Modeling of certain physico-chemical parameters by Matlab Software in wastewater treatment protocols

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Abstract— the object of our work is to define the coupling between the various geological-biological, hydro-hydrodynamic, aerobic-anaerobic physicochemical tools in the study of wastewater and their impact on environmental pollution. This study allowed us to determine the evolution of some parameters of pollution in time and space. Indeed, the synthesis of this study on the quality of surface water indicates the existence of a high pollution of these waters due to the various urban and industrial discharges [1].

The evolution of the heavy metal contents in this wastewater shows the cause of several factors, namely: The variation of the pH-Eh, the existence of a strong physicochemical infiltration, the adsorption and desorption in the form of an oxidation-reduction of heavy metals and the intensive use of fertilizers and industrial chemicals coupled by wastewater. The effect of the storage of these products in the soil promotes the increase in the salinity of the Wastewater due to the infiltration of surface water [18] [19].

In order to protect our environment against pollution, a risk map must be draining up, based on the hydrodynamic characteristics of the soil, the directions of ground and surface water flow, the position of the industrial sites and the types of different types of pollution by sewage.

Key words: pollution, wastewater, heavy metals, infiltration, adsorption, oxidation,

I. Introduction

WASTE water or polluted water are all water resulting from domestic, agricultural and industrial activities loaded with toxic substances that enter the sewerage pipes. The latter also include rainwater and its polluting loads. They give the receiving environments all kinds of pollution and nuisances. Water pollution understands as an unfavorable or harmful modification of physico-chemical and biological properties, produced directly or indirectly by human activities [2]. According to the origin and quality of the polluting substances, four categories of wastewater can be distinguishes: domestic, industrial, runoff, agricultural, etc.

II. Wastewater

Domestic water: They come from homes and are transporting usually by the sewage network to the sewage treatment plant. These waters are characterizing by high levels of organic matter, mineral salts (nitrogen, phosphorus), detergents and fecal germs [3]. Domestic wastewater contains suspended minerals, food substances based on organic matter (carbohydrates, lipids, proteins, etc.) and detergents. They come from sanitary facilities and are very rich in hydrocarbons, nitrogen and phosphorus. The latter represent a suitable substrate for biological treatment processes and are rich in pathogenic elements (bacteria, viruses and various parasites) [30] [4].

Industrial wastewater: They come from factories and are characterized by a great diversity of organic matter and fat (food industry), metallic salts (surface treatment, metallurgy), acids, bases, various chemicals, hot water (cooling circuits of thermal power stations), radioactive materials (nuclear power stations, radioactive waste treatment, hospitals). Agricultural waters whose agricultural effluents contain various substances of agricultural or animal origin, namely solutions of fertilizers leached by heavily fertilized soils, plant protection products (pesticides) and animal manure (manure and livestock manure). In adding, mainly rainwater or runoff, which is a major source of pollution in watercourses [5-13-31].

III. Different types of water pollution

In urban areas, households, institutions, businesses and industries generate wastewater daily. However, their characteristics change depending on the type of use. For example, domestic wastewater is characterizing by the presence of nitrogen compounds, micro-organisms, pharmaceuticals, greases and detergents. This heterogeneous composition may involve other types of

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pollution such as; organic, chemical, physical and microbiological.

Chemical pollution: the chemical oxygen demand (COD) is the oxygen consumption, expressed in (mg/l), under the conditions of an oxidation reaction in the presence of the sulphide, in the presence of a catalyst, by the oxidizable matter of water. These oxidizable materials are dissolved or particulate and of mineral or organic nature. The chemical oxygen demand (COD) is representative of the quantity of organic matter oxidizable by the chemical reaction [7]. As an index, COD and BOD have some similarities. The difference between COD and BOD results solely from the oxidation of biodegradable organic matter and by the action of bacteria. When COD is high and suspended matter is small in an urban effluent, there is evidence of industrial water discharge [7-18].

Total Nitrogen: Nitrogen in wastewater measured in different forms, and divided into two main families for purification: reduced nitrogen and oxidized nitrogen. Reduced nitrogen is the organic nitrogen found in wastewater, particularly from metabolic waste (proteins, ureas). In sewage networks, hydrolysis of urea converts nitrogen to ammonium carbonate.
Oxidized Nitrogen: is mineral nitrogen found marginally in wastewater, nitrate NO3~ and nitrite NO2. [8]

The nitrates (NO-3): Nitrates are the final stage of oxidation of organic nitrogen in water. Nitrating bacteria (Nitrobacter) transform nitrites into nitrates. This reaction calls nitration and accompany by an oxygen consumption [9]:

$$2NO_2\text{-}+O_2\text{Nitrobacters)} \longrightarrow 2NO_3.$$

Nitrates are not toxic; but high levels of nitrates cause an algal bloom that contributes to the eutrophication of the environment. Their potential danger nevertheless remains relative to their reduction in nitrates.

Nitrites (NO_2^-): The nitrite ions (NO_2^-) are in an intermediate stage between ammonium (NH4+) and nitrate ions (NO_3^-). Nitrifying bacteria, (Nitrosomonas) convert ammonium into nitrites. This operation, which requires a high oxygen consumption, is nitritation. Nitrites come from the bacterial reduction of nitrates, called denitrification.

$$4NH_4^+ + 7O_2 \longrightarrow NO_2\text{-} + 6H_2O + 4H^+.$$

Nitrites are a poison dangerous to aquatic organisms, even at very low concentrations. Its toxicity increases with temperature. They cause a degradation of hemoglobin in the blood of fish that can no longer carry oxygen. The result is death from asphyxia [9]. In infants, the inability of the blood to transport oxygen is methaemoglobinaemia [9-10].
Nitrogen Kjeldahl = Ammoniacal nitrogen + Organic nitrogen [9]. NTK is a parameter used by regulation to limit the release of nitrogen into the natural environment. Plants and animals continuously recycle organic nitrogen, the major component of proteins. The Ammoniacal nitrogen is present in solution in two forms; ammonia NH3 and ammonium NH4 +. Their relative proportions depend on the pH and the temperature of the medium. Ammonium is often dominant; therefore, this term is using to describe ammoniacal nitrogen. In an oxidizing medium, ammonium is convering into nitrites and nitrates; which leads to high oxygen consumption [10]. The nitrogen concentration of urban wastewater varies between 30 and 100 mg/l. However, in general, these waters consist of ammonia nitrogen NH4+ at about 60%, organic nitrogen 40%, less than 1% nitrogen nitrate, and nitrous nitrogen [8-9-11].

Total nitrogen = (NH4+) + (Kjeldahl nitrogen) + (Nitrites) + (Nitrates) [10].

Phosphorus: Phosphorus is present in water in several forms: phosphates, polyphosphates, organic phosphorus; the most important inputs come from human and animal dejections, and especially from washing products. Phosphorus compounds are undesirable in drinking water distribution tanks because they contribute to the development of algae and more generally aquatic plankton. Disruptive eutrophication agents in the natural environment. Phosphates do not have a health impact and polyphosphates are authorizing as adjuvants for the prevention of scaling in networks. [12]

Organic pollution: Organic pollution is expressed in biochemical oxygen demand (BOD), expressed in (mg/l) [6]. BOD shows the amount of biodegradable organic compounds by microorganisms. Biodegradation is a process that often takes place in the presence of oxygen. [7-26]

Physical pollution: Color, temperature and odor are all indicators of the physical pollution of a water. Changes in these parameters are generally relating to the presence of suspended solids (TSS) that affect water quality, including water turbidity. Indeed, much polluted water that is very turbid is often too loaded with suspended matter. [8-31]

Color: A domestic wastewater should normally look grayish in color. On the other hand, the older this water gets in the sewer network, the more it tends towards black. This change in color is due to bacterial activity, which consumes all the oxygen to produce hydrogen sulphides (H_2S), which makes the septic effluent and produces foul odors [3].

Odor: They accompany the smell and the color of a wastewater. The darker the color, the stronger and more unpleasant the odor. This is mainly due to the presence of hydrogen sulphide (H_2S) [4].

Temperature: The temperature of a wastewater is normally higher than that of the drinking water. It can be notes that there is a correlation between the color, the odor and the temperature of the wastewater. Indeed the higher the temperature of the wastewater the stronger the bacterial activity, which causes a change in the color and the odor of the wastewater.

Suspended matter: The very fines particles, which are undissolved in water (sand, clay, organic products, particles of pollutants, microorganisms), which give a turbid appearance to the water (turbidity) oppose the penetration of the light necessary for aquatic life. In very large quantity, it constitute a solid pollution of the waters [31].

Microbiological pollution: This pollution link to the presence of living microorganisms present in the polluted water and can affect human health drastically [8]. Most microorganisms found in wastewater. Protozoa: They are present in the wastewater in the state of cysts. The main pathogenic form for humans is (Entamoeba-histolytica), it is the agent responsible for amoebic dysentery [14]. Helminths: Wastewater can carry a large number of parasite helminths of human or animal origin. Most of these parasites are excreting in the external environment in the form of fecal eggs, and the number and variety of helminth eggs in the wastewater is relating to the level of infestation of the human population and / or animal services. Viruses: Viruses are founding in wastewater at concentrations of the order of thousands of infectious units per milliliter of water. Among water-borne viral infections, polio and hepatitis are founding [15]. Faecal coliforms: Faecal coliforms, or thermo-tolerant coliforms, are a sub-group of total coliforms capable of fermenting lactose at a temperature of 44 ° C. These are Gram (negative), aerobic and optionally anaerobic rods; non-sporulation, they are often referred to as Escherichia Coli although the group comprises several different strains [16] [17].

IV. The various treatment protocols

Screening: During the screening process, the waste water passes through a grid whose bars, which are more or less spaced apart, which hold the bulk materials carried by the raw water and which could impair the effectiveness of the following treatments. The screening also makes it possible to protect the station against the untimely arrival of large objects, which may cause plugging in the various units of the installation. The selected elements are then disposed of with the household waste [20].

Sandblasting: The object of sandblasting is to extract raw water such as gravel, sand and fine mineral particles. This protocol used to prevent deposits in the ducts, to protect pumps and other devices from abrasion. The flow of water at a reduced speed in a basin results in a strong deposit at the bottom of the structure. The sands recovered by suction are drained and then washed or they are sent to landfill as they can be reused according to the quality of the washing [21].

Oiling-degreasing. Deoiling is a liquid-liquid separation operation, whereas degreasing is a solid-liquid separation operation at a sufficiently low water temperature to allow the fat to freeze. These two processes can eliminate the presence of fatty substances in wastewater, which can impede the effectiveness of a subsequent biological treatment [22].

Decantation: The primary treatment is a simple decantation carried out in settling ponds, the size of which depends on the type of installation and the volume of water to be treated. Similarly, the residence time of the effluents in this basin depends on the quantity of material can be eliminated and the capacity of the installation. At the end of this treatment, decantation will have eliminated about 60% of the suspended matter, about 30% of the biological oxygen demand (BOD) and 30% for the chemical oxygen demand (COD). The suppressed matter forms at the bottom of the decanter a bed of primary mud. In the settling ponds, the overall elimination efficiency of helminth eggs is between 50 and 90%. Protozoal cysts are very small with a sedimentation rate is too low, they are eliminated below 50% [23-26].

Organic treatment: The primary objective of organic or secondary treatment is the removal of soluble compounds of organic origin. At the same time, the flocculation of the biomass makes it possible to trap the suspended solids, which are present after the treatment by decantation. The principle of this treatment is to bring the organic matter contained in the wastewater into contact with a bacterial population. These bacteria then assimilate the organic matter for their own development. These devices make it possible to intensify and localize on reduced surfaces the phenomena of transformation and degradation of organic matter as they occur in natural environment [24].

Secondary treatment processes based on microbial digestion in both the presence and absence of oxygen to reduce the concentration of organic matter [25]. Several techniques can be distinguished the choice of one or the other depends on the location available for the treatment process, the load of the effluent and the amount of pollution to be treated. Bacteria are the most active microorganisms because they have a good mode of development. For this, they are classified into two treatment processes; aerobic and anaerobic conditions [25].

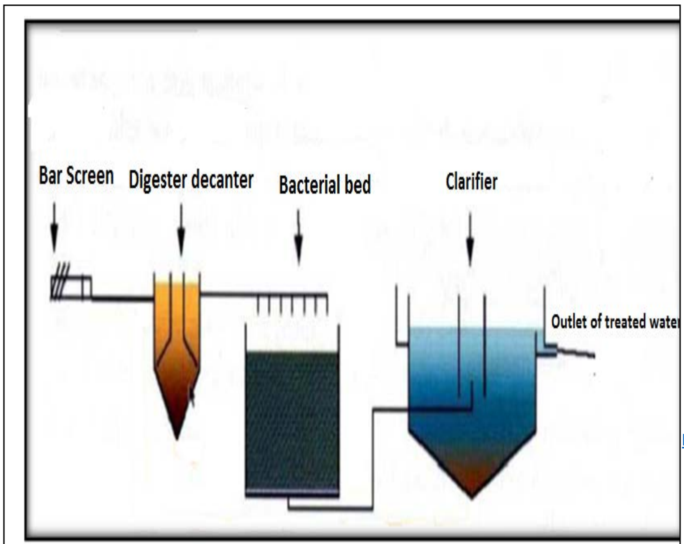
Anaerobic treatment: Anaerobic secondary treatment is a microbiological process of conversion of organic matter, involving mainly bacterial populations as well as protozoa and some anaerobic fungi. The principle of anaerobic digestion is described as the conversion of organic matter into biomass and biogas, mainly composed of methane (CH_4) and carbon dioxide (CO_2) [25].

Aerobic treatments: The bacteria used require a permanent supply of oxygen.
Two main families can be distinguished fixed culture processes (microorganisms fixed on supports) and free culture processes (microorganisms kept in suspension in the mixture to be purified) [29].

Activated sludge: The activated sludge process is the most widespread in the world. Its development is due to its strong performance against carbon, nitrogen and phosphorus pollution. The principle of this process is simple: it is the elimination of the pollutant compounds in aerobic mode by a free biomass. The oxygen of which is supplied by the aeration. Pollution happens continuously. Its degradation is aerobic and assured by a suitable, sufficient and constant biomass. It is then necessary to separate the clear water from the biological sludge. The aeration-brewing couple allows aerobic maintenance during bio elimination. The recirculation and extraction of biological sludge, from the bottom of the clarifier, maintains a constant biomass in the basins. The clarifier or secondary clarifier recovers the clear water, treated at the end of treatment. The activated sludge treats the wastewater by contact with a biomass held in suspension and aerated in an activation tank. Activated sludge is can be considered as a living organism that feeds, breathes, develops and dies [29].

V. Bacterial Beds

The bacterial bed process consists in supplying a pre-decanted water to a neutral substrate containing a mass of materials and serving as a support for the microorganisms, which form a biological film responsible for the assimilation of the pollution. In bacterial beds, the active mass of the microorganisms fixed on inert porous supports having a vacuum rate of about 50%, through which the effluent to be treated is decanted to prevent the clogging of the filtering material. In a first stage, the effluent distributes as evenly as possible on the surface of the filter [6]. The distribution is ensuring either by fixed distributors feeding perforated tubes or by mobile systems of the rotary sprinkler type. The remaining sludge in the effluent will then be separating from the treated water in a clarifier. A recirculation of part of this water to the digester decanter is necessary to maintain conditions of self-cleaning and dilution of the raw effluents [5-31].



A technique using fixed cultures consists of rotating biological disks. The microorganisms develop and form a scrubbing film on the surface of the disks. The discs being semi-immersed, their rotation allows the oxygenation of the fixed biomass. The wastewater, previously decanted in the work in which discs fixed on an axis are rotated at slow speed. On these plastic biological disks a bacterial film develops. During their emersion, these bacteria take the oxygen necessary for their respiration and during immersion; they absorb dissolved pollution from which they feed.
As soon as the biological film exceeds a thickness of a few millimeters, it detaches and drives towards the final decanter where it is separating from the purified water. The sludge-trapped returns pumped back to the head structure for storage and digestion [32].

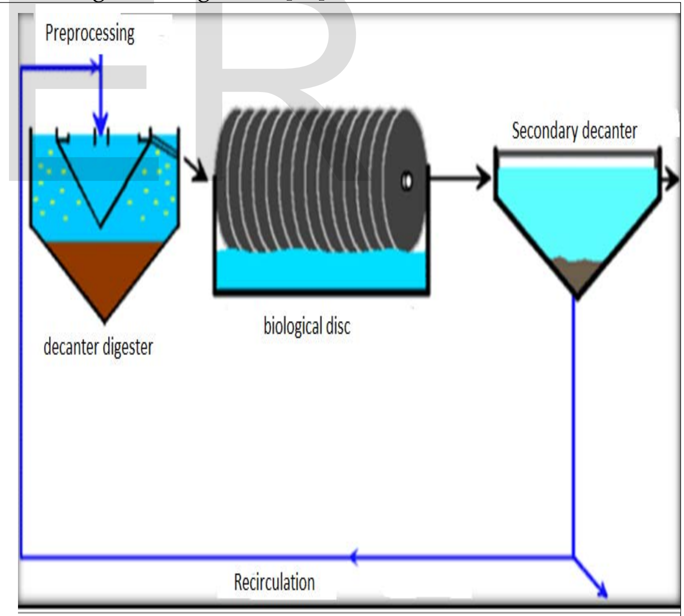
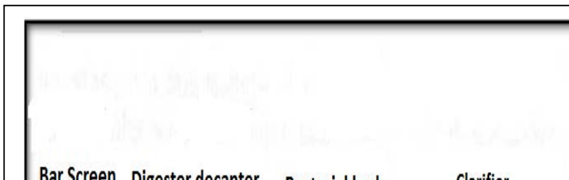


Figure 2: Diagram of a biological disk system

Free culture aerobic processes: These processes require a large space where the system purifies by the use of solar energy to produce oxygen through photosynthesis. This system requires a very long residence time and a large area of treatment. Two main types of processes are using Lagunage and infiltration / percolation.

V.1 The lagoon



Lagooning is a purification process, which consists in circulating effluents in a series of basins for a sufficiently long time to carry out the natural processes of self-purification. It is using in very sunny regions, in shallow basins. This simple process requires large surfaces because the reaction time is very long. For the lagooning to take place under the best aerobic conditions, while avoiding odors and the proliferation of insects, a primary decantation of the effluents must be providing. There are two types of lagoon: one is natural and the other is aerated. Natural lagooning, which is the purification of effluents, is carrying out essentially by aerobic bacteria whose oxygenation is ensuring by the chlorophyllian action of plants, which also participate in the direct synthesis of organic matter. There are three main types of natural lagoon according to the depth of the basins, their number and their mode of operation.

Microphyte lagoons

Small plants, contains deep basins (more than 1m): this system eliminates nitrogen poorly and rapidly eutrophies. Macrophyte lagoon: (large plants) Contains shallow basins (0.3 to 0.5m) for plants to grow there. Mixed Microphyte and Macrophyte Lagoon: Includes a first deep basin of 1m and the following two (3) shallow basins (0, 3 to 0.5m). This last technique of lagooning is the simplest and the most efficient. [29]

V. 2. Aerated Lagoon

By supplying the oxygen by mechanical means, the necessary volumes are reducing and the depth of the lagoon can be increasing. The concentration of bacteria is greater than in natural lagooning. The residence time is of the order of one week and the depth of 1 to 4 m. The yield can be 80% and there is no recycling of sludge. The homogenization must be satisfactory in order to avoid deposits. Some industrial waste treated by this process, which remains valid for very slowly biodegradable organic products. The stirring is making by turbines fixed on floats moored in the center of the basin [33].

V. 3. Infiltration-percolation

Infiltration - percolation involves treating the water through the soil or a massive filter. This purification system consists in infiltrating pretreated wastewater into an unsaturated granular medium on which is retained the purifying biomass. Sand filtration in an unsaturated medium mainly serves to oxidize organic matter and to reduce pathogenic germs. Removal of suspended solids by infiltration-percolation allows the removal of the microorganisms attached to it and the adsorption of free bacteria by the sand grains of the filter. Then a contaminated biological film is formed is mainly in the upper part. This film will allow microbial degradation of organic matter and dissolved substances in the effluent (phosphates, nitrates etc...) [29].

Tertiary treatment

The water is releasing into the natural environment so they have to undergo a complementary treatment, which allows a reuse of these waters for industrial or agricultural purposes.

Disinfection

Is using when the receiving medium is sensitive and requires removal of bacteriological pollution. For an illustrative culture or bathing environment, one finds the use of chlorine, which allows a persistent disinfection throughout the distribution network, as well as the treatment by the ultraviolet, which destroys the pathogenic germs.

Sludge treatment

Almost all-urban wastewater treatment processes, whether biological or physicochemical, lead to the concentration of pollutants in the form of sludge. This sludge constitute voluminous waste, since they generally contain between 95 and 99% of water and cause nuisance to the extent that they consist of fermentable organic matter and may still contain toxic substances. The problem of sludge is a phase of fight against pollution that proves difficult for multiple reasons, namely; the scarcity of land available for spreading or for depositing, the necessities and demands of the environment and public hygiene.

This treatment takes place in two possible cases

The reduction of the fermentable capacity of the sludge in order to limit or even cancel the olfactory nuisances. Reducing the volume of sludge to facilitate handling. This operation consists in ensuring more or less elimination of the moisture of the sludge and is generally carried out in two modes; a preliminary concentration of the sludge by thickening and a prior mechanical dewatering of the sludge. For the final destination of the dehydrated sludge, one of the following three solutions considered as landfilling, agricultural recovery or incineration.

Dissolved oxygen it is founding in watercourses as a result, of contact between air and water and through the photosynthesis of algae and aquatic plants. The dissolved oxygen depends on the temperature of the water, the brewing phenomenon, the oxygen consumption by the animals, the plants and the bacteria, which degrade the organic matter. Photosynthesis of plants and algae can vary the rate of dissolved oxygen over a 24-hour period, between day and night.

Measurement protocols of some Physic-chemical parameters in wastewater. In order to study the impact of industrial area discharges on water quality, samples were taken monthly at the time of plant activity. The pH and redox potential are measuring by a portable pH meter and temperature by a thermometer. Similarly, the conducti meter and COD gave conductivity and salinity. The dissolved oxygen values were measuring using an oximeter measured BOD5 with the OxiTop system integrated in an oven at a temperature of 25 ° C for five days.

Measurement of dissolved oxygen

Dissolved oxygen (O.D.) measured in milligrams of oxygen (O2) per liter of water (mg/l) or percentage saturation. The percentage of saturation expresses the amount of oxygen present in the water relative to the total amount of oxygen that the water can contain at a given temperature. It should be note water temperature, time of sampling and weather conditions of the last hours.

VI. APPLICATIONS

VI .1. The different processing protocols and the data modeling by Matlab software:

The results are taking from several PhD thesis titles (Morocco) and treatment companies [28]. A study carried out by ONEP, the purpose of which is the qualitative classification of wastewater in Morocco by a few parameters such as BOD5, COD, suspended matter and the rate of return according to the size of the center table1.

Table 1: Degradation indicator reports

Report	Conventional values for domestic wastewater	Meaning
DCO /DBO_5	2.5	Informs on the mixing of the effluent and gives indicators on the treatment
%DCO	30% (DCO total)	The nutritional balance of the effluent.
MES/DBO_5	0.8 - 1.2	The production of mud.
[illegible]	[illegible]	Informs about the organic

During the sewage treatment process, there are reports, which inform about the degradation of the polluting load; these reports summarized in Table 1 above.

Classification in comparison with France and the United States:

In accordance with the methodological approach described above, the treatment is carrying out on all the selected centers (result on a national scale). The minimum value and the maximum value are taking directly.
This inevitably leads to the adoption of values of the median as characteristic parameters of Moroccan wastewater, namely.

VI. 2. Characteristics of releases:

Liquid discharges

According to these data, the plant produces a volume (5liltrs/second) of wastewater in the receiving environment during its activity. These waters have a nauseating unpleasant odor because there is degradation of the organic matter by the aera-anaerobic bacteria. The firm salt content gives a grayish to whitish color. Similarly, the temperature governed by their thermodynamic and kinetic characteristics plays a role in physic-chemical and biological reactions. For this, we present four curves of different parameters.

Hydrogen potential (pH)

The results noted in Fig. 3 show that the pH values of the wastewater oscillate between an acid pH of 5.8 - 11.16 basic. These values are not acceptable according to the limit values for rejections proposed by the Standards and Standards Committee. Generally, the pH values of the receiving medium, between upstream and downstream, remain between a minimum extreme value of 6.80 and a maximum extreme value of 8.36 (Fig. 3).

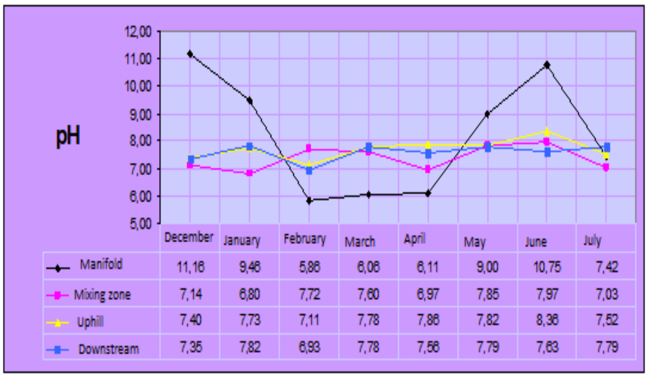


Figure 3: Monthly change in the pH of the wastewater

The values of the basic pH of the effluent are explaining by an evacuation of an enormous quantity of detergents. Anionic surfactants contained in detergents; are recognizing as toxic to aquatic fauna and flora from concentrations of

(100 µg/l) [40]. Wastewater discharges result in a low pH value, since the organic matter is present in excess. The latter promotes microbial activity and increases the production of CO2 and some acidic compounds. Anaerobic degradation of organic matter releases CO2 and causes a decrease in pH. This parameter also varies according to the origin of the waters examined and the presence of oils and acid products.

Acidic releases lead to an acidification of the aquatic receptor environment, which leads to the death of certain species not adapted to these new conditions of life. Acidification of the medium may also occur on the physic-chemical properties of certain heavy metals and thus modify their bioavailability for organisms and their toxicity.

Electrical conductivity: This parameter characterizes the total mineralization of a water. Distilled water has a conductivity close to zero while seawater has an average conductivity of (50 mS/cm). In some bibliographic data in wastewater, a high value of 2700 mS / cm was exceeding.

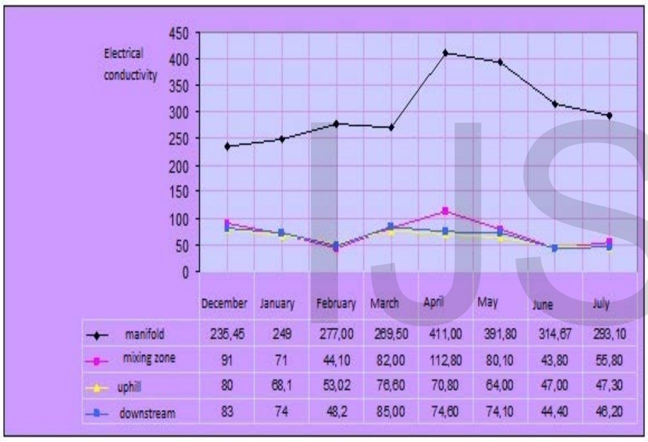


Figure 4: Monthly change in the electrical conductivity of wastewater

Salinity

A high degree of salinity was also recording at the receiving medium with a maximum value of the order of (113g/l). This high salinity content highlights the state of pollution of the environment known by the evacuation of very high levels of salinity (253.8 g/l) - (380.5g/l) (Fig 5).

Figure 5: Monthly change in the salinity of the wastewater

The redox potential

The results of the redox potential show that the values obtained are generally negative. The evolution of this parameter in wastewater varies from (-234 mV) to (+49 mV). On the other hand, the values of the redox potential recorded in the mixing zone are between (-83 mV) and (+1mV) (Fig. 6).

The reductive nature of wastewater and the receiving environment reflects the anoxia of these media as a result, of the depletion of dissolved oxygen used by aerobic bacteria and in addition to the installation of the anaerobic processes that follows.

According to the surface water quality grid proposed by the Standards and Standards Committee, this scour gives a very bad aspect to the water quality of the receiving environment (Figure 5).

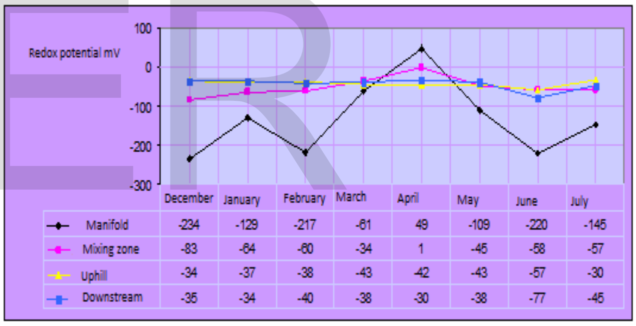


Figure 6: monthly change in the redox potential of wastewater

Sulphides, sulphites and ferrous iron are reducing agents found in effluents. They react on the consumption of oxygen. In addition, organic matter is not toxic, but its presence in drinking water can cause public health problems. This has done by the formation of toxic compounds after several reactions, with the halogenated compounds or by bacterial revivification.

Solid Releases

The organic and mineral filler: the quantity of solid waste organic material discharge into the external medium. Sewers using water to facilitate this elimination. When organic matter settles at the rejection level, bacterial degradation processes occur and biochemical oxygen demand rises. This phenomenon favors an oxygen deficiency in the receptor medium and will be using by the aerobic bacteria at the level of the upper layer, from the first millimeters of its surface. In the end, there is an intense production of nutrients like orthophosphate, nitrate, nitrite, CO_2, etc . [35].

Organic Matter + O_2 → NH_3 + H_3PO_4 + H_2O + CO_2.

At the level of the inner layers of the waste, dissolved oxygen depletes as degradation processes occur. The balance is then broken and so-called "anaerobic" processes put in place. Similarly, in the presence of dissolved oxygen, ammonia is converting into nitrates (NO_3^-) by the action of nitrifying bacteria. The nitrite ion (NO_2^-) is the intermediate product of the decomposition of ammonia into nitrate. It is present in the middle, when the oxygen concentration is low [34]. The succession of oxidation reactions shows that the use of sulphates by sulfato-reducing bacteria constitutes a deferred consumption of dissolved oxygen. The return of sulphides to the sulphate form in the anoxic surface layers constitutes a biochemical oxygen demand.
Several authors have described this anoxic crisis process [41]. Causing the mortality of the individuals present and it also promotes the remineralization of the biomasses present in the study area.

VII. Conclusion

The development of the industry in Morocco is the source of the major discharges into water, air, soil, coastal and environmental pollution, the impact of which is perceptible on ecosystems [43]. Biological treatment is widely applied for the depollution of water in urban areas does not allow treating all types of contaminants, especially those industrial wastewater that contain organic compounds non-biodegradable or bactericidal and persistent. These are technologies, based on the production of reactive, oxidizing, non-selective species, which will allow the oxidation of a large number of organic pollutants [42]. The elimination of these toxic pollutants is necessary before the wastewater can be recycled or treated in a treatment plant. Indeed, many chemical or physical processes are in sustainable application.

This study allowed us to evaluate the purification performance of any wastewater treatment plant by different treatment methods. The purification yields of the main physicochemical parameters (BOD5, COD, MES) are the factors of pollution loads. A characterization of domestic raw sewage is carrying out by comparing the ratios (COD / BOD5) and (MES / BOD5) with the usual ratios of urban wastewater. The yields noted are BOD5 (5% compliance), COD (45% compliance) of anaerobic ponds; BOD5 (15% compliance), COD (60% compliance) and TSS exceed 56% compliance [28].
The minimal purification performance required by wastewater treatment plants does not achieved in terms of the proliferation of recorded data. The under-loaded operation of the STEP with the infiltration of parasitic water into the sewage network promotes the accumulation of sludge in the anaerobic basins, which influences the residence time and causes the passage of sludge from the anaerobic basins to the options [44]. The wastewater is heavily loaded with pollutants and various contaminants, which poses the problem of the health risks associated with a Reusing its Purified Wastewater and the very thorough and necessary treatments.

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