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PERFORMING SYSTEM FOR PURIFYING WASTE WATER

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ABSTRACT

Status of water pollution can be controlled and reduced. For this purpose it uses two types of processes, applied more or less consistently by the management and technical design. The first group of processes is characterized by a "preventive manner of driving" and includes all methods aiming at limiting discharge residue in water.

KEYWORDS: water pollution, purification, filtration performance

1. Introduction

Water is recognized worldwide as the main source to support life on Earth. In its natural state, water is found, mainly in three forms:

- liquid form, which is the predominant form;
- in solid form (ice, snow);
- in the form of vapor in the atmosphere and the clouds.

In nature, there is chemically pure water practically. Water will always contain, along with atoms of hydrogen and oxygen and, also, atoms of other substances, organic or inorganic, and even living organisms.

Depending on the substances contained and its concentration, there are two main types of water:

- water that can be consumed for drinking and cooking food,
- water which cannot be used for drinking or cooking because it contains hazardous chemicals dangerous for human beings, known as industrial water.

2. Water pollution

Maintaining water purity in the natural form means to maintain the content of salts and gases, and micro-organisms specific to a natural unspoiled waters. By means of water pollution, according to the conclusions of the international Conference on this issue (Geneva 1961), "*changing the composition or status of water sources occurred as a result of human activity so that the waters become less appropriate for all or only some of the uses, that can gain its natural state.*" A city or an industrial complex, which has more channels to discharge wastewater and house residue, is a generator of multiple pollution. Pollutants in water under the form of suspensions (Figure 1) or other many components may fall into the following categories: organic substances; organic residues; non organic residues; radioactive substances; petroleum products; pathogenic microorganisms; hot water.

The volume of industrial waste water is generally 70% higher than the municipal waste water, and loading its harmfulness is much larger. Currently, the "range" of pollutants has diversified enormously, as a result of spectacular industrial growth in recent decades. Waste water, from the hostage complex has a special cleaning system, because of its large organic load.

Waste water from mining contains metals, inorganic pollutants, toxic products, dissolved or in suspension. In sectors where nuclear technology is developing, special precautions are necessary because of the effluent which contain radioactive substances can trigger "cascade pollution"; thermal energy released by hot water discharges cause pollution of rivers and lakes.

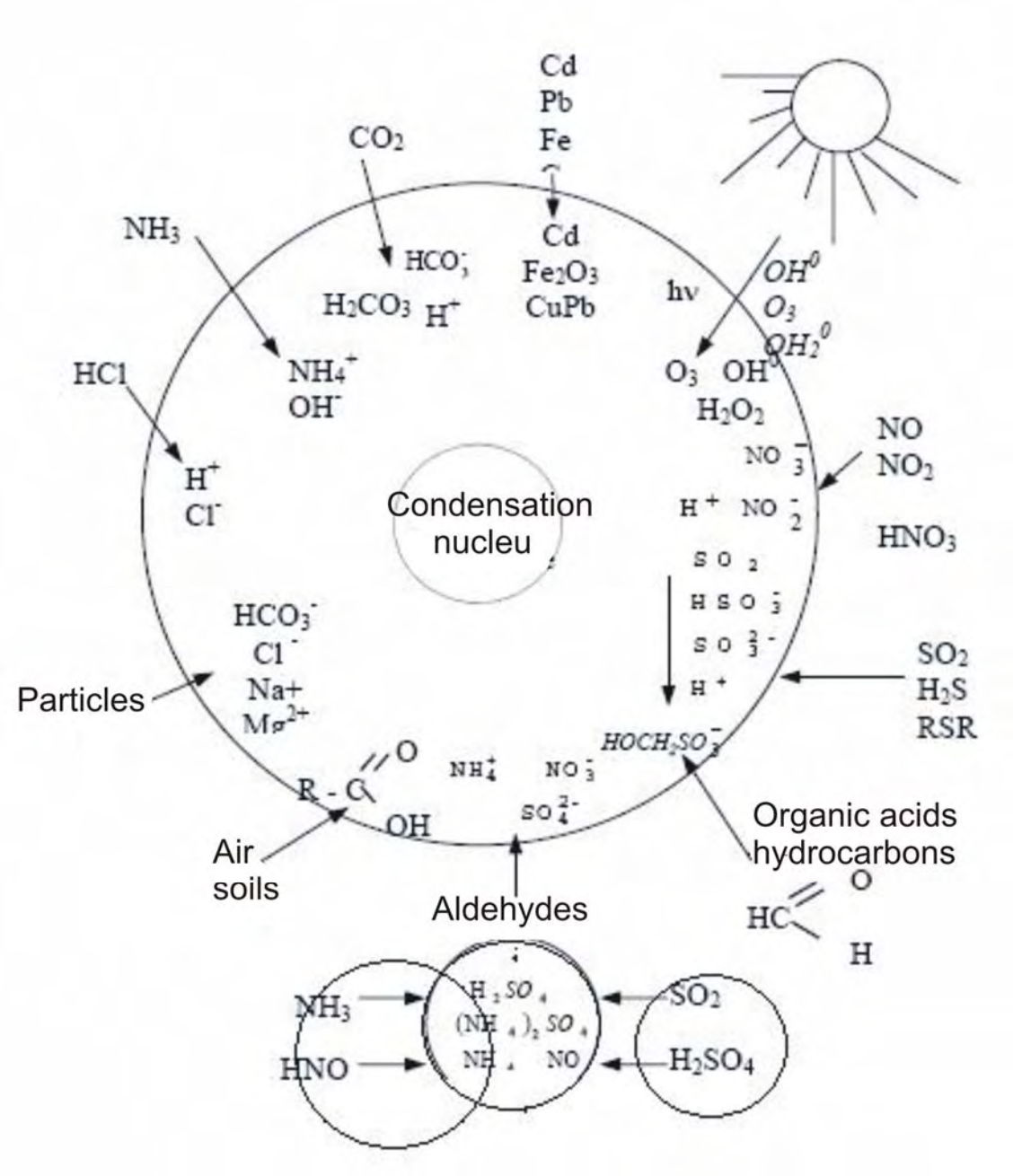

Fig.1. *Influence of environmental pollution on a drop of water.*

3. Water pollution data

The design stage of the industrial installations, transportation, utilities, etc., has adopted a concept which corresponds to a diametrically opposite orientation to the old one, characterized by the idea of "water washes everything".

Thus, the solid residue, especially substances of high toxicity, may be discharged or burnt. Also it is necessary to reduce water consumption of industry. Recirculation of water used as cooling agent and the reintroduction of the system is used as a solvent, after appropriate correction quality. In the second group of procedures aimed at purification of water already used (polluted) by various methods of physicochemical filter and purifying wastewater ca be used. A purifying by freezing (- 20 ^{0}C), to conserve the sample over a longer period of time (min. 30 days). In this case, the preservation by freezing can lead to loss of the elements to be analyzed by precipitation. In that case it must be a problem especially for phosphate and pesticides.

Table 1.

Indicators of quality	Analysis techniques	Limit detection	Other techniques
Organoleptic indicators			
- color	colorimetry	2.5mg/L pt. CO	colored discs
turbidity		0.1 NTU	Secchi disk
- smell	sensorial analysis	without smell	
- taste	sensorial analysis	without taste	
Indicators physic - chemical			
- pH	indicators		
specific electrodes			
- Pot.redox.rH	specific electrodes		
- conductivity (S cm^{-1})	measurement of conductometry		
- Cl^-	Volumetry (pp)	5.1 mgL^{-1}	uncolor
- SO42-	Gravimetrics (precipitation)		
- Silica	colorimetry	5.3 µgL^{-1}	I.C.P.
- Ca^{2+}	Complexonometry	200 µgL^{-1}	I.C.P.
A.A.	Colorimetry		
- Mg^{2+}	A.A.	Colorimetry	
- Na^+	Bright photometry	9.83 µgL^{-1}	I.C;AA
- K^+	Bright photometry	49.7 µgL^{-1}	
A.A.			
- Al^{3+}	Colorimetry	A.A.; I.C.P.	
- Hardness	Complexonometry	Colorimetry	
- Dry residue	Gravimetry (evaporation)	Conductivity	
- T.A.	Alcalimetry		
- Dissolved oxygen (OD)	Volumetric specific electrodes		
- CO_2 free	Measurement of acidity	Calculation of equilibrium calcium carbonic	
Indicators of unwanted substances			
- MES	Gravimetric filtration or centrifugation	0.5 mgL^{-1}	
- NO3-	Colorimetry	1.2 mgL^{-1} NO 3-	Specific electrodes I.C. Absorbed.
- NO2-	Colorimetry	5 mgL^{-1} NO 2-	
- NH4+	Colorimetry Alcalimetry	4.81 mgL^{-1} NH 4+	Specific electrodes
- NTK	Mineralization	0.5 mgL^{-1} N	
- Oxidability $KMnO_4$	Hot oxido- reduction	0.43 mgL^{-1} O_2	Cold 4 h
- COT	Oxidation absorption IR	0.21 mgL^{-1}	
- H_2S	Distillation volumetric	Specific electrodes	

The main modes of preservation of samples depending on the parameters were determined. Table 1 presents the main indicators of water quality, limits of detection and the most commonly used methods of analyzing them. In this table are presented on a standardized national and European level other

instrumental methods used in laboratories equipped with analytical techniques such as: - ionic chromatography (IC) - spectrophotometry of plasma with inductive coupling (ICP) -- atomic absorption spectrophotometry (AA) - gas chromatography (CG) - liquid chromatography to high pressure (HPLC). In essence, the waste water must be subjected to a treatment which will remove pollutants loading up to a tolerable limit. Basically, purifying water includes a sequence of physical and chemical processes, biological and physicochemical necessary to remove various types of pollutants and the destruction of pathogens existing in the water. The filtering is done by retention (and disposal) of solid impurities, mainly, which are floating, or immersion in water source. By chemical treatment with certain substances neutralized, to obtain the elimination of some organic or inorganic substances whose presence made pure water. All through this process are disposed of living microorganisms and pathogens, an operation known as disinfection, which is usually made, by treatment with chlorine or nitrogen.

4. Water filtering system

A method often used for filtering water is the so called reverse osmosis. It enables people worldwide to transform possible contaminated water into water free of any substances. The RO (Reverse Osmosis – Fig. 3) can be seen today producing pure water from small private homes to space stations.

Reverse osmosis technology is seen virtually everywhere there is a need for pure water:

- drinking water;
- ice;
- production recovery of the water used in auto laundries;
- waste water
- biomedical applications
- applications Laboratory
- photo laboratory
- pharmaceutical industry
- industrial water recycling
- cosmetics industry
- feed
- greenhouse
- hemodialysis
- water heating used in the production of semiconductors
- battery electric industry

Reverse osmosis works on the following principle: a semi-permeable membrane similar to the cell membrane or intestinal capacity is selected. Water passes easily through the membrane due to the reduced size of the molecule while its other substances are passing very slowly or not at all. Water is present on both sides of the membrane presenting a difference in concentration of dissolved substances. In normal osmosis – Fig. 2, water will tend to cross the membrane from the lower contaminant concentration solution to the higher concentrated contaminant solution, until both concentrations equalised the level inside of vessel. The pressure thus created is called osmotic pressure.

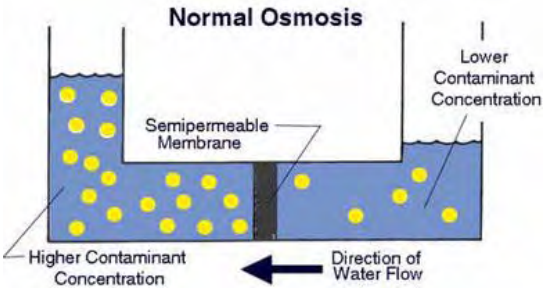

Fig.2. *Process of normal osmosis.*

The process of reverse osmosis forces water solution with a concentration greater than contaminants (water - source) to cross the semi-permeable membrane by low concentrated solution (processed water). High pressure source is used to reverse the natural osmotic process so that the semi-permeable membranes allow the movement of water while most contaminants rejected. The specific phenomenon that occurs is called "ion exclusion" on the surface membrane to form a film that allows "ion" passage of water molecules but not other substances.

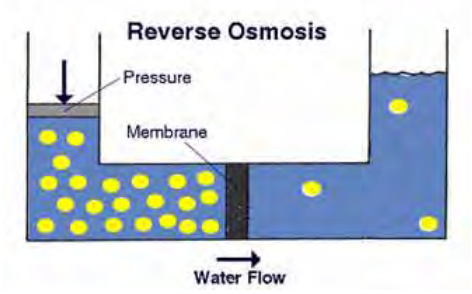

Fig.3. *Process of reverse osmosis.*

RO systems typically require a pre-filter with active carbon for the retention of chlorine which can destroy the membrane and a pre-filter sediment to retain materials suspended. Reverse osmosis is one of the most effective methods of treating water as regards very dangerous primary contaminants: arsenic, asbestos, atrazine (herbicides/pesticides), fluorides, lead, mercury, nitrates, nitrites and radium. The use appropriate Activated carbon filters suited (included in most RO systems) entails filtering water of volatile organic contamination (primary contaminants) and benzen, trichlorethylene, trihalometanii and radon. Some RO units are able to

remove the organic components of the water source such as Giardia harmful health and Criptosporidium. Water Quality Association (WQA) warns that RO membranes do not manage to remove all microorganisms. Specialists in water treatment must take into account firstly the quality of water source, the types of pollutants, climate consideration, and the territorial network configuration and do the project with specific design of integrating a cleaning system in all its complexity.

5. Conclusions

The study shows that for water treatment may be necessary to add chemicals to achieve the quality finally required.

We give some examples:

1.For potabilizing water, we add sodium hypochlorite and other disinfectants

2. To prevent lodging: add polyphosphates

3. To neutralize the pH: add acid or base

4.To remove sulphides, ammonia nitrogen, iron and manganese are added sodium hypochlorite, potassium permanganate, peroxide, etc.

5. To prevent corrosion, add sodium silicate solution.

Galati town, although it is one of the largest cities in Romania it does not have a station for waste water treatment. Also, the drainage system is incomplete and Galati tries to complete the restoration with the aid programs.

Another strong point is represented by the upgrading of the plant for treating drinking water for city residents and the construction of a sewage collector and a water purification stations for Galati city.

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