1. **INTRODUCTION**

The industrial revolution that ushered in the last quarter of 18\textsuperscript{th} Century and progressed through the coming centuries has resulted in industrialization and urbanization throughout the world. Industrial and commercial activities invariably result in the release of chemicals into the natural environment leading to several public health and ecological consequences. Municipal wastewater, industrial effluent, runoff from farms and other open areas are the main source of wastewater generation. One of the pathways of migration and dispersion of these chemicals is through the water cycle ultimately leading to the contamination of surface and ground water resources. Sometimes effluent from these sources directly joins rivers through small drains and pipe outlets. Often, the effluents are just led to pits, from where these invisibly seep to the rivers rendering them unsuitable for further use.

The chemical and pharmaceutical industries including large number of inorganic and organic chemicals, plastics, fibers, fertilizers, dyestuffs, paints, pesticides, specialty chemicals, drugs and pharmaceuticals, has grown tremendously throughout the world (Jose Luis Martinez, 2009). The presence of toxic organics in the process wastewaters from chemical industries is a topic of global concern. Many of these pollutants are substituted phenols, nitro aromatics, halogenated organic compounds, etc. The environment fate of the effluents from these chemical industries depends upon the nature of the compounds present. The compounds
present in the effluents are usually toxic to animals and human beings and sometimes prove to be physiologically active as well as potentially carcinogenic. Therefore, it is essential to remove toxic chemicals from industrial wastewaters prior to their final disposal.

Due to the wide application of phenols it is synthesized in industries and released as an major fiberboard effluent. Phenol is used for the preparation of dyes like yellow red and violet red in dye manufacturing industries. Phenols can be used in paint industry for various applications and also phenol can be used as best surfactant in bulk drug and pesticide industrial wastewater. The less amount of low concentrated phenol is used as a disinfectant for the cleaning of floors and it is used as a best sterilization agent in microbiological and biotechnological processes. Phenolic compounds are also useful in food processing wastewaters, paper and pulp industries, dairy wastewater industries, pharmaceutical industries and colour effluents (Sreeraghava et al., 1999). Because of toxicity and hazardous nature of these phenolic compounds can cause environmental problems like water pollution. So there is a more attractive demand for the treatment of these type of phenolic compounds (Delia teresa sponza et al., 2008)

Environmental Problems Caused by Phenolic compounds:
Phenols are released in wastewater and can be lost to waste streams. This explains the many reports on determination of phenols in the environment. Phenols are included among drinking water disinfection by-products. It also includes so many major disinfectants are used in the environmental process. Among all the disinfectants some of the disinfectants are used like chlorine dioxide, ozone, chloramines. Chlorine dioxide individually it was not used as a disinfectant with its physical structure. And also chloramines was used as a best disinfectant and also it does not produce by-products and also bromine containing compounds was used as disinfectants. If the concentration of bromine was high and it forms the brominated phenols instead of chlorinated phenols chlorophenols, mainly formed phenols. The bromo and chlorophenol derivatives are formed by the phenolic compound. This derivative was more toxic than the chlorine dioxide from the surface water. These are few toxic compounds in water bodies which are produced by the interaction the starting compound, of phenol with other compounds particularly.

**The effect of phenolic compounds on Human health**

It occurs in and is harmless in small quantities but higher concentrations. It can be and by swallowing absorbed deep. through skin it causes caustic burns on the. Excess of phenol poisoning causes paralysis of central nervous system and severe drop in body temperature.
If these symptoms phenol penetrates to the tissue this can lead to phenol animals a state gangrene through damage to blood vessels. The effect normal area of skin affected metabolism of phenols on central ne collapse and loss absorbed by skin through of consciousness inhalation is same for human and animals. In of cramp precedes because effect of phenol has an motor activity controlled by central nervous system.

A wide range of adverse effects has been reported following well documented to phenol by the dermal oral or intravenous routes. Gastrointestinal irritation hyperventilation has been reported following ingestion. Local effects following dermal exposure range following from painless blanching or erythema to corrosion and deep necrosis. Systemic effects include cardiac dysrhythmias, metabolic acidosis, respiratory human exposure distress, dark urine, methaemoglobinemia, neurological effects (including convulsions), cardiovascular shock, coma and acute renal failure, renal damage, death. threshold for phenol has The lowest reported dose resulting in human death was 4.8 g by ingestion; death occurred within 10 min. The human odour been reported to range from 0.021 to 20mg/m3 in air. The odour threshold for phenol in water has been reported to be 7.9mg/litre, and the taste threshold 0.3 mg/litre in water.

1.2.1 INHALATION:
Inhalation of phenols leads to dyspnea, coughing, cyanosis, and lung edema in human being as well as animals.

1.2.2 SWALLOWING:

Swallowing of phenols leads to causing burns on mouth, esophagus and stomach pains in human being as well as animals. Phenol causes damage to inner organs namely kidney, liver, spleen, lungs and heart. Acute phenol poisoning disturbance. Phenol poisoning leads is excreted in urine as phenol and its metabolites. Only little amount of phenol is excreted through faecus. leads to neuropsychiatric phenol to muscular convulsions which may end in myocardial depression.

1.2.3 METABOLISM:

Phenols was a substance which which was adsorbed by all exposure routes. Phenol absorption mainly conjugates with mixture of sulfonic and gluconic acids. And the formation of hydroquinone and catechol from hydroxylates. A shift rate of urinary excretion of phenol Urinary excretion elimination to glucuridination was observed the phenol dose. The liver, the lung, and the are sites of from sulfation phenol metabolism. The relative role played by these tissues depends on phenol. In vivo and invitro studies have administration metabolites demonstrated to tissue and of in rats after proteins. the most important Some increasing and dose also bind to plasma route proteins. is the major route in animals
and gastrointestinal mucosa humans. The varies with dose, route of administration, and species. A minor part is excreted in faeces and expired air

1.3. Removal methods of phenolic compounds:

The remediation of these phenols containing wastewaters has traditionally relied on removing toxicants by physical, chemical and biological means. Pollutants in a particular type of treatment of process depends upon their physical chemical properties and chemical structure. Behavior of toxic organic Therefore, treatment based on the nature of the compounds present (particulate bound, volatile or non-volatile, hydrophobic or processes are decided hydrophilic etc). Removal of organic compounds can be accomplished by (without chemical alteration) as both non destructive well as destructive (with chemical alteration) means. Non destructive process like air stripping and adsorption is not a suitable treatment for changing the nature of toxicants, at the same time former leads to air pollution. Chemical oxidation is quite effective for complete degradation of toxic organic compounds; however, chemical oxidation as a sole treatment is uneconomical and pollutant problem in the total ecological environment remains unsolved. At the same time biological treatment process has been most economical process for organic degradation.
Natural communities of microorganisms harbour an amazing physiological versatility and microorganisms also extends catabolic potential for the number of Almost every natural product, irrespective of its molecular weight or structural complexity is readily degraded by one or another microbial organic molecules. species in some particular environment. This breakdown of an enormous omnipotence of to the majority of synthetic compounds, which are funneled in to the natural metabolic cycles (Fredrick Orori Kengara et al., 2010). The genetic potential and certain environmental factors such as temperature, pH and available nitrogen and phosphorous determine the rate and extent of anaerobic degradation (Uma Upadhyay et al., 2008). (Van Haandel Lettinga, 1994). no support material is needed for immobilization of microorganisms. Many studies have demonstrated applicability of UASB technology for treating variety of wastewaters containing wide range of toxic organic compounds (Helena Nadais et al., 2010, Vandana Patil et al., 2010, Graaff, de M.S. et al., 2010, Prakash and Gupta, 2000). The fate of toxic contaminants in conventional anaerobic sludge digestion systems and high rate anaerobic digesters such as UASB may differ for several reasons, including:

- Longer sludge retention time typically associated with UASB rectors may allow the biomass to acclimate to chronic loading of toxic contaminants more readily.
Most of the research has been carried out on the degradation of chlorophenols like 2-Chlorophenol, 4-Chlorophenol, 2,4 di Chlorophenol, 2,4,6, trichlorophenol, pental Chlorophenol and nitrophenols like 2- nitrophenol, 4- nitrophenol, 2,4 di nitrophenol. No study has been carried out on the degradation of chloro and nitro aromatic compounds. Hence in the present study an attempt has been made to evaluate the degradation of phenolic compounds, Bulk drug pharmaceutical wastewater and dye manufacturing wastewater using (UASB) at five HRTs.

The broad objectives of the research as follows.

- Optimization of process parameters like methane percentages temperature, Chemical oxygen demand (COD) removal, Biochemical oxygen demand (BOD) removal, Volatile fatty acids accumulation, hydraulic retention time (HRT), pH, ORP, microbiological characteristics of sludge granulation during the treatment of phenolic compounds and industrial wastewaters.
- Optimization of the effect of HRT on the performance of reactor for the degradation of phenolic compounds like 4C-2-NP, 2C-4-NP, 2C-5-MP and industrial wastewaters.
- Studies of Biodegradation of phenolic compounds with glucose as a co-substrate.