

# **Chapter – 6**

## **Recycling and Reuse of Wastewater from Steel Industry**

## **6.1 What Is Water Recycling?**

“Recycling is a process of recovering the useful materials from the waste or the garbage for their reuse.”

“The critical part of managing the available water resources is the water recycling.” A sustainable development, a viable economy and the environmental needs can be achieved through proper water recycling & the conservation of the water.

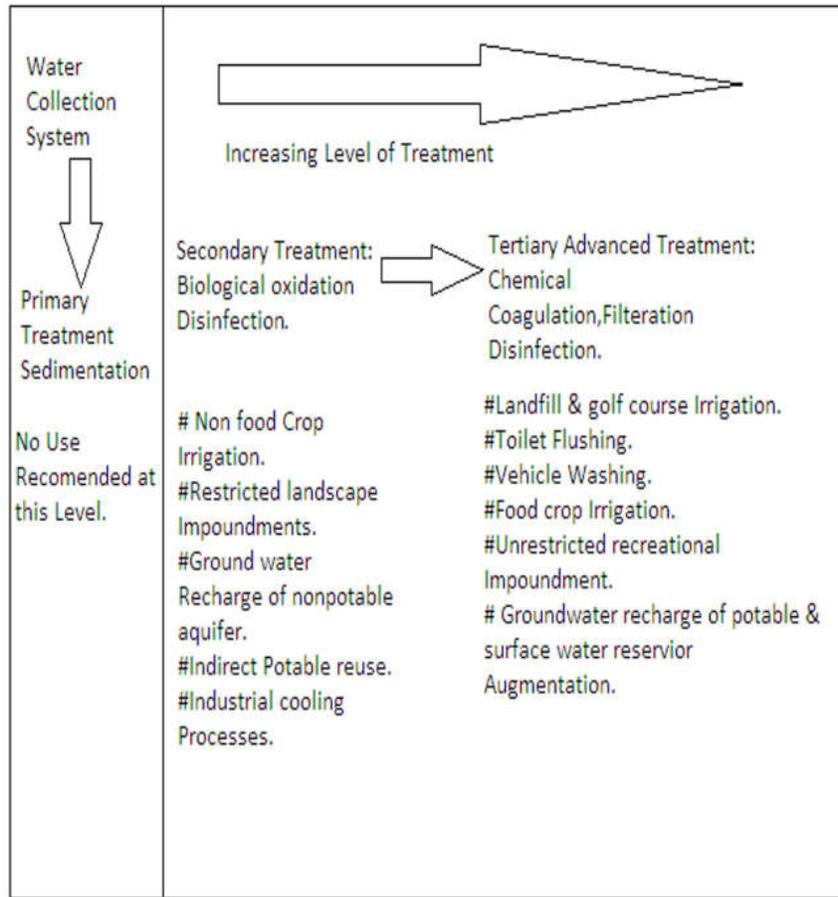
For the various purposes like irrigation, landscaping, processes used in various industries, flushing of toilets and the ground water recharging the treated wastewater is reused. The water is recycled & reused many times also for the onsite purposes like for the various cooling processes. The common recycled water is the water from the municipal wastewater or sewage waste & the industrial wastewater. The water reclamation & water reuse are the term generally used with the term water recycling.

The technologies uses to speed up the natural recycling processes are the common projects of the recycling of water. Since from millions of years, the earth has recycled & reused water through the natural water cycling.

## **6.2 How Can Recycled Water Benefit Us?**

After the water being recycled the effectively treated water to ensure the suitable water quality, can satisfy most of the water demand for individual use. The types of various treatment processes & the suggested uses at every step of the treatment are discussed here in the table 6.1. Generally, where there is a greater chance of human exposure to water, a greater treatment of the water is always required. Numerous different health problems may arise by drinking or being exposed to the recycled waters, if this water contains disease causing organisms & the other pollutants and these water sources are not properly treated.

**Table 6.1: Suggested Water Recycling Treatment and Uses:**



The maximum water demands can be satisfied by the recycled water, as the water is adequately treated ensuring the water quality of water for the appropriate use.

### **6.2.1 Uses for Recycled Water:**

- For the purposes of Agriculture
- Use in Landscapes
- For the utilities & services at Public Parks
- Irrigation in Golf Course
- Power Plants and Oil Refineries cooling with water
- Process water for mills & plants
- Flushing of Toilets
- Dust Control,
- Uses in different construction activities
- Uses in concrete mixing processes
- For making artificial lakes.

The various non-potable purposes like agricultural purposes, landscaping, various different uses in community parks, golf courses; the recycled water is widely used. The other several applications of the non-potable water are water cooling for power plants & oil refineries, use of water in different industrial process of paper mills. Also the non potable water may be effectively used in flushing the toilets, different construction activities, concrete mixing of concrete mixture machine, carpet dyers, dust control, and artificial lakes.

Many projects use the recycled water for their various potable & non-potable purposes even directly & indirectly and basically, the purpose of these projects are to recharge & augment the ground water & the reservoirs of the surface water with the water which has been recycled. In the projects of ground water recharging, there is a process to inject the recycled water into the aquifers of ground water to supplement the ground water provisions & also to prevent the salt water imposition in the coastal areas. During the intensification of the potable ground water supply; California, The Asian Orange County, was having approximately 21 direct injection projects, has been injecting a highly treated recycled water into the aquifer to prevent salt water intrusion.

The planned augmentation of the surface water reservoirs is not very common, since very long years in past many successful ground water recharge projects are operation. Some ground water recharge projects have been already in existence and many others are in the planning stages. In Virginia the potable water sources of Fairfax country, the upper Occoquan sewage authority is discharging the recycled water into a stream above Occoquan Reservoir. The Indirect Potable Reuse Reservoir Augmentation Project was studied in San Diego of California, and after considered technically feasible & it was approved by the City Council and Mayor and successfully in existence.

By using the grey water at the decentralized sites for landscape irrigation and toilet flushing, a huge quantity of the requirement of potable water, fertilizer required & the quantity of the generated wastewater, treated at wastewater treatment facilities & the transportation will be reduced. Or, we can say that, the reuse of water saves; water, energy & money simultaneously. In the dry regions, where long term drought conditions exist, the decentralized water reuse systems are in maximum use. As the gray water systems are in successful operations, since last many years, approx up to 50% of property water need is being achieved by supplying water for

landscaping. The grey water recycling saves fresh potable water and reduces wastewater volume from the septic systems and the treatment plants used for wastewater treatment increases the communications capacity for new users.

### **6.3 What are the Environmental Benefits of Water Recycling?**

Water recycling provides tremendous environmental benefits, in addition to dependable, locally-controlled water supply systems. Through providing an additional source of water & the other important benefit including the decreasing of wastewater discharges, reducing & preventing pollution, the diversion of water from the sensitive ecosystem can be minimized by recycling of the water. Through the proper use of recycled water, the wetlands & riparian habitats can be created & enhanced.

#### **6.3.1 Water recycling can decrease diversion of freshwater from sensitive ecosystems:**



**Figure: 6.1. Ecosystem (freshwater) required for Plants, wildlife, Fish & many**

**others.**

For the livings & reproduction of the whole ecosystem entities like plants, wildlife & fish sufficient water flows to their habitats. The inadequate flow of water, due to the diversion of the water flow for the agricultural, industrial purposes & the urban utilization, can cause the deterioration of water quality & ecosystem health. By using the reliable sources of recycled water, people can supplement their requirements & can free considerable amounts of water for the environment & the ecosystems.

**6.3.2 Water Recycling Decreases Discharge to Sensitive Water Bodies**

The water recycling motivation is also comes from a need to eliminate or decrease the wastewater discharge to the ocean or a stream and is not only for the need of water supply. About 21 million gallons approximately of recycled water is generally provided from the South Bay recycling program for the agricultural irrigation and industrial use per day. The habitat for the rare species can be sheltered by avoiding the alteration of salt water marshland to salty marsh.

**6.3.3 Recycled Water May Be Used to Create or Enhance Wetlands and Riparian (Stream) Habitats:**

There are many benefits of swampland, which include surroundings for the animals and birds, enhancement in water quality, overflow exhaustion & grounds of breeding for the fisheries. To improve & sustain the aquatic and wildlife habitat some streams which have been impaired or

dried, augmentation of water flow can be implemented with the recycled water with the diversion of water.

#### **6.3.4 Water Recycling Can Reduce and Prevent Pollution:**

By preventing the pollutant discharge to the bodies like oceans, rivers & other water bodies the loading of the pollutants into these bodies are also decreased. The pollutants, when discharged to a body of water can be constructively reused for irrigation. The nutrient such as nitrogen at an advanced level, than potable water is also contained by the recycled water. There is no need to apply synthetic fertilizers to the agricultural and landscape areas when the recycled water is used for the agricultural & landscaping.

#### **6.3.5 Recycling water can save Energy:**

The water extraction from the available ground water is increasing with the increase in demand of the water and this extracted water is then transported to very long distances after treatment and this requires plenty of power & energy. The extraction of more water from the ground water, as if the ground water is the local source of water, is reducing the level of the ground water and this increases the energy essential to pump the water to the surface. The process of recycling the water at site or the areas nearby the site area always reduces the energy required to transport water to a longer distance or to pump the water from the deeper level within the aquifer. The energy desirable for the treatment of water is reduced by improving the water quality to a specific water use. The quality of water required to flush the toilet is not very particular & specific as the quality of the water required for the drinking purposes & also this requires less energy to achieve. By reducing the treatment requirement of the recycled water which is of generally inferior quality for the uses that don't need very high quality water also saves the energy & money also by reducing the treatment necessity.