Modeling of Sulfur Dioxide Gas Dispersion in Steel Industry

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Abstract

One of the problems raised in the steel industry is various pollutants produced by chemical interactions during steel production. Toxic emission modeling used to analyze the effect of pollutants on the environment. In this study mathematical modeling of air pollutants and carbon dioxide emission modeling was performed using software. Mass emission, specifications of exhausted smoke and chimney, meteorological data of topographic situation have been used as the main input of software. According to results the pollutants disperse more as the atmospheric stability decreases; as the wind speed is low the emission zone increases in different months of the year and in the same climate conditions due to lower mixing. Also the results showed that temperature and humidity has less effect than wind in pollutant dispersion. The highest pollutants were related to November and the lowest pollutants were related to December, January and June respectively.

Keywords: Air Pollution Modeling, Steel Industry, Carbon Dioxide, Gas Dispersion, Atmospheric Condition

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Introduction to Design, Construction and Operation of Wastewater Stabilization Ponds

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Abstract

Stabilization ponds due to reasonable performance, ease of operation, and economic advantages, have been primarily considered for wastewater treatment for large and small communities. Today, however, due to changes in the quality of wastewater, increased levels of toxic pollutants, strict environmental regulations, and the need for reusing the effluent, modification of these ponds seems necessary. Current ponds must be upgraded in a way that sustains their benefits such as simplicity of construction, maintenance and operation, and less need to electromechanical equipment expert manpower, while removing their disadvantages such as high suspended solids in the effluent, odor, and the need for vast lands. In this paper, major defects of the conventional stabilization ponds are discussed, and methods of improving them as well as novel technologies are introduced.

Keywords: Wastewater Stabilization Ponds, Improve Performance, Quality Improvement

Investigation and Modeling of the Effect of Rock Permeability on the Performance of Nitrogen Injection into Reservoirs by Neural Network

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Abstract

In this work we used an ideal model to investigate the effect of rock permeability on the production rate and reservoir pressure decline. The model was simulated and developed by using ECLIPSE300 software, which involved two producing wells and one injection well. Change in permeability, in Z direction is the scenario introduced. Production rate increases with increasing permeability in the same direction. Maximum pressure loss occurs at 1 milli Darcy permeability, which results in the reduction of pressure loss(due to well completion) and pressure decline(due to injection into the reservoir and its saturation). Also we determinded and established the correlation between permeability and pressure and total production with the aid of neural network.

Keywords: **N_2 Injection, Neural Network, Permeability, Correlation Factor**

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Experimental Investigation and Thermodynamic Modeling of Drying of Green Peas in a Batch Fluidized Bed Dryer

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Abstract

In this paper, air drying of green peas in a batch fluidized bed dryer has been modeled using a thermodynamic approach. Samples were dried in a laboratory scale fluidized bed dryer at three temperatures of 40, 50 and 60°C. The proposed model has been developed based on mass, energy and entropy balance on the air and drying materials. Temperature variations of samples and exhaust air, moisture content of samples and humidity of exhaust air, exergy and entropy generations during dehydration were predicted by the proposed model. The results show that the air velocity doesn't have a considerable effect the drying rate. The proposed model was validated by the experimental data. The relative errors between predicted values and the experimental data (MRE) were 4.6 and 5.6%, for moisture content of drying samples and output air temperature, respectively.

Keywords: **Drying, Thermodynamic Modeling, Fluidized Bed, Green Pea**

Investigation of Artificial Lift Installation Using Electrical Submersible Pump in an Iranian Offshore Field

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Abstract

Usually none-volumetric hydrocarbon reservoirs during their lifetime reach to a situation that the reservoir pressure is not sufficient to produce expected amount of fluids. Artificial lift is one of the conventional methods to overcome this problem and enhance production. In the field under study from the beginning of production to now, well's conditions have undergone considerable changes which made the rate of production to fall behind the production schedule. In this paper, first a general description about advantages and disadvantages of various methods of artificial lift are expressed. Then the future of production as a function of changes in basic parameters for one of the field's wells has been calculated and According to that, electrical submersible pump is chosen as the best artificial lift method for that well. Determination of proper depth of pump installation and investigation of possibility of gas lock occurrence in the pump are the other results which are obtained from this research.

Keywords: **Artificial Lift, Production Enhancement, Electrical Submersible Pump**

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Kinetic Parameters for Water- Gas Shift Reaction Over Platinum Catalys

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Abstract

In this study, "water – gas shift reaction" which is, an exothermic reaction aimed at production of hydrogen and reduction of CO level in gas reaction, as well as mechanism and kinetic models of this reaction on platinum catalyst have been calculated. Two types of redox and associative mechanisms based on Langmuire-Hinshelwood and Eley-Rideal models have been considered in the range of 573-723K. Fifteen kinetic model based on the rate-limiting step were derived and they were compared with each other by using suitable objective function and Genetic Algorithm. In view of very minor calculation's error, variation in rate constants based on Arrhenius and Vant-Hoff equation were achieved. Finally amongst submitted models, kinetic model based on redox mechanism and Langmuire – Hinshelwood model which had the least error were recommended as the best model.

Keywords: **Water-Gas Shift Reaction, Kinetic Models, The Objective Function, Genetic Algorithm, Arrhenius and Vant Hoff**

Enzymatic Control of Stickies in Recycle Paper

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Abstract

One of the most important problems in recycled paper and paperboard is stickies. When the recycle paper converting to the pulp, this stickies will deposition on the paper machine, dryer and wires and decreases the quality and tear strength of paper. Recently in paper recycling to control the stickies and pressure sensitive adhesive (PSA) utilize the enzyme technology that performance is very high. Pressure sensitive adhesive (PSA) is one of the types of stickies found in recycled paper. In this study we focused on effect of controlling pressure sensitive adhesive (PSA) in recycled Old Corrugated Containers. In this research we use some enzymes including Lipase and Esterase to controlling the pressure sensitive adhesive. Pressure sensitive adhesive and stickies contain a large number of ester linkage. Esterase and lipase enzymes could break these links. Stickies become to finer particle due existing Steras and Lipase and help to better removal and more complete. Also these enzymes changed the surface adhesion of pressure sensitive adhesive and reduce the adhesion strength. By controlling the enzyme could remove the viscous material about 70 to 90 percent. Remove the stickies and pressure sensitive adhesive of recycled paper by enzymes improve their optical and resistance properties.

Keywords: Pressure Sensitive Adhesive (PSA), Enzyme, Esterase, Lipases, OCC Recycled Pulp, Enzyme Control

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Review of Turbulent Reactive Flow CFD Simulation Methods

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Abstract

In this paper different approaches that mostly used in CFD simulation of reactive flows have been studied. Contents of the current study are included of turbulence reaction simulation by RANS, LES and DNS method and also simulation of multiphase flow by VOF, Eulerian-Eulerian and Eulerian-Lagrangian. Furthermore, simulation approaches of fast reaction processes respect to mixing time and common models and also their acceptable operational range have been presented in particular. Study of probability distribution function (PDF) models in which effect of reaction terms has been removed and also phenomenological models that are based on dominant micro-mixing time scale respect to reaction time scale have been considered.

Keywords: Reactive Flow, CFD Method, Turbulence, Multiphase Model, Fast Reaction, Micro-Mixing, PDF and Phenomenological Models

Investigation of Suggestion of Culturing Dunaliellasalina Microalgae in Urmia Lake for Betacarotene Production and Assistance to Survival of the Lake

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Abstract

Microalgae are the most suitable microorganisms for producing valuable substances. Otherwise, chemical methods are alternatives which have advantages and disadvantages. Dunaliella salina microalgae is very popular because of having special culture, biological production of valuable substances like carotenoids, etc. Different parameters affect growth rate, cellular density and carotenoids production which can be optimized for better productivity. The other important matter is kind of culture system for commercial production of desired substances from microalgae that can be selected by considering financial matters and advantages and disadvantages of them. For example, by selecting suitable methods and considering economical matters, we can cultivate Dunaliella salina in Urmia Lake. It's worth mentioning here that, on the one hand, the microalgae is native microorganisms in this lake and producing carotenoids can be very profitable, at the other hand, this microalgae can cover Urmia lake like a rug and prevents more drying of this lake by decreasing water evaporation.

Keywords: Microalgae, Dunaliellasalina, Carotenoid, Urmia Lake