

## Extinguishment of Fire: Biotechnical Method

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**Abstract:-** Water mist technology has emerged as most acceptable and accountable alternative method to central and extinguish the fire. It is a more useful to deplete the flame condition as a fire suppression agents because of its inherent advantage, rapid heat absorption and effectiveness on wide range of fires. Hydrocarbons are most important organic matter and play most urgentable and key role as a basic need to use as an energy, medicine, fire etc. in human daily life. Hydrocarbons generate in nature by slowly-slowly biochemical reaction in organic as well as inorganic matter in earth crust. Some hydrocarbons develop as bi-product of biochemical reactions takes place in large laboratory. These are so many stage may develop some hazardous conditions like-fire accident, a large fire may occur with a small spark easily due to the highly flammable properties of these hydrocarbons. Hydrocarbon fire consist of organic solvents petroleum products, motor sprit like kerosene, gasoline, diesel, petrol, LPG, petroleum sprit, wax, naphtha,(residue product) naphthalene, bitumen (residue of petroleum refinery), etc. These hydrocarbons are easily ignitable with a small spark. To control and prevent the hydrocarbon fire in storage vessels, pipeline (including in forest region develop the large forest fire) is very difficult to control after fire occurs. To extinguish the hydrocarbon which inhibit the oxygen (O<sub>2</sub>) between fuel and fire flame. Thus fire flame is extinguish on hydrocarbons. The protein foam(heme-protein) is generated by passing water under pressure through a slaughter waste i.e., animal blood, matter (a liquid blood form). By atomization process blood mist generate with passing pressurized water jet. Thus a heme protein foam develop and extinguish the fire of such hydrocarbons in refinery, governmental office reservoir, pipelines and also control the forest fire (occurs due to the pipeline damage or leakage in desert/ forest areas). The liquid form of slaughter house waste i.e., blood added with small amount anti-coagulant agent like EDTA or sodium citrate as an anti-coagulate to maintain the liquid form of blood. This biotechnical method to prevent such fire by using the mist formatic technology, is very useful and non-hazardable technology and may be accept world-widely to save the economy as well as our energy resources. This paper includes details of use of slaughter house waste and highlight the environmental benefit of such experiment in social life.

**Keyword:** Hydrocarbons, fire heme protein, mist.

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### I. Introduction

The fire is a common word in our daily life. It is generally used by everyone at different way of life to survive in nature. Fire is a triangle of fuel, heat and air which combine together, fire occurs. It is a home utility to cook the food and produce the energy etc. as a basic need of our community to survive in nature. It also emit light which illuminate the darkness of our surrounding as well as of our mind and provides the brightness in life. It also generate the energy for better future. Most of the people afraid by listening the name fire because it damage the surrounding property when it is out of control and behave as an enemy. But fire is not an enemy, it is a friend when it is under control. Spiritually, our body is made up of fire natural elements i.e. earth, water, air, fire and atmosphere. Scientifically, the fire of body is very useful for completing the physiological activities for example oxidation and reduction reaction process takes place and different organic as well as inorganic molecule or compound / s build- up and break – up. Finally, tissues and organs of the body develop and form a complete body structure on any species in nature. During these biochemical & metabolic reactions, the body energy release in the form of adenosine triphosphate (ATP) which require by every unit of living cell/s.

To control and manage the fire in our surrounding, a scientific technical process applied which are less hazardous and low cost prevention method generally to save our precious thing in the nature including environmental conditions.

Hydrocarbons are the organic matter, develop in nature by slowly-slowly biochemical reactions in some biomolecules e.g. C, H, N, O etc. There are several organic matter develop under earth crust mainly in the form of petroleum products, gasoline, spirit motor (diesel, petrol, kerosene oil etc.). These hydrocarbons are very precious and useful to produce the energy and complete the basic needs of community life and also generate the nation economy in the world. Similarly, forests are develop on earth and act as a basic needs of life

by produce the energy, food, wood, fuel and also economy to survive the nature. Forest give us mostly air, food, oxygen, energy, rain and provide a clean green environmental conditions and also organic matter to develop the fuel e.g. coal, wood, hydrocarbons, petroleum gasoline etc. in nature[1] forest fire and hydrocarbons fire is an important and critical issue in our environment. Every year large fire of forest region burnt huge amount of precious woods, medicinal and other biological flora in various countries throughout the world. These fire directly destruct the large amount of direct cost and inhibit the clean environmental conditions. Forest fire is a complicated phenomenon that takes place into both chemical-physical and biological diversity aspects of the forest stratum combustion which produce a large heat in environment and directly affect the local meteorological forecast. Similarly, hydrocarbon fire consists of organic solvents (benzene, toluene, Xylene, etc.), petroleum products, diesel, kerosene oil, petrol, gasoline, vax, naphtha, naphthalene, bitumen etc. and other fuel product/s e.g. coal gases etc. These hydrocarbons are easily ignitable with small spark due to their highly flammable properties and directly affect to environmental condition of their surroundings. The physical properties of different hydrocarbons are different. The boiling point of petrol product is 30 C, diesel (110 C), benzene (78 C), toluene (110 C), xylene (140 C), acetone (57 C), ethyl alcohol (78 C), methyl ethyl ketone (MEK, 89 C), kerosene (110 C). There are some post natural gases contain mainly five lower number the paraffin hydrocarbons such as methane boiling point is -164C, ethane (-84C), propane (-44C), butane (0.3C), and liquid pentane (36C) and also hexane (69C).

The petroleum gasoline cover the range C4 to C8 and do not represent wide difference in physical properties. Aviation gasoline has the narrower boiling range 40C to 170C and contains a higher proportions of low boiling constituents about 50% at 105C. The motor gasoline varies from 0.532 – 0.54 Cal./g./C. The other physical properties such as vaporization, latent heat and specific gravity (SPG) are different of different hydrocarbons. The boiling range of motor gasoline is 37C (initial), 50% at 112C and final is 185C; aviation 100 octane boiling is 42C initial and 170C (final); motor benzole 79C (initial at 0C) and 170C (final), while ethyl alcohol boiling point is finally at 78.3C. The calorific value of motor gasoline 10440 Cal./g., 100 octane (10510), motor benzole (9600), ethyl alcohol (6403) cal./g. (B.Th. U.). the mean specific latent heat of motor gasoline (0.53), aviation 100 octane (0.53), motor benzole (0.39) and ethyl alcohol (0.53 cal./g./C). The explosive percentage of motor gasoline, aviation 100 octane, motor benzole and ethyl alcohol are 1.4- 5.2, 1.5- 5.3, 2.7-6.3, 4.0-13.6 respectively [2]. Due to these physical properties of such hydrocarbons fuel are flammable and easily ignitable with a small spark. Similarly, liquid petroleum gas (LPG) is a petroleum refinery waste product and a major domestic fuel which produce in petroleum refineries as a mixture of propane 60% (Carbon three Hydrocarbon) and butane 40% (a carbon four hydrocarbons). The density of LPG is approximately half that of water i.e. range from 0.525-0.580 Kgm<sup>-3</sup> at 15C [3]. It is a highly flammable and operation of manufacturing and handling of LPG is most hazardous which may causes many major fire and explosion [4-5].

The forest wood and leaves, pines etc. material also behave as a flammable property in their dry conditions. Generally, the thermal value of dry wood and average compositions of different elements exhibit different physical properties [6]. The flammable conditions occurs due to the presence of organic solvents e.g. terpenoids, turpentine oils and other several organic compounds. These organic compounds are active flammable when these wood materials (cellulose structure mainly) under high heating temperature which develop by sun energy. A huge fire develop in condensed forest due to the hydrocarbon pipeline incidence which is passing through the forests and lose the great amount of biological diversity and economy also.

To control and prevent of such hydrocarbon and forest fire, various researchers, scientist are trying to develop a dynamical model to extinguish the fire spreading and propagation in forest as well as residential place, industrial sectors, refineries, reservoirs etc. The intensity of fire spreading and propagation depends on cause of fire occur due to the ignitable and flammable condition of fuel, motor spirit, wood, and other hydrocarbon matter properties i.e. chemical -physical properties. To extinguish the fire, mainly the inhibition condition of oxygen molecule between flame and fuel is very important step to select a suitable extinguisher material like liquid, gaseous and dry compounds which directly inhibit the oxygen at wide range effectiveness level. The evaluation for effectiveness of fire extinguisher is an important pre-requisite in their commercial development and evaluated by using them to extinguish the fire of specific size using a procedure in various standards [7]. For this purpose many researchers are using advanced technology to prevent the fire at different level. Out of that water mist technology has demonstrated the capabilities to extinguish the fire and has great potential to control the spreading of fire in building, forest and other residential area widely under natural ventilation [8]. It promises as a fire suppression agent (gas like behavior) and exploit the characteristics of water to suppress the fire [9].

Present paper would highlight the technology to extinguish the hydrocarbon fire consist of active molecules of C & H and highly flammable in the presence of oxygen molecules. If we inhibit these oxygen molecules between flame and fuel, fire can be extinguish. For this purpose, slaughter house waste material (atomized waste blood) use with water mist technology as a high pressure jet pump to extinguish the fire in wide range of area.

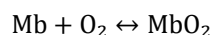
## **II. Experimental:**

To extinguish the fire in different places, a protein foam develop by using the standard water mist technology process. The protein foam is generated by passing the water in slaughter house waste material i.e. uncoagulated waste blood etc. under high pressure jet pump. By atomizing process the waste material mix externally and a mist and protein foam develop on the bed of hydrocarbon fires. The slaughter house waste material also mix with some small amount of ethyl amine di-chloro tetra acetic acid or sodium citrate compound as an anti-coagulant to maintain the liquid form of waste blood material. When protein foam generated on the bed of hydrocarbon flame, the fire flame extinguish easily.

## **III. Result and Discussion:**

To extinguish the hydrocarbon fire, some hydrocarbon such as petrol, diesel taken in a large size water container and fire flame develop (as shown in figure 1 sketch). Simultaneously, a water jet pump at high pressure generate the protein foam i.e. heme-protein (micro-globulin) on the bed of such hydrocarbon fire. These hydrocarbons are highly flammable due to their chemical- physical properties, when the protein foam develop and misting (spraying) on fire, the fire flame mitigate and extinguish finally. Similarly, the other organic solvent such as ethyl alcohol, acetone, MEK, toluene, and xylene fire also extinguish in same manner. In this process, the heme-protein which are generated by high pressure jet-pump inhibit the oxygen between flame and fuel and fire extinguish finally, it occurs due to the protein foam structural reactions. Because of that heme protein have great affinity to bind up the oxygen molecule at large and wide range area [10]. These protein foam structure easily bind together with oxygen molecule.

As hemoglobin (Hb) and myoglobin (Mb) belong to the globin super family whose members occur widely in all three kingdoms of life, where most of them participate in a variety of enzymatic and oxygen sensing functions. In invertebrates, hemoglobin vary in quaternary structure from dimers to as many as 180 subunits. the presence of chlorocruorins occur in blood are green when de-oxygenated and red (light) when oxygenated and have oxygen transport affinity [10]. Hemoglobin is 65-kD heterotetramer,  $\alpha_2\beta_2$  (alternatively, a dimer of  $\alpha\beta$  protomers).  $\alpha$  &  $\beta$  subunits are related to each other and myoglobin (Mb), the 18-kD monomeric oxygen – binding protein. Myoglobin and each of the subunits of hemoglobin presence non-covalently bind a single heme group [10]. The presence of globin protein in blood (globin are the heme free protein of Hb and Mb) is a monomer bind easily with one molecule of oxygen. Similarly, Fe (iron) ions also have binding affinity to oxygen [10].



The globin protein binding properties to oxygen molecule may cause the extinguishment of fire during protein foam generation. During this biochemical process, the heme protein coagulated at high temperature and develop a layer to inhibit the oxygen level between flame and fuel due to the high oxygen dissociation by hyperbolic reactions. The mechanism of oxygen binding to globin protein arise from the effect of the ligand-binding state of one heme on the ligand binding affinity [11] of another molecules because of that heme is a tetramer and spheroidal molecule and develop a polypeptide chain which are arranged as extensive interaction between unlike subunits [12]. As a result, several hydrocarbons breakdown and develop in some another biomolecules which easily bind up with protein foam and convert into carbon monoxide, carbon dioxide, acetate form i.e. hydrocarbon status dissolve easily and the spreading of fire control and manage easily. The major losses of precious natural products and economy of the nation may be prevent by such biotechnological techniques. If we follow these biochemical techniques to extinguish the fire at large globally, it would also be helpful to mitigate and minimize the pollution load of gases, toxic chemicals and most infectious disease spreading condition in future. The global warming condition developing due to the such hydrocarbon fire and forest fire may be mitigated globally.

## **IV. Conclusion**

To extinguish the hydrocarbon fire in reservoir, refinery, industrial sector, residential sector and official building etc. the use of slaughter house waste material may have beneficial to save the natural things as well as lives. This biotechnological method to extinguish the fire by such biochemical reaction as the inhibition of oxygen between flame and fuel is very beneficial and more effective. The use of slaughter house waste in this way may great importance to minimize the pollution load into the environment and prevent the micro-organism infectious disease in society and also it is a simple handling and management of waste material by using it to extinguish the hydrocarbon fire. Because of that the treatment and recycling management of slaughter house waste, mainly protein material (waste) is great challenge to the human community for the mitigation and minimization of environmental pollution that occurs by the micro-organism. Generally, these material easily spread the bacterial, fungal, as well as vector and viral disease in living being society and also affects the environmental condition directly.

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