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Contents

Long-term planning for water reuse

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ABSTRACT

As there is an intension to facilitate the population growth of the country and if it is assumed to achieve this goal, based on 100 million populations in the country within the coming decade the following analysis is done. Based on literature and data available, the water for overall development is about 2000 cubic meter per capita per year, so we need 200 billion m^3/ year. But the yearly renewable water is around 120 billion m^3, and consequently there will be a shortage of about 80 billion m^3/ year for the development of the country. The sanitary sewage of this population is about 6 billion m^3/ year which is about 7-8 percent of the shortage. But it is about 70 percent of water needed in municipal communities. So, if the sanitary sewage is treated, it can be reused in communities and the problem of shortage can be coped. To achieve this goal we need a long term planning and investment in treatment of sanitary sewages. So, the first phase of this plan is to run pilot plants to treat the effluent of sewage treatment plants at different levels for different reuse.

Keywords: long-term planning, pilot plant, water resource development, water reuse.

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Comparative assessments of effluent reuse in industrial wastewater plants with energy approach

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ABSTRACT

In this research, industrial wastewater treatment plants (IWWTPs) were investigated and categorized by effluent applications and electrical energy cost. For the purpose of this research, 51 plants were assessed and results indicate that 17 plants discharged the effluent directly to the surface water that most of them are located in north of Iran and 24 plants used the effluent for irrigation. Other plants used the effluent for agricultural purposes or discharging it to near lands for feeding ground water resources and etc. Also, average monthly costs of electrical energy consumption per cubic meter of influent of those plants were investigated. IWWTPs were categorized to 5 groups of flow under 250, 250 to 500, 500 to 750, 750 to 1000 and more than 1000 m^3/day. Finally, it was concluded that larger IWWTPs consume more electrical energy per cubic meter influent in comparison with smaller IWWTPs. It was concluded that according to the total costs in IWWTPs, necessity of effluent reuse should be more considered.

Keywords: effluent Usage, energy, industrial wastewater, reuse, treatment plant.

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Assessment of public awareness and acceptance towards usage of treated wastewater in Yazd city

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ABSTRACT

In addition to technical, economic and environmental factors, public acceptance plays an important role in successful treated wastewater reuse projects. The aim of this study is to evaluate Yazd citizens' awareness regarding water and wastewater issues and public acceptance towards wastewater reuse by questionnaire-type survey. For this purpose 250 questionnaires were distributed and filled out in various districts of Yazd city in June 2014. Study results showed that, only 13% of respondents had high awareness about water and wastewater issues. In general, the usage of treated wastewater in low human contact alternatives has more acceptability. Public health risk (85%) and redress of water resource shortages (81%) were the most influential factors on public acceptance. Respondents with higher level of awareness about water and wastewater issues have low favorable opinions regarding usage of treated wastewater.

Keywords: public acceptance, public awareness, treated wastewater, water recycling, Yazd city.

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Impact assessment of cultivating sunflower (*Helianthus annus* L.) by treated municipal wastewater on growth, yield and soil properties

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ABSTRACT

In this paper, the growth and yield of sunflower (*Helianthus annus* L.) in addition to the soil properties are compared and assessed according to three irrigation types. It uses treated municipal wastewater, well water and their equal mixture for irrigation. For this purpose, pot trials are carried out in 4 months having 10 liters volume using completely randomized design with three times replications. Experimental results verify that the dry weight and crop yield of sunflower are significantly higher by treated municipal wastewater. In details, the average of seed weight, plant height, capitulum diameter, and crop yield per pot are higher about 21%, 14%, 27%, and 40%, respectively. This is also observed that in the harvesting period, nitrogen, phosphor and potassium are significantly restored in the leaves, seeds, and stems, respectively. Soil experiments approve that the quality degradation is not significant and conversely it becomes more fertilized. It finally points to the potential safe reuse of secondary treated wastewater however it is recommended to be mixed with well water for irrigation.

Keywords: crop yield, municipal wastewater, reuse, soil, sunflower, wastewater treatment.

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Estimation of production potential of biogas and electricity from municipal sewage sludge in the Iran

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ABSTRACT

Producing biogas is the most common method of energy generation in municipal and industrial wastewater treatment plants in the world. Methane production rate depends on degradation rate of organic pollutants in wastewater, temperature and treatment process. Typical parameters for assessment of organic wastewater such as BOD or COD indicate the potential to produce methane. There is no accurate information about wastewater treatment plants in the country and exact calculation is not possible, so in this article, average amount for wastewater produced in the country and approximate coefficients were used. Based on demographic calculations, the maximum amount of methane produced from anaerobic digestion of sewage sludge produced in the country, is estimated about 219437.03 ton/ yr (more than 307.21 Mm^3/yr), equivalent biogas is about 337595.43 ton/yr (more than 472.63 Mm^3/yr) and maximum electricity generation capacity is approximately 174.52 MW. Calculations show that, if the activated sludge treatment plants in the country equipped with anaerobic digesters and power generation systems such CHP, there is a potential to produce electricity about 44 MW. Furthermore, taking into account wastewater plants with anaerobic digester, a capacity of 22 MW electricity generation is attainable.

Keywords: biogas, digester, energy potential, IPCC method, wastewater.

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Arsenic removal from synthetic water using activated carbon derived from walnut shell

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Abstract

Increasing of fresh water consumption and consecutively drought periods caused reduction of renewable freshwater resources in recent years. One of the basic strategies to conquer this problem is using non-conventional water resources particularly reuse of polluted water. In this study, activated carbon derived from walnut shell was used as tertiary treatment. Activated carbon powder was used in laboratory-scale experiments and was used for arsenic removal from synthetic samples. Different parameters such as contact time, pH, concentration of adsorbate and adsorbent dose were investigated. The optimum equilibrium contact time, pH, concentration of adsorbate and adsorbent dose were achieved 3 minutes, 6.5, 120 µg/l and 0.4 g/l, respectively. The results indicate that the Freundlich isotherm (with R^2=0.977) is more consistent with experimental data than Langmuir isotherm. Comparison of this study with other research studies indicates that low cost activated carbon derived from walnut has a high surface area and arsenic is well adsorbed up to 100 percent from aqueous solution.

Keywords: adsorption, arsenic, langmuir isotherm, walnut shell.

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Disinfection of municipal wastewater by the systems of suspended and immobilized nano-TiO_2 in the cement

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ABSTRACT

The photocatalytic activity of nano-TiO_2 has been used in inactivation of microorganisms, mainly in the form of suspension in a liquid or partially in an immobilized system. Using advanced oxidation processasa new approach has been used in the purification of water and wastewater. In this research, the systems of suspended (0.1 g/L) and immobilized nano-TiO_2 in the cement bed (0.1-2%) under a 160-Watt ultraviolet irradiation were used to study the antibacterial properties in water. The estimated nano-TiO_2 photocatalytic antimicrobial property was exhibited by the colony counting method of the viable bacteria. The test results of the nano-TiO_2 suspension system indicated that nanoparticles don't have bactericidal effect on microorganisms in the dark condition, but in contrast, they exhibit high antimicrobial activity (>99%) under UV irradiation. Furthermore, the photocatalytic activity of the immobilized nano-TiO_2 system in cement bed showed that their antimicrobial properties play a role in bacterial killing (>80%) after UV irradiation and the most favorable concentration of nano-TiO_2 is found to be 1%, though the bacterial re-growth was observed in the dark condition after UV irradiation. Therefore, the beam source should be constantly turned on till the microorganisms exists in wastewater are killed by photocatalytic properties of nano-TiO_2 and clean water is prepared.

Keywords: antimicrobial activity, cement, E. coli, nano-TiO_2, photocatalytic property, wastewater.

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Improving OSA process efficiency in sludge production reduction in SBR

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ABSTRACT

OSA (Oxic Settling Anoxic) process is one of the sludge reduction methods. In this method an anaerobic reactor is placed in activated sludge recycling line for sludge reduction purpose. This method is getting popular because of possibility of its application in currently operating waste water treatment plants. In this research, the performance of OSA process in sludge reduction in SBR was improved through thermal and mechanical treatment of recycling activated sludge. An experimental pilot was developed for this purpose. Sludge was warmed up to 50, 70 and 90°C. A mechanical mixer with different voltages was used for mechanical treatment of sludge. By application of OSA process the sludge production was reduced up to 24% and COD removal efficiency was reduced from 90% to 86%. After thermal treatment the sludge production was reduced up to 48%. The sludge reduction would decrease to 34% when mechanical treatment is employed. Application of OSA method does not highly affect the effluent quality based on TSS and COD indicators, but the effluent quality is reduced in case of mechanical and thermal treatment.

Keywords: mechanical treatment, OSA, SBR, sludge reduction, thermal treatment.

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Runoff generation and soil loss control using combined application of vermicompost and vinasse

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ABSTRACT

Application of additives on soil surface has been considered to control runoff and soil erosion as well as the necessity of recycling. However, application of the environmentally-friendly techniques has been less taken into consideration. Hence, the present study was planned to determine the effect of combination of vermicompost (24 g) with sugarcane vinasse (22 cm^3) on runoff and soil loss at plot scale for an erosion prone soil from southwest of Mazandaran Province, Iran. The comparison was made with control and individually treated plots. In this study, three small plots of 0.5 × 0.5 × 0.3 m with a slope of 30% in three treatments statistical design and three completely random repetitions were used. To conduct the study, a rainfall with intensity of 80 mm h^{-1} and duration of 8 min was simulated after 48 h from saturation time to apply treatments and combined application of vermicompost and vinasse. Ultimately, runoff and sediment were sampled. The results of the statistical analysis verified a significant effect (p=0.009) of combined application of vermicompost and vinasse on soil loss. Whereas, the reducing effect of similar treatment and the necessity of water recycling was found non-significant (P=0.295) in controlling runoff from the plots.

Keywords: erodibile soil, rainfall simulator, sediment production, soil additives, water management, water recycling.

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