

The Role of Nano-Coagulant in Treatment of Diluted Drilling Waste Water; Investigation of New Method

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Abstract

The role of the mud engineer or more properly drilling fluids engineer is very critical to the entire drilling operation because even small problems with mud can stop the whole operations on rig. Results also indicate the optimum velocity which shows the minimum amount of TDS using 450 cc of $Fe_2(SO_4)_3$ is 90 rpm. So this may since of the higher amount of coagulant which reaches lower amount of TDS using smaller shear rates and lower mixing velocity in the fast reactor. Also, using 450 cc of $FeCl_3$ and also, $Al_2(SO_4)_3$ results low amount of TDS at 90 rpm of fast reactor mixing velocity. Using 150 cc of coagulant results 120 rpm as the effective mixing velocity of fast reactor and $Fe_2(SO_4)_3$ as efficient coagulant obtain TDS= 0.348 g/lit. Also, a multi-layer feed forward BP network is optimized which is $n_{input} - n_{hidden} - n_{output}$ type. The number of neurons in input layer which is number of most effective independent variables is selected according to sensitivity analyzing. Number of neurons in hidden layer is found during network optimization.

Keywords

Al_2O_3 , Fe_2O_3 , Coagulant, Environmental Pollution, Nano, Coagulation, Treatment

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1. Introduction

In order to drill a well two main types of platforms are in use, fixed platforms and moveable platforms [1-4]. A fixed platform is used only when production wells are drilled for the purpose of producing an oil or gas field [5-8]. It is accordingly called a production platform, its main purpose is to receive the oil and gas produced, to separate the oil and gas, remove water, and in general give the treatment necessary for transport to land [9-12]. This type of platform is permanently mounted on the sea bottom and is dissembled when the production of the field is terminated [13-16]. As a production platform always uses several wells the drill floor with the derrick is mounted on skids (rails) for moving

around to drill all the planned wells [17-19]. These production wells are closely spaced to some short distance below the sea bottom, where they curve away in different directions, mainly to reach different parts of the reservoir, or different reservoirs, but also to reduce the risk that a new well is drilled into another well. The performance of nano coagulants and also auxiliary coagulants are evaluated in this paper.

2. Materials and Method

The nano coagulants and auxiliary coagulants are used in this

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experiment. Two reactors with mixed type are applied in this experiment. The rotation of mixer in the two reactors is different. The amount of nano coagulants which are injected to each of reactors is different, also. The three auxiliary mineral coagulants, Aluminum Sulfate, $Al_2(SO_4)_3$, Ferric Sulfate, $Fe_2(SO_4)_3$ and Ferric Chloride, $FeCl_3$, are used in the pretreatment process of waste stream of drilling. Moreover in softening process Sodium Carbonate and Sodium Hydroxide must be added to the waste drilling fluid. To prepare the NaOH and Na_2CO_3 solution, 10 gr Na_2CO_3 and 10 gr NaOH solutes in one liter distilled water and then the appropriate volume of the solution is taken to the first reactor. Two mixed flow reactors are used in this process.

3. Results and Discussion

3.1. Biological Oxygen Demands

The amounts of biological oxygen demands are shown in the Figure 1 versus the fast mixing rate. So, the effect of conditions in coagulation process is investigated and the results are shown in Figure 1. The trend shows the relation between the amounts of TH, TDS, COD and BOD. Results also indicate the role of 120 rpm of fast mixing rate on the elimination of biological oxygen demands. The minimum amount of BOD is obtained on 120 rpm. This may be since of the elimination of microorganisms due to keeping between coagulants. Perhaps the complexes of total hardness and coagulants keep the microorganism inside and remove them in this way.

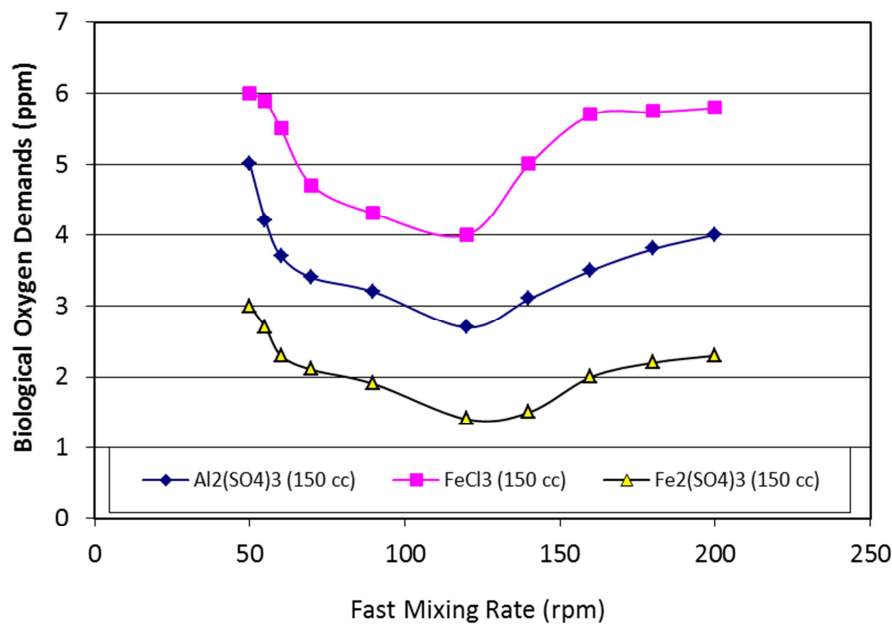


Figure 1. The amounts of BOD versus fast mixing rate.

3.2. Different Amounts of Coagulant

Using 150 cc of coagulant results 120 rpm as the effective mixing velocity of fast reactor and $Fe_2(SO_4)_3$ as efficient coagulant obtain TDS= 0.348 g/lit. In this section the changes in the amount of TDS and TH using different amounts of three mineral coagulants in 150 cc, 300 cc and 450 cc values. The optimum fast velocity also is investigated.

3.3. Mathematical Modelling

ANN models managed to escape being trapped in noise present in the data in a specific algorithm and this is the superiority of the ANN models with respect to the regression models. Optimal experimental data are used in ANN mathematical modeling to forecast the performance of FCC.

The multi-layer feed forward neural network with back-

propagation (BP) learning algorithm is implemented usually, because of its simplicity, strength to extract useful information from cases, and capability of storing the information implicitly in the connecting links in the weights form.

In this application to model crystallizer performance, a multi-layer feed forward BP network is optimized which is $n_{input} - n_{hidden} - n_{output}$ type. The number of neurons in input layer which is number of most effective independent variables is selected according to sensitivity analysing. Number of neurons in hidden layer is found during network optimization. Output layer contains three neurons which are important dependent variables and denote the crystallizer performance. Energy consumption, size distribution of crystals and produced sodium chloride are neurons in output layer, Figure 2 illustrates the topology of the three-layer feed-forward neural network.

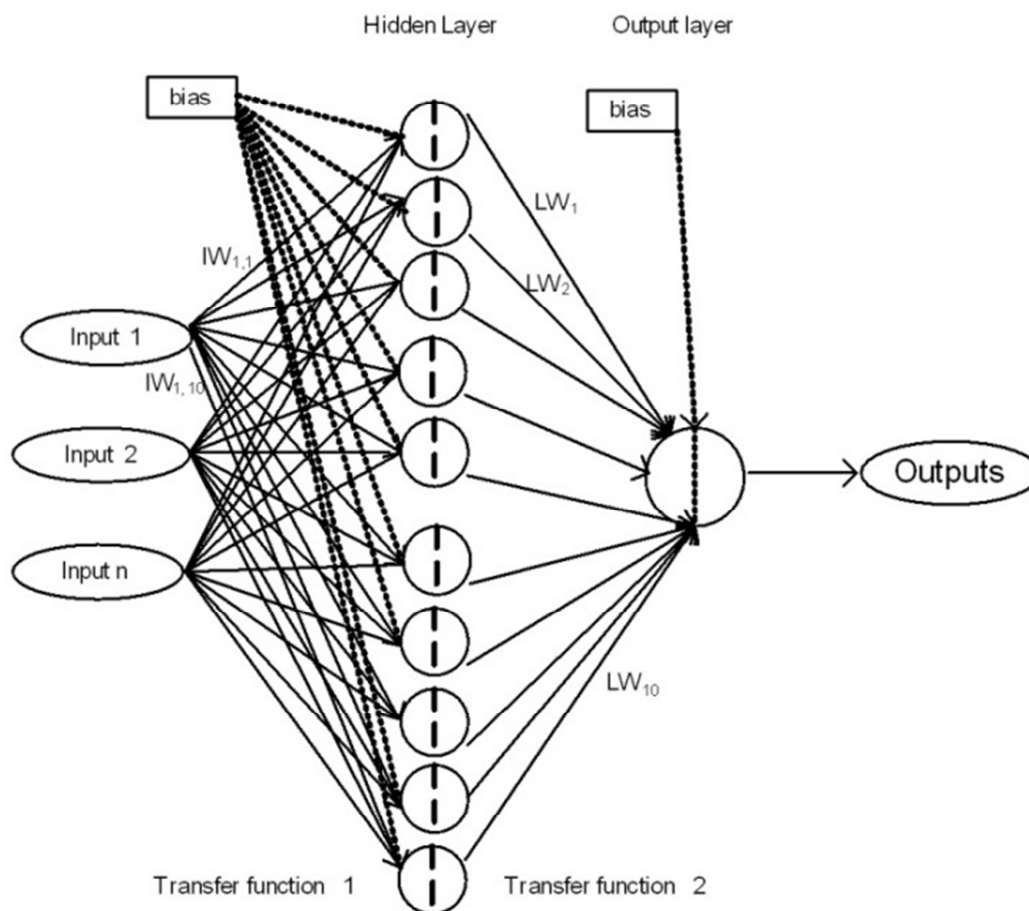


Figure 2. Neural Network Algorithm.

4. Conclusion

The disposal of drill cuttings and produced water has become a major concern for operators and environmental controls have been tightened by regulatory authorities. Most oil and gas operators today develop and implement an environment management system (EMS) for all operations which is in line with international standards. Results also indicate the role of 120 rpm of fast mixing rate on the elimination of biological oxygen demands. The minimum amount of BOD is obtained on 120 rpm. The obtained results show, increasing in the amount of coagulant decreases the amount of TDS for all types of coagulant. Results also shows the minimum amount of TDS 0.191, 0.241, 0.477 g/lit applying $Fe_2(SO_4)_3$, $Al_2(SO_4)_3$ and $FeCl_3$, respectively as coagulants. The obtained results show, multi-layer feed forward neural network with back-propagation (BP) learning algorithm is implemented usually, because of its simplicity, strength to extract useful information from cases, and capability of storing the information implicitly in the connecting links in the weights form. In this application to model crystallizer performance, a multi-layer feed forward BP network is

optimized which is $n_{input} - n_{hidden} - n_{output}$ type. The number of neurons in input layer which is number of most effective independent variables is selected according to sensitivity analysing. Number of neurons in hidden layer is found during network optimization.

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