CFD Simulation of Perforation - Pipe Liquid Distributor in Structured Packing Columns

M. Zivdar*, R. Asadollahi
Chemical Engineering Department, Sistan & Baluchestan University, Zahedan, Iran.
E-mail: morteza@hamoon.usb.ac.ir

Abstract
Liquid distributors are widely used in packed columns. In this work, first, the Moore-Rukovena (1987) and Bilingham-Lockett (1997) theories which are explained the quality of liquid distribution is mentioned, then, the conditions for a good liquid distributor and types of liquid distributor are presented. Finally the distribution of liquid in perforated-pipe liquid distributor is analyzed by CFD simulation. The results of simulation show the high liquid velocity in the right side of distributor, good liquid distribution in center area of perforated-pipe liquid distributor and maldistribution in far from center area.

Keywords: Packed column, Structured packing, Liquid distribution, Computational fluid dynamics (CFD)

❐❐❐❐

Prediction of Nucleate Boiling Heat Transfer Coefficients of Binary Solutions Using a New Correlation

S. M. Peyghambarzadeh[1*], M. Jamialahmadi[2]
1- Islamic Azad University, Mahshahr branch, Mahshahr, Iran.
2- Petroleum University of Technology, Engineering Faculty, Ahvaz, Iran.
E-mail: peyghambarzadeh@gmail.com

Abstract
Boiling has long played a significant role in many technological applications due to its superior heat transfer performance. During the last 30 years many correlations have been proposed as a result of the intensive researches on the nucleate boiling mechanism. In this article, a new correlation has been developed on the basis of correlation of Stephan and Körner which is known as a successful correlation for the prediction of nucleate boiling heat transfer coefficient of mixtures. Comparison of the prediction of new correlation with experimental data indicates that this modification can improve the performance of Stephan and Körner correlation.

Keywords: Boiling, Heat transfer coefficient, New correlation, Stephan and Körner correlation

Extraction of Starch from Potato and its Application in the Water-Based Drilling Fluids

M. Nasiri, S. N. Ashrafizadeh*
Research Lab for Advanced Separation Processes, Chemical Engineering Department,
Iran University of Science and Technology, Tehran, Iran.
E-mail: ashrafi@iust.ac.ir

Abstract

Potato starch (pregelatinized form) has been known as a suitable component in the formulation of water-based drilling fluids. Starch has an important role in the properties of drilling fluid including fluid loss control, improvement of rheological properties, stability of shale layers, enhancement of oil recovery, and decreasing the drag forces. However from the operational point of view, one can extract starch from various plants, it is only from potato which shows feasible. On the other hand, production of starch is always accompanied with by products. In this regards, separation of protein from potato has an important role in the economic balance of the whole process.

In this study, after the examination of starch production processes, modern equipments in the separation of protein from starch are introduced. Concerning the starch extraction, while a minimum value of 95% is reached, in the modern potato starch plants, an optimum engineering may gives recovery rates of 97 to 98%. In the starch refining process, three-phase nozzle separators equipped with water supplies allow to achieve a purified starch. The study presented in this article also addresses the required characteristics of natural starch as well as its pregelatinized derivative in the well drilling industry.

Keywords: **Starch, Pregelatinized, Drilling Fluid, Potato, Protein**

❐❐❐❐

Novel Sulfur Recovery Techniques for Oil and Gas Industries

A. Shahsavand*, A. Enferadi
Chemical Engineering Department, Engineering Faculty,
Ferdowsi University, Mashhad, Iran.
E-mail: shahsavand@um.ac.ir

Abstract

In January 2007, Iran with 974 TCF natural gas reserves (around 16% of the global reserves) has occupied the second place after Russia. Most of these gases are referred to as "sour gas" because they are contaminated with hydrogen sulfide. Because of that, the production of elemental sulfur from hydrogen sulfide has a great role in Iranian natural gas industry. Unfortunately, all existing sulfur recovery units (SRU's) or even the new ones constructed in Assalouye industrial zone are using the old "Claus" process. Such processes, although using relatively expensive catalysts, they have low recovery efficiency (97%) and will eventually contaminate the environment.

in this article, some novel technologies based on biotechnology (via microorganisms) and thermal decomposition of hydrogen sulfide (known as thermolysis) have been considered for sulfur recovery units. The techno-economical aspects of the latter process have been investigated in more details. In this process, the hydrogen sulfide is directly dissociated to hydrogen and elemental sulfur at elevated temperature and in the presence of appropriate catalyst. Hydrogen is then separated from other gases (hydrogen sulfide, sulfur and feed impurities), using a special membrane reactor. Only small amount of sulfure is then exhausted to atmosphere as sulfur dioxide due to superb efficiency (99.4%) of the thermolysis process. Furthermore, the produced hydrogen can also be used as a valuable raw material in petrochemical industry (such as methanol or ammonia productions) or as a clean and environment friendly fuel for automobiles.

Keywords: **Sour Natural Gas, Hydrogen sulfide, Sulfur recovery, Claus, Thermolysis**

Modeling of Reaction Furnace in Claus unit for Converting H_2S to SO_2 using Western Empirical Equation

Sh. Ebrahimzadeh and R. Halladj*
Chemical Engineering Department, Amirkabir Universityof Technology, Tehran, Iran.
E-mail: halladj@aut.ac.ir

Abstract

Gases obtained from oil, gas and petrochemical industries contain large amount of H_2S gas. This gas is harmful and damages equipments and transportation lines of natural gas. Also this gas deactivate the catalyst in various industries Hydrogen Sulfide is a pollutant of environment and should be separated from natural gas. Otherwise, sulfur dioxide gas is produced from combustion of natural gas which is a strong pollutant of environment.

Claus process is used to remove hydrogen sulfide from natural gas. This process produces sulfur. In this work at first modeling and simulation of reaction furnace in Claus unit has been done. After that the results are compared with the results of sulsim software which is usual software for simulation of process like Claus process. The compared results show that this work can be a suitable substitution for sulsim software which is very expensive and hard to obtain.

Keywords: Sulfur Kecovery, Claus reaction, Reaction furnace, Equilibrium reaction, Western empirical Methods

❐❐❐❐

Biofuels Production Methods

D. Zareh
Biotechnology Center, Iranian Research Organization for Science & Technology, Tehran, Iran.
E-mail: davoodz@yahoo.com

Abstract

Energy resources will play an important role in the world's future. Increasing atmospheric concentrations of greenhouse gases and their projected consequences, in particular global warming, have caused widespread consideration of feasible remedies and transformation of the energy system from fossil fuels towards the use of renewable resource. Fossil fuels can be replaced by Biofuels such as bioethanol, biomethanol, biohydrogen and biodiesel. Bioethanol is the most important biofuel and can be produced by molasses, starch and cellulose. Biomethanol as a good fuel can be produced by methane gas. One of the drawbacks of methanol as a fuel is its corrosivity to some metals, including aluminum. Biohydrogen is hydrogen produced via biological processes or from biomass and it is a suitable biofuel because produces the least air pollution. Biodiesel can be produced from consumed vegetable oils and is very appropriate for diesel fuel replacement. Generally speaking, biofuels are generally considered as offering many benefits, including sustainability, reduction of greenhouse gas emissions, regional development, social structure and agriculture and security of supply.

Keywords: Biofuel, Bioethanol, Biomethanol, Biohydrogen, Biodiesel

A New Method to Calculate C_{7+} Distribution Function Parameters for some Iranian Crude oils

S. F. Aghamiri*, L. Kavoshi, F. Goodarzi
Chemical Engineering Department, Engineering Faculty, Isfahan University, Isfahan, Iran.
E-mail: aghamiri@petr.ui.ac.ir

Abstract

In this research a new method to calculate parameters of Riazi's distribution function, a two-parameter function based on Gauss function, is presented. This method utilizes using bulk properties of crude oil and C_{7+} cut. Riazi's proposed method requires the refractive index that is not practically measurable for heavy samples while the new method doesn't have this restriction. Performance of the presented method is shown by calculations for 8 Iranian crud oil samples. Results represent superior agreement between experimental data and calculated properties can be achieved by the new method than original one.

Keywords: Characterization, C_{7+} Cut, Distribution function, Splitting, Lumping