t+\Delta t} = I + \propto X_t \quad ---------- (4)$$

$where,$

$X_t \rightarrow$ single state variable

$\Delta t \rightarrow$ Interval duration

I→constant based on time and population size

Case (ii) Model for closed population:-

$$\frac{dN}{dt} = [\text{useful rate of energy utilization} - \% \text{ of wastages/pollutants}] \quad --- (5)$$

$$\frac{dN}{dt} = (\beta - \delta)N, where, N_t \rightarrow \ population\ size \quad ---------- (6)$$

Case (iii) Model for toxicant in thermal power plant:-

$$\frac{dq}{dt} = \frac{R}{V}(q_{in} - q) \quad ---------- (7)$$

Where,

q→ Concentration of toxicant

R→ Flow rate constant

V→ Volume of sediments

7. CONCLUSION:

Generally, it is predicted that role of ecological dynamics interms of climate change for thermal power plants are highly influencing the environmental changes, and the performance of all the heat related, fluid related equipments as well. And it is also noticed that the nitrogen cycles and sulphur cycles are more in the case of thermal power plants, because of the existence of kinetic behaviour under chemical-kinetics, disassociation; chemical fate and transport. However, matter; cycles of matters, ecology, ecotoxicology and bio-sphere are influencing the phenomenal changes in climate in the case of thermal power plants. In this context, a viable modelling for climate change is proposed under ecological dynamics in power plants as a highly genuine approach.

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