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Investigating quality indices of industrial wastewater of bangestan gas compressor station for irrigating green space

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Abstract

In recent years, reusing water due to water shortage, the need for new water sources and modifying environmental problems by this way were particularly considered in Iran. This research was conducted in Gas Compressor Station in Ahvaz district (Bangestan) Karoon Company, oil, water and soil basins were sampled and samples were transferred to the laboratory to analyze soil and water quality parameters. Mixing basins water was analyzed in terms of EC, TDS, TSS, and pH and then was assessed in several different dilution levels according to the level of water quality. Analysis performed on basin water included measuring total suspended solids salts, total soluble salts, electrical conductivity and soil reaction. The results showed that, among mixing samples, the one tested by the treatment of 75% irrigation water and 25% water separated was more appropriate for irrigating green space than the other samples. In this treatment, Bangestan Gas Compressor Station sample had TSS=3.093 mg/lit and TDS= 980 mg/lit, the results showed that the use of unconventional water for environmental purposes required specific management, which in addition to desirable utilization did not have environmental and health hazards in the soil, plant, and surface and underground water resources.

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Introduction

Iran is one of the arid and semi-arid countries in the world with an average rainfall of 250 mm per year. Continuation of the current trend of increased consumption of drinking water and wastewater generation in drinking water, and agricultural and industrial sectors caused limited accessing to freshwater resources, imperiling next generation life and qualitative developments in open water. One of the main points in using wastewater in green space and agriculture is considering wastewater quality used and standards established in this regard, and can be said that the utilization of wastewater may have detrimental effects on human health, soil quality, health and environment. In the Mediterranean, the treated wastewater is considered as an important source of irrigation in agriculture (Jafari, 2002). Iran has seriously experienced water crisis in recent years due to locating in arid region. Increased water consumption due to the expansion of community reduced water resources and consequently using wastewater was increased. In many parts of the world, water is used for various purposes. Waste water which was considered as a source of contamination at a time now is considered as a new source of water supply in the world. Limited water resources, climate fluctuations, uneven distribution of water in the country, increasing population, contamination of groundwater and surface water and thereby reaching to a level of water stress led water managers and planners seek the use of non-conventional water resources to achieve sustainable development (Rhoades *et al.,* 1992). The present study was conducted to achieve the mentioned goals and also use separated water from oil and water basins of GAS Compressor Station, as an alternative water source, for irrigating green space. The main objective of this project was investigating the suitability of separated water for green space around the processing facility and providing appropriate solutions to improve quality up to the standard level. (Petygrove and Asano, 1990) It is noteworthy that finding and planting a kind of shrubs which are resistant to such water is a positive movement to solve the problem of contaminated water in the facility and use the productive resources efficiently due to environmental requirements and with the aim of avoiding the transfer of water out of the facility as well as the efficient use of such water.

Materials and Method

Ahvaz Bangestan oil field: This reservoir with a combination of Ilam and Sarvak production zones contained approximately 31 billion barrels of oil in the first location and its exploitation begun since 1971. After the imposed war, high volume of well drilling activities focused in this reservoir due to its role in the collection of reservoirs in National Iranian South Oil Company, since 1979 up to now, the total supplementary wells achieved to 125 by drilling 96 new wells and the total production was increased to approximately 160,000 barrels per day. The reservoir oil (API = 25.5) required resistant plants against hydrogen sulfide due to having about 3% volume of S2H gas. After studying the status of oil -water basins at gas compressor stations, water sampling was performed and the samples were transferred to the laboratory for analysis of water quality parameters. Separated basins were completely analyzed, the analysis included TSS, TDS, EC, and pH. Basin dimensions were approximately five to ten meters with the depth of about six meters, which was located in Karoon Company Bangestan Gas Compressor Station. The fluid was drinking water used for washing the station and machinery which was contaminated with oil. The main contamination of water was related to the oil on the water, and the salinity was too low because the water was supplied from Karoon River and had no relation with the zone. The water should be analyzed at four different levels due to the basins water quality: a mixture of 25 % basin water and 75 % well water (drinking water), a mixture of 50 % basin water and 50 % well water, a mixture of 75 % basin water and 25 % well water, 100 % use of the basin water, control: 100% use of well water (Riad, 2001).

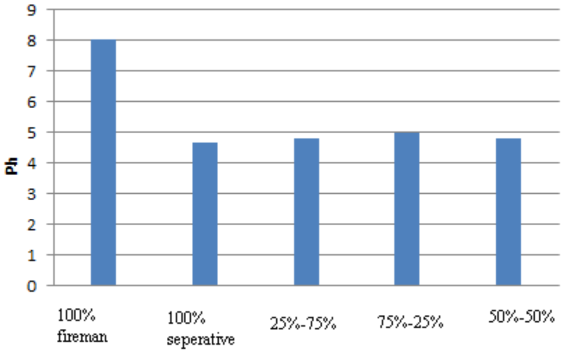

Fig. 1. Comparing chart of different ratio of separated water pH in Bangestan area.

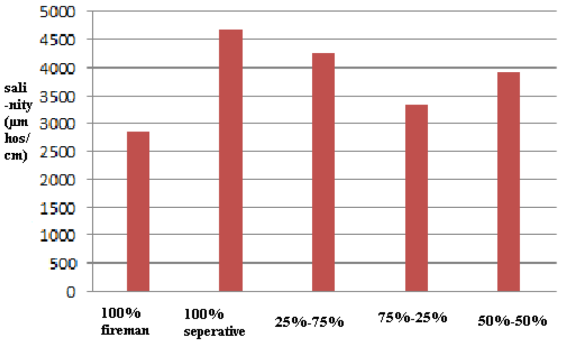

Fig. 2. Comparing chart of different ratio of separated water EC in Bangestan area.

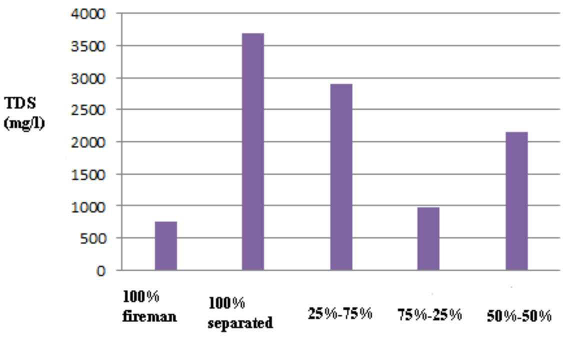

Fig. 3. Comparing chart of different ratio of separated water TDS in Bangestan area.

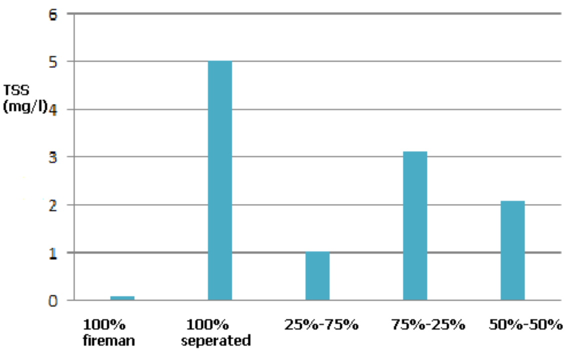

Fig. 4. Comparing chart of different ratio of separated water TSS in Bangestan area.

Results and Discussion

Water pH indicates the amount of acid or alkaline in water. Appropriate pH range of irrigation water is actually 6.5-8.4, which the plant has good growth in this interval. Generally, lime can be used to improve the low pH or water and soil acidity and sulfur, gypsum or other acidic materials can be used to improve the high pH or too much alkalinity. Figure 1 showed that pH levels were greater than 4 in all samples and pH levels of all separated samples (75 % -25 %, 50 % -50 %, 25 % -75 %) were between 4 and 5. The pH levels of separated samples were low for irrigation and there was acidity problem that should be improved before irrigation. Lime is commonly used to improve the low pH or water and soil acidity. As it was observed in figure 2, all samples EC was more than 2500 µmhos/cm and the samples with 75% irrigation water and 25% basin water had lower EC than other separated samples regarding separated samples (75 % -25 %, 50 % -50 %, 25 % -75 %). But generally, all samples had limitations for irrigation and located on C4 Class based on Wilcox Table and were not suitable for irrigation. As it was observed in figure 3, all samples TDS was more than 500 mg/l and the samples with 75% irrigation water and 25% basin water had lower TDS than other separated samples regarding separated samples (75 % -25 %, 50 % -50 %, 25 % -75 %). Nevertheless, generally, all samples had limitations for irrigation. As it was observed in figure 4, all samples TSS was more than 0.0055 and the sample with 25% irrigation water and 75% basin water had lower TSS than other separated samples regarding separated samples (75 % -25 %, 50 % -50 %, 25 % -75 %). However, generally, not all samples had limitations for irrigation due to having TSS less than 40mg.l. Environmental monitoring is one of the most essential components of utilizing wastewater and returned water projects. There are significant health and environmental effects as well as possible discontinuity of the project usefulness and impact without designing and implementing evaluation program and consistent and effective monitoring.

Conclusion

Environmental monitoring program included evaluating efficiency of wastewater treatment plants to improve effluent quality, quantity of wastewater generated, evaluating the quality of wastewater, returned consumed water, and adjusting it with the considered standard, water supply line to the place of consumption, quality and quantity of products, and other activities in design to achieve the objectives of the project. In general, objectives of the monitoring plan are as follows: Evaluating project components to achieve optimum yield. Amending various sections and components of the system to reduce the potential health and environmental effects. Controlling the effectiveness of programs and proposed actions to eliminate or minimize health and environmental effects and consequences. Changing system components to increase the efficiency and yield of the system components and sustainable use of these resources. In general, in a comprehensive and engineering design, reuse of wastewater considering wastewater treatment to the extent to achieve quality criteria recommended by monitoring operations program, is mostly focused on treatment stages; however, ongoing evaluating and monitoring treatment stages and design components including soil, crops, groundwater and surface water resources workers health are essential due to probable problems in the treatment stages or potential deficiencies in the management.

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