

A transient method for characterizing flow regimes in a Circulating Fluid Bed

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Abstract

In recent years, although an increase number of literature have been devoted to circulating fluidized bed, the prediction of velocities over which different fluidization regimes exist is still difficult. In this study, a transient method was applied which readily allows one to identify operational features and critical transitions. The method is based on stopping the solids flow rate into the riser when riser is operating in fully dense transport regime. The analysis of transient pressure drop data across the riser during a solids flow cut-off experiment against its time derivative demonstrate the three distinct operating regimes that exist as the gas deplete the solid out of the riser. The transient was compared to data taken under steady state operations using statistically designed experiments. Results indicated that although there were significant differences when comparing operations in dilute conditions, there were no significant differences between the two methods in the fast fluidized and dense transport regimes. The transient method was capable of reproducing the solids circulation dependence on riser solids holdup and on the axial pressure profile. This transient method offers an accurate, easy, rapid, and reproducible means of characterizing CFB operations over a wide range of flow conditions. The lack of accuracy in the dilute regime is conjectured to be due to the wide particle size distribution that resulted in segregation during the transient testing.

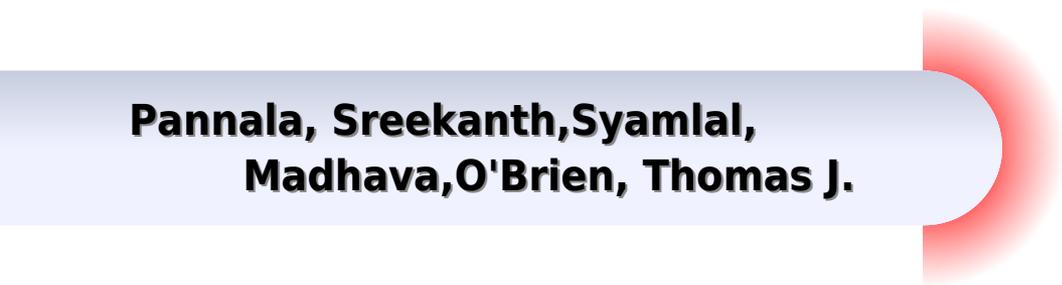
1. Introduction

Circulating fluidized beds (CFB) and pneumatic conveying of solids have been widely used in chemical and petroleum industries, including pressurized circulating fluidized bed combustion, catalytic cracking, and aluminum oxide calcination. Understanding of the flow regimes in CFB risers is the key to successful design and scale-up of CFB systems. Numerous studies on CFB riser's regimes are available in the literature [1-6]. Due to restricted range of operating conditions, generally these studies are carried out for the specific regimes (i.e. dilute, fast fluidized, and dense). For instance, studies on the dilute regime do not provide any information on the neighboring regimes, such as fast fluidized regime. Therefore, it is difficult to recognize the operating conditions for fast fluidized regime. There is a lot of

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A Transient Method For Characterizing Flow Regimes In A

**Pannala, Sreekanth, Syamlal,
Madhava, O'Brien, Thomas J.**



A Transient Method For Characterizing Flow Regimes In A:

Computational Gas-Solids Flows and Reacting Systems: Theory, Methods and Practice Pannala,

Sreekanth, Syamlal, Madhava, O'Brien, Thomas J., 2010-09-30 This book provides various approaches to computational gas solids flow and will aid the researchers graduate students and practicing engineers in this rapidly expanding area Provided by publisher *Sustainable Natural Gas Reservoir and Production Engineering* David A. Wood, Jianchao Cai, 2021-10-30 Sustainable Natural Gas Reservoir and Production Engineering the latest release in The Fundamentals and Sustainable Advances in Natural Gas Science and Engineering series delivers many of the scientific fundamentals needed in the natural gas industry including improving gas recovery simulation processes for fracturing methods and methods for optimizing production strategies Advanced research covered includes machine learning applications gas fracturing mechanics aimed at reducing environmental impact and enhanced oil recovery technologies aimed at capturing carbon dioxide Supported by corporate and academic contributors along with two well distinguished editors this book provides today's natural gas engineers the fundamentals and advances in a convenient resource Helps readers advance from basic equations used in conventional gas reservoirs Presents structured case studies to illustrate how new principles can be applied in practical situations Covers advanced topics including machine learning applications to optimize predictions controls and improve knowledge based applications Helps accelerate emission reductions by teaching gas fracturing mechanics with an aim of reducing environmental impacts and developing enhanced oil recovery technologies that capture carbon dioxide Official Gazette of the United States Patent and Trademark Office, 1996 **Unconventional Resources** Cenk Temizel, Cengiz Yegin, Jihoon Kim, Luigi Saputelli, Ole Torsæter, 2025-02-27 The oil and gas sector is a vital player in the energy transition With their vast resource potential unconventional shale plays will be an essential part in enabling this change Unconventional Resources serves as a comprehensive reference covering the latest technologies methodologies and applications of unconventional shale resources in the oil and gas industry and their role in the evolution of the sector's energy transition This book Offers an overview of geophysics geology and reservoir characterization in unconventional resources Discusses drilling well stimulation and completion production engineering and artificial lift Covers reservoir management and surveillance recovery enhancement production forecasting and surface facilities and testing Details technical and technological advances including machine learning AI data analytics and Industry 4.0 Explores the latest methods workflows in performance analysis in unconventional plays Employs integrated and hybrid approaches to the energy transition The book provides surface and subsurface technical professionals in the oil and gas industry a thorough overview of unconventional along with the integrated hybrid applications that will enable them to stay current with the industry's transition

Theoretical Chemical Engineering Abstracts, 1978

International Petroleum Conference & Exhibition of

Mexico, 1994

Pressure Transient Testing

John Lee, John B. Rollins, John P. Spivey, 2003 Pressure Transient Testing

presents the fundamentals of pressure transient test analysis and design in clear simple language and explains the theoretical bases of commercial well test analysis software Test analysis techniques are illustrated with complete and clearly written examples Additional exercises for classroom or individual practice are provided With its focus on physical processes and mathematical interpretation this book appeals to all levels of engineers who want to understand how modern approaches work Pressure transient test analysis is a mature technology in petroleum engineering even so it continues to evolve Because of the developments in this technology since the last SPE textbook devoted to transient testing was published we concluded that students could benefit from a textbook approach to the subject that includes a representative sampling of the more important fundamentals and applications We deliberately distinguish between a textbook approach which stresses understanding through numerous examples and exercises dealing with selected fundamentals and applications and a monograph approach which attempts to summarize the state of the art in the technology Computational methods that transient test analysts use have gone through a revolution since most existing texts on the subject were written Most calculations are now done with commercial software or by spreadsheets or proprietary software developed by users to meet personal needs and objectives These advances in software have greatly increased productivity in this technology but they also have contributed to a black box approach to test analysis In this text we attempt to explain what's in the box and we do not include a number of the modern tools that enhance individual engineer productivity We hope instead to provide understanding so that the student can use the commercial software with greater appreciation and so that the student can read monographs and papers on transient testing with greater appreciation for the context of the subject Accordingly this text is but an introduction to the vast field of pressure transient test analysis

EPRI NP. Electric Power Research Institute,1983 **Technical Report** ,1994 **Standard Handbook of Petroleum and Natural Gas Engineering** William C. Lyons,Gary J Plisga BS,2011-03-15 This new edition of the Standard Handbook of Petroleum and Natural Gas Engineering provides you with the best state of the art coverage for every aspect of petroleum and natural gas engineering With thousands of illustrations and 1 600 information packed pages this text is a handy and valuable reference Written by over a dozen leading industry experts and academics the Standard Handbook of Petroleum and Natural Gas Engineering provides the best most comprehensive source of petroleum engineering information available Now in an easy to use single volume format this classic is one of the true must haves in any petroleum or natural gas engineer's library A classic for the oil and gas industry for over 65 years A comprehensive source for the newest developments advances and procedures in the petrochemical industry covering everything from drilling and production to the economics of the oil patch Everything you need all the facts data equipment performance and principles of petroleum engineering information not found anywhere else A desktop reference for all kinds of calculations tables and equations that engineers need on the rig or in the office A time and money saver on procedural and equipment alternatives application techniques and new approaches to problems

Standard Handbook of Petroleum and Natural Gas Engineering: Volume 2 William C. Lyons,1996-10-16 Volume 2 presents the industry standards and practices for reservoir engineering and production engineering It also looks at all aspects of petroleum economics and shows how to estimate oil and gas reserves ANS Proceedings ,1989 *Standard Handbook of Petroleum & Natural Gas Engineering* William C. Lyons,1996 Petroleum engineering now has its own true classic handbook that reflects the profession s status as a mature major engineering discipline Formerly titled the Practical Petroleum Engineer s Handbook by Joseph Zaba and W T Doherty editors this new completely updated two volume set is expanded and revised to give petroleum engineers a comprehensive source of industry standards and engineering practices It is packed with the key practical information and data that petroleum engineers rely upon daily The result of a fifteen year effort this handbook covers the gamut of oil and gas engineering topics to provide a reliable source of engineering and reference information for analyzing and solving problems It also reflects the growing role of natural gas in industrial development by integrating natural gas topics throughout both volumes More than a dozen leading industry experts academia and industry contributed to this two volume set to provide the best most comprehensive source of petroleum engineering information available **Symposium on Turbulent Shear Flows** , *Transactions of the 8th International Conference on Structural Mechanics in Reactor Technology: Computer methods for structural analysis* J. Stalpaert,1985 CJChE ,1998-08 SPE Reservoir Evaluation & Engineering ,2010 **Mass Flow Measurement** American Society of Mechanical Engineers. Winter Annual Meeting,1988 **Flow-induced Vibrations** ,1996 *SPE Production Engineering* ,1991

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<https://matrix.jamesarcher.co/public/Resources/fetch.php/paper%20research%20bio%20of%20har%20gobind%20khorana.pdf>

Table of Contents A Transient Method For Characterizing Flow Regimes In A

1. Understanding the eBook A Transient Method For Characterizing Flow Regimes In A
 - The Rise of Digital Reading A Transient Method For Characterizing Flow Regimes In A
 - Advantages of eBooks Over Traditional Books
2. Identifying A Transient Method For Characterizing Flow Regimes In A
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an A Transient Method For Characterizing Flow Regimes In A
 - User-Friendly Interface
4. Exploring eBook Recommendations from A Transient Method For Characterizing Flow Regimes In A
 - Personalized Recommendations
 - A Transient Method For Characterizing Flow Regimes In A User Reviews and Ratings
 - A Transient Method For Characterizing Flow Regimes In A and Bestseller Lists
5. Accessing A Transient Method For Characterizing Flow Regimes In A Free and Paid eBooks
 - A Transient Method For Characterizing Flow Regimes In A Public Domain eBooks
 - A Transient Method For Characterizing Flow Regimes In A eBook Subscription Services
 - A Transient Method For Characterizing Flow Regimes In A Budget-Friendly Options
6. Navigating A Transient Method For Characterizing Flow Regimes In A eBook Formats
 - ePub, PDF, MOBI, and More
 - A Transient Method For Characterizing Flow Regimes In A Compatibility with Devices
 - A Transient Method For Characterizing Flow Regimes In A Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of A Transient Method For Characterizing Flow Regimes In A
 - Highlighting and Note-Taking A Transient Method For Characterizing Flow Regimes In A
 - Interactive Elements A Transient Method For Characterizing Flow Regimes In A
8. Staying Engaged with A Transient Method For Characterizing Flow Regimes In A

- Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers A Transient Method For Characterizing Flow Regimes In A
9. Balancing eBooks and Physical Books A Transient Method For Characterizing Flow Regimes In A
- Benefits of a Digital Library
 - Creating a Diverse Reading Collection A Transient Method For Characterizing Flow Regimes In A
10. Overcoming Reading Challenges
- Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine A Transient Method For Characterizing Flow Regimes In A
- Setting Reading Goals A Transient Method For Characterizing Flow Regimes In A
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of A Transient Method For Characterizing Flow Regimes In A
- Fact-Checking eBook Content of A Transient Method For Characterizing Flow Regimes In A
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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