"Integration of Research to Industrial Application"

Environmental Information System INDIA

RECYCLE GCPC REUSE

Gujarat Industrial Development Corporation
A Government of Gujarat Undertaking

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Foreword:

There is an urgent need for promoting change in attitudes and behavior in relation to the environment; for encouraging students to appreciate and enjoy the world around them and for equipping policy-makers of both present and future with the knowledge, skills and attitudes that will encourage them to adopt environmentally responsible approaches. Around the world there is active debate on how best to achieve these goals and on the most appropriate strategies for developing and implementing programmes of environmental education.

Contributions of GCPC over the years towards promotion of Cleaner Production in the state of Gujarat to improve the productivity and the environmental problems faced by SMEs have been significant. GCPC had also played active role in framing Industrial Policy 2003, 2004 and 2009 and 2015, also supported in developing many schemes pertaining to CP/CT. Several success stories from implementation of CP have been documented. In appreciation of the efforts of GCPC, though GCPC is a regional CP Centre, UNIDO has recognized it at par with NCPC and included in RECP (Resource Efficiency and Cleaner Production) networking membership. GCPC is also member of Climate Technology Centre and Network (CTCN), a working arm of UNFCCC.

GCPC had organized a "Capacity Building of Academicians & Students on Environment Management through Cleaner Production and Clean Technology" in March 2014 at Grand Cambay Hotel, Thaltej, Ahmedabad.

Looking to the success of this programme, it has been decided to continue the efforts in ordered to fill the gap between Industries, Academia & Government and also, to motivate exemplary work done by students and faculties.

In view of this, we have invited Abstracts of Dissertation / Thesis / Research Paper from Graduate, Post Graduate & Ph. D (Chemical & Environment) Students of current & previous year from different Engineering Colleges of the state and received total of 56 abstracts. These compiled abstracts will be distributed to the industries, wherein the industries can implement the work done by the students wherever it is feasible. With this GCPC makes an effort to fill the gap between the industries and academia.

We are confident that this effort will go a long way in inspiring the younger generation of entrepreneurs, technocrats and academia, decision makers.

We are thankful to our panel of experts: Dr. C. B Upasani, Director, Jyoti Om Chemical Research Centre Private Limited, Mr. Rajesh Doshi, Executive Director, VWEMCL, Vapi, Mr. Syamal De, General Manager - Technology Projects & Operation, Atul Ltd, Ankleshwar, Mr. Paresh Mevavala, Director, ENPRO, Surat for selecting the best five abstracts.

We are thankful to L.D college of Engineering, Atmiya Institute of Science and Technology, Pandit Deendayal Petroleum University, Sarvajanik College of Engineering and Technology, Government Engineering College-Valsad, Vishwakarma Government Engineering College, Lukhdhirji Engineering College-Morbi, Institute of Technology-Nirma University, Department of Environmental Science & Technology - Shroff S.R Rotary Institute of Chemical Technology, V. V. P. Engineering College-Rajkot, G. H. Patel College of Engineering & Technology-Vallabh Vidyanagar, Government Engineering College-Bhuj, Marwadi Education Foundation Group of Institute-Rajkot, Birla Vishvakarma Mahavidyalaya – Vallabh vidyanagar.

23rd March 2015
Gandhiangar

Dr. Bharat Jain
Member Secretary
GCPC

ABSTRACT TITLE

1. "Dynamic Simulation of Ethanol Rectification Using CHEMCAD"

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Ethanol is used extensively as a solvent, fuel & distillery component in the manufacture of varnishes, perfumes, gasoline blending, liquor etc. It is used as a preservative for biological specimens, in the preparation of essences and flavorings, in many medicines and drugs, as a fuel and gasoline blending additive. It is a renewable domestically produced alcohol fuel made from plant material such as corn, sugarcane or grasses. Lignocelluloses biomass is the most promising feedstock for producing bio-ethanol due to its global availability. In large concentration of ethanol, it became harmful to human body. Possible aspiration hazard if swallowed (can enter lungs and cause damage). It may be irritating to the skin and eyes. Different major sources or renewable raw materials are widely available for production of ethanol. For these renewable raw materials based produce ethanol rectification simulation study has been carried out using CHEMCAD and through some idea on to hazard point of view.

2. "Catalytic Ozonation by Cerium Oxide for the Degradation of RB-5"

Bhargav Mehta, Guide: Prof. Nikita Chokshi, Prof. J. P. Ruparelia,
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Water pollution is a one of the major environmental issue in India. One of the major sources of water pollution in India is untreated sewage.Novel advanced oxidation processes (AOPs) show great promise for application in many wastewater treatment areas. AOPs are an emerging technology that may be employed for specific goals in wastewater treatment. Catalytic ozonation has higher efficiency in the degradation of

organic pollutant and because of this reason it has received more attention now days. By catalytic ozonation, Organics can be oxidized in the room pressure and temperature, which are hard to done by only ozonation.

3. "New era of Thermoplastic Vulcanization Alloy for sponge Application"

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The main objective of this review is to describe some of the important topics related to the thermoplastic vulcanized alloy sponge for automotive application. Thermoplastic vulcanized (TPV) is a special class of thermoplastic elastomers (TPEs) made of a rubber/plastic polymer mixture in which the rubber phase is highly vulcanized. TPVs represent the second largest group of soft thermoplastic elastomers, after styrene-based block copolymers. TPVs have undergone evolutionary changes in terms of the selection of polymers, design of cross linking, compounding techniques, methods of production, and have achieved better elastic recovery, easy process ability and low hardness etc. Currently, TPV is replacing EPDM rubber dramatically because of the impressive advantages for automotive sealing applications. Some of the advantages of TPV compared to that of EPDM rubber are good gloss, recyclability, improved color ability, shorter cycle time, and design flexibility. The development of TPV foaming technology is to fulfill the requirement of achieving lower cost, lighter weight, and better fuel economy. Foaming of TPV has not been investigated extensively. The complete dissolution of the blowing agent in the molten polymer is the most critical step in TPV foaming processing, and this strongly depends on the solubility of the blowing agent, the saturation pressure, the degree of mixing, and residence time.

4. "Enrichment of Petro-diesel using bio-derived additive Delta-3-Carene"

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In the present work, we would be blending different percentage of delta-3-Carene, a bio-derived additive in petro diesel in order to increase its substitution and thereby reduce dependency on crude oil which is on the verge of extinction. Essential oils are alternative blending materials which has potency to be used as bio-additives as they are oxygenated cyclic compounds. We are using carene oil as a derived additive of turpentine oil which is blended with virgin diesel. It is a natural product that can be blended with diesel to form single clear blend as it is completely miscible in it. Current work is being executed in two phases, during first phase physical properties of blends would be studied and in the second phase these selected stable blends would be subjected to single cylinder compression ignition engine in order to ascertain their engine performance parameters such as Brake power, specific fuel consumption, and thermal efficiency and exhaust gas temperatures. Also emission study of the exhaust gas would be carried out. Here the work done in first phase has been mentioned, future work on engine and emission would verify the blends to be a sustainable eco-friendly blending option for future fuels.

5. "Replacement of Organic Solvents Using Eco-friendly Green Lechant Ionic Liquids in the Separation of Close Boiling Compounds"

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Separation of the close boiling azeotropic mixture methanol & methyl acetate is recently carried out in most of industries likemanufacturing of poly(vinyl) alcohol by either using conventional solvents or organic solvents , which requires higher energy

consumption and is also harmful to the environment due to its nature like high toxicity organic solvents which creates high pollution ,so the new & most recent technology is to use ionic liquid as an entrainer in the separation of close boiling compounds. Two ionic liquids namely 1-ethyl 3-methyl imidazolium chloride & 1-ethyl 3-methylimidazolium acetate is used in the Isobaric vapor liquid equilibria of close boiling compounds carried out with ionic liquids & organic solvents, effect of both of them compared deeply, it is observed that salting out effect & separation factor is quite good as compared with same of organic solvents & finally research moves towards the selection of best ionic liquid for particular system , Advantages of ionic liquid over organic salt defined & also comparison of separation processes is defined briefly. Economical analysis of ionic liquids & organic solvents will be done thoroughly on several bases for the system of methanol-methyl acetate.

6. "Chlorination of Copper Phthalocyanine Blue using ionic liquid to eliminate environmental problems"

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Copper Phthalocyanine blue is an important pigment of the colour family. Numerous shades of blue can be made using this basic blue pigment. It is also called as monastral blue, phthalo blue and helio blue. This pigment finds its applications in paints, plastics and dyes. Copper Phthalocyanine is the highest volume pigment produced in the world.

The chlorination of this pigment is done to produce Copper Phthalocyanine green. This green pigment helps to produce a variety of green shades. Thus, the chlorination process is very vital to obtain totally different green-colour pigments from the original blue-colored pigments. The chlorination done traditionally involves the use of organic petroleum-derived solvents like dichloromethane, hexane, toluene, ethyl benzene etc.

These organic solvents are potential carcinogens along with being non-renewable at the same time. Also, the traditional chlorinating agents include sulfonyl chloride, thionyl chloride, sulphurmonochloride etc. which are costly as well as harmful.

Ionic liquids are made up of ions and ion pairs. These have very low melting points and are mostly liquids at room temperatures. They have good selectivity for water and organics. Moreover, these can be synthesised in the laboratory as per the requirement by varying the cation and anion combinations thereby enabling them to be tailored to suit a given application. Easy recovery and recycle at the end of the process as well as good solubilities have accelerated the use of ionic liquids as solvents in recent past.

Following research sheds light on the use of the ionic liquid, 1-butyl-3-methylimidazolium bromide [bmim][Br], as solvent and catalyst (dual-role) in the chlorination of Copper Phthalocyanine blue. The process involves the synthesis of the ionic liquid as stated in the literature and its characterization as well as the subsequent application of the synthesised liquid for chlorination.

7. "Photocatalytic Degradation of Pharmaceutical Compounds Using Titanium Dioxide Nano Particles"

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The presence of drugs in the aquatic media has emerged in the last decade as a new environmental pollution. The main objective of the study was to evaluate the photocatalytic degradation of an aqueous solution containing antibiotic using TiO_2 for the degradation of the
Azithromycin and Esomeprazole. First of all TiO_2nano particles was successfully synthesized by the sol-gel method and characterization by the X-ray Diffraction (XRD) and Transmission Electron Microscope (TEM).The Photocatalytic degradation of the Esomeprazole and Azithromycin antibiotics in aqueous solution was studied under UV

irradiation and TiO2 nano powder. Percentage Degradation of this antibiotics was improved when Titanium dioxide concentration was increased, the degradation was found maximum when TiO_2 was 0.5 -1.0 gm/L. At a room temperature and PH 6, 60% COD reduction was achieved with a 150 min. in case of Esomeprazole and 67% COD reduction was achieved in a case of Azithromycin. The results show that COD removal was increased with increasing TiO_2 concentration and decreasing initial concentration of antibiotics.

8. "Experimental Investigations of Vacuum Heat pump Cycle for Air-Conditioning"

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Refrigeration and air-conditioning is an important area for providing human comfort, storage and various industrial applications. Refrigeration is an energy intensive process. The conventional refrigeration systems have large global warming potential is toxic.In Refrigeration, refrigerant plays a major role in energy efficiency and environmental effects. Water is one of the potential refrigerants having high latent heat of vaporization and is environment friendly, economically cheapest refrigerant. Using vacuum heat pump cycle with water as refrigerant, we can achieve required cooling with high vacuum. Vacuum cycle with such conditions doesn't remain economical. Adding partially miscible component in water will increase the vapour pressure and hence increase the efficiency of refrigeration cycle. We proposed to use water and *n*-butanol system as a refrigerant, which is relatively non toxic, chemically stable has high thermal conductivity. It makes low boiling partially miscible liquid system. Vapor pressure of system at 10°C-15°C should be in the range of 50-150 mm of Hg for the applicability as refrigerant in air-conditioning system. Here experimental investigations of vacuum heat pump cycle for air-conditioning and the effect of operation parameters will be thoroughly analyzed.

9. "Preparation, Characterization and application of a novel grapheme oxide supported PVA membrane for the Separation of Acetic acid and Water Mixture by Pervaporation"

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Since polymer–inorganic hybrid membrane can combine the excellent film forming ability of polymer and the unique property of inorganic constituent, polymer–Graphene oxide (GO) membranes have drawn much interest in diverse separation processes. Through incorporating GO into different polymer matrices, the hybrid membranes showed higher water fluxes and better antifouling properties. Novel kind of hybrid membrane was prepared by filling GO into poly vinyl alcohol (PVA) and formaldehyde as cross linking agent. This combination was expected to improve the separation performance of the membranes by the synergistic effect of blending and filling. The membranes, thus prepared, were characterized through scanning electron microscopy (SEM), Fourier Transform Infrared (FTIR) Spectroscopy, and Atomic Force microscopy (AFM). In the present work we report the dehydration of dilute acetic acid solution using pervaporation process in a pilot plant. The relationship between membrane morphology and pervaporation performance is studied in depth, although more emphasis is placed on the practicality of implementation. The ultimate process development used in this work can, in principle, be applied broadly to other organic/water, or even to organic/organic separators.

10. "Treatment of groundwater containing fluoride using chemically modified magnesium and iron impreganated fly-ash"

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With the increase in the industrial activities, including pharmacy, fluorspar mining, semiconductor process, aluminum electrolysis, electroplating, generating electricity, rubber and fertilizer production, the excessive fluoride has been drained into water bodies. Water resources substitution is impossible; therefore, the removal of fluoride from aquatic environment is necessary. A novel adsorbent, magnesium and iron impregnated fly ash from wood fired furnace of a local industry was prepared by wet impregnation of fly ash cenospheres with magnesium sulphate and ferric chloride solution. The physicochemical properties of the prepared materials were characterized by X-ray diffractometry (XRD), X-ray fluorescence spectroscopy (XRF) Fourier transform infrared spectrometry (FTIR), and Field emission scanning electron microscopy (FESEM). Adsorption experiments were conducted to test the effects of pH, adsorbent dosage, contact time, reaction temperature and coexisting anions on fluoride removal. Magnesia impregnated fly ash, which was prepared by using fly ashes as raw material, is low cost and has considerable fluoride adsorption capacity, thus it will be a potential candidate for the fluoride removal from wastewater. Experimental data was well fitted to the pseudo-second order kinetic model and followed the Langmuir isotherm. The Gibb's free energy changes showed that the fluoride removal by was the spontaneous nature process at 318 K while non-spontaneous at 298 K and 308 K. However, effective regeneration of impregnated fly ash and cost–benefit analysis of its application needs to be carried out for its commercial acceptance.

11. "Effect of surfactant on the permeate flux and quality during nano filtration of dye contaminated wastewater"

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Despite having several advantages, one of the most important drawbacks of nanofiltration is the decline in flux due to concentration polarization and membrane fouling during the operation. The accumulation of species at the membrane surface adversely affects the membrane performance. Detailed studies of the effects of the operational parameters including ionic strength, feed concentration and feed pressure in the nanofiltration membrane separation process have been conducted to study the flux decline However, besides the operational parameters, the membrane properties such as the molecular weight cut off (MWCO), pure water permeability, surface charge surface roughness and membrane hydrophilicity play a paramount role in separation performance of the nanofiltration membrane process. Therefore, a good understanding of the impacts of membrane properties on the separation performance under different operational conditions is vital on the controlling of membrane fouling and successful application of NF process for dyeing wastewater treatment. Synergistic mixtures of surfactants could provide combinations of electrostatic, steric, and hydration interactions that could be optimized for the particular solutes and membranes. Keeping this is mind in the present work; series of experiments were carried out to study the effect of anionic and cationic surfactant on the performance of a polyamide (PA –NF 150) membrane in spiral wound membrane module. The surfactants chosen were sodium dodecyl sulfonate (SDS) as anionic and cetyl-trimethyl ammonium bromide (CTAB) as cationic for the nanofiltration of the C.I. Reactive yellow 160 dye waste water. Experiments were carried out at different surfactants concentration 1,2,4,8 and 20 mg/L for both the surfactants and fixed dye concentration of 25 mg/L at 490, 686 and 980 kPa trans-membrane pressures. The strategy examined in this study combines the benefits of increased hydrophilicity with those of steric hindrance by adsorbing a variety of nonionic surfactants onto polyamide thin film composite (PA) NF membrane.

12. "Process Modeling and Simulation of Post-combustion CO2 Capture with Activated Methyl Diethanolamine and Sulfolane based Solvent"

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Carbon dioxide capture from the flue gas streams of fossil fuel based power plants and its sequestration (CCS) has received global attention due to the environmental need to substantially reduce the emission of CO2 to the atmosphere to mitigate the global warming problem. For post-combustion CO2 capture, regenerative chemical absorption is still the method of choice for the power plants. At present the major focus of global CCS research is the development of more efficient solvents with higher CO2 capacity, higher rate of absorption, lower regeneration energy requirement in order to the reduce the prohibitive cost of capture. In this work, new experimental data and modeling of vapour-liquid equilibrium (VLE) of CO2 in piperazine (PZ) activated aqueous solutions of n-methyl diethyl amine (MDEA) has been presented. Besides, experimental VLE data of CO2 in hybrid solvents containing sulfolane as physical solvent along with aqueous(MDEA+PZ) have also been reported over the temperature range of (303-333) K and CO2 partial pressure range of (1-1400) kPa. PZ is used as a rate activator with a concentration range of 2 to 8 mass% and the total amine concentration in the aqueous solution of (MDEA+PZ) has been kept within 30 mass% and 50 mass%, while for the hybrid solvents the concentration of physical solvent sulfolane has been maintained at 10 mass% along with total 50 mass % (MDEA+PZ). Electrolyte non random-two liquid (eNRTL) theory has been used to model the VLE. It has been found that there is a good agreement between the experimental and model results of CO2 solubility in PZ activated MDEA solution. For the sulfolane based hybrid solvents, it has been observed that the CO2 cyclic capacity of the solvent decreases at 323 K with the lower lean-rich partial pressure range of (10-100) kPa but increases at higher partial pressure ranges of

100-1000) kpa. PZ mass% in the hybrid solvent has also been found to have a positive effect on the CO2 cyclic capacity. The CO2 capture performance of hybrid solvent (MDEA+PZ+Sulfolane+H2O) has been studied through simulation using Aspen Plus and compared with that of the corresponding PZ activated aqueous MDEA solvent. The hybrid solvents have been found to achieve much better performance than the PZ activated aqueous MDEA solvents with respect to % CO2 capture even at low L/G ratio and higher temperatures, solvent capacity and regeneration energy requirement.

13. "COD removal from Reactive Dye wastewater by Photolysis and Photo catalytic Processes "

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Dyes are common industrial residues present in wastewater of different industries, ordinarily in textile dyeing process, inks, and photographic industries, among others. It is estimated that nearly 15% of world production of dyes is lost during synthesis and dying process. Dye contains high organic load, but due to the toxicity present in the dye waste water, biological process cannot be used. The emerging wastewater treatments methods like advanced oxidation processes are increasingly gaining popularity since they have shown the potential of converting harmful organic pollutants into innocuous compounds such as carbon dioxide and water. TiO_2-assisted photo catalytic degradation of pollutants using solar light has been successfully used being an economically viable process that can replace artificial light sources which are costly and hazardous. This report focuses on treatment of reactive dye wastewater collected from the collection basin of an ETP of a Reactive dye manufacturing industry in Nandesari, Gujarat. In the present study comparison was made between Photolysis process and Photo catalytic Process for removal of COD from the wastewater. Photolysis process which was done by two methods using UV light (mercury lamp) and UV from direct

sun (concentrated by parabolic converter). The maximum degradation of COD achieved with the UV light (mercury lamp) is 75.14 % at 150 minutes of reaction time and the maximum degradation of COD observed with the UV light (Concentrated sunlight by parabolic converter) was 70.18% at 180 minutes of reaction time. By Photo catalytic ($UV/TiO_2/H_2O_2$) Process, the maximum percentage degradation of COD was observed as 80.42 % with the TiO_2-H_2O_2 dose of 0.8g/L:1ml/L for 150 minutes of reaction time. Photo catalytic process is more effective than photolysis process.

14. "Sulfonation of Aromatic Compound by SO3"

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Aromatic compound can be sulfonated directly with SO3 in commercially available continuous and batch equipment. Conventionally sulfonation is done by sulphuric acid or oleum. But with SO3 sulfonation process has the following advantages. It is more direct and considerably faster than the present process. It requires fewer man hours and therefore, is more economical. Conditions can be varied to give a wide range of products having different solubility characteristics and combined SO3 content. Since the reaction, batch or continuous, is stoichiometric, no waste products are formed, thus eliminating any pollution problems. In sulfonation processes sulfur trioxide is vaporized and is brought into contact with the aromatic compound in the presence of gaseous diluents such as air, nitrogen or an inert hydrocarbon. It has been thought necessary to utilize such diluents carrier gases to reduce the intensity of the reaction between the sulfur trioxide and the material being sulfated and thereby suppress unwanted side reactions. The purpose of add mixing the sulfur trioxide vapour with an 14 iluents gas is to reduce the partial pressure of the sulfur trioxide, so that the chance of a single molecule of the material is sulfated or sulfonated contacting several molecules of Sulfur trioxide is reduced. In sulfonation process sulfur trioxide is in

vapour phase and aromatic compound phenol is in liquid phase. Aromatic compound is sulfonated by sulfur trioxide in sulfonation reactor.

15. "Cleaner techniques to Reduce Emission and Energy saving in Industrial plant by applying coal treatment"

Vimmy Prakash Chauhan, Khushbu Patel, Pooja Tailor, Kurvesh Patel, Jaimish patel, Guide: Prof. R. V. Prajapati,
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To study of different paper related to cleaner techniques and energy saving in various plants like chemical, Petrochemical, Power plant etc. In thermal plant, the area of work, application of coal, its environment effect which is going to lead harmful effects for environment to be studied. The implementation of cleaner production in coal-based boiler plants is necessary for environmental protection and also an effective way of energy saving and emission reductions. This project reviews about coal and its test sample regarding its calorific value and also its ash content. The Study is carried out to reduce emission and energy saving in power plant.

16. "Studies on Copper Chlorine Thermo chemical Cycles for Hydrogen Production"

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Hydrogen is green fuel for future. Currently major hydrogen sources are based on the crude oil. Concept of hydrogen production from water splitting is very old and electrolysis process is also there. But it is not economically feasible. If hydrogen can be produced from water through economically feasible process, then it is best sustainable fuel option and one of potential solution for the current energy and environmental

problems. Towards better economic feasibility of water splitting for hydrogen production, using solar energy is best option. Many papers have been published about thermo chemical cycles but overall problems associated with the various techniques are not discussed. This report addresses various routes for the hydrogen production from water using solar energy and also discusses various problems reported by various researchers.

17. "Removing hardness of water and improving regeneration time of Resin bed by applying electro-chemistry"

Sunny Singh, Jash Pandya, Sheetal Mali, Guide: Prof. R. V. Prajapati, Prof. Y. J. Morabiya,

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Now days, Electro-chemistry is going to attract the attention of worlds in various area of technology. As the concept, Electrodeionization process attracts the resin chemistry. Electrodeionization is the separation process which combines membrane and ion-exchange resins. EDI has different types to remove different pollutantsform waste stream. In any, resin ion exchange process, the resin regeneration processis time consuming and also this process disturbsthe entire plant capacity. For the production of pure water and recovery of some valuable species, the EDI shows up as agood advantage. Different literature are said, some component like, carbon dioxide and boron are difficult to remove via such membrane processes as reverse osmosis and electrodialysis reversal (EDR). The EDI offers the benefit of continuous removal of these species to a very high degree. The technology'smain parameters are to define current strength, the dilute and concentrate compartments, temperature, and TDS.

18. "Rearrangement of induced draft counter-flow cooling tower for application of Chemical and Petrochemical plants"

Amit B. Parmar, Bhagirath V. Jalela1, Jay Bhalsod, Guide: Prof. Rahul V. Prajapati,

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Cooling water is used in various areas of chemical plants& petrochemical plants. Nowadays cooling water is necessary to be optimized for better work performance. The induce draft cooling tower is widely used in various area. The temperature drop point of cooling tower is impacting to entire design in induce draft. The cooling tower contains various type of fan arrangement in different area which will perform different temperature drop down. In this model, cooling tower has been modified on basis of water requirement area. The cooling tower temperature drop point is slightly increased than the conventional cooling tower.

19. "Evaporative cooling of water for indirect air cooling"

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Cooling through evaporation is a natural occurrence. Evaporative cooling lowers the temperature of air using principle of evaporative cooling, converting sensible heat into latent heat. Here work is done based on the concept of evaporative cooling. Cost of energy is increasing day by day. It has now become necessary to think about alternate sources of energy or to reduce its consumption using alternate technologies. Any type of AC system is associated with the generation of heat, waste affecting the environment, has become noticeable and alarming issue to the environmentalist. The systems like domestic air coolers, mist fans provide humid air creating health problems like asthma, air conditions give dry and cold air with high operation and maintenance cost. The goal of this project work is to construct a hybrid, energy efficient and eco-friendly system -- an air cooler, functioning like an AC, at the cost of air cooler, providing humidity free air, no ozone layer depletion problem, reducing the temperature of the surrounding by 10 °C to 15 °C, with canvas as MOC for tubes, copper radiator as heat exchanger.

20. " Low Cost Adsorbent for COD Reduction"

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Now a days, COD reduction is the major engineering problem in the industries by the concern of cost.The most common adsorbent Activated Carbon is costly adsorbent, so the COD reduction process becomes costlier.Hence, Low cost adsorbents can be tried instead of conventional adsorbents like Neem leaf powder, Orange peel powder etc.Several experiments on use of these adsorbents directly without any treatment and activating it by pyrolysis at 550˚C - 600˚C were carried out on the neutral effluent obtained from a dye manufacturing unit producing reactive dye BLACK HN. The results showed that reduction of COD from activated carbon is about 80 % reduction, and from Neem leaf powder and orange peel powder, we got 40-65% of reduction in COD and 32-65% reduction respectively by changing the time of contact and the amount of adsorbent. The various results can be used to demonstrate the type of various adsorption phenomenon models like Freundlich, Rathipuranik model etc. occurring for the present system.

21."Production of Hydrogen from Glycerol via Steam Reforming"

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The depleting fossil fuels with their ever increasing prices have paved ways for alternative fuels. Glycerol is a potential feed stock for hydrogen production because one mole of glycerol on steam reforming produces 7 moles of hydrogen. Production of hydrogen from glycerol is environmentally friendly because it adds value to glycerol generated from biodiesel plants. The study focuses on Nickel based catalysts modified with Mg, Ce, La on Alumina support. The catalysts were prepared by the incipient

wetness technique. The experiments were carried out using lab scale catalytic reactor and the gas products generated are analyzed in GC. The paper discusses the effect of the catalysts on hydrogen selectivity and glycerol conversion ranging from 700 to 900oC. The effect of glycerol to water ratio, metal loading, temperature and feed flow rate was analyzed.

22. "Studies on Advance Oxidation Processes for Treatment of Dye Effluent"

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Wastewater is becoming a major issue as the population and industrialization has been increased. 90% of fresh water has been converted into wastewater after usage. So daily, large amount of wastewater is being generated which must be treated because source of fresh water is limited so waste water must be reused. For wastewater treatment there are so many techniques available but some techniques have sludge problem which will finally give solid waste. The new era of Advanced Oxidation Processes is arising. It gives no solid waste and removes pollutant in good quantity. Ozone / Persulfate are new technique in ozonation. Persulfate cannot be used directly; it must be activated before application. It is activated by different methods like by heat, by UV radiation, etc.

23. "Preparation and application of inorganic-organic hybrid polymer for dye wastewater treatment"

Sagar Kavathia, Guide: Prof. Parin Shah,
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Hybrid materials are product composed of two materials in one polymeric form. In recent year it gained increase attention over conventional inorganic coagulant or

organic flocculent due to its unique properties for wastewater treatment for solid-liquid separation. Here inorganic-organic hybrid polymer like ferric chloride-polyacrylamide and magnesium chloride-polyacrylamide is prepared using free radical solution polymerization. Here emphasis is given on application of hybrid materials in coagulation/flocculation of wastewater under different condition like pH, concentration, settling time, dosage of materials.

24. "Process Design and Simulation of Phenol and Ammonia Removal from Wastewater having high pH value"

Akshatha Joiys, Guide: Prof. Sukanta K. Dash,
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Waste water containing high percentage of phenol and ammonia are difficult to purify as they have high pH value. In this work a newer proposes has been designed and simulated to remove ammonia and phenol using solvent extraction under acidic process. This flowsheet consists of a sour water wastewater stripper with side-draw to remove ammonia and sour gas. Removal of phenol is carried out using an extractor, and two distillation columns to recover solvent used in the extraction process. Process simulation using Aspen Plus has been performed to study the performance of the process and to find cause and effect relationship. Thermodynamic model based on NRTL-RK and UNIFAC property method has been chosen to represent the non-ideal multicomponent system NH3-CO2-H2S-NaOH-phenol-H2O. The new process has been design to treat industrial effluent of 1000 tons/day. In this process the final concentration of phenol in the pretreatment can be less than 200 ppm. With this concentration of phenol the waste water is further suitable for subsequent biological treatment.

25. "Removal of Ammonical Nitrogen from Secondary Biological Effluent"

Neel Shah, Nikunj Patel, Binjal Raj, Guide: Prof. Urvij B. Dave,
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Ammonical Nitrogen plays an important role for many industrial wastes as it may hamper the secondary biological system, produces many organic amines while react with them and plays a leading role for Eutrophication. One of the chemical industries in the Bharuch district manufactures various chemicals / pesticides generate such effluent. They are treating effluent with primary, secondary and tertiary treatment system; and achieving the discharge norms specified by Gujarat Pollution Control Board. However, due to presence of organic Nitrogen in the effluent, even though BOD and COD are reduced to the norms, NH_4-N increases during the biological treatment. The Company has adopted chemical treatment to reduce the NH_4-N and discharging to FETP of NCTL for further treatment and disposal to the deep sea. The Unit has proposed to take up treatability studies involving various alternatives to reduce NH_4-N in the secondary treated effluent from approximately 400 mg / l to less than 50 mg / l. We have classified treatment options in to three category named 1) chemical treatments 2) Physical Treatments and 3) Physico chemical Treatments. For chemical treatment, we referred Sodium bi-Sulphate, Sodium Hypochlorite and Magnesium Ammonium Phosphate (MAP). For Physical Treatment, we used Stripping tower with different packing's, and for Physico chemical process, we have concentrated on Electrochemical Oxidation. After thorough and extensive literature survey, we reach at conclusion that MAP and Electrochemical Oxidation both are prominent methods we would like to apply for removal of NH_4-N on secondary outlet effluent.

26. "Review of all the major treatments to treat the various waste streams of gasification system"

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In today's energy scenario, gasification seems to be an effective utilization of the fossil fuel like coal or bio-waste. Though many developed technologies are available for the gasifier manufacturing; there is an unresolved question of proper handling of the waste streams generated from the gasification system from environment point of view. Here in this paper it has been tried to cover many treatment technologies or alternates for these waste streams generated from the system. Gaseous emissions can be controlled by using absorption and flare system. Tar having high calorific value can be substituted as an alternate fuel for heat generation. Ash or soot can have many alternate beneficial uses and liquid waste stream can be treated with series of biological or physiochemical treatments.

27. "Tailoring Properties of Polybutadiene Rubber Based Nano composites by Using In-situ and Ex-situ Approaches"

1Dhara Pancholi, Guide: 2Madhuchhanda Maiti, 2Ganesh C. Basak, 2Rakshvir Jasra
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Preparation, characterization and properties of polybutadiene rubber based nanocomposites prepared by both ex-situ/in-situprocess were studied. Fillers used were carbon black, Silica, nanosilica, Cloisite 20A/30B, and Carbon nanotube (CNT). It was observed that the composite containing 3 phrCloisite 20A and 5 phr CNT showed maximum improvement in tensile strength (245% and 137% respectively) and increased

thermal stability compared to the virgin matrix. In-situ BR nanocomposites were prepared with the best nanofillers, observed in ex-situ, using Ziegler-Natta polymerization. A maximum of 72 % improvement in tensile strength was accomplished using 1 phrnanosilica loaded BR nanocomposites as compared to virgin BR. The swelling and thermo gravimetric analysis results of all the BR based nanocomposites were in good agreement with mechanical properties of the same.

28. "Dye Industrial Waste Water Treatment by Electrochemical Technology"

Nirav H. Bhatt, Mangesh V. Sabale, Ajay S. Aevle, Pawan V. Yadav, Dhaval S. Patel,
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This project reviews the development, design and applications of electrochemical technologies in dye industrial wastewater treatment. Particular focus was given to electro coagulation (EC), electro flotation (EF) and electro oxidation (EO).The electrochemical technology is effective in removing colloidal particles, oil & grease, micro-organisms as well as organic pollutants. Electro coagulation-electro flotation (ECF) technology is a treatment process of applying electrical Current to treat and flocculate contaminants without having to add coagulations. Electrochemical processes generally have lower temperature requirement than those of other equivalent non-electrochemical treatments and there is no need for additional chemicals. It was observed that increasing the electrolysis time and increased current density bring down the concentration of pollutants. The electrochemical treatment of wastewater is considered as one of the advanced oxidation processes, potentially a powerful method of pollution control, offering high removal efficiencies of color. After treatment of waste water it produces minimum waste and also has possibilities of regeneration of dye from this waste. For treatment of dye industrial waste water here we are using Fe-Fe electrodes on waste water which has 10,000 ppm COD, after treatment COD reduces up

to 95% on applying 10-15 voltage and 2-3 ampere current, also reduce color particles, pH of water reaches to 7 and get neutralized.

29. "Acetic Acid Production from Natural sources by Fermentation Process"

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Occurring naturally in body fluids and plant juices acetic acid, also called ethnic acid, is the most important of the carboxylic acids. It is an important metabolic intermediate being involved in fatty acid and carbohydrate metabolism. Acetic acid can be made from any liquid that is capable of being converted into alcohol in a two stage process. During fermentation the sugar in the liquid is converted into alcohol and carbon dioxide gas by the actions of yeast enzymes. Then, the alcohol combines with atmospheric oxygen by the action of the Acetobacter bacteria, forming acetic acid and water. In commercial production producers often use sugar cane molasses as raw material due to their abundance and low costs. Sugar cane molasses were diluted with water to a resultant sugar content of 180-200 g/l. The prepared solution is then fermented by inoculating the solution with yeast, Sacharomycescerviseae. After alcoholic fermentation for about 4 to 5 days, the clear liquid is siphoned off and inoculated with mother Acetic acid containing acetobacter bacteria. It is recycled and the process of acidification is repeated until strength of 4 percent is attained. Acetic acid is also formed from coconut water and pineapple peels or any other west material which contain sugar in it by fermentation process.

30. "Separation of azeotropic mixture of isopropyl alcohol and furfural amine from waste stream"

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Separation of azeotropic mixtures is a topic of great practical and industrial interest. Separation of the azeotropic mixture is major issue faced by chemical industries although there are the options to separate azeotropic mixture. Many advanced separation technology have been developed to separate components. Options available to separate azeotropic mixture are azeotropic distillation, extractive distillation, pressure swing distillation and membrane separation technology. Most liquid mixtures of organic components from non ideal systems. The presence of some specific groups, particularly polar groups (oxygen, nitrogen, chlorine and fluorine), often results in the formation of azeotropes. Azeotropic mixtures may often be effectively separated by distillation by adding a liquid material (entrainer) to the system. For the development of separation processes for azeotropic mixtures, there is a need for insight into the fundamental phenomena of non-ideal and azeotropic phase equilibria. The complexity of azeotropic distillation analysis and is a key to a simple evaluation of the possibilities and limitations of azeotropic mixtures separation. Here, we are separating this mixture by azeotropic distillation using entrainer in batch distillation process.

31. "Removal of azeotropic mixture from effluent using freeze crystallization"

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Some of the component which forms azeotrope with water is difficult to separate from effluent by simple distillation or any other operation. Many advanced separation technology has been developed to separate components. Separation of the azeotropic mixture is major issue faced by chemical industries although there are the options to separate azeotropic mixture. Options available to separate azeotropic mixture are azeotropic distillation, extractive distillation, pressure swing distillation and membrane

separation technology. Here membrane separation technology is economical but it cannot be used in each azeotropic mixture but it can be used rarely because it depends on selection of membrane which can percolate one of the azeotropic components. Azeotropic distillation requires additional component called entrainer which forms low boiling azeotrope with one of the component. Thus after separation of essential component remaining mixture is ultimately azeotropic mixture. Also this technology is not economical. Extractive distillation requires additional component called solvent which alters the relative volatility of the mixture. Also this technology is not economical. Thus innovative ideas are required to separate azeotropic mixture which should be economical. Freeze crystallization is the new idea which should be developed by performing the experiment in laboratory and should be enhanced to put this technology in chemical industry. Thus experiments are performed in laboratory to separate azeotropic mixture such as formic acid – water and tried to develop new idea to separate azeotropic mixture by freeze crystallization.

32. "Development of Thermoplastic Elastomer in Automobile application: High heat resistant and low oil swell "

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The main objective of review is to develop thermoplastic elastomer for the automobile application. Automobile sector plays a major part in consumptions of rubber in world. There are many applications of rubber in automobile, and there are many critical application of rubber in this sector. In this era of technology there is some very sensitive and critical application of rubber such as high heat resistant and high strength. There is application in oil also; in that case there should be low oil swell. Now a day's cars and vehicles are meant to be light for the more fuel economy. Weight of rubber part is also important. For that thermoplastic elastomer have low specific gravity than that of conventional rubber, so aim of thesis is to fulfill the requirement of automobile sector

with TPE having high heat resistant and low oil swelland thermoplastic elastomer have reproducibility same as plastics. Thermoplastic elastomer have high production rate and good processing characteristics. There is also a major advantage of using plastic processing machinery.

33. "In-situ oxidant generation by applying Electro Chemistry and Membrane separation"

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Nowadays, the adverse effects of pesticides are increasing day by day. So, it is becoming necessary to find the alternative of use of pesticides. This project is to find the alternative method of the pesticides and its application in the field. By applying and using a variety of oxidants, such as hydrogen peroxide, permanganate, persulfate, percarbonate, and ozone which are able to generate in situ water, successfully to remove significant contaminant mass from soils and groundwater at numerous sites. This project has described the efficient method i.e. In-situ Oxidant Generation in Water with the help of Electrochemistry and Membrane Separation Technology asan alternative of the pesticide.

34. "Cleaner electro chemistry to reduce organic load in Effluent treatment plant"

Payal M. Desai, Nirmal A. Patel, Nirav A. Patel, Guide: Prof. R. V. Prajapati, Prof. Y. J. Morabiya,
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Conventional treatment for effluent plant wastewater does not to meet desire limit. Electro-chemistry attracts with good output for various kinds of wastewater. This paper

shows the conventional treatment of industrial effluent, consisting of primary, secondary and tertiary treatment with an output not exceeding more than 70 % to 75%. By applying electrochemistry with continuous electrocoagulation techniques the primary results were found more than 87 % to 92 % in COD reduction. Electro coagulation techniques running with DC power supply and sacrificial electrode. This method of treatment was also found as eco-friendly treatment.

35. "Use of Cleaner Technology for Combustion in Furnace"

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Air is used as an oxidizer for combustion, where air contains 78 % of N2 and only 21 % of O2 and remaining inert gases. But only oxygen is required for combustion to take place. There is large quantity of nitrogenpresent in the air so it leads to excess energy utilization as nitrogen also gets heated up unnecessarily along with the oxygen. Hence there is huge heat loss in combustion process while using air. Also, higher amount of emission of pollutants like CO, CO_2, NO_x occurs. The probable solution for this problem is using oxygen rich stream instead of atmospheric air. When concentration of oxygen is more than that present in atmospheric air, it is called oxygen rich stream. By mixing pure oxygen in different quantity with air we get oxy-rich stream of different concentration. The oxygen enriched combustion and its benefits are discussed in this paper.

36. "Energy Conservation in Ceramic Industry"

Tushar Kavar, Tushar Sitapara, Vatsaln Joshi, Tarang Bamania, Guide: Prof. D. K. Mehta,
Department of Chemical Engineering, Lukhdhirji Engineering College, Morbi.

Ceramic industry is energy intensive industry. CNG and coal is the main source for energy. Use of coal is creating pollution. CNG is clean source of energy. Now a day, price of CNG is increasing. So, it is beneficial to make plant more energy efficient. This report consists of detailed description of energy conservation in ceramic industry. It also consists of important information such as composition and properties of CNG, material and energy balance of kiln, and different suggestion to save energy from firing and drying process. Among the given suggestions we choose to design a shell & tube heat exchanger having star fin inside the tube. This will save around Rs. 4000/- per day and reduces pollution.

37. "Utilization of Solar Energy in Industrial Waste Water Treatment Using Photocatalyst"

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The features afforded by solar energy are its cleanness and abundance. It is estimated that the magnitude of the available solar energy striking the earth's surface in 1 hr (4.3×1020 J) is even higher than that consumed on the planet in one year (4.1×1020 J) in every year. Using visible spectrum of solar energy, wastewater treatment by its degradation. This is a combination of solar technology and catalysis. Fabrication of CPC photo reactor configurations for the use of sunlight to treat wastewater.

38. "Techno - Economic Comparison between Electro-Coagulation and Nalgonda Techniques for Fluoride Removal from Ground Water"

Hiren Prajapati, Brijesh Amipara, Ruchita Vasava, Guide: Prof. Majmudar Kunal, Prof. Kumar Manoj,
Department of Environmental Science & Technology (EST) Shroff S.R Rotary Institute of Chemical Technology, Ankleshwar.

One of the major challenges faced by mankind today is to provide clean water to a vast variety of the population around the world. The need for clean water is particularly critical in increased resource demand scenario. In developing countries like India where access to the safe drinking water is not guaranteed to the majority of the population, it is very important to maintain the quality of ground water resources. Groundwater is a major source of water for both in urban and rural areas. Besides it's an important source of water for agriculture and industrial sector. Also fluoride ion present in excessive quantity in water (>1.5 mg/L) causes dental and skeletal fluorosis, thus its removal is essential. In present work comparison between Electrolytic Defluoridation and Nalgonda techniques were investigated for the effective removal of fluoride from drinking water. Different initial concentration (4 mg/L to 10 mg/L) of Fluoride solution was considered for the experiment. The voltage was varied from 2volts to 6 volts and the current density was varied from 18Amp/m2 to 36 Amp/m2, for the Electrolytic defluoridation technique and simultaneously the treatment time was observed. It was seen that the Fluoride removal was about 85% - 90% in case of Electrolytic defluoridation technique. In Nalgonda technique the calculated amount of lime and alum were added and the fluoride removal efficiency was observed. It was seen that the fluoride removal was about 70% in case of Nalgonda technique. Thus the results showed that Electrolytic defluoridation technique was found to be much more effective and efficient method as compared to Nalgonda technique for the removal of fluoride from drinking water with a very less amount of sludge generation.

39. "Optimization of Precious Metal Dissolution from E-Waste for Its Recovery through Aqua – Regia"

Nikita Karelia, Yuvraj Atodariya, Vishal Patel, Guide: Prof. Majmudar Kunal, Prof. Kumar Manoj,

Department of Environmental Science & Technology (EST), Shroff S.R Rotary Institute of Chemical Technology, Ankleshwar.

WEEE (Waste from electrical and electronic equipments) comes under a special category of waste which is the result of industrialization and ever increasing demand of electronic products in daily life. With increasing usage waste production is also increasing. Now, the situation is alarming as a huge quantity of E-waste is generated by India as well as other countries. The condition in India is much worse because about 80% of E-waste generated in US is exported to India, China and Pakistan under the name of charity. Only 3% of total WEEE-waste generated is recycled properly in India. The rest of it is handled by workers who work with bare hands, without mask under unhygienic conditions, informally recycling terms of E-waste for about 12-14 hours a day. It causes both environmental as well as health problems. No. of laws are framed but none is able to stop this informal recycling. Extraction and recycling of precious metal from E-waste (PCB`s, processors, RAM, chips, etc.) by Aqua-Regia method is done.

40. "Economic analysis of Melamine Formaldehyde Production an experimental approach with process design"

Ashish Ramani, Vishal Patel, Darvin Bhalodiya, Guide: Prof. Rajesh Tripathy,
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Melamine-formaldehyde resins which have thermo plasticity after curing are prepared by reacting formaldehyde with melamine in a mole ratio of 3.0:1 to 35:1 until the resin is miscible to the extent of one part per 1-3.5 parts of water, then adding melamine to adjust the formaldehyde-melamine mole ratio to about 2.021 to 2.5:1, and then heating the resulting mixture until one part of the product is miscible in 0.5-1.5 parts of Water. The product is useful in making post-formable laminates. This study relates to melamine-formaldehyde resins of improved stability and to laminates made there from, particularly such laminates having post-formability. A reactor which handles the mass

is designed mechanically. Also environmental aspects as well as industrial aspects are kept into the consideration.

41. "Utilization of waste plastic in manufacturing of pavement materials"

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The quantum of plastic waste is increasing due to population explosion, urbanization and less recycling knowledge, which leads to widespread littering on the landscape. Waste plastic is a serious problem globally due to their non-biodegradable nature and unaesthetic view. The various products and materials consisting of plastic are not disposed or recycled scientifically; therefore it creates extreme pollution at ground level due to land filling and contributes to water pollution as well. This waste plastic can partially replace the conventional pavement materials such as asphalt, tarmac, concrete and so on to improve mechanical characteristics of roadways. Bitumen is used as binder for conventional roadway making processes in India. Such bitumen mix can be modified using the different kinds of plastic wastes. One can develop plastic waste based construction techniques utilizing plastic-mix flexible pavements on basis of their thermoplastic, thermosetting to provide higher mechanical and chemically resistive strength to roadways for longer life and better finishing. Numbers of experiments were carried out in the present study to analyze the uses of waste plastic modified bitumen-mix for the construction of roadways. The mix thus obtained, showed better results in various aspects such as superior binding property, higher Marshall Stability, and also satisfactory Benkelman road test. California bearing ratio test and resistance to water seepage was also carried out to assess its suitability. The materials thus produced can be used as a substitute of conventional pavement materials with better efficiency.

42. "A review on surface tension reduction due to industrial physical water treatment for fouling control in heat exchangers"

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There is a certain importance of water treatment for industrial heat exchangers to reduce the scaling fouling etc.The present study was to review whether or not a physical water treatment (PWT) reduces the surface tension of hard water. Two different PWT devices were observed: a permanent magnet (PM) and a solenoid coil electronic device (SCED). The effects of the treatment number of the PWT on the surface tension were reviewed. Separate experiments were observed which was conducted by others: Two of them are under our study one was the measurement of surface tension, and the other was a flow-visualization of dye behavior in water samples. As the number of treatments of the PWT increased, the surface tension of the sample water decreased a phenomenon that was consistent with the results in the dye flow-visualization experiment.

43. "Process Design, Optimization and Cost analysis Of Biodiesel Production from Vegetable Oil"

Saumil Chandira, Divya Mehta, Guide: Prof. Sukanta K Dash,
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With diminishing fossil fuel reserves and growing demand for sustainable fuel from renewable sources, research on biodiesel has gained significant importance in recent times. The engineering of biodiesel production process requires process design,

simulation, optimization and it should be economically viable. The work presents an AspenPlus® simulation of biodiesel production process using homogeneous alkali catalysis, transesterification reaction with canola oil as the vegetable oil and sodium hydroxide as the catalyst. Transesterification is used most commonly and leads to mono-alkyl esters of long chain fatty acids, which is biodiesel. The kinematic viscosity of transesterified biodiesel is much closer to petroleum based fuel than virgin vegetable oil. We have assumed a conversion rate of 95% for canola oil. The thermodynamic model based on modified UNIFAC Dortmund model used for this simulation work which is suitable for property determination of organic compounds. Further NRTL model will be used for property calculations which may probably give more accurate results, after obtaining binary interaction parameters using data regression. This work illustrates optimization of various unit operations like methanol recovery, liquid extraction and FAME (Fatty Acid Methyl Esters) purification to obtain 99.9% purity of FAME which is the primary component of biodiesel. Optimization with respect to process condition such as temperature, pressure, flow rates, equipment sizing have been carried out and the cause and effects relations are shown graphically. In addition, detailed cost analysis of a biodiesel plant considering CAPEX and OPEX has been performed. The economic feasibility of the biodiesel production process has been presented to provide a holistic view for a plant setup.

44. "Carbon foot print analysis and development of a CDM model for the BRTS project of Ahmedabad. A case study"

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The Clean Development Mechanism (CDM), established under the 1997 Kyoto Protocol and overseen by the United Nations Framework Convention on Climate Change (UNFCCC), provides a funding mechanism for Greenhouse Gas (GHG) reduction

projects in developing countries. Transport sector represents a small percentage of projects approved for CDM financing, possibly because of its complex and lengthy implementation process as well as the general large scale cost. So there is general need for study that reduces the adverse effect of transportation project into the environment. The present research work is mainly concentrated on developing a tool that calculates carbon emission from Bus Rapid Transit (BRT) project and compare the result with different alternatives of fuel and different mode of vehicles that were used before BRTS. The Developed tool is a work based on input data function and the final result is in terms of tones of CO2 emitted due to operation phase of BRTS. During operation phase there are mainly two sources of emission i.e., electricity and fuel consumed during transportation. In this work carbon emission from the operation phases of BRTS has been calculated. The total carbon emission found in the operational phase is 4280 tons of CO2/ year. Further analysis has been carried out by collecting BRTS user's feedback for their earlier mode of transport such as AMTS, 2-wheelers, 4-wheelers, auto, cycle, etc. The carbon footprint per passenger are calculated and compared. Finally, a suggestion has been given about the use of the different modes which are environmental friendly or users friendly. The carbon footprint has also been compared to the total emission by considering use of different fuel type such as Diesel, CNG, Bio-Diesel. The study is focused on the feasibility of bio-diesel as fuel in BRTS project.

45. "The study of biodiesel production: A review"

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The rate of depletion of fossil fuel is on the rise. Soon it will be vanished. This demands the use of new alternative fuels which can be made or found in abundance. Biodiesel is one such fuel. Biodiesel is an eco-friendly clean alternative diesel fuel that is derived from oils and fats of plants like Sunflower, Canola or Jatropha. Recently, biodiesel from

Jatropha has attracted huge attention from all over the world because of its renewability. These natural oils when processed chemically show striking similarities to petroleum derived diesel. It can directly be used or blended with petroleum derived diesel. Biodiesel is prepared by a process called Transesterification. Transesterification is the process of exchanging organic group of an ester with the organic group of an alcohol. The raw material for biodiesel is oil from crop seeds, algae and/or waste oil from cooking or motor oil. The oil contains triglycerides which can be broken into glycerol and ester using the same. The effect of temperature, molar ratio, co-solvent, agitation speed, etc. was studied using literature.

46. "Biomethanization generation from house hold food Waste"

Mohan Bhadru, Satish B. Kachhot, Ketan J Parmar, Guide: Prof. R. V. Prajapati,
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Any kind of Solid waste disposal like, food waste etc is a major challenge to environmentin all over the world. Thefood waste, being organic in nature, it can be used for production of biogas, which further can be utilized for various purposes. An Organic Processing Facility to create biogas should be more cost effective, eco-friendly, cut down on landfill waste, generate a high-quality renewable fuel and reduce carbon dioxide & methane emissions.Anaerobic digestion is a microbial process for production of biogas, which consists of primarily methane (CH_4) & carbon dioxide (CO_2). Biogas can be used as energy source and also for numerous purposes. But, any possible applications require knowledge & information about the composition and quantity of constituents in the biogas produced. The continuously-fed digester requires addition of sodium hydroxide (NaOH) to maintain the alkalinity and pH to 7. A combination of these mixed inoculums was used for biogas production at 37°C in laboratory(small scale) reactor (20lit capacity) In our study, the production of biogas and methane is done from the starch-rich and sugary material from our canteen food waste.

47."Medicinal Uses of Graphene"

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In today's era the growth of research and invention in science and technology had changed the scenario of medical diagnosis and treatment approaches. Carbon is having four main widely known forms viz, coal, graphite, diamond and fullerene in addition to it recently graphene is added by chemist in the list of the allotropes of carbon. In general grapheneis a two-dimensional thin layer of carbon atom which is having useful properties and applications in many of our science and technological fields. In thispresent review article history of graphene and some synthesis process for production of graphene are discussed here. It also highlights the medicinal applications like Cancer therapy, Drug delivery, Gene delivery and also in Tissue Engineering. This paper will be very useful for new researchers and scholars to get knowledge about recent and future applications of this strongest and thinnest material graphene.

48. "Industrial Recovery processes for Extraction of Important metals from E-Waste: A Review and Indian perspective"

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In the late of 20th century, there was tremendous growth of Electrical and Electronic devices. Because of this growth, people lifestyle is changed. So, in this generation people are attracted to the new technology and advanced gadgets. Due to this new technology lots of Electronic gadgets are becoming un-useable and these un-useable devices are known as E-Waste. If we can recover precious metals from E-waste devices, then this becomes as an advantage for us. It is also helpful for economy of nation and also for Environment pollution and reducing the E-waste materials. In this review article we have discussed some Environment friendly metal recovery processes like hydrometallurgical, bio-metallurgical, and pyro-metallurgical; cyanide leaching, halide

leaching, trio-urea leaching, trio-sulfate leaching methods. Along with these routes we have also described their advantages and disadvantages in Indian perspective.

49. "A comparative study of Fenton process and electro Fenton oxidation process for reduction of high COD in wastewater"

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High COD is a common problem with industrial waste water. Various chemical and biological processes are used in different industries to reduce the COD. Fenton process is one of the advanced oxidation process which is commonly used in waste water treatment plants to bring down COD up to discharge standards but this process is usually associated with excess sludge generation. A number of researches support that the efficiency of electro Fenton oxidation process (which is advancement of Fenton process) for the treatment of high COD industrial effluent is far better than the traditional Fenton process and the sludge generation in this process is comparatively very less.

To select the more efficient process for specific waste water, and to optimize the efficiency of this process, several experiments were carried out. Artificial waste water was prepared for this purpose and was optimized initially for specific Fenton ratio and Fenton dose. In order to compare the treatment efficiency of both processes, this waste water was then treated by both Fenton oxidation and electro Fenton oxidation process. The efficiency of any process is very much dependent on various operating parameters; therefore optimization of electro Fenton process for those specific parameters was also included in the scope of this research project. This research can be very useful in establishing and optimizing the treatment process for industrial waste water.

50. "Solar Desalination"

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Solar desalination is a rapidly growing field of research. The coming global oil crisis implies that alternatives to the conventional desalination plants based on fossil fuels must be developed. System use common seawater because it is cost effective and can make full use of low-grade solar energy converting sea water into drinkable water by giving high efficiency with low cost. This paper describes several technologies for solar desalination. The primary focus is on those technologies suitable for use in remote areas, especially those which could be integrated into solar thermal energy systems.

51. "Oxygen Separation from the using of Pressure Swing Adsorption"

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Pressure Swing Adsorption (PSA) is widely used for separation of gaseous mixture. Nitrogen is an important element for the chemical industry because it's an inert gas suitable for a large area of application covering various chemical manufacturing appearance, handling, shipping, and processing. Due to its low reactivity, Nitrogen is an excellent covering and purging gas used to prevent useful product from harmful adverse contaminants. In the chemical process industries(CPI) widely and growing use of nitrogen, industrial gas companies have been continually developing method of nitrogen generation and supply efficiently, convenient for chemical process and cost effective. Using PSA (pressure swing adsorption) method on side nitrogen generator can be greater cost effective than traditional stored liquid nitrogen and cryogenic

fractional distillation. PSA works on the base of adsorption. This process has been developed during past 10 years into a very high efficient technique for generating nitrogen on site. Carbon molecular sieves (CMS) based PSA absorbers have been known for more than 20 years. This review article represents PSA process for separating nitrogen from Oxygen-nitrogen mixtures from the atmosphere, instrumentation and process control of PSA in industrial appliances, application of PSA.

52. "Performance Up-Gradation of CETP by Adsorption"

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Water used for industrial processes is polluted by various activities carried out in process plants. This hazardous waste water can't be discharged directly on ground or in water bodies. Common effluent treatment plant is the concept of treating the effluent by means of collective effort mainly for a cluster of small scale industrial units. In CETP the waste water treatment is carried out in three stages primary, secondary and ternary treatment. The treatment is carried out in sequence: pH adjustment, biological treatment and adsorption. The study aims at demonstrating the adsorption as first stage of treatment increases the efficiency of biological treatment. Experiments are carried out on different waste water samples from CETP and observing the effect of quantity and contact time of adsorption for adsorbent like activated carbon, lignite. The result of rate of COD reduction is fitted in to the different models available in the literature.

53. "Spatial and Temporal Variation of PM 10 across Winter Season in Rajkot City, India"

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Due to rapid urbanization and industrialization air quality had deteriorated at very fast rate in Rajkot city. Semi arid climate and anthropogenic source has resulted in higher PM_{10} concentration in city. Study for Variation PM_{10} concentration in air will be done for two season i.e. pre winter and post winter season. As in air pollution, winter season is said to be a critical period since dispersion of pollutant is least due to inversion condition. Sub indices of PM_{10} will calculate for each monitoring site. Monitoring will be done at 9 sampling sites consisting of industrial sites, residential sites, commercial site etc. Meteorological data will be collected using weather monitoring station. Air quality will be monitored using PM 2.5/10 sampler using Glass Fiber filter. Spatial variation and temporal variation will be studied for all sampling sites. This project can help in decision making regarding the control measure to be taken to maintain air quality under Indian standard.

54. "Process Development for Precious Metal Recovery from Copper Waste"

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Copper is one of the most essential metals used for household application to industrial production and transportation. Copper waste is mainly differentiated in four categories; Industrial wastes, consumer wastes, e-waste, Metallurgical waste. This waste contains amounts of copper, tin, lead, zinc, nickel, iron, aluminum and some traces of manganese and silicon. Out of these metals, copper has maximum economical value as well as highest value presented in the waste.

Copper mines are having concentration around 1.0 percent. So with a view to extract 1 part of pure copper from the mines, one has to deal with 99 part of waste that has to be handled because of low concentration. This increases the demand of recycling to meet the copper consumption

Four copper recovery methods exist; Froth floatation, leaching, roasting and smelting. Electroplating is more of a purification process than copper recovery process. But new idea is being developed to recover copper from electroplating process. Leaching and electroplating is done simultaneously to achieve purest form of copper.

55. "Preparation of an Edible Grade Paper from Groundnut Shell"

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The paper is generally manufactured from sawdust wastepaper, rice husk, wheat husk, wood pulp. Due to these, many trees are cut down resulting into deforestation which leads to many environmental problems such as global warming disturbing the ecological balance and wild life. The groundnut shell is of no use after peas are removed. This waste can be used as raw material for the preparation of a paper. The present work will describe the preparation of edible grade paper from groundnut shell .The groundnut shell are crushed in a grinder. Uniform shell powder is obtained using sieve shaker and now these powder , starch , natural gum ,vegetable oil and specific quantity of water is mixed to get the pulp and now from these the final product is obtained as paper. Now, the different properties of paper such as hardness, opacity, tensile stress, brightness etc are checked.

56. "Cleaner Production in Rubber Industries-Implementation of Good Housekeeping"

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For several decades, rubber has been a main revenue earner for a large population of rural masses until industries like tea; textile and many others become a prime attraction.

Unfortunately, despite numerous efforts that are rendered to the modernization of this world by natural rubber, the consequence of rubber processing has yet provides a serious problem due to its highly polluted effluents. The rapid growth of the industry generates large quantity of effluent coming from its processing operations which is really a big problem because its wastewater contains high biological oxygen demand and ammonia. However, these characteristics vary from country to country due to the difference in raw latex and applied technique in the process.

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