International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 04 | April - 2023 Impact Factor: 8.176 ISSN: 2582-3930

REDUCTION OF COD FROM REACTIVE DYE WASTE WATER

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CHAPTER: 1

1: INTRODUCTION.

Due to the scarcity of water resources, it is crucial to safeguard public health and well-being. One way to achieve this is by enforcing stringent regulations on the discharge of wastewater effluents to minimize the introduction of harmful substances into water bodies. Furthermore, there is a growing trend to reduce total solids (TS) in wastewater and repurpose them for industrial applications. The treatment of wastewater to a high standard has expanded the potential uses while reducing negative impacts on freshwater ecosystems.

Currently, the main environmental issue in wastewater treatment is related to dye effluents. This is because the textile industry consumes a substantial amount of water, resulting in wastewater that contains unused colours and their constituents. Dye-containing wastewater produced by the textile sector is extremely toxic and poses severe challenges for wastewater treatment facilities. Textile effluents contain high levels of colour, TDS, and hazardous metals, which have reduced the ability of contaminants to self-degrade in wastewater. Numerous techniques, such as chemical oxidation, coagulation and adsorption processes, as well as biological processes, are employed to remove dye using traditional methods, but none of these are sufficient on their own to remove dye from wastewater. For instance, biological processes are unsuitable for decolourization of dyes since the majority of the colours are inorganic and harmful to the process microorganisms. Activated carbon is effective for treating soluble colours, while coagulation is better suited for insoluble dyes but not for soluble ones. Due to the product of their degradation, most dyes in particular reactive dyes cause serious environmental problems. Due to the complicated structure and refractory nature of dyes, the degradation of colours from textile effluent is exceedingly hard. Wastewater produced in textile manufacturing plants may contain both natural and synthetic pollutants, the composition of which depends on the production techniques employed. Several parameters are commonly used to evaluate the characteristics of textile wastewater, such as Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Suspended Solids (SS), Dissolved Solids (DS), pH, Chloride, Sodium, and others. The quality of textile wastewater is determined by these parameters, and it is important to take them into account when selecting appropriate treatment methods to ensure that the environment is not adversely impacted.

1.2. CLASSIFICATION OF DYE.

The textile industry begins with the production of fibers that are spun into yarn and then woven into fabric. To give the fabric its desired color, various techniques are applied to apply dyes, such as dyeing, which uniformly colors the entire textile fiber. Another technique is printing, which applies color to specific areas of the fabric. Bleaching, which includes crosslinking, softening, and waterproofing, is used to decolorize textile fibers. Dyes can be divided into two categories based on their source - natural dyes obtained from plants and synthetic dyes synthesized chemically. Synthetic dyes are further classified into three groups based on the type of fiber they create: cellulose, protein, and synthetic fibers. These dyes are widely used in the textile industry because they are readily available, cost-effective, and offer a wide range of colors.

However, they can have negative environmental impacts due to the release of toxic chemicals into the environment. Therefore, it is essential to minimize their use and employ eco-friendly alternatives in the textile industry.

1.4. Cellulose fibre dyes.

Hemp, linen, cotton, ramie, rayon, and lyocell are cellulose fibre sources suitable for reactive, direct, indigo, and sulphur dyeing.

1.4.1. Reactive dyes.

Reactive dyes are commonly used for cellulose fibres and some protein fibres due to their high pigmentation, permanent effect, and versatility. Their ability to establish covalent bonds with various fibres makes them easy to manipulate across a wide temperature range.

1.4.2. Direct dyes.

Direct dyes are a cost-effective option for coloring synthetic fibers, but they tend to remain in an aqueous state and do not bond well with cellulose fibers. To improve their binding capability with fabrics, they are mixed with inorganic electrolytes and anionic salts, such as sodium sulfate (Na2SO4) or sodium chloride (NaCl).

(Figure 1). As a result, it is advised to wash them on the cold cycle and with similar coloured clothes.

1.4.3. Indigo dyes.

Vat dyes are a type of dye that is initially insoluble in water but can become soluble after an alkaline reduction. Indigo, a dark blue dye, is an example of a vat dye. To ensure a strong bond between the dye and fabric, the water-soluble or leuco form of indigo is first used in textile dyeing. Upon exposure to air, this form oxidizes and reverts to its insoluble or keto form. Indigo dyes are commonly used in the production of blue jeans, which is why they are produced on a large scale worldwide.

1.4.4. Sulfur dyes.

Sulphur dyes are a significant class of dyes known for their excellent dyeing properties, ease of use, and low cost (Figure 1). They contain a disulfide (S-S) bridge and belong to the vat dye category. To convert them from the keto form to the leuco form, sodium sulfide is used. Leuco sulfur dissolves in water to achieve the desired dyeing result.

1.4.5. Protein fibre dyes.

Fibres such as silk, cashmere, angora, mohair, and wool are derived from animals (Figure 1) and are dyed using water-soluble acid dyes to create insoluble dye molecules on the fibres, since they are sensitive to high pH levels. Azo dyes are the most significant group of acid dyes, followed by anthraquinone, triarylmethane, and phthalocyanine dyes.

1.4.6. Azo dyes.

Azo dyes are the largest segment (60-70%) of the synthetic dye market because of their versatility, affordability, ease of use, high stability, and intense colour. The chromophore structure (-N=N-) of this dye provides its solubility in water and attachment to the fibre. Azo dyes are classified into three groups (mono, di, and poly) based on the number of azo groups in their structure. These groups are attached to an unsaturated heterocycle, carboxyl, sulfonyl, or aliphatic group on one side and an aromatic or heterocyclic compound on the other.

1.4.7. Anthraquinone dyes.

Anthraquinone dyes are extensively used in the textile dyeing industry, particularly for red dyes, owing to their water solubility, bright colours, and excellent fastness properties. The anthraquinone structure can also have azo dye linkages.

1.4.8. Triarylmethane dyes.

Triphenylmethane dyes, with two sulfonic acid groups (SO3H), are commonly used in the textile industry to colour protein fibres like wool and silk. If they have only one sulfonic acid group (SO3H) in their chemical structure, they can be used as indicators. These dyes are well-known for their water solubility and wide range of vibrant colours.

1.4.9. Phtalocyanine dyes.

Phthalocyanine dyes, which include green and blue hues, are produced by reacting the the 1,4-Dicynobenzene molecule with a metallic atom like Nickel, Cobalt, or Copper. They have several natural characteristics such as high resistance to fading, oxidation, solubility in water, and chemical stability.

1.4.10. Synthetic fibre dyes.

Fabrics made of spandex, polyester, acrylic, polyamide, polyoac-estate, polypropylene, ingeo, and acetate are made of synthetic fibers. Due of their numerous applications, they are used in 60% of the world's production of fiber. Direct dyes, basic dyes, and disperse dyes are used to colour these fibers.

1.4.11. Disperse dyes.

Disperse dyes consist of the smallest molecules among all dyes and are insoluble in water but remain stable at high temperatures. The dye powder and the dissolving agent are combined to create a high-temperature dyeing solution.

1.4.12. Basic dyes.

They change into vibrant cationic salts that colour anionic fibre textiles, basic dyes are also known as cationic dyes. Since these dyes are photosensitive, they can only be used to colour modified polyesters and paper nylon. Cyanine, triarylmethane, anthraquinone, diarylmethane, diazahemicyanine, oxazine, hemicyanine, thiazine, and hemicyanine are their main chemical compounds.

CHAPTER: 2

2: LITERATURE REVIEW.

Synthetic dyes offer numerous benefits such as a diverse range of colors, ease of handling, resistance to external factors, and cost-effective energy consumption. However, these advantages are overshadowed by the negative effects that can result when synthetic dyes are released into the environment in untreated or partially treated forms. Studies have shown that textile dyeing processes, which include dying, fixing, and washing, require a significant amount of water, and up to 15% of the applied dyes can escape into wastewater. This incorrect discharge is often rejected, but even treated wastewater can contain harmful substances that contribute to contamination of the air, soil, vegetation, and water supplies.

The effluents from textile industries containing dyes comprise a variety of inorganic and organic pollutants such as heavy metals, sulphur, chlorinated compounds, formaldehyde, naphthol, nitrates, soaps, chromium compounds, benzidine, sequestering agents, dyes, and pigments. These pollutants have high chemical and biological oxygen demands (COD and BOD) and can persist even after treatment, leading to severe environmental pollution and human health issues. The existence of harmful substances like dye, plastic, polyester, fibres, and yarns in both solid and liquid waste complicates the problem. Particularly in developing nations, these polymeric substances have contaminated nearby landfill ecosystems and agricultural fields. By producing oxidative stress, decreasing protein content, photosynthesis, and CO 2 assimilation rates, this soil pollution inhibits plant growth.

Effective treatment methods are required to manage the problem of textile dyeing wastewater, which contains pollutants like plastic, polyester, fibres, yarns, and hazardous materials. Physical, chemical, and biological processes, such as coagulation, flocculation, adsorption, oxidation, membrane filtration, and biodegradation, are used to treat this wastewater. Different methods can be used based on the type of pollutants or dyes present, and a combination of methods may be required for optimal outcomes. Reducing water consumption during the dyeing process and exploring the use of eco-friendly dyes are other important steps to address this issue.

In conclusion, while synthetic dyes offer many benefits to the textile industry, their release into the environment can cause significant harm. Efforts to reduce wastewater discharge and implement effective treatment methods are necessary to protect human health and the environment. Additionally, exploring alternative, sustainable dyeing methods can help minimize the negative impact of textile dyeing on the environment.

The textile dye industry's air pollution can cause harmful emissions like formaldehyde, nitrogen oxides, volatile chemicals, dust particles, and sulfur, which can have an unpleasant odor. This type of pollution can negatively impact the environment, animals, people (including employees and consumers), and the surrounding community. illustrates the pollutants emitted by the textile dye industry. It is essential to develop effective strategies to minimize air pollution by implementing cleaner production techniques, using energy-efficient equipment, and adopting eco-friendly dyeing processes. Additionally, raising awareness and promoting sustainable practices can contribute to reducing the environmental impact of the textile dye industry.

Industrial dye effluent discharge can have a significant impact on the environment, particularly on water bodies such as rivers, lakes, and seas. Even small amounts of wastewater (above 1mg/L) containing numerous harmful substances and multiple dyes can cause detrimental effects across large areas. The typical concentration of textile effluent dye is around 300 mg, which can lead to dark-coloured wastewater with high turbidity. The effluent's high turbidity prevents sunlight from penetrating the water, reducing the amount of dissolved oxygen and altering the pH level. These factors can have severe ecological effects on the aquatic ecosystem, reducing aquatic plant photosynthesis and the biodegradability of aerobic bacteria, which can adversely affect the food chain. Water is particularly vulnerable to pollution, and it can be challenging to gauge the extent of pollution in aquatic systems. Even though the pollution may persist for a long time in fish and sediment, the water may appear clear. The presence of high levels of organic and inorganic pollutants, such as chlorinated compounds, heavy metals, sulphur, nitrates, naphthol, soaps, chromium compounds, formaldehyde, benzidine, sequestering agents, dyes, and pigments, in dye effluents also contributes to high biological and chemical oxygen demand (BOD and COD). Even after some treatment methods, harmful substances can remain in the wastewater, contributing to severe human ailments and contaminating the air, soil, vegetation, and water supplies. To mitigate these negative impacts, effective treatment methods for textile dyeing wastewater are necessary. Physical, chemical, and biological processes such as coagulation, flocculation, adsorption, oxidation, membrane filtration, and biodegradation can be implemented. However, some methods may be more effective for specific types of pollutants or dyes, and a combination of methods may be necessary for optimal results. Additionally, reducing water consumption in textile dyeing processes and exploring the use of alternative, eco-friendly dyes can also help address this issue.

The textile dye industry is known to emit toxic gases like sulphur, formaldehyde, nitrogen oxides, and volatile chemicals, which have an unpleasant odor and can be harmful to the environment, animals, and humans, including employees and consumers. To address the negative impacts of industrial dye effluent, various steps can be taken, including the implementation of stringent regulations and policies for effluent discharge, the adoption of cleaner production techniques, and the development of more sustainable and eco-friendly dyes. The utilization of efficient treatment technologies, such as adsorption, chemical precipitation, membrane filtration, and advanced oxidation processes, can also help reduce the levels of pollutants in dye effluent before discharge. These measures can significantly reduce the adverse effects of industrial dye effluent on the environment and human health.

CHAPTER: 3

3: METHOD AND MATERIALS.

Wastewater treatment processes are classified into physical, chemical, and biological units based on the contaminants present in the wastewater. These units work together to effectively treat and purify wastewater.

Various physical, chemical, and biological treatment technologies can be used to treat textile dye wastewater effectively. Physical unit operations such as screening, comminution, flow equalization, sedimentation, flotation, and granular-medium filtration can help remove solid particles and organic matter from wastewater. Chemical unit operations such as chemical precipitation, adsorption, disinfection, and dichlorination can help remove dissolved contaminants, heavy metals, and other pollutants from the wastewater.

Biological unit operations such as the activated sludge process, aerated lagoon, trickling filters, rotating biological contactors, pond stabilization, and anaerobic digestion can help remove organic matter, nutrients, and other pollutants from wastewater using microorganisms. These processes rely on bacteria, fungi, and other microorganisms to break down the pollutants in the wastewater into harmless substances.

The choice of treatment method(s) depends on several factors, including the composition of the wastewater, the desired effluent quality, the availability of resources, and the environmental regulations in the area. A combination of physical, chemical, and biological treatment methods may be required to achieve the desired effluent quality.

It is essential to choose treatment methods that are energy-efficient, cost-effective, and eco-friendly. Additionally, it is necessary to monitor the effectiveness of the treatment methods regularly to ensure that they are operating optimally and to make any necessary adjustments. Proper treatment of textile dye wastewater can significantly reduce the environmental and health impacts of the dye industry, making it more sustainable and eco-friendly.

3.1 Levels of waste water treatment:

Primary, secondary and tertiary, these are the main degrees of treatments. Sometimes, preliminary treatment may also occur.

1. **Preliminary treatment:** This procedure eliminates grit and coarse suspended materials. This improves the maintenance and operations of succeeding treatment unit. At this stage, the flow monitoring tools, frequently standing-wave flumes are required.
2. **Primary treatment:** The sedimentation process removes floating materials and scum by skimming and settling organic and inorganic solids. It can remove up to 50% of BODS, 70% of suspended particles, and 65% of grease and oil, as well as heavy metals, organic phosphorus, and nitrogen. However, it is not effective for removing colloidal and dissolved elements.
3. **Secondary treatment:** This process get rid of suspended particles and leftover11 organics utilizing aerobic biological treatment procedures, biodegradable organic debris which are dissolved also gets

eliminated, also removing organic matter. Mechanical treatment options include trickling filters, rotating biological contactors, anaerobic treatment, oxidation ditches, and stabilization ponds.

4. **Tertiary treatment:** Advanced treatment processes are necessary to remove certain wastewater elements that cannot be removed through secondary treatment. These elements may include bacteria, viruses, heavy metals, biodegradable organics, nitrogen, and phosphorus. The latest technology for this purpose is disc filtration, which involves using large fabric discs attached to rotating drums to filter the water. Once the water has been filtered, it can be disinfected using methods such as chlorine, ozone, or UV rays to meet international standards for agricultural and urban reuse.

3.2 Methods of waste water treatment:

It has been established that both conventional and unconventional wastewater treatment systems are effective at treating wastewater. When compared to unconventional wastewater treatment systems, convectional procedures have a high level of automation, have power and pumping requirements.

- **Convectional method:** This techniques include spinning biological contactors, activated sludge, and trickling filters. This filters are more expensive to construct than activated sludge systems remove less BOD and are temperature sensitive because energy required is more expensive.
- **Activated sludge:** In this process, called the activated sludge process, microorganisms in suspension are used to remove solids and BOD by aerating the wastewater, resulting in bacteria flocs that degrade organic matter and are then separated through sedimentation. This method requires less space than a trickling filter and produces high-quality effluent.
- **Trickling filter:** It is a growth process where microorganisms are responsible for treatment which are attached to an inert packing material. It is made from a round tank filled with a carrier material.

- **Rotating biological contactors:** Here plastic media are sacked vertically on a rotating shaft. With about 40% media immersed, the biomass-coated media are slowly rotated at 1-1.5 rpm and alternatively exposed to wastewater and ambient oxygen. The thickness of the disc and spinning speed varies from 2-4 mm, depending on the strength of wastewater. numerous petroleum plants have installed this depending on their capacity. RBC’s only need a small amount of electricity and can work on the compressor.

- **Non-Convectional method:** These biological treatment systems for municipal wastewater are low-cost, low-tech, and less complex to operate and maintain. When compared with traditional high-rate biological process, these systems uses more area. Some of the unconventional techniques also include soil aquifer treatment, oxidation ditches, stabilising ponds as well as artificial wetlands.
- Waste stabilization ponds.
- Constructed wetlands.
- Oxidation ditches.
- Up flow anaerobic sludge blanket.

- Soil aquifer treatment.
- Faecal sludge treatment and disposal.

3.4 MATERIALS.

- Ferrous sulphate
- Sample of reactive dye wastewater
- Distilled water
- Analysis method

3.4.1 FERROUS SULPHATE.

The chemical ferrous sulphate is the chemical I used in this work to reduce the chemical oxygen demand.**$FeSO_4.7H_2O$**

3.4.2 SPECIFICATION.

	Percentage
Minimum assay by redox titration	99.0%
Maximum limits of impurities	
Free acid(H_2SO_4)	0.245%
Ferric ion(Fe^{3+})	0.2%
Copper (Cu)	0.005%
Lead(Pb)	0.005%

3.4.3 IMPACT OF DISTRILED WATER

In COD testing, water is used to prepare blanks, dilute samples, and rinse glassware. The following water impurities could influence the COD test results.

Organic:

For precise outcomes, it is crucial to prevent the inclusion of any additional organic matter in the sample being analysed since this can lead to the overestimation of the oxygen demand of organic compounds in the water sample. This can be achieved by ensuring that the collection, storage, and analysis of samples are carried out under controlled conditions. Also, it is essential to note that the COD test is more sensitive to certain types of organic compounds than others, which can impact the accuracy of the results. Therefore, it is crucial to select the appropriate analytical method for the type of wastewater being tested and interpret the results accordingly.

Bacteria:

The dilution water should have as little of them as possible because they could release organics.

Ions:

Inorganic substances that are Oxidizable may obstruct the measurement of COD. Chlorides are frequently the most problematic form of interference since they can be oxidised by dichromate and produce falsely high COD readings. The COD test may also be affected by nitrates, sulphides, disulphides, sulphites, thiosulfates, and ferrous ions. Dilution water has been prepared using distilled water, but chlorine may co-distil with the water and affect the COD test. As a result, distilled water would need to be treated with sodium thiosulfate again. Alkaline permanganate distillation was occasionally advised, but this purification method is also very time-consuming. Deionized water can include organics and bacteria and have high COD readings because it is solely treated by ion exchange resins. Since the level of organic contamination of deionized water may vary with time, this test does not call for it. Low levels of organics and oxidizable inorganic compounds can be found in water that has undergone a mixture of processes, including reverse osmosis, ion exchange, electrode ionization, and activated carbon. As a result, the COD exam is best suited for it.

CHAPTER: 4

4: METHODOLOGY.

4.1. Preparation of reactive dye sample.

TEST1:

In a 500 ml beaker; 400 ml distilled water was taken and 0.5 ml reactive dye waste water solution was added. Then add 0.8 g ferrous sulphate in to this solution and let it sit for 24 hours under proper UV lights to remove cod. In this TEST 1, cod was allowed to settle:

TEST 2:

In 200 ml beaker, 200 ml distilled water was taken and 0.1 ml reactive dye waste water solution was added. Then add 0.5 g ferrous sulphate in to this solution and let it sit for 24 hours under proper UV lights to remove cod.

In this TEST 2, cod was allowed to settle:

After taking it for 24 hrs in proper UV light, we can take it for a filtration

4.2. Filtration.

Membrane-based separation processes, such as reverse osmosis, ultrafiltration, and Nano filtration, are commonly used techniques for filtering industrial effluent, enabling the recovery of recycled dyes and reusable water. The treatment process of membrane filtration includes passing wastewater through several membranes with varying mesh sizes and separation mechanisms to produce clean water. Liang et al. conducted a study using nano membrane filtration in combination with the electro-Fenton reaction to treat dye wastewater, which resulted in improved outcomes. Similarly, Liu et al. used membrane filtration with iron nanoparticle reduction to remove various dyes. Despite the success of membrane filtration technology in removing dye from wastewater, it has some limitations, such as the permanent alteration of the membrane, unpleasant odours, and the generation of insoluble wastes that require additional processing. Moreover, membrane filtration may not be effective in removing some contaminants, such as viruses and bacteria, and it can be expensive to operate and maintain. Fouling, a process where contaminants accumulate on the membrane's surface, can lead to reduced efficiency and shorter membrane lifespan, increasing operating costs. However, advancements in technology have led to the development of new membrane materials and coatings that can resist fouling and reduce operating costs. Overall, membrane filtration technology has proven to be effective in treating wastewater, especially in removing dyes, and further research may lead to improved technology with fewer drawbacks.

In addition to these limitations, membrane-based separation processes can be energy-intensive, leading to increased operating costs. Moreover, fouling, scaling, and clogging of the membranes can reduce the efficiency of the process, resulting in a lower quality of treated water. However, ongoing research is focusing on improving membrane materials, design, and operation to overcome these challenges and make the process more efficient and cost-effective.

Despite its limitations, the use of membrane-based separation processes is an important step towards achieving sustainable water use in industries that use large amounts of water, such as textile dyeing. It enables the recovery of valuable resources and reduces the amount of wastewater discharged into the environment. Membrane-based separation processes have the potential to become increasingly important in the treatment of industrial effluent with further development and optimization.

After filtration we can take this filtrate sample for COD testing.

4.3. COD TESTING.

COD stands for Chemical Oxygen Demand, which is a measure of the amount of oxygen that is consumed when all the substances in a water sample are completely oxidized. Unlike BOD (Biological Oxygen Demand), which measures the amount of organic material that is biodegradable over a five-day period, COD measures the amount of oxygen required for complete chemical oxidation of all components in the sample. While there is no specific method or parameter defined for COD, any technique that can oxidize substances and determine the rate of oxidation can be used to calculate COD. Therefore, it is important to avoid any extraneous organic matter that can cause the COD test to overestimate the oxygen demand of organic compounds present in the water sample to obtain accurate results.

4.3.1 APPROVED METHODS.

There are only two major distinctions in approved methods for COD

> COD can be measured using either titrimetric or photometric methods. The titrimetric methods available include EPA 410.3, SM5220 C, ASTM D1252-95,00(A), and USGS I-3560-85. These methods provide instructions for overcoming chloride in excess of 2000 mg/L. The photometric methods available include EPA 410.4, SM522o D, ASTM D1252-95,00(B), and USGS I-3561-85. However, EPA 410.4 does not contain provisions for low-level determinations. Both methods involve the chemical oxidation of organic compounds in a sample followed by the measurement of the oxygen demand. The choice of method will depend on factors such as the required sensitivity and the presence of interfering substances in the sample.

4.4. Method summary.

A portion of the sample is processed for two hours at 150°C with sulfuric acid and dichromate present. The resultant solution is read on a spectrophotometer at the proper wavelength or titrated to a coloured endpoint with ferroin indicator.

4.4.1. Method procedure.

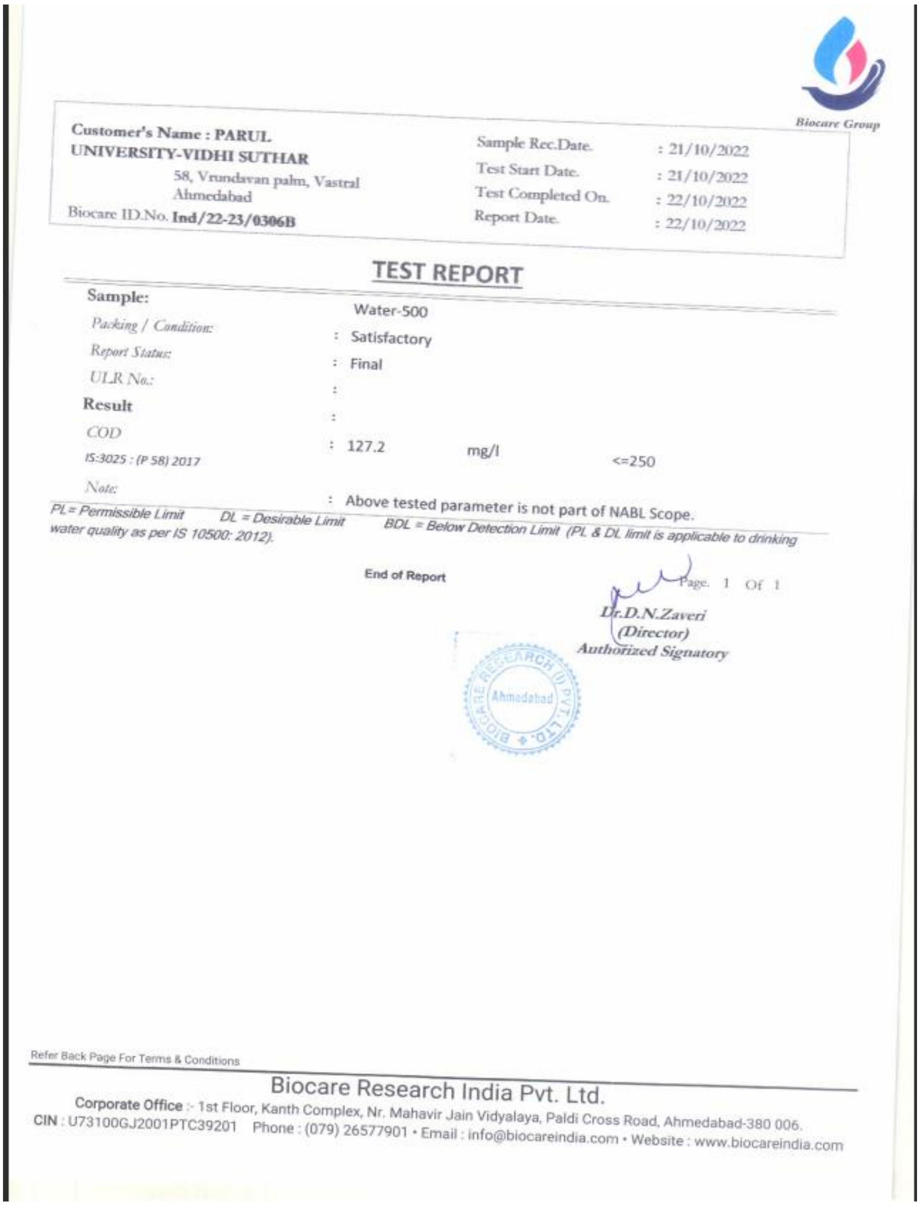
1. Collect the sample using a suitable container and preserve it by adding the correct amount of sulfuric acid.
2. Properly label an adequate number of COD vials that have been manufactured (without mercury for non-regulatory samples).
3. Start the COD reactor and confirm the temperature at 150°C. Mix or shake the sample, add 2 mL of the sample or standard to each vial, and replace the cap.
4. Be careful handling the tubes because they will get quite hot when the samples or standards are added.
5. After reaching the desired temperature, place the vials with the samples or standards in the reactor and set the timer for two hours.
6. The vials with samples or standards must be taken out of the COD reactor after 2 hours and cooled down to room temperature. The cooling process should not be accelerated as it could cause dangerous leaks and the vials may break. It is important to handle the vials with caution after digestion as toxic gases may have built up under high pressure. Proper protection and ventilation should be used when opening the vials. It is strictly prohibited to open the vials after digestion if participating in the COD disposal program.
7. Read the absorbance after setting the right wavelength on your spectrophotometer.

CHAPTER: 5

5: RESULT

5.1. RESULT OF THE TEST 1 REACTIVE DYE WASTE WATER.

COD VALUE:


Biocare Group

Customer's Name : PARUL UNIVERSITY-VIDHI SUTHAR
58, Vrundavan palm, Vastral
Ahmedabad
Biocare ID.No. **Ind/22-23/0306B**

Sample Rec.Date. : 21/10/2022
Test Start Date. : 21/10/2022
Test Completed On. : 22/10/2022
Report Date. : 22/10/2022

TEST REPORT

Sample:	Water-500		
Packing / Condition:	: Satisfactory		
Report Status:	: Final		
ULR No.:	:		
Result	:		
COD *IS:3025 : (P 58) 2017*	: 127.2	mg/l	<=250
Note:	: Above tested parameter is not part of NABL Scope.		

PL = Permissible Limit DL = Desirable Limit BDL = Below Detection Limit (PL & DL limit is applicable to drinking water quality as per IS 10500: 2012).

End of Report

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5.2. RESULT OF THE TEST 2 REACTIVE DYE WASTE WATER.

COD VALUE.

Biocare Group

Customer's Name : PARUL UNIVERSITY-VIDHI SUTHAR
58, Vrundavan palm, Vastral
Ahmedabad
Biocare ID.No. **Ind/22-23/0306A**

Sample Rec.Date.	: 21/10/2022
Test Start Date.	: 21/10/2022
Test Completed On.	: 22/10/2022
Report Date.	: 22/10/2022

TEST REPORT

Sample:	Water-200		
Packing / Condition:	: Satisfactory		
Report Status:	: Final		
ULR No.:	:		
Result	:		
COD IS:3025 : (P 58) 2017	: 33.92	mg/l	<=250
Note:	: Above tested parameter is not part of NABL Scope.		

PL= Permissible Limit DL = Desirable Limit BDL = Below Detection Limit (PL & DL limit is applicable to drinking water quality as per IS 10500: 2012).

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CONCULSION.

Water is essential to our survival, and wastewater is an inevitable by-product of human activities that can become contaminated or altered in quality. Proper treatment and management of wastewater can contribute to public health and a safe environment. There are two main approaches to wastewater treatment - conventional and non-conventional - which are selected based on a range of factors, including the composition of the wastewater, technical specifications, maintenance requirements, potential environmental impacts, and energy consumption. These methods use different techniques to remove pollutants from the water and make it safe for reuse or discharge into the environment. The choice of treatment method is crucial for achieving efficient and effective results while also minimizing any negative impacts on the environment. Careful consideration of the factors mentioned above is necessary to select the most appropriate treatment approach for a given situation. While low-tech and cost-effective techniques have been successful in some developing countries like Ghana, some systems such as trickling filters and activated sludge have faced challenges. However, these issues can be addressed with proper attention and financial support.

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