Saturation refers to any Gas – Vapor Combination. While Humidity refers only Air – Water Vapor System.

Absolute Humidity It is defined as the weight of water vapour present in a unit weight of dry (Non – condensable) gas.

$$H = \frac{\text{kg of water Vapour}}{\text{kg of dry Air}}$$

Vapor = Condensed
gas = Liquified

⇒ **Molal Humidity (Molal Saturation)** It is defined as the ratio of Mole of Vapour [Condensable] to the Mole of dry (Non – condensable) gas.

$$H_m = \frac{\text{kmol of Vapor}}{\text{kmol of dry gas}}$$

for air – wada vapor System

$$H = H_m\left(\frac{18}{29}\right) = 0.6207\, H_m$$

In Vapor – gas Mixture

P = total / Barometric pr.
P_A = Partial pr. of Vapor
P_B = Partial pr. of gas

$P = P_A + P_B$

$PV = nRT \Rightarrow P_A = \frac{n_A}{n_A + n_B} P$

$P_B = \frac{n_B}{n_A + n_B} P$

$\Rightarrow \frac{P_A}{P_B} = \frac{n_A}{n_B}$

then $H_m = \frac{P_A}{P_B} = \frac{P_A}{P - P_A} \Rightarrow H = 0.6207 \frac{P_A}{P - P_A}$

Process Calculation Chemical Engineering

Joacim Rocklöv

Process Calculation Chemical Engineering:

Process Calculations V. Venkataramani,N. Anantharaman,K. M. Meera Sheriffa Begum,2011 This compact and highly readable text now in its second edition continues to provide a thorough introduction to the basic chemical engineering principles and calculations to enable the students to evaluate the material and energy balances in various units of a process plant Unless a chemical engineer is conversant with the energy conservation techniques at every stage of the process economy cannot be achieved in the design of process equipment The text lucidly explains the techniques involved in analyzing different chemical processes and the underlying theories by making a generous use of appropriate worked examples The examples are simple and concrete to make the book useful for self instruction In this new edition besides worked examples several exercises are included to aid students in testing their knowledge of the material contained in each chapter The book is primarily intended for undergraduate students of Chemical Engineering It would also be useful to undergraduate students of Petroleum Technology Pharmaceutical Technology and other allied branches of Chemical Engineering KEY FEATURES Exposes the reader to background information on different systems of units dimensions and behaviour of gases liquids and solids Provides several examples with detailed solutions to explain the concepts discussed Includes chapter end exercises with answers to enhance learning **Chemical Process Calculations** K. Asokan,2007

STOICHIOMETRY AND PROCESS CALCULATIONS K. V. NARAYANAN,B. LAKSHMIKUTTY,2006-01-01 This textbook is designed for undergraduate courses in chemical engineering and related disciplines such as biotechnology polymer technology petrochemical engineering electrochemical engineering environmental engineering safety engineering and industrial chemistry The chief objective of this text is to prepare students to make analysis of chemical processes through calculations and also to develop in them systematic problem solving skills The students are introduced not only to the application of law of combining proportions to chemical reactions as the word stoichiometry implies but also to formulating and solving material and energy balances in processes with and without chemical reactions The book presents the fundamentals of chemical engineering operations and processes in an accessible style to help the students gain a thorough understanding of chemical process calculations It also covers in detail the background materials such as units and conversions dimensional analysis and dimensionless groups property estimation P V T behaviour of fluids vapour pressure and phase equilibrium relationships humidity and saturation With the help of examples the book explains the construction and use of reference substance plots equilibrium diagrams psychrometric charts steam tables and enthalpy composition diagrams It also elaborates on thermophysics and thermochemistry to acquaint the students with the thermodynamic principles of energy balance calculations Key Features SI units are used throughout the book Presents a thorough introduction to basic chemical engineering principles Provides many worked out examples and exercise problems with answers Objective type questions included at the end of the book serve as useful review material and also assist the students

in preparing for competitive examinations such as GATE **Basic Principles and Calculations in Chemical Engineering** David M. Himmelblau,James B. Riggs,2012-05-31 The Number One Guide to Chemical Engineering Principles Techniques Calculations and Applications Now Even More Current Efficient and Practical Basic Principles and Calculations in Chemical Engineering Eighth Edition goes far beyond traditional introductory chemical engineering topics presenting applications that reflect the full scope of contemporary chemical petroleum and environmental engineering Celebrating its fiftieth Anniversary as the field s leading practical introduction it has been extensively updated and reorganized to cover today s principles and calculations more efficiently and to present far more coverage of bioengineering nanoengineering and green engineering Offering a strong foundation of skills and knowledge for successful study and practice it guides students through formulating and solving material and energy balance problems as well as describing gases liquids and vapors Throughout the authors introduce efficient consistent student friendly methods for solving problems analyzing data and gaining a conceptual application based understanding of modern chemical engineering processes This edition s improvements include many new problems examples and homework assignments Coverage includes Modular chapters designed to support introductory chemical engineering courses of any length Thorough introductions to unit conversions basis selection and process measurements Consistent sound strategies for solving material and energy balance problems Clear introductions to key concepts ranging from stoichiometry to enthalpy Behavior of gases liquids and solids ideal real gases single component two phase systems gas liquid systems and more Self assessment questions to help readers identify areas they don t fully understand Thought discussion and homework problems in every chapter New biotech and bioengineering problems throughout New examples and homework on nanotechnology environmental engineering and green engineering Extensive tables charts and glossaries in each chapte Many new student projects Reference appendices presenting atomic weights and numbers Pitzer Z factors heats of formation and combustion and more Practical readable and exceptionally easy to use Basic Principles and Calculations in Chemical Engineering Eighth Edition is the definitive chemical engineering introduction for students license candidates practicing engineers and scientists This is the digital version of the print title Access to the CD content that accompanies the print title is available through product registration See the instructions in back pages of your digital edition CD ROM INCLUDES The latest Polymath trial software for solving linear nonlinear and differential equations and regression problems Point and click physical property database containing 700 compounds Supplemental Problems Workbook containing 100 solved problems Descriptions and animations of modern process equipment Chapters on degrees of freedom process simulation and unsteady state material balances Expert advice for beginners on problem solving in chemical engineering CHEMICAL PROCESS CALCULATIONS D. C. SIKDAR,2013-05-22 Keeping the importance of basic tools of process calculations material balance and energy balance in mind the text prepares the students to formulate material and energy balance theory on chemical process systems It also demonstrates how to solve the main process related problems that

crop up in chemical engineering practice The chapters are organized in a way that enables the students to acquire an in depth understanding of the subject The emphasis is given to the units and conversions basic concepts of calculations material balance with without chemical reactions and combustion of fuels and energy balances Apart from numerous illustrations the book contains numerous solved problems and exercises which bridge the gap between theoretical learning and practical implementation All the numerical problems are solved with block diagrams to reinforce the understanding of the concepts Primarily intended as a text for the undergraduate students of chemical engineering it will also be useful for other allied branches of chemical engineering such as polymer science and engineering and petroleum engineering KEY FEATURES Methods of calculation for stoichiometric proportions with practical examples from the Industry Simplified method of solving numerical problems under material balance with and without chemical reactions Conversions of chemical engineering equations from one unit to another Solution of fuel and combustion and energy balance problems using tabular column

Process Calculations for Chemical Engineers Ch Durgaprasada Rao,D V S Murthy,1980-02-01 This book presents an introduction to chemical engineering calculations along with the techniques of writing mass and energy balances for chemical nuclear biochemical electrochemical and other less conventional processes Both undergraduate students of

Introduction to Process Calculations Stoichiometry KA. Gavhane,2012 **Handbook of Chemical Engineering Calculations** Nicholas Chopey,2004 Provides detailed procedures for performing hundreds of chemical engineering calculations along with fully worked out examples **Chemical Process Calculations Manual** David Carr Igbinoghene,2004 This compact information dense resource provides instant access to hundreds of the calculations used in chemical process plants around the world Readers will also find a wealth of useful tables for the density of gaseous and temperature of liquids Midwest Basic Principles and Calculations in Process Technology T. David Griffith,2016

STOICHIOMETRY AND PROCESS CALCULATIONS, SECOND EDITION NARAYANAN, K. V.,LAKSHMIKUTTY, B.,2016-12-01 Designed as a textbook for the undergraduate students of chemical engineering and related disciplines such as biotechnology polymer technology petrochemical engineering electrochemical engineering environmental engineering and safety engineering the chief objective of the book is to prepare students to make analysis of chemical processes through calculations and to develop systematic problem solving skills in them The text presents the fundamentals of chemical engineering operations and processes in a simple style that helps the students to gain a thorough understanding of chemical process calculations The book deals with the principles of stoichiometry to formulate and solve material and energy balance problems in processes with and without chemical reactions With the help of examples the book explains the construction and use of reference substance plots equilibrium diagrams psychrometric charts steam tables and enthalpy composition diagrams It also elaborates on thermophysics and thermochemistry to acquaint the students with the thermodynamic principles of energy balance calculations The book is supplemented with Solutions Manual for instructors containing detailed solutions of

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composition behaviour of gases vapour pressure of pure substances and humidity and saturation are covered in detail In addition mass and energy balances of chemical processes have also been described Chemical processes without chemical reactions include fluid flow mixing evaporation distillation absorption and stripping liquid liquid extraction leaching and washing adsorption drying crystallization and membrane separation process SALIENT FEATURES Description of all concepts and principles with a rich pedagogy for easy understanding Correct use of SI units Over 270 solved examples for understanding the basic concepts Answers to all chapter end numerical problems for checking the accuracy of calculations TARGET AUDIENCE BE B Tech Chemical Engineering **Basic Principles and Calculations in Process Technology** T. David Griffith,2015-09-02 A Practical Guide to Physical and Chemical Principles and Calculations for Today s Process Control Operators In Basic Principles and Calculations in Process Technology author T David Griffith walks process technologists through the basic principles that govern their operations helping them collaborate with chemical engineers to improve both safety and productivity He shows process operators how to go beyond memorizing rules and formulas to understand the underlying science and physical laws so they can accurately interpret anomalies and respond appropriately when exact rules or calculation methods don t exist Using simple algebra and non technical analogies Griffith explains each idea and technique without calculus He introduces each topic by explaining why it matters to process technologists and offers numerous examples that show how key principles are applied and calculations are performed For end of chapter problems he provides the solutions in plain English discussions of how and why they work Chapter appendixes provide more advanced information for further exploration Basic Principles and Calculations in Process Technology is an indispensable practical resource for every process technologist who wants to know what the numbers mean so they can control their systems and processes more efficiently safely and reliably T David Griffith received his B S in chemical engineering from The University of Texas at Austin and his Ph D from the University of Wisconsin Madison then top ranked in the discipline After working in research on enhanced oil recovery EOR he cofounded a small chemical company and later in his career he developed a record setting Electronic Data Interchange EDI software package He currently instructs in the hydrocarbon processing industry Coverage includes Preparing to solve problems by carefully organizing them and establishing consistent sets of measures Calculating areas and volumes including complex objects and interpolation Understanding Boyle s Law Charles s Law and the Ideal Gas Law Predicting the behavior of gases under extreme conditions Applying thermodynamic laws to calculate work and changes in gas enthalpy and to recognize operational problems Explaining phase equilibria for distillation and fractionalization Estimating chemical reaction speed to optimize control Balancing material or energy as they cross system boundaries Using material balance calculations to confirm quality control and prevent major problems Calculating energy balances and using them to troubleshoot poor throughput Understanding fluid flow including shear viscosity laminar and turbulent flows vectors and tensors Characterizing the operation of devices that transport heat energy for heating or cooling Analyzing mass transfer

in separation processes for materials purification *Preliminary Chemical Engineering Plant Design* W.D. Baasal,1989-11-30 This reference covers both conventional and advanced methods for automatically controlling dynamic industrial processes Handbook of Chemical Engineering Calculations, Fourth Edition Tyler G. Hicks,Nicholas P. Chopey,2012-07-30 Solve chemical engineering problems quickly and accurately Fully revised throughout with new procedures Handbook of Chemical Engineering Calculations Fourth Edition shows how to solve the main process related problems that often arise in chemical engineering practice New calculations reflect the latest green technologies and environmental engineering standards Featuring contributions from global experts this comprehensive guide is packed with worked out numerical procedures Practical techniques help you to solve problems manually or by using computer based methods By following the calculations presented in this book you will be able to achieve accurate results with minimal time and effort Coverage includes Physical and chemical properties Stoichiometry Phase equilibrium Chemical reaction equilibrium Reaction kinetics reactor design and system thermodynamics Flow of fluids and solids Heat transfer Distillation Extraction and leaching Crystallization Absorption and stripping Liquid agitation Size reduction Filtration Air pollution control Water pollution control Biotechnology Cost engineering *Chemical Engineering Design* Ray Sinnott,Gavin Towler,2019-05-26 Chemical Engineering Design SI Edition is one of the best known and most widely used textbooks available for students of chemical engineering The enduring hallmarks of this classic book are its scope and practical emphasis which make it particularly popular with instructors and students who appreciate its relevance and clarity This new edition provides coverage of the latest aspects of process design operations safety loss prevention equipment selection and much more including updates on plant and equipment costs regulations and technical standards Includes new content covering food pharmaceutical and biological processes and the unit operations commonly used Features expanded coverage on the design of reactors Provides updates on plant and equipment costs regulations and technical standards Integrates coverage with Honeywell s UniSim software for process design and simulation Includes online access to Engineering s Cleopatra cost estimating software

This book delves into Process Calculation Chemical Engineering. Process Calculation Chemical Engineering is a crucial topic that must be grasped by everyone, from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Process Calculation Chemical Engineering, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
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    - Chapter 3: Process Calculation Chemical Engineering in Everyday Life
    - Chapter 4: Process Calculation Chemical Engineering in Specific Contexts
    - Chapter 5: Conclusion
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3. In chapter 2, the author will delve into the foundational concepts of Process Calculation Chemical Engineering. This chapter will elucidate the essential principles that must be understood to grasp Process Calculation Chemical Engineering in its entirety.
4. In chapter 3, the author will examine the practical applications of Process Calculation Chemical Engineering in daily life. The third chapter will showcase real-world examples of how Process Calculation Chemical Engineering can be effectively utilized in everyday scenarios.
5. In chapter 4, this book will scrutinize the relevance of Process Calculation Chemical Engineering in specific contexts. The fourth chapter will explore how Process Calculation Chemical Engineering is applied in specialized fields, such as education, business, and technology.
6. In chapter 5, this book will draw a conclusion about Process Calculation Chemical Engineering. This chapter will summarize the key points that have been discussed throughout the book.

The book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Process Calculation Chemical Engineering.

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