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Aims and Scope

Journal of Water and Wastewater (Ab va Fazilab) is a bimonthly journal that publishes peer-reviewed research focusing mainly on integrated municipal water management and water supply with special concern to water resources management at catchment areas. While covering a wide variety of general topics and challenges involving usual municipal water and wastewater management which in itself are reflected from physical, natural and human activities in the urban residential area, the Journal has special emphasizes over issues that are reflected from suburban, river basin and catchment areas.

Bimonthly Journal of Water and Wastewater (Ab va Fazilab) has been published onward in Persian with English abstract since 1989.

It is an open access, peer-reviewed bimonthly of Water and Wastewater sciences, published on behalf of the Water and Wastewater Consulting Engineers.

Water and Wastewater (Ab va Fazilab) Journal publishes refereed, original research papers and high quality review papers on all aspects of water and wastewater sciences.

All articles published by Water and Wastewater (Ab va Fazilab) Journal are made freely and permanently accessible online immediately upon publication.

The following shows some examples of the journals main fields of study:

- Rural and municipal water supply management (Conventional & Unconventional Sources)
- Municipal water demand management (unaccounted for water, water reuse and Water-Saving tips)
- Urban hydrology (urban runoff, urban flooding, echo hydrology etc.)
- Processes (physical, chemical and biological), technologies and strategies in water treatment and also municipal, industrial and rural wastewater treatment
- Application of mathematical modeling in water and wastewater treatment processes- Public health issues related to water and wastewater
- Water reuse (environmental and health impacts)
- Waste sludge management (treatment, disposal and reuse)
- Water and wastewater operation and maintenance- Sanitation and protection of aquatic ecosystems and water resources (surface and ground water)
- Urban water accidents managements, data collection, standards, regulations and strategies related to water and wastewater management
- Water governance and Sustainable water resources management and pollution control.

Journal of Water and Wastewater (Ab va Fazilab)is indexed by srlst.com , SID.ir and magiran.com and has an Impact Factor of 0/2 among Iranian science and technical journals in ISC. ISC is a system which deals with analysis and ranking authors, publications and institutes.(Regional Information for Science and Technology)

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An Intelligent Network Proposed for Assessing Seismic Vulnerability Index of Sewerage Networks within a GIS Framework (A Case Study of Shahr-e-Kord)

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Abstract

Due to their vast spread, sewerage networks are exposed to considerable damages during severe earthquakes, which may lead to catastrophic environmental contamination. Multiple repairs in the pipelines, including pipe and joint fractures, could be costly and time-consuming. In seismic risk management, it is of utmost importance to have an intelligent tool for assessing seismic vulnerability index at any given point in time for such important utilities as sewerage networks. This study uses a weight-factor methodology and proposes an online GIS-based intelligent algorithm to evaluate the seismic vulnerability index (VI) for metropolitan sewerage networks. The proposed intelligent tool is capable of updating VI as the sewerage network conditions may change with time and at different locations. The city of Shahr-e-Kord located on the high risk seismic belt is selected for a case study to which the proposed methodology is applied for zoning the vulnerability index in GIS. Results show that the overall seismic vulnerability index for the selected study area ranges from low to medium but that it increases in the southern parts of the city, especially in the old town where brittle pipes have been laid.

Keywords: Seismic Vulnerability Index, Intelligent Network, Sewerage Network, Weight-factor Method, Geographic Information System (GIS), Shahr-e-kord.

Evaluatiopn of Strategies for Modifying Urban Storm Water Drainage System Using Risk-based Criteria

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Abstract

Appropriate modification of existing urban storm water drainage networks may help reduce network inundation and flood-borne pollution risks. It will, therefore, be necessary to analyze the risks associated with water quantity and quality during urban flooding before any reconstruction strategies can be identified that are adaptable to, or compatible with, urban sustainable development strategies. In this paper, three network modification strategies are evaluated against the three criteria of network inundation at different sections, flood pollution risks, and modification plan costs. The modification strategies evaluated include the conventional approach of increasing conduit dimensions as well as the two novels swale and bio-retention systems. The strategies are then prioritised using a Multi-Criteria Decision Analysis (MCDA) method. The application of the proposed methodology is illustrated in the case study of urban storm water drainage systems in the Golestan City in Tehran Province for which a hydrological and hydraulic simulation model has been developed using the SWMM software. The results show that the swale system is the best strategy with an approximate cost of 20 billion Rials (almost US\$ 6 million). Compared to the existing system in operation, the proposed system will be capable of reducing 59% of the quantitative risk of flooding (inundation) and 26% of the water quality risk (pollution loads).

Keywords: Risk Assessment. Urban Flood. Runoff Pollution Sources, Multi Criteria Decision-Making, SWMM.

The Role of Water and Wastewater Networks in Urban Infill Development : A Case Study of District 1 of Isfahan Municipality

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Abstract

Social and physical decline of older inner city districts over time leads to the creation of deserted or inefficient areas in the heart of cities so that many such deteriorating land areas in cities remain undeveloped. The infill development strategy focuses on unused and deserted land areas in cities in an attempt to blow new life into old parts of cities aimed at urban sustainable development through optimally enhanced constructions and population density as well as striking a logical balance between density and land use change. Location of infill development can be assessed based on the excess capacity of urban water supply and wastewater collection infrastructure. In this study, EPANET, Sewer-Cad, Arc-GIS, Spatial Analysis, and AHP were employed to determine the potentials and capacity of the water and wastewater networks in District 1 of Isfahan Municipality as the zone selected for implementing infill development. The results obtained indicate that Khalaja and Darb Kooshk neighborhoods are of the highest priority due to their infrastructure excess capacity. The proposed method can lead to optimal use of missed opportunities and potential in urban areas, provide better inner city sites for future planning, and minimize unnecessary economic and social investments.

Keywords: Infill Development, Water and Wastewater Networks, Spatial Analysis.

Arsenic Removal from Aqueous Solutions Using Modified and Unmodified Oak Sawdust

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Abstract

In this research, oak sawdust, in both modified and unmodified forms, was used as an economical and low-cost material for the removal of arsenic from aqueous solutions. For this purpose, arsenic synthetic samples were prepared using NaAsO₂ in distilled water and the effects of pH, adsorbent dosage, contact time, and initial As(V) concentration were investigated on As(V) adsorption using the adsorbents prepared. The results showed that modified sawdust achieved the highest efficiency (>91%) over a contact time of 60 min and at pH 7 when the adsorbent dosage was 4gr/L and the initial As(V) concentration was 150 µg/L. The data from both adsorbents fitted well to the Langmuir isotherm. Under optimum conditions (an initial As(V) concentration of 150 µg/L and optimal absorption pH, contact time, and adsorbent dosage), maximum As(V) removal efficiencies were 93.85% and 91.034% with the modified and unmodified sawdust adsorbents, respectively. Given the availability and low cost of the adsorbent used and the high removal efficiency obtained at lower adsorbent dosages and contact times, the modified oak sawdust may be recommended as an effective adsorbent for the removal of arsenic (v) from aqueous solutions, especially since it requires no need for pH modification.

Keywords: Oak, Sawdust, Arsenic, Aqueous Solution.

Performanc of Electrocoagulation (Using Al Electrodes) in Surface Water Treatment

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Abstract

Access to safe drinking water is an important means of safeguarding public health. This cross-sectional study was designed to investigate the performance of electrocoagulation in the treatment of surface waters. For this purpose, water samples were taken from the intake to the Soleymanshah-Songhor Dam. Treatment was carried out in a reactor operating in the batch mode. Experiment runs were designed using the Design Expert Software (Stat-Ease Inc., Version 6.0.6) to investigate the effects of voltage (5-25), reaction time (20-60), temperature (10-30°C), and rapid mixing (200-400) on the Mn (II), Fe (II), hardness, alkalinity, and turbidity removal efficiencies as a result of treatment with aluminum electrodes. After the treatment process, the study parameters and the dissolved metal content due to the dissolution of the anode electrode were measured. Maximum removal efficiencies for Fe (II), Mn (II), hardness, and alkalinity were 96.2%, 94.6%, 26.6%, and 12.2%, respectively, while turbidity reduced from 0.6 to 0.15 NTU. Moreover, the dissolved Al content in the treated sample was found to be higher than the standard limit allowed for drinking water. Thus, the electrocoagulation process seemsto be effective in the removal of the investigated contaminants from surface waters. However, the factor limiting the use of this method under maximum efficiency conditions is the dissolved metal content due to the dissolution of the anode electrode, which is a significant concern for the public health. In contrast, the electrocoagulation process seems to be an efficient and safe pretreatment method using aluminum electrodes if operated for achieving optimum efficiencies.

Keywords: Electrocoagulation, Surface Water, Aluminum Electrode, Water Treatment.

In-situ Lead Removal by Iron Nano Particles Coated with Nickel

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Abstract

This study investigates the potential of nano-zero-valent iron particles coated with nickel in the removal of lead (Pb²⁺) from porous media. For this purpose, the nano-particles were initially synthesized and later stabilized using the starch biopolymer prior to conducting batch and continuous experiments. The results of the batch experiments revealed that the reaction kinetics fitted well with the pseudo-first-order adsorption model and that the reaction rate ranged from 0.001 to 0.035 g/mg/min depending on solution pH and the molar ratio of Fe/Pb. Continuous experiments showed that lead remediation was mostly influenced not only by seepage velocity but also by the quantity and freshness of nZVI as well as the grain type of the porous media. Maximum Pb²⁺ removal rates obtained in the batch and lab models were 95% and 80%, respectively. Based on the present study, S-nZVI may be suggested as an efficient agent for in-situ remediation of groundwater contaminated with lead.

Keywords: nZVI/Ni, Lead Pb²⁺, In-situ Remediation, Groundwater.

Optimization of Aqueous Phenol Treatment with Persulfate in the Presence of Iron

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Abstract

Phenolic compounds are among the priority pollutants due to their adverse effects on human health and other living organisms. Advanced Oxidation Processes (AOPs) offer promising prospects for the removal of pollutants in water and wastewater due to their high efficiency as well as acceptable health and environmental effects. Persulfate, especially when used with iron, is far stronger than many other oxidants with respect to oxidation properties since it produces sulfate radicals which create a higher oxidation potential. In this research, efforts have been made to achieve the best conditions for phenol removal from aqueous environments by activating persulfate with iron ions. The experimental design was accomplished using the Taguchi statistical method and the Minitab 16 software. For the purposes of this study, four factors, each with five levels, were considered to determine the optimal conditions for phenol removal. The optimum conditions for phenol removal by integrated persulfate/iron ions were found to comprise a contact time of 120 minutes, a persulfate/iron molar ratio of 5/4, and $\text{pH}=3$. Phenol removal efficiencies of $94.93\% \pm 0.708$ and $58.21\% \pm 0.675$ were obtained under the optimum conditions for the experimental minimum (50 mg/l) and maximum (750 mg/l) phenol concentrations, respectively. The results revealed that among the parameters affecting the process, environmental pH with 54.80% and persulfate concentration with 11.05% have the highest and lowest effects, respectively. It is expected that this process is also capable of removing phenol from industrial wastewaters with removal efficiencies in the range of 59-95%.

Keywords: Persulfate/iron Process, Free Radicals, Aqueous Environment, Phenol, Organic Materials.

Isolation, Identification and Characterization of Two Phenol-Degrading Species of *Trichosporon* Isolated from Wastewater of Zarand Coking Plant -Kerman

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Abstract

Phenol and phenolic compounds are environmental contaminants that are commonly found in industrial effluents from oil refineries, coal mines, and petrochemical plants. Phenol removal from industrial effluent is, therefore, of extreme importance for environmental protection. Phenol degradation is commonly accomplished by physicochemical methods that are not only costly but also produce hazardous metabolites. Recently, phenol biodegradation has attracted much attention due to its lower process cost. In this study, yeast, as a phenol-degrading agent, was initially isolated from samples in the surrounding environment (soil and water) taken from Zarand coking plant. The total heterotrophic and biodegrading yeasts were then counted. Compared to effluent samples, soil samples were found to exhibit higher yeast degrader counts. Yeast growths were measured after three passages and the two strains K1 and K11 were recorded as the ones with the highest growth rates. These same yeasts were the ones capable of removing phenol as evidenced by the remaining phenol content measured by the Gibbs reagent. The effects of four different phenol concentrations (0.1, 0.125, 0.2, and 0.275) were investigated to observe two degradation patterns in the yeasts. Moreover, the hydrophobicity and emulsification activities were measured in all the eleven yeasts isolated. Finally, part of the 18S rRNA gene section was cultured using primers (Euk-A, Euk-B) especially used for this gene and a series of biochemical tests were run for the molecular identification of the yeasts predominantly involved in phenol degradation. The sequences obtained were compared against the available gene banks and the highest homology (greater than 98%) was introduced as the genus and species of phenol degrader yeasts. The isolated yeasts belonged to the genera *Trichosporon montevidense* and *Trichosporon cutaneum*.

Keywords: Biodegradation, Phenol, Coal Tar, Yeast.

Effects of Sludge Holding Tank on the Effluent Quality and Sludge Settling Potential in Conventional Activated Sludge

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Abstract

Excess sludge treatment and disposal is a major challenge for wastewater treatment plants worldwide. In this study, sludge reduction was evaluated using pilot scale sequencing batch reactors (SBRs). Two SBRs were operated alongside each other over a period of 12 months during which time measurements were performed to determine COD, MLSS, MLVSS, pH, DO, SV1, SOUR, and ORP. The results showed that among the different SRT durations (5, 10, 15, 20, 25 days), the 10-day sludge retention time yielded maximum COD removal efficiency (90%) without any bulking or foaming problems. Prior to any reactions taking place in the reactor, the sludge was exposed to various oxidation reduction potentials for 1 to 8 hours in order to determine the effects of uncoupling metabolism on biomass production under different anoxic and anaerobic conditions. COD was observed to decrease from 600 to 33 mg/l while MLSS increased from 1350 to 1500 mg/l over a retention time of 7 hours and for an ORP value of -238 mv. The effluent COD obtained as a result of operating this process was below the limits set by environmental regulations for surface waters and reuse in agriculture. For an ORP value of -238mv, SOUR and SVI were measured to be 22 mgO₂/h.gVSS and 40 ml/g, respectively.

Keywords: Activated Sludge, Sludge Holding Tank, Effluent Quality, Excess Sludge Minimization.

Treatment of Synthetic Wastewater Containing AB14 Pigment by Electrooxidation in both Pilot and Bench Scale Reactors

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Abstract

The electrochemical oxidation process was used for the degradation of Acid Brown 14 in both bench and pilot scale reactors. The bench scale one with a working volume of 0.5 L was equipped with platinum plate used as the anode and stainless steel (SS-304) plates as the cathode. The pilot scale reactor had a volume of 9 L and was equipped with SS-304 plates used as both the anode and the cathode. Experiments were run using these reactors to investigate the two parameters of energy consumption and anode efficiency. The bench scale reactor was capable of removing 92% and 36% of the dye and COD, respectively, after 18 min of operation. The pilot scale reactor, however, was capable of removing 87% and 59% of the dye and the COD content, respectively, after 60 min of operation. The kinetic study of both the bench and pilot reactors for dye and COD removals showed that both processes followed a zero order kinetic.

Keywords: Dyestuff Effluent, Electrooxidation, Electrocoagulation, Pilot Scale Reactor.

Comparing the Efficiency of Stabilization Ponds and Subsurface Constructed Wetland in Domestic Sewage Treatment in City of Yazd

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Abstract

Wastewater is one of the most important contributors to water pollution on the one hand, while it has the potential to serve as an alternative source of water if subjected to proper treatment, on the other. The present study was designed to compare the removal efficiencies of stabilization ponds and subsurface constructed wetlands in the treatment of urban wastewater in Yazd. For this purpose, 72 samples were collected at the inlet and outlet of a constructed wetland as well as 72 from the inlet and outlet of stabilization ponds over a period of one year. The samples were subjected to identical tests and the results were compared. The removal efficiencies for BOD₅, COD, TSS, NH₄-N, NO₃-N, and PO₄ in the stabilization ponds were 79.7, 79.6, 44.4, 57, 0, and 42.5 percent, respectively. The same parameters for the constructed wetland system were 80.7, 81.5, 77.7, 9.9, 34, and 59.4, respectively. Moreover, BOD₅, COD, TSS, and PO₄ removal efficiencies were higher in autumn and summer. From these results, it may be concluded that constructed wetlands are more commercially viable than stabilization ponds both in terms of performance and cost-effectiveness.

Keywords: Stabilization Ponds, Constructed Wetland, Sewage Treatment.

Investigation of Cd Uptake and Transfer in Different Parts of Wheat, Spinach, Cucumber and Carrot Crops

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Abstract

Environmental pollution due to the accumulation of heavy metals in soil and their subsequent transfer to crops is a global concern that arises from improper application of industrial wastewaters. This study was conducted to investigate the effects of different levels of soil Cd on its accumulation rate in the various organs of four common crops in Iran (namely, wheat, spinach, cucumber, and carrot). The experiment was performed in a factorial design with random blocks including 3 treatments with 0 (control), 50, and 100 mg/kg.soil in 4 replicates. Soil was collected from the farm belonging to the Research Institute for Plant and Seed Breeding (Karaj) and filtered twice using 2-mm sieves before Cadmium Nitrate (Cd(NO₃)₂) was added and completely mixed. Crops were planted in plastic pots 40 cm in diameter and 60 cm in height. The water demand was determined using the Jenman Mantite method. At the end of the growing season, samples were taken from various organs of the crops and their Cd concentrations were measured. The results revealed a direct relationship between Cd accumulation and Cd concentration in the root region. All the treatments other than the control exhibited Cd concentrations higher than the standard limits for human consumption. Cadmium accumulation in the different organs of the crops exhibited the following orders: Root: Cucumber<Carrot<wheat<Spinach; Stem and Leaf: Carrot<Cucumber<wheat<Spinach; Fruit:wheat<Cucumber<Carrot<Spinach; and Fruit peel: wheat<Spinach<Carrot<Cucumber.

Keywords: Cadmium, Crop Uptake, Industrial Wastewater.

Effect of Water Stagnation in Households Pipes and Tanks on Drinking Water Quality (Case Study: Some Areas in Tehran)

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Abstract

The water quality in distribution networks is regularly monitored on a routine basis. However, the quality of water in pipes and tanks inside buildings is rarely ever inspected. This study investigated the overnight stagnation of drinking water in household taps and building tanks. For the purposes of this study, the Heterotrophic Plate Counts test was conducted for which water samples were taken from 25 different buildings located in different parts of Tehran, among which 11 buildings had water storage tanks. The results showed a considerable increase in bacterial concentrations in all the water samples after stagnation. The results of bacterial enumeration in water tanks indicated that although building tanks reduced the quality of the stored water, bacterial concentrations in water tanks were still below the standard limit.

Keywords: Water Distribution Networks, Quality Monitoring, Water Stagnation, Heterotrophic. Plate Counts.