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The Economic and Social Necessity of Water Reuse in Iran

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ABSTRACT

Water scarcity in Iran has worsened as a result of population growth, increasing pollution, poor water management practices, and climate change. Using proper utilization and management of wastewater can provide the ability to cope with pollution threats and take the opportunity to benefit from the new sources of water. In this study, the impact of water scarcity on the production and macroeconomics indicators in Iranian economy was analyzed and in the social appraisal, the relationship between the household poverty and the source of drinking water and sewage disposal unit was evaluated. The results show that in the optimistic scenario, the economic losses of water scarcity is estimated 34000 billion Rials. As a result, an investment in the water efficiency improving programs and water reuse projects is a beneficial strategy for coping with economic losses of water shortages. Furthermore, poverty is more prevalent in the households with no access to public water supply network and sewage collection and disposal unit systems. According to the current methods of sewage disposal in Iran, reuse of wastewater and controlling water and soil pollutions is inevitable.

Keywords: economic losses, poverty, sewage disposal, water reuse, water scarcity.

Pharmaceutical Wastewater Treatment Using Subcritical and Supercritical Water Technology

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ABSTRACT

The presence of pharmaceutical compounds in the environment and waste streams has received lots of attention in recent years due to its adverse effects on the health of different organism. The emerging of these compounds in the environment is a growing concern and recent researches have focused on finding new ways for enhancing the pharmaceutical compound's removal efficiency in the effluent of wastewater treatment plants. Removing organic compounds using sub- and supercritical water technology has gained lots of attention in recent years. In this research paper the application of subcritical and supercritical water technology for destruction of pharmaceutical compounds (carbamazepine, metoprolol and sulfamethaxazole) inside batch reactor in temperature range of 250°C to 500°C with different residence times of 5 to 50 minutes was investigated. Using this treatment method more than 90% of above-mentioned compounds were destructed that is higher than the conventional methods. It was shown that carbamazepine, metoprolol and sulfamethaxazole are optimally destructed in 20 minutes at 350°C, 400°C and 300°C, respectively. Consequently the results of the study illustrated that this technology can be used as an alternative for efficient removal of pharmaceutical compounds from wastewater treatment plants.

Keywords: batch reactor, removal efficiency, pharmaceutical compounds, sub- and supercritical water, wastewater treatment plants.

Evaluation of the Effect of Irrigation with Treated Wastewater on some Soil Properties

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ABSTRACT

Water crisis is an important issue in arid regions like Iran and has been exacerbated because of successive droughts recently. So the use of unconventional water is increasing in places where there is no good-quality water. One of these resources is urban wastewater that can provide nutrient for plant and if it has no negative impact on soil and water, it can be used for irrigation in de desertification plans. So in this research the effect of reclaimed urban wastewater on soil properties was assessed in Yazd. For this aim, soil samples were taken of depths of 0-30 and 30-60 cm in three different regions including control area, planting area irrigated with reclaimed wastewater and region without any plant that is influenced by treated wastewater. The results showed that organic matter percentage, SAR and EC in area affected by reclaimed wastewater were about 0.45, 112.80 and 6.25 lower than control area, respectively, but concentration of phosphorus, potassium, nitrogen and pH were about 122 ppm, 12.83 ppm, which were 0.004 % and 0.4 greater than control area, respectively. Also the percentage of calcium carbonate in region with no plant that was affected by treated wastewater was about 0.52 greater than control area and in planting area irrigated with wastewater was about 1.6 lower than control area.

Keywords: irrigation, reclaimed wastewater, unconventional water, water crisis, Yazd.

Identifying Training Needs in Agricultural Wastewater Reuse

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ABSTRACT

This study aimed to identify problems arising from lack of knowledge in interest groups about wastewater reuse and Delphi survey was conducted. According to experts, the most important factor that may cause the public resistance against the use of treated wastewaters is “health concerns”. This factor may be resulted from “lack of trust on the responsible organizations” and “ignorance about treatment processes”. Experts believed that the main concern for the use of treated wastewater by farmers is their concerns about production of “unhealthy crops” that could affects on “products market”. According to experts, these problems can be caused by “lack of farmer’s awareness about quality standards of irrigation water” and “unfamiliarity to the wastewater treatment processes”. On the other hand, “lack of skill” in experts in responsible organizations and “unfamiliarity about new sciences and technologies”, resulting in “inefficient wastewater treatment” and together with “lack of understanding about public attitudes”, lead to inefficient implementation of wastewater reuse projects. According to experts, first factor affecting policymakers and regulators sights about wastewater recycling projects to ratify necessary legislation and funding, is giving an “understanding about sustainable development” to them and inform them about “socioeconomic benefits” of wastewater recycling projects.

Keywords: culture building, delphi, public attitude, training, wastewater, reuse.

The Effect of Using Untreated Industrial Wastewater for Irrigation of Rapeseed (Case study: Yeast Factory Raw Wastewater)

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ABSTRACT

The aim of this paper is to investigate the affects of untreated wastewater using yeast factory wastewater on the growth of rapeseed and two its dominant weeds: wild mustard (*Sinapis arvensis*) and Gares (*Eremopyrum bonaepartis*). The research was performed in both laboratory and greenhouse based on factorial method and completely randomized design. The experimental factors include wastewater concentration in 6 levels: Blanket and 25%, 50%, 75% and 100% concentrations of wastewater, besides irrigation one day with clean water and the other day with wastewater (wastewater/ water) as a first factor and herbal treatments in 3 levels: rapeseed, wild mustard and Gares along with the rapeseed were applied as a second factor. The results showed that the effect of wastewater using on growing traits of rapeseed and its weeds except the number of tiller per plant of Gares was significant. The use of raw wastewater caused plant completely death in all samples and different percentages of plant death were occurred by using of up 50% dilution of wastewater. In term of the plant death percentage, Wild Mustard showed less tolerance threshed in comparison with rapeseed and Gares.

Keywords: agricultural products, industrial wastewater, irrigation, reuse, soil.

Comparing the Sludge Characteristics in a Moving Bed Membrane Bioreactor and Conventional Membrane Bioreactor

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ABSTRACT

The properties of excess sludge wasted from two parallel pilot plants membrane bioreactor (MB-MBR and conventional MBR) have been monitored. Sludge samples of MB-MBR and MBR have been examined and compared in terms of VSS/TSS, filtration index, EPS and SMP concentration, nitrogen and phosphorous in dry matter, FI, SVI and polyelectrolyte requirement for sludge conditioning. By keeping similar operational conditions (organic loading, F/M, HRT, temperature, and pH) in both reactors, their sludge characteristics in some terms were significantly different. Results showed that the direct correlation between sludge stabilization ratio and SRT and stabilization ratio in MB-MBR process was 15% higher than stabilization ratio in MBR process. In MB-MBR reactor the SMP and EPS concentration were higher than MBR process. Polyelectrolyte requirement for sludge conditioning in both processes was in range of 4-5 g/kg dry solids and no significant difference was observed. In MB-MBR process SND occurs, and also its excess sludge has higher quality especially in terms of stabilization ratio, nutrient content and higher fertility value.

Keywords: attached growth, filtration index, membrane bioreactor, nutrients, sludge quality.

Hydrodynamics Investigation of Refinery Effluent Treatment in a UASB Reactor Using CFD Technique

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ABSTRACT

Nowadays, with the industry development, a lot of waste is produced damaging the environment. Among wastewater treatment methods, anaerobic techniques have been highly regarded due to numerous advantages. In anaerobic systems, upflow anaerobic sludge blanket (UASB) reactor has many features. In this study using computational fluid dynamics techniques, three-phase reactor hydrodynamics in two and three dimensions have been studied. Initial results showed that the geometry of three-dimensional compared to its two-dimensional, more accurately predict hydrodynamics behavior in the process of wastewater treatment, so simulations were conducted based on a three-dimensional reactor. Interaction between phases was surveyed based on Eulerian model and for validation of the simulation model, the numerical results were compared with experimental data. COD removal and biogas production rates agree well with the results of the experiments. Evaluating numerical results show that the channel flow at heights of 20-40 cm occurs and presence of granules in the reactor causes an irregular pattern flow. Increasing residence time in the reactor lead to greater production of biogas and thus further reduction of the COD was occurred.

Keywords: computational fluid dynamics, eulerian model, upflow anaerobic Sludge blanket, wastewater treatment, Biogas.

Qualitative Analysis of Social - Cultural Barriers of Using Recycled Water

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ABSTRACT

This study aims at investigating social and cultural barriers to the use of recycled water for the first time in Iran from the sociological perspective. Applying qualitative methods, the understanding of women from water recycling and causes and conditions for the use of recycled water was studied. The required data was collected by using semi-structured interviews with a number of women. The interviews were taken place on campus (Allameh Tabatabai University). Findings of the study indicate that the respondents have understood the climate crisis, but are reluctant to use recycled water. The results also show that factors such as hatred, risk perception, sensation spread distrust and acceptance of recycled water were playing as inhibiting factors. The results indicate that doing the recycled water projects, need to recognize social and cultural barriers. This suggests to the policy makers that social mechanisms should be provided to the successful implementation of the project.

Keywords: cultural barriers, qualitative methods, recycled water, social barriers, women.