

Simulation of Methanol Production from Synthesis Gas

Dr. Ruhul Amin, Imran Hassan, Avijit Das, Rabeta Yeasmin, Taslima Rahman, Tania Hossain

Department of Chemical Engineering

Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh.

Abstract

An innovative process scheme to produce methanol from carbon monoxide and carbon dioxide is here presented and accessed via simulation. In this configuration, the synthesis gas stream, composed by CO, CO₂, and H₂ and fed to the methanol synthesis reactor, is produced by means of a reverse-water-gas-shift by which a CO stream is partially converted in carbon dioxide. A simulation model is applied to define the proper operating conditions to achieve synthesis gas composition targets. The simulation results show that the plant configuration represents a feasible way to produce methanol using carbon dioxide, competitively with the traditional process in which the synthesis gas is produced by a natural gas steam reforming unit. From the simulation, some graphs were plotted. These graphs showed the dependency of simulation on variables (temperature, pressure etc). This were useful to understand the changes that will occur

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Maurice William Ranney



Simulation Of Methanol Production From Synthesis Gas:

23 European Symposium on Computer Aided Process Engineering M. Gadek, R. Kubica, E. Jedrysik, 2013-06-10 Increasing awareness of the environmental issues forces a strong drive towards the development of new sustainable processes for renewable energy production Likewise the economic issues related to the increasing prices of crude oil and its derivatives lead to the recognition of advantages of alternative fuels thus a significant interest in biomass derived synthetic fuels is observed Among various thermo chemical conversion processes biomass gasification is one of the most effective efficient and sustainable solutions to the production of renewable energy It provides a gaseous fuel composed mainly of carbon monoxide and hydrogen suitable to produce chemicals heat and energy In particular syngas can be used to obtain methanol MeOH and dimethyl ether DME both energy carriers of great interest for many advanced energy applications The herein presented work provides the reader with a comparison of the technicalities as well as economics of methanol and DME production from biomass derived syngas by different pathways For that purpose a process simulation by means of the ChemCAD commercial code was used The developed simulation strategies include both optimization of the kinetic models and unique solution of fuel refinement Advances in Synthesis Gas: Methods, Technologies and Applications Mohammad Reza

Rahimpour, Mohammad Amin Makarem, Maryam Meshksar, 2022-10-18 *Advances in Synthesis Gas Methods Technologies and Applications* Syngas Process Modelling and Apparatus Simulation consists of numerical modeling and simulation of different processes and apparatus for producing syngas purifying it as well as synthesizing different chemical materials or generating heat and energy from syngas These apparatus and processes include but are not limited to reforming gasification partial oxidation swing technologies and membranes Introduces numerical modeling and the simulation of syngas production processes and apparatus Describes numerical models and simulation procedures utilized for syngas purification processes and equipment Discusses modelling and simulation of processes using syngas as a source for producing chemicals and power

27th European Symposium on Computer Aided Process Engineering ,2017-09-21 27th European Symposium on Computer Aided Process Engineering Volume 40 contains the papers presented at the 27th European Society of Computer Aided Process Engineering ESCAPE event held in Barcelona October 1 5 2017 It is a valuable resource for chemical engineers chemical process engineers researchers in industry and academia students and consultants for chemical industries Presents findings and discussions from the 27th European Society of Computer Aided Process Engineering ESCAPE event **23rd**

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proceedings present and evaluate emerging as well as established research methods and concepts as well as industrial case studies Contributions from the international community using computer based methods in process engineering Reviews the latest developments in process systems engineering Emphasis on industrial and societal challenges 14th International Symposium on Process Systems Engineering Yoshiyuki Yamashita, Manabu Kano, 2022-06-24 14th International Symposium on Process Systems Engineering Volume 49 brings together the international community of researchers and engineers interested in computing based methods in process engineering The conference highlights the contributions of the PSE community towards the sustainability of modern society and is based on the 2021 event held in Tokyo Japan July 1-23 2021 It contains contributions from academia and industry establishing the core products of PSE defining the new and changing scope of our results and covering future challenges Plenary and keynote lectures discuss real world challenges globalization energy environment and health and contribute to discussions on the widening scope of PSE versus the consolidation of the core topics of PSE Highlights how the Process Systems Engineering community contributes to the sustainability of modern society Establishes the core products of Process Systems Engineering Defines the future challenges of Process Systems Engineering Mathematical Modeling of Fluid Flow and Heat Transfer in Petroleum Industries and Geothermal Applications Mehrdad Massoudi, 2020-04-16 Geothermal energy is the thermal energy generated and stored in the Earth's core mantle and crust Geothermal technologies are used to generate electricity and to heat and cool buildings To develop accurate models for heat and mass transfer applications involving fluid flow in geothermal applications or reservoir engineering and petroleum industries a basic knowledge of the rheological and transport properties of the materials involved drilling fluid rock properties etc especially in high temperature and high pressure environments are needed This Special Issue considers all aspects of fluid flow and heat transfer in geothermal applications including the ground heat exchanger conduction and convection in porous media The emphasis here is on mathematical and computational aspects of fluid flow in conventional and unconventional reservoirs geothermal engineering fluid flow and heat transfer in drilling engineering and enhanced oil recovery hydraulic fracturing CO₂ injection etc applications *Simulation and Techno-Economic Analysis of the AChT Green Methanol Process* Sean McCaul, 2019 Methanol is a valuable commodity with many uses It is used to manufacture other chemicals such as olefins formaldehyde and methyl tert butyl ether MTBE Methanol is also being researched as an alternative fuel for vehicles Global methanol demand is increasing making it a valuable chemical to manufacture Methanol production requires three main steps syngas production methanol production and methanol purification Syngas is a mix of carbon monoxide and hydrogen that can be made through the reforming of natural gas The production of syngas is done through many methods Three primary methods are steam methane reforming SMR partial oxidation POX and autothermal reforming ATR Once syngas is produced it is sent to a methanol reactor where three main reactions occur the hydrogenation of CO the hydrogenation of CO₂ and the water gas shift reaction A product stream with

methanol is then purified in using distillation The company Technology Convergence Inc TCI made a process for manufacturing methanol in 2004 called the Green Methanol Process This process involved the use of a POX reformer and an electrolyser to provide the required hydrogen and oxygen TCI is now known as Advanced Chemical Technologies AChT and they have since updated their Green Methanol Process The new process still uses an electrolyser to generate hydrogen and oxygen but now uses an ATR for syngas production Aspen Plus was used in this work to simulate the updated AChT process Heat integration was successfully implemented into the simulation Additionally the syngas production method was changed over from POX to ATR An initial analysis of the amine reboiler of a CO₂ capture unit was done Finally it was discovered that the waste stream contained a large amount of hydrogen To remedy this a method of hydrogen purification was studied called pressure swing adsorption PSA A version of the methanol process simulation was done with the PSA hydrogen recycle system added An economic analysis looked into the OPEX and CAPEX of the process with and without PSA hydrogen recycling Without hydrogen recycling the CAPEX and OPEX were found to be 248 CAD metric tonne MT methanol and 300 CAD MT methanol respectively while producing 217 MTPD metric tonne per day of methanol This resulted in a combined overall cost of 548 CAD MT methanol produced With hydrogen recycling the CAPEX and OPEX were found to be 223 CAD MT methanol and 280 CAD MT methanol respectively while producing 249 MTPD of methanol This resulted in a combined cost of 503 CAD MT methanol Overall it was found that the implementation of a PSA hydrogen recycle system was a good investment Additionally hourly Ontario electricity price HOEP data from 2018 were used to determine on average the most expensive consecutive 11 day period Since the plant was planned to be shut down for 11 days for maintenance this would inform when the best time to shut down would be to save the most on electricity The best day to start the maintenance was found to be January 5th The next most expensive periods started on December 4th and April 9th

Polygeneration with Polystorage
Kaveh Rajab Khalilpour, 2018-11-27 Polygeneration with Polystorage For Energy and Chemicals addresses the problem of both traditional and dispersed generation with a broad multidisciplinary perspective As the first book to thoroughly focus on the topic of polygeneration users will find the problem presented from different scientific and technical domains down to both macro and micro levels Detailed analyses and state of the art developments in specific fields are included focusing on storage in conventional energy supply chains and demand side renewable polygeneration systems management advice and the necessary market mechanisms needed to support them This reference is useful for academics and professionals in conventional and unconventional energy systems Includes an outlined framework towards polygeneration and polystorage down to both micro and macro levels Contains fluid and continuous chapters that provide detailed analysis and a review of the state of the art developments in specific fields Addresses the wider global view of research advancement and potential in the role of polygeneration and polystorage in the move toward sustainability

Energy Conservation Update ,1979
Energy Research Abstracts ,1991

Hydrogen Energy Progress VI T. Nejat Veziroğlu, Nikola Getoff, Peter

Weinzierl,1986 **Methanol Production and Use** Wh-Hsun Cheng,1994-06-10 This work details the technical environmental and business aspects of current methanol production processes and presents recent developments concerning the use of methanol in transportation fuel and in agriculture It is written by internationally renowned methanol experts from academia and industry Geophysical and Geochemical Techniques for Exploration of Hydrocarbons and Minerals Marshall Sittig,1980 **Fuels from Biomass** J. S. Robinson,1980 Hydrocarbon Processing ,1983-04 *Synthetic Oils and Additives for Lubricants* Maurice William Ranney,1980 **Gas Abstracts** ,1990 *Government Reports Announcements & Index* ,1995 CJChE ,2004-08 *Coal Abstracts* ,1992

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