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Autore	Zlokarnik Marko <1931->
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Nota di contenuto	Scale-Up in Chemical Engineering; Contents; Preface to the 1st Edition; Preface to the 2nd Edition; Symbols; 1 Introduction; 2 Dimensional Analysis; 2.1 The Fundamental Principle; 2.2 What is a Dimension?; 2.3 What is a Physical Quantity?; 2.4 Base and Derived Quantities, Dimensional Constants; 2.5 Dimensional Systems; 2.6 Dimensional Homogeneity of a Physical Content; Example 1: What determines the period of oscillation of a pendulum? Example 2: What determines the duration of fall of a body in a homogeneous gravitational field (Law of Free Fall)? What determines the speed v of a liquid discharge out of a vessel with an opening? (Torricelli's formula)Example 3: Correlation between meat size and roasting time; 2.7 The Pi Theorem; 3 Generation of Pi-sets by Matrix Transformation; Example 4: The pressure drop of a homogeneous fluid in a straight, smooth pipe (ignoring the inlet effects); 4 Scale Invariance of the Pi-space - the Foundation of the Scale-up; Example 5: Heat transfer from a heated wire to an air stream 5 Important Tips Concerning the Compilation of the Problem Relevance List5.1 Treatment of Universal Physical Constants; 5.2 Introduction of Intermediate Quantities; Example 6: Homogenization of liquid mixtures

with different densities and viscosities; Example 7: Dissolved air flotation process; 6 Important Aspects Concerning the Scale-up; 6.1 Scale-up Procedure for Unavailability of Model Material Systems; Example 8: Scale-up of mechanical foam breakers; 6.2 Scale-up Under Conditions of Partial Similarity; Example 9: Drag resistance of a ship's hull

Example 10: Rules of thumb for scaling up chemical reactors: Volume-related mixing power and the superficial velocity as design criteria for mixing vessels and bubble columns7 Preliminary Summary of the Scale-up Essentials; 7.1 The Advantages of Using Dimensional Analysis; 7.2 Scope of Applicability of Dimensional Analysis; 7.3 Experimental Techniques for Scale-up; 7.4 Carrying out Experiments Under Changes of Scale; 8 Treatment of Physical Properties by Dimensional Analysis; 8.1 Why is this Consideration Important?; 8.2 Dimensionless Representation of a Material Function

Example 11: Standard representation of the temperature dependence of the viscosityExample 12: Standard representation of the temperature dependence of density; Example 13: Standard representation of the particle strength for different materials in dependence on the particle diameter; Example 14: Drying a wet polymeric mass. Reference-invariant representation of the material function D(T, F); 8.3 Reference-invariant Representation of a Material Function; 8.4 Pi-space for Variable Physical Properties; Example 15: Consideration of the dependence (T) using the (w)/ term

Example 16: Consideration of the dependence (T) by the Grashof number Gr

Sommario/riassunto

Covering the important task of the scale-up of processes from the laboratory to the production scale, this easily comprehensible and transparent book is divided into two sections. The first part details the theoretical principles, introducing the subject for readers without a profound prior knowledge of mathematics. It discusses the fundamentals of dimensional analysis, the treatment of temperature-dependent and rheological material values and scale-up where model systems or not available or only partly similar. All this is illustrated by 20 real-world examples, while 25 exercises plus solutio