iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** VI **Month of publication:** June 2017

DOI:

www.ijraset.com

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Volume 5 Issue VI, June 2017
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Re-Use Of Treated Effluent from Waste Water Treatment Plant- A Review

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Abstract**: There is a requirement of time to require more efficient use of water resources, both in urban andrural environments. Good and effective technique to face the problem of water sources reduction is the reuse of wastewater. The effective ways of reusing of treated wastewater for agricultural irrigation to promote recycling mechanism for large scale consumption of water because problem of ground water depletion is mostly due to heavy irrigation in the various state of our country "India". Advantages of reusing treated wastewater are in the form of constant supply for our purposes and necessary for environmental and hydraulic balance. However, about the impacts and qualities of treated wastewater users are unknown and no awareness to use most of the cases. Water quality issues that can create real or perceived problems in agriculture include nutrient and sodium concentrations, heavy metals, and the presence of contaminants such as human and animal pathogens that are injurious for health of users. Due to uncertainties about required nutrients in crops, irrigated by treated wastewater, market values of such crops are also affects. Effluent nutrient concentrations vary depending on the particular processes used to treat influent wastewater. In this paper we will focus on the advantages from using different types of recycled water and highlight the current knowledge and risks related to water quality issues.

Keywords: Water sources reduction, Reuse, Recycling, Environmental and Hydraulic balance, and Health risk.

I. INTRODUCTION

As population increase, open space, forest and agricultural fields are reducing day by day. This problem draws our attention towards high efficiency of crop production to meet our needs of food. Crop yield is directory related to water resources for agricultural purposes. Effluents are reused for irrigation purposes in many countries around the world on all of the populated continents (USEPA, 1992). Different countries follow their standards for reusing treated waste water in the agricultural fields depend on methods of treatment, method of using and climatic conditions. This is major world wise problem of drinking water due to excess and irresponsible use of drinking water in to other proposes where use of drinking water can be ignored (ie in agricultural purposes). Considering this problem, crops needs frequent irrigation has been banned by government of India at respective places of our countries. Recycling of waste-water is one of the most suitable mechanisms to escape such dangerous problem up to some level. Treated waste-water can be used for agricultural needs in place of drinking water resources. Wastewater reclamation is the treatment of wastewater up to standards that make it reusable, and water reuse is the use of reclaimed wastewater.

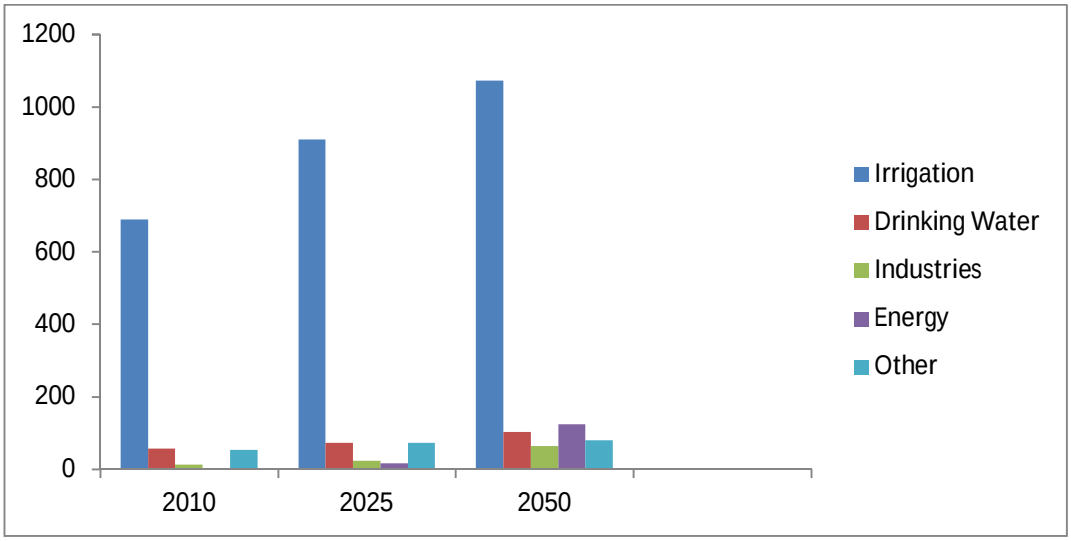

Figure-1 Projected water demands by different sectors in Billion Cubic Meter (BCM) in India (CWC2010)

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Currently, wastewater treatment plants have to treat wastewater so that it is clean enough to be released into bodies of surface water; this treated water is known as secondary effluent (Leverenz, H. and T. Asano (2011).

Wastewater reclamation involves taking secondary effluent and purifying it further, which results tertiary effluent that can be used for activities that don't require drinking water (called non-potable uses). Waste water can be reused for either potable (drinking) and non- potable depend on type of use after treatment. Different agencies have their own guidelines for reusing effluent into deferent sectors of demands.

A. Potable Reuse

The option of direct potable reuse is the most technically demanding and societal contentious. In direct potable reuse the effluent of a wastewater treatment plant is routed directly to the intake of a drinking-water treatment plant. Because of the seemingly closed-loop cycle this process achieves, it is often called ``toilet-to-tap" (*WRA, 2001*). Direct potable reuse is technically demanding because wastewater requires more extensive treatment prior to re-introduction in the drinking water plant. Typically, wastewater is discharged to receiving bodies of water such as lakes and rivers; directly cycling the wastewater back into drinking water requires physical and chemical treatment surpassing that necessary for surface water discharge (Baumann and Dworkin, 1978).

B. Industrial Reuse

Cooling systems in many industries are major water consumers therefore using reclaiming wastewater for these purposes can save considerable amount of potable water. Current applications and reuse trends of cooling water in oil refineries, chemical industry, steel mills, food industry, electronics works, textileplants and power stations.According to the statistical analysis, the portable water and groundwater are the primary sources of makeup water for cooling systems. The multiple-chemicals method and makeup treatment are increasingly accepted for the reclamation of cooling water.Global threats of fuel shortages in the near future and climate change due to blindly uses of natural fuels. Bio fuels production by micro-organisms and micro algae is sustainable and better options of fuel for future. Continuous production of hydrogen from sugary wastewater by anaerobic microflora in chemostat culture.

Large quantities of phosphate present in wastewater is one of the main causes of eutrophication that negatively affects many natural water bodies, both fresh water and marine. It is desirable that water treatment facilities remove phosphorus from the wastewater before they are returned to the environment. Phosphorous mixed manure generated from waste water treatment plants used as fertilizers.

C. Residential Reuse

People can use tertiary effluent for non-potable uses like lawn irrigation or toilet flushing. Residents can get treated effluent from the treatment plant rather than collecting and treating wastewater at the neighborhood level. Where wastewater treatment plants provide tertiary effluent, communities can transport that water to neighborhoods either through a secondary pipe system or via tanker trucks. These methods are also applicable to commercial or municipal facilities in the community.Since lawns and other landscape features that require irrigation do not necessarily need potable water. Treatment standards for tertiary effluent can vary based on the particular irrigation project.

D. Irrigation of crops fields

Major source for irrigation is groundwater (CWC 2010), but as we know that ground water level is depleting and getting polluted day by day.

We have to think about other options for irrigation purposes that is irrigation with wastewater treatment plants effluent, which would be right choice for present as well as future generation. Nutrients concentrations in wastewater is an important aspect of water quality management because excessive nutrient concentrations often prevent water bodies from meeting designated uses. Soil and crops quality parameters are adversely affected by long term wastewater irrigation. This may lead to accumulation of salts nutrients and heavy metals beyond specified limit of tolerance. Proper management of irrigation, periodic monitoring of soil fertility and quality parameters are required to ensure for safe use of wastewater in irrigation.

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Volume 5 Issue VI, June 2017
ISSN: 2321-9653

S.No	Parameters	On land irrigation (Indian Standards)
1	pH	5.5-9.0
2	BOD	100 mg/l
3	COD	150 mg/l
4	Total Suspended Solids (TSS)	200 mg/l , Shall pass 850 micron IS Sieve
5	Total Dissolved Solids (TDS) Inorganic	2100 mg/l
6	Oil & Grease	10 mg/l
7	Chlorides	600 mg/l
8	Electrical Conductivity (EC)	1.0-2.5 dS/m
9	Sodium Adsorption Ratio (SAR)	4 – 9
10	Total Coli forms	< 1000 / 100 ml
11	Fecal coli forms	<200/100 ml

Table-1: General discharge standards for Land Irrigation [Ref : 7,910]

II. HEALTH RISK FROM REUSING TREATED WASTEWATER

Pathogenic microorganisms including Bacteria, Viruses, Helminths and Protozoa is present in wastewater and they survive for days, weeks and at times months in the soil and on crops that come in contact with wastewater. Health risk from these microorganisms depends on their survival in to soils, crops, and wastewater.

Pathogens	Survival Time (Days) In Soil	Survival Time (Days) On Crops
Viruses (Enteroviruses)	<100 but usually <20 days	<60 but usually <15 days
Bacteria's (Faecal coli form, Sanmonella)	<70 but usually <20 days	<30 but usually <15 days
Protozoa (Entamoebahistolytica cysts)	<20 but usually <10 days	<10 but usually < 2 days
Helminths Ascarislumbricoides eggs Hookworm larvae Taeniasaginata eggs Trichuristrichiura eggs	 Many months <90 but usually <30 days Many months Many months	 <60 but usually <30 days <30 but usually <10 days <60 but usually <30 days <60 but usually <30 days

Table-2: Survival times of selected excreted pathogens in soil and on crop surfaces at 20-30°C[Ref : Feachemet.Al 1983]

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III. BENIFITS OF REUSING TREATED WASTEWATER

Recycled water can satisfy most water demands, as long as it is adequately treated to ensure water quality appropriate for the use.Projects which use recycled water indirectly for potable purposes. These projects include recharging ground water aquifers and augmenting surface water reservoirs with recycled water. Treated effluent serves as dependable and locally controlled water resources. Fresh water is very important components for balancing ecosystem. Water Recycling Can Decrease Diversion of Freshwater from Sensitive Ecosystems. Recycling of wastewater can reduce water pollution and danger of water borne deceases.

IV. CONCLUSION

Reuse of wastewater is necessary for water conservation and also reduces load on the environment. Quantity of treated wastewater is very less than wastewater production, mostly in developing countries likes India due to lack of proper fund for this purpose. Fund should be released by government for installing new treatment plants based on latest treatment technologies. Chemical parameters are mostly responsible for health hazards; therefore, arise from the contamination of crops or groundwater's. Hillman (1988) has drawn attention to the particular concern attached to the cumulative poisons, principally heavy metals, and carcinogens, mainly organic chemicals. So guidelines set by different agencies should be followed for safe and beneficial disposal of treated wastewater.

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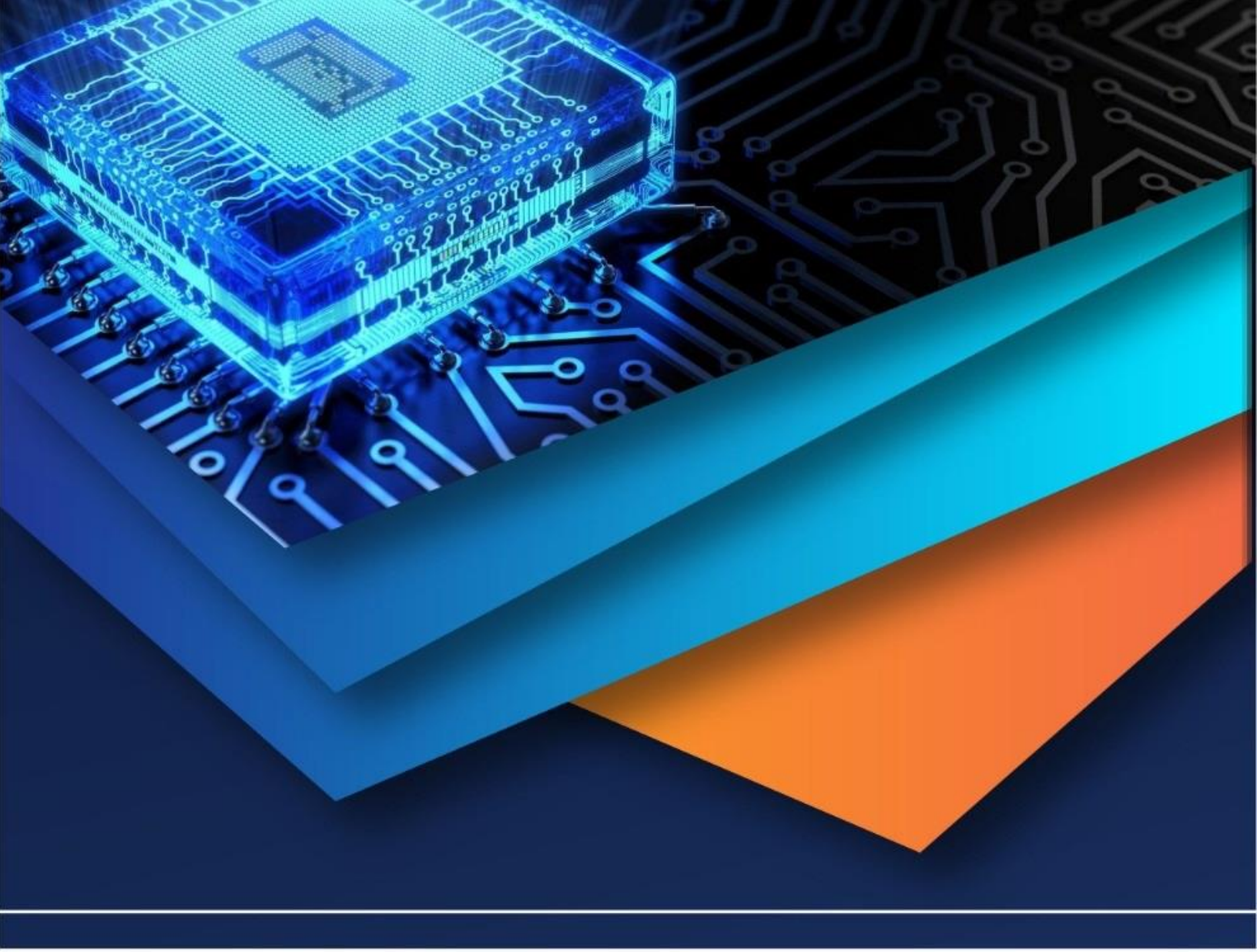

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