

# “WATER RECLAMATION AND REUSE”

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**Abstract** - This report deals with the water reclamation and reuse. Water reclamation and reuse provides a unique and viable opportunity to augment traditional water supplies. Effective water reuse requires integration of water and reclaimed water supply functions. Reclaimed or recycled water is the process of converting wastewater into water that can be reused for other purpose. Reused water may also be directed toward fulfilling certain needs in residences businesses and industry and could even be treated to reach drinking water standards. Effective water reuse requires integration of water and reclaimed water supply functions. Water resources in developing countries in arid and semi-arid regions of the world with rapidly growing populations and limited economic resources need special attention. Wastewater treatment technologies for protecting public health and the environment in developing countries are often established in relation to the limited resources available for public works.

**Key Words:** Public Health, Environment, Wastewater, Water Reclamation, Water Standards

## INTRODUCTION

In many communities around the world, the growth of populations and economies are causing demand for fresh water to increase at an alarming rate. One integrated approach that is gaining acceptance is to consider municipal waste water as a vital resource for appropriate applications including agricultural and other irrigation, industrial and domestic uses. This practice is called water reclamation and reuse. Water pollution control efforts have advanced to the point that the treated effluent from municipal wastewater treatment plants is suitable and economical for augmenting traditional water supplies particularly when compared to alternatives such as importing water through costly conveyance systems or constructing dams and reservoirs. The successful development of reclaimed water sources depends upon close examination and synthesis of elements from infrastructure and facilities planning wastewater treatment plant siting, treatment process reliability and water utility management. Inadequate water supplies and water quality deterioration represent serious contemporary concerns for many municipalities, industries, agriculture, and the environment in various parts of the world. This conviction in linking responsible engineering and water sustainability has gained practical experience in many parts of the world. Reuse of

wastewater will help to maintain environmental quality and simultaneously, to relieve the unrelenting pressure on conventional, natural freshwater sources. Therefore, much of the waste water generated after first use can be used again in the same location usually referred to as recycling.

## 1. WATER RECLAMATION PROCESS

Here the water undergoes further purification using three advanced treatment steps: microfiltration, reverse osmosis, advanced oxidation with ultraviolet light and hydrogen peroxide.

### 1.1 Microfiltration:

A low pressure membrane filtration process where pressure is applied to push water through a filter with pores that are 5000 times smaller than a pinhole to strain suspended particles, bacteria and other materials from the water. Microfiltration is used in commercial industries to process food, fruit juices, in computer chip manufacturing and to sterilize medicines that cannot be heated.

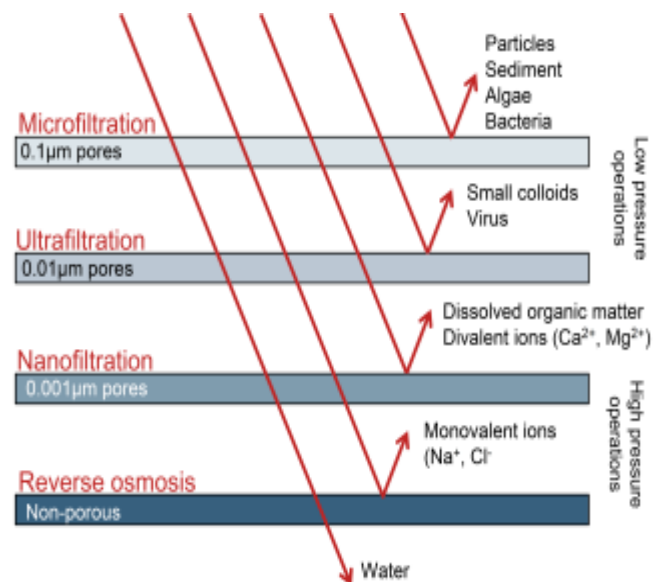


Fig. 1. Microfiltration

### 1.2 Reverse Osmosis:

A high pressure membrane filtration process forces water through tightly wound layers of thin plastic sheets. Although the water can pass through most minerals

cannot. RO filters out contaminants, viruses, salts and other materials from the water. RO is also commonly used for desalting brackish groundwater, in kidney dialysis and in the beverage industry. Many bottled water companies use reverse osmosis because of its proven purifying capability.

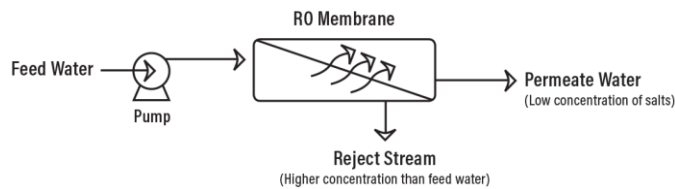


Fig. 2. Reverse Osmosis

**1.3 Advanced oxidation with ultraviolet light and hydrogen peroxide:**

Disinfection is provided by UV, a high intensity light similar to extremely concentrated sunlight. UV converts hydrogen peroxide into a disinfectant that destroys any microorganism and organic materials that might remain in the water after the previous two steps of treatment.

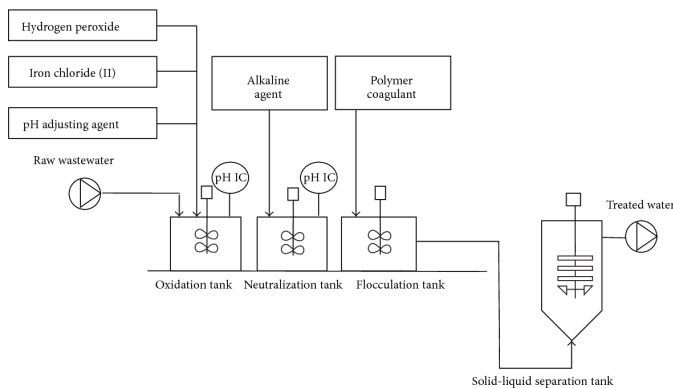


Fig. 3. Advanced Oxidation Process

**2. TESTS CONDUCTED ON WASTE WATER FOR WATER RECLAMATION**

The determination of wastewater quality set forth in environmental permits has been established since the 1970s in a series of laboratory tests focused on four major categories:

**2.1 Organics :**

A determination of the concentration of carbon-based (i.e., organic) compounds aimed at establishing the relative “strength” of wastewater (e.g., Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), and Oil and Grease(O&G)).

**2.2 Solids :**

A measurement of the concentration of particulate solids that can dissolve or suspend in wastewater (e.g., Total

Solids (TS), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Total Volatile Solids (TVS), and Total Fixed Solids (TFS)).

**2.3 Nutrients:**

A measurement of the concentration of targeted nutrients that can contribute to the acceleration of eutrophication.

**2.4 Physical Properties and Other Impact Parameters**

Analytical tests designed to measure a varied group of constituents directly impact wastewater treatability (e.g., temperature, color, pH, turbidity, odour)

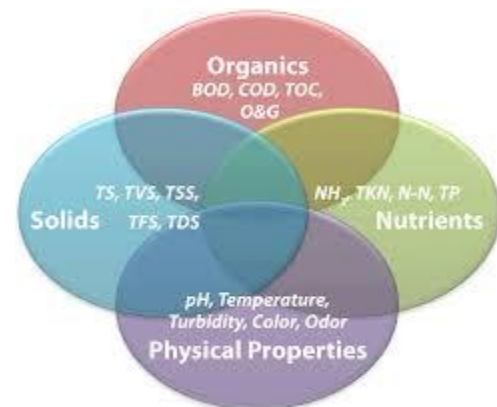


Fig. 4. Interaction of wastewater analytical categories and laboratory tests.

**2.1.1 Biochemical Oxygen Demand:**

BOD is the traditional, most widely used test to establish concentration of organic matter in wastewater samples. BOD is based on the principle that if sufficient oxygen is available, aerobic biological decomposition (i.e., stabilization of organic waste) by microorganisms will continue until all waste is consumed.

**2.1.2 Chemical Oxygen Demand:**

COD is the most popular alternative test to BOD for establishing the concentration of organic matter in wastewater samples. The COD test only takes a few hours to complete, giving it a major advantage over the 5-day BOD test. Wastewater treatment system personnel can use COD as an almost real-time operational adjustment parameter. It can test wastewater that is too toxic for the BOD test.

**2.1.3 Total Organic Carbon:**

TOC test procedures are relatively simple and straightforward, but are specific to the type of carbon-analyzing instrument utilized in the laboratory. Thus, no typical TOC procedure exists.

#### **2.1.4 Oil And Grease:**

O&G consists of a group of related constituents that are of special concern in wastewater treatment due to their unique physical properties and highly concentrated energy content. The term O&G (oil and grease) has become the popular term replacing the term FOG (fat, oil and grease), although both terms refer to the same wastewater constituents. The O&G constituents in wastewater can come from plants and animals e.g, lard, butter, vegetable oils and fats as well as petroleum sources e.g., kerosene, lubricating oils.

### **5.0 VARIOUS ASPECTS OF WATER RECLAMATION**

#### **5.1 Environmental Aspect:**

There is debate about possible health and environmental effects. To address these concerns, "A Risk Assessment Study" of potential health risks of recycled water was conducted by the WaterReuse Research Foundation. The usage of water reclamation decreases the pollution sent to sensitive environments. It can also enhance wetlands which benefits the wildlife depending on that eco-system. It also helps to stop the chances of drought as recycling of water reduces the use of fresh water supply from underground sources. It sometimes contains higher levels of nutrients such as nitrogen, phosphorus and oxygen which may somewhat help fertilize garden and agricultural plants when used for irrigation.

#### **5.2 Health aspect:**

Reclaimed water is considered safe when appropriately used. Reclaimed water planned for use in recharging aquifers or augmenting surface water receives adequate and reliable treatment before mixing with naturally occurring water and undergoing natural restoration processes. A water quality study published in 2009 compared the water quality differences of reclaimed/recycled water, surface water, and groundwater. Results indicate that reclaimed water, surface water, and groundwater are more similar than dissimilar with regard to constituents. Many humans associate a feeling of disgust with reclaimed water and 13% of a survey group said they would not even sip it. Nonetheless, the main health risk for potable use of reclaimed water is the potential for pharmaceutical and other household chemicals or their derivatives to persist in this water. This would be less of a concern if human excreta was kept out of sewage by using dry toilets or systems that treat blackwater separately from greywater.

### **CONCLUSION:**

After studying the report on water reclamation and reuse we had concluded that reclamation and reuse of wastewater is the need of future so as to preserve the

sources of fresh water and reduce the scarcity of freshwater. Also water reclamation and reuse provides a unique and viable opportunity to augment traditional water supplies. Reclaimed water is permitted for many nonpotable uses, including landscape and commercial agricultural irrigation, groundwater recharge; industrial uses such as cooling process or wash waters; fire protection; wetlands creation; restoration and enhancement. Reclaimed water is used in commercial agricultural operations too including irrigation of edible food crops such as citrus, corn and soybeans.

### **ACKNOWLEDGEMENT**

I would like to take this opportunity to express my heartfelt thanks to my teacher for their immense support and guidance especially through difficult times and also I would express my gratitude towards my teachers for guiding me.

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