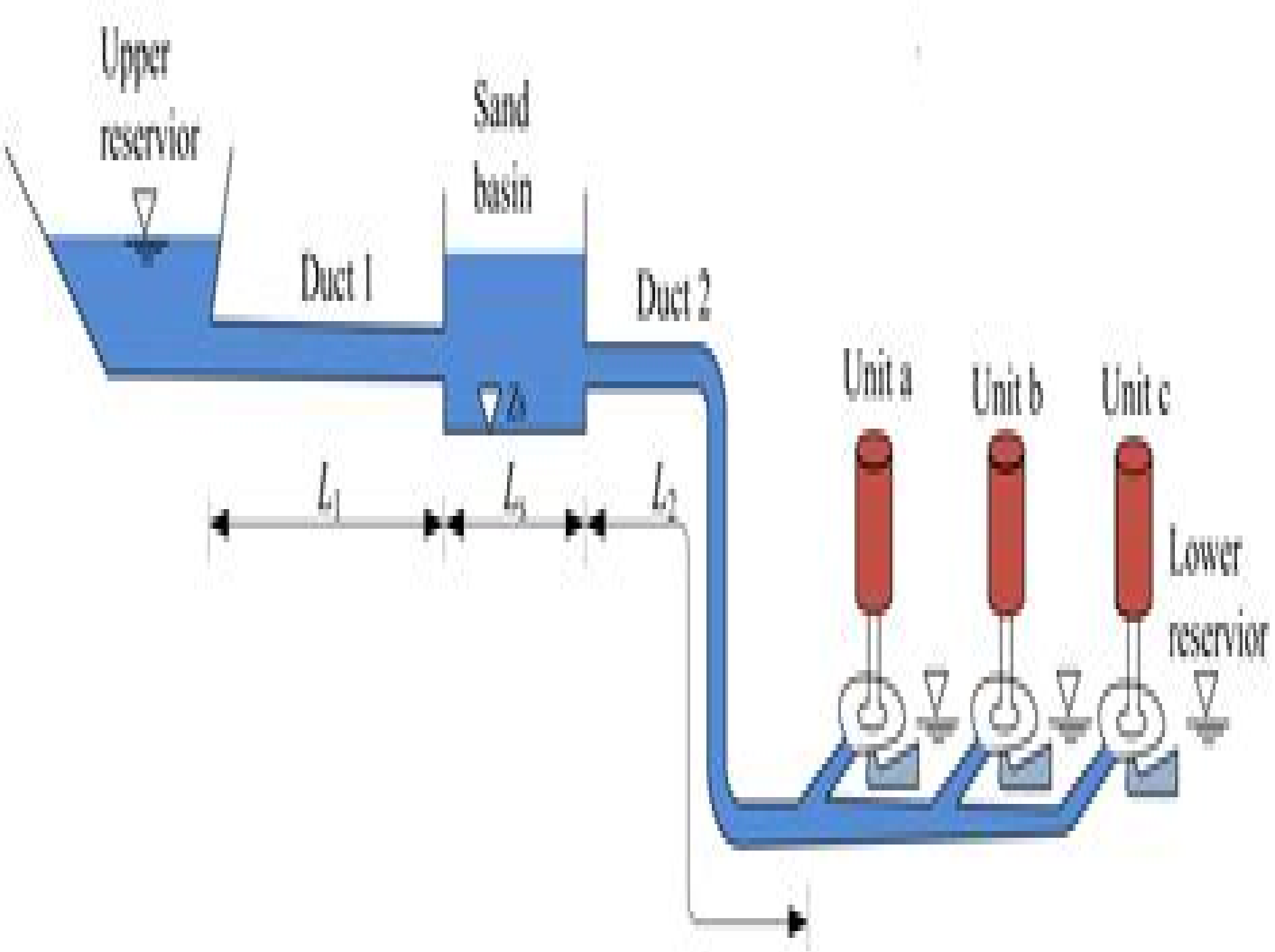




# Hydraulic Transient In A Pipeline Lunds Universitet

**American Geophysical Union. Meeting**



## **Hydraulic Transient In A Pipeline Lunds Universitet:**

**Pipeline Systems** E.P. Evans,B. Coulbeck,2013-03-09 This conference provides a forum for exchange of technical and operational information across a wide range of pipeline activities Various supply and distribution industries and their service organisations have traditionally approached pipeline systems from many different perspectives The organisers believe that significant benefits can be gained by enabling representatives from the oil gas water chemical power and related industries to present their latest ideas and methods An awareness of these alternative methodologies and technologies should result in a more unified and coherent approach to each individual type of pipeline system The overall theme of the conference is the optimisation of pipeline systems through design analysis component specification operational strategies and performance evaluation in order to minimise both risk and the lifetime cost of ownership Wherever possible emphasis is given to important developing technologies with special consideration to use of computational equipment and methods **SYSTEMS APPROACH** For the major activities of design operation and performance pipeline systems can be conveniently classified in terms of the systemV components constraints and objectives These are described using fluid terminology to suit the majority of conference participants as given below Components consist of pumps and valves controls pipe networks transmission and distribution reservoirs storage and consumer demands disturbances The arrangement of these components to form the system must take into account the conflicting requirements of structural hydraulic and cost performance *Fluid Transient Analysis by Microcomputer* University of Michigan. Engineering Summer Conferences,1987 **Process and Plant Safety** Jürgen Schmidt,2012-05-14 The safe operation of plants is of paramount importance in the chemical petrochemical and pharmaceutical industries Best practice in process and plant safety allows both the prevention of hazards and the mitigation of consequences Safety Technology is continuously advancing to new levels and Computational Fluid Dynamics CFD is already successfully established as a tool to ensure the safe operation of industrial plants With CFD tools a great amount of knowledge can be gained as both the necessary safety measures and the economic operation of plants can be simultaneously determined Young academics safety experts and safety managers in all parts of the industry will henceforth be forced to responsibly judge these new results from a safety perspective This is the main challenge for the future of safety technology This book serves as a guide to elaborating and determining the principles assumptions strengths limitations and application areas of utilizing CFD in process and plant safety and safety management The book offers recommendations relating to guidelines procedures frameworks and technology for creating a higher level of safety for chemical and petrochemical plants It includes modeling aids and concrete examples of industrial safety measures for hazard prevention *Water resources and distribution* William Robert Blain,K. L. Katsifarakis,1994 **Thermodynamic Equilibria and Extrema** Alexander N. Gorban,Boris M. Kaganovich,Sergey P. Filippov,Alexandre V. Keiko,Vitaly A. Shamansky,Igor A. Shirkalin,2006-07-19 Since the creation of classical equilibrium thermodynamics in the second part of the nineteenth century by Clausius Helmholtz

Maxwell Gibbs and Boltzmann its potential has increased immeasurably due to the rapid development of numerical mathematics and computers Now models based on Gibbs s fundamental equations allow one not only to find the point of final equilibrium in a given system but also to examine the entire area thermodynamically attainable from a given initial point Moreover they are capable of finding in this area the equilibrium states partial equilibria of interest to a researcher for their extreme values of a considered parameter such as the concentration of useful or harmful products of a chemical process In doing so it appears possible to take into consideration in a strict thermodynamic form with no use of the time variable the limitations posed by chemical reaction rates and irreversible processes of mass energy and impulse transfer

*Selected Water Resources Abstracts* ,1989

### **Untersuchung von Energie- und Massespeichervorgängen in**

**Pkw-Kälteanlagen** Katrin Pröll,2009-07-16 In der vorliegenden Arbeit wird mit Hilfe von Simulationsmodellen in der Modellierungssprache Modelica das Systemverhalten eines automobilen K ltekreises anhand zweier Fragestellungen beleuchtet die eine Berücksichtigung transienter Vorgänge erforderlich machen Die Speicherung von thermischer Energie in einem Phasenwechselmedium das in den K ltemittelverdampfer eingebracht wird bildet die Grundidee für eine Überbrückung des fehlenden Kompressordrehmomentes während kurzer Stopp Phasen eines Fahrzeuges mit Mild Hybrid Antrieb Die Komponente wird anhand von Daten einer realisierten Variante modelliert und im Gesamtprozess simuliert Der zweite Anwendungsfall beschäftigt sich mit dem charakteristischen Prozessverhalten einer Pkw K lteanlage bei K ltemittelverlust und dem Ziel diesen anhand von ausgewählten Prozessgrößen zu erfassen Die Verteilung der K ltemittelmasse im System und das spezifische Massespeicherverhalten der einzelnen Prozesskomponenten wird dabei ebenfalls auf Basis transienter Modellansätze untersucht Zu Beginn der Arbeit werden zunächst die theoretischen Grundlagen der verwendeten Modelle vorgestellt Die Komponentenmodelle bauen auf vorhandenen Basismodellen auf die darin implementierten Erhaltungsgleichungen für Masse Energie und Impuls werden für die eindimensional betrachtete Fluidströmung aufgestellt Das angewendete Finite Volumen Verfahren ordnet die Energie und Massenbilanzen einerseits und die Impulsbilanz andererseits auf einem versetzten Gitter an die Bilanzgrenzen sind daher jeweils um ein halbes Volumen zueinander verschoben Da jedes Volumen als ideal durchmischt angesehen wird besteht an der Volumengrenze gleichzeitig eine Diskontinuität im Verlauf der thermodynamischen Zustandsgrößen die insbesondere bei groben Diskretisierungen stark ausgeprägt sein kann Während die komponentenbasierte Modellierung durch die strukturelle auch graphisch erkennbare Trennung der einzelnen Komponentenmodelle den Anschein von klaren Systemgrenzen erweckt ist nicht immer auf Anhieb erkennbar welcher Seite der Systemgrenze die in einer Konnektorverbindung gleichgesetzten Zustandsgrößen zuzuordnen sind Eine Vorstellung von Schnittstellenkonzepten die in weiteren Fluid Bibliotheken realisiert wurden verdeutlicht die Auswirkungen eines jeden Ansatzes und ordnet das im weiteren Verlauf der Arbeit verwendete Konzept ein Die Auflistung räumlicher Gradienten der thermodynamischen Zustandsgrößen in eine Raumrichtung beschreibt die abzubildenden Fluidströmungen

mungen auf konvektive Ströme mit einer eindeutig dominierenden Hauptströmungsrichtung. In Wärmeübertragern kommt die Wärmeleitung im Wandmaterial und eine Aufteilung der eintretenden Fluidströme in mehrere parallele Ströme hinzu. Bei den in Automobilen Kälteanlagen zum Einsatz kommenden kompakten Ausführungen entsteht durch die entsprechende thermische Verknüpfung schnell eine dreidimensionale Struktur mit einer Vielzahl von dynamischen Zuständen. In dieser Arbeit werden die vereinfachenden Annahmen vorgestellt, die ein Modell eines Kreuzgegenstromwärmeübertragers für die Systemsimulation tauglich machen und die gleichzeitig die Grenzen des Modells aufzeigen. Dieser Sachverhalt wird besonders an dem vorgestellten Modell des Speicherverdampfers deutlich. Hier wird eine herkömmliche Kreuzgegenstromführung zwischen Luft und Kältemittel ergänzt um ein Phasenwechselmaterial, das zwischen den beiden Medien angeordnet ist. Das Bauteil wird in einem Fahrzeugkältekreis mit dem Ziel eingesetzt, die erforderliche Austrittstemperatur der Verdampferluft auch während kurzer Stoppzeiten des Motors in denen kein Drehmoment an der Kompressorwelle zur Verfügung steht zu gewährleisten. Zwar kann dank vorhandener Symmetriegrenzen die mehrdimensionale Wärmeleitung in dem Speichermaterial abgebildet werden. Sobald jedoch die gerichtete Strömung des Kältemittels einbricht, wird die fluidgebundene Energieverteilung in der Komponente nicht mehr korrekt wiedergegeben. Aus den Simulationsergebnissen wird deutlich, dass die verwendete Menge an PCM kaum dazu ausreicht, genügend Wärme zu speichern. Sollte nicht eine zusätzliche bewegliche Kapazität für die Wärmeaufnahme im Bauteil vorhanden sein? Daher ist der Einsatz des Modells beschränkt auf Situationen, die eine minimale Kältemittelströmung als Randbedingung vorgeben. Dafür wäre in einem Kreisprozess ein Ventilmodell erforderlich, das die Reaktion auf einen Kompressorstopp korrekt wiedergibt und den Zusammenhang zwischen sehr kleinen Massenströmen und geringen Druckdifferenzen abbilden kann. In einem weiteren Anwendungsfall der beschriebenen Modell wird das charakteristische Prozessverhalten einer R134a Kälteanlage bei einer Änderung der im Kreislauf enthaltenen Kältemittelmasse untersucht. An einer Versuchsanlage mit Standardkomponenten eines R134a Fahrzeugkältekreises wurde schrittweise die enthaltene Kältemittelmenge erhöht und mit einem Systemmodell nachsimuliert. Die Modelle der Kältemittelführenden Komponenten wurden dafür um einen empirischen Dampfvolumen-Ansatz aus der Literatur erweitert, der den Schlupf zwischen den beiden Phasen berücksichtigt. Die in dem hochdruckseitigen Kältemittelsammler eingelagerte Masse wird über den Grad der Phasentrennung in dem Bauteil bestimmt. Anhand eines gläsernen durchsichtigen Sammlers im Experimentalsystem können Bereiche starker Durchmischung und auch ein deutlicher Phasentrennspiegel ausgemacht werden. Zusätzlich kann ein visueller Einblick in den Prozess an einer Stelle gewonnen werden, an der bei einer starken Unterfütterung des Kreislaufes eine Bestimmung des zweiphasigen Kältemittelzustandes anhand von Temperatur- und Druckmessungen nicht möglich ist. Das Modell der Komponente aufgeteilt in Bereiche mit idealer Durchmischung der Phasen und mit einer idealen Phasentrennung zeigt im Verlauf einer schrittweisen Anlagenbefüllung eine gute Übereinstimmung mit den visuellen Beobachtungen und dem registrierten Gewicht des Sammlers in der Versuchsanlage. Diese können ebenfalls herangezogen

werden um verschiedene Phasen der Masseeinlagerung in den einzelnen Bereichen des Kreisprozesses zu identifizieren. So zeigt sich deutlich, dass die betrachtete Anlagenkonfiguration mit einem hochdruckseitigen Sammler und einem thermostatischen Expansionsventil relativ tolerant innerhalb eines weiten Bereiches auf Unterfllung reagiert, ohne dass eine starke Leistungseinbu e erfolgt. In dieser Phase wandert der Zustand am Kondensatoraustritt von einer Unterk hlung in den Zweiphasenbereich mit einem Haltepunkt auf der Phasengrenze, bei dem sich allein die Masse im Sammler ndert. Vorher verringert sich in erster Linie die Bef llung im Kondensator, danach in der Fl ssigleitung zwischen Kondensator und Expansionsventil. Sobald aber der Zustand zwischen den beiden Bauteilen anfgt von der S ttigungsdichte stark abzuweichen, brechen K ltleistung, Massenstrom und letztendlich auch die Kompressorschmierung ein. Da es auch andere Gr nde f r eine nicht erreichte Sollleistung bei Normalbef llung gibt, etwa ein nicht ausreichendes Drehmoment an der Antriebswelle oder extreme Au enbedingungen, wird statt dessen vorgeschlagen, mit Hilfe zweier Temperatursensoren an der Abstr mfl che des Verdampfers eine charakteristische Verschiebung des berhitzten Bereiches in dem W rme bertrager zu registrieren. Diese konnte sowohl im Experiment als auch in der Simulation nachgewiesen werden. Unter der Voraussetzung einer korrekten Wiedergabe des Anlagenverhaltens bei einem K ltemittelverlust kann das Simulationsmodell verwendet werden, um den charakteristischen Betrieb eines beliebigen Systems mit unterschiedlichen Bef llungen zu untersuchen und dabei Pr fstandsversuche einzusparen. Da installierte Messtechnik h ufig das Anlagenvolumen ver ndert, kann in einigen F llen sogar die Simulation das einzig m gliche Werkzeug sein. Trotz einer guten bereinstimmung bez glich des charakteristischen Verlaufes verschiedener Prozessgr en und in weiten Bereichen auch ihrer absoluten Werte treten einzelne Abweichungen zwischen Modell und Messung auf. Dies betrifft in erster Linie den stark unterf llten Bereich, der einen deutlichen Druckabfall zur Folge hat und in der Simulation erst bei niedrigeren Bef llungen als im Experiment erreicht wird. Es wird vermutet, dass das verwendete Modell des Drosselorgans nur unzureichend den realen Betrieb bei sehr geringen Massenstr men und einem zweiphasigen Eintritt abbildet. Dennoch ist aufgrund der dynamischen und weitestgehend prozessunabh ngigen Modellierung der Einzelkomponenten, insbesondere der W rme bertrager, eine Abbildung des K ltekreisbetriebes au erhalb der Normalbedingungen m glich. Anders als in station ren Prozessberechnungen ist die Vorgabe einer Berhitzung am Verdampferaustritt und einer Unterk hlung am Kondensatoraustritt nicht erforderlich, sondern diese folgen aus der eingef llten K ltemittelmenge und nehmen im Verlauf der Bef llung im Vergleich zum Normalbetrieb stark abweichende Werte an.

Heating and Cooling with Ground-Source Heat Pumps in Cold and Moderate Climates Vasile Minea, 2022-04-19. Heating and Cooling with Ground Source Heat Pumps in Cold and Moderate Climates. Fundamentals and Basic Concepts covers fundamentals and design principles of vertical and horizontal indirect and direct expansion closed loop as well as ground and surface water ground source heat pump systems. It explains the thermodynamic aspects of mechanical and thermochemical compression cycles of geothermal heat pumps and describes the energetic, economic and environmental aspects associated

with the use of ground source heat pump systems for heating and cooling residential and commercial institutional buildings in moderate and cold climates Based on the author s more than 30 years of technical experience Focuses on ground source heat pump technologies that can be successfully applied in moderate and cold climates Discusses technical aspects as well as the most common and uncommon application fields of basic system configurations This work is aimed at designers of HVAC systems as well as geological mechanical and chemical engineers implementing environmentally friendly heating and cooling technologies for buildings

*Analysis and Design of Energy Geostructures* Lyesse Laloui, Alessandro F. Rotta Loria, 2019-10-19 Analysis and Design of Energy Geostructures gathers in a unified framework the theoretical and experimental competence available on energy geostructures innovative multifunctional earth contact structures that can provide renewable energy supply and structural support to any built environment The book covers the broad interdisciplinary and integrated knowledge required to address the analysis and design of energy geostructures from energy geotechnical and structural perspectives This knowledge includes Part A an introduction to the technology Part B the fundamentals of heat and mass transfers as well as of the mechanics of geomaterials and structures required to address the unprecedented behavior of energy geostructures Part C the experimental evidence characterizing the considered geostructures Part D various analytical and numerical modeling approaches to analyze the response of energy geostructures and Part E the performance based design and detailing essentials of energy geostructures Proposes the theoretical and practical application essentials required to address the analysis and design of energy geostructures from energy geotechnical and structural perspectives Presents a substantial amount of resolved exercises on key aspects governing the behavior and performance of energy geostructures to be considered in analysis and design Summarizes and discusses the most recent scientific and technical knowledge about energy geostructures including energy piles energy tunnels and energy walls

Heating and Cooling with Ground-Source Heat Pumps in Moderate and Cold Climates, Two-Volume Set Vasile Minea, 2022-07-30 Heating and Cooling with Ground Source Heat Pumps in Moderate and Cold Climates Two Volume Set focuses on the use of very low temperature geothermal energy for heating and cooling residential institutional and industrial buildings and aims to increase the design community s awareness and knowledge of the benefits design and installation requirements of commercial institutional building ground source heat pumps GSHP This set helps readers assess applicability select a GSHP system type and estimate building thermal load to ensure proper size for ground source subsystems appropriate brine and groundwater flow rates and apt design of building closed loops with distributed or central geothermal heat pumps The first volume addresses fundamentals and design principles of vertical and horizontal indirect and direct expansion closed loop as well as ground and surface water ground source heat pump systems It explains the thermodynamic aspects of mechanical and thermochemical compression cycles of geothermal heat pumps as well as the energetic economic and environmental aspects associated with the use of ground source heat pump systems for heating and cooling residential and commercial institutional buildings in moderate and

cold climates The second volume focuses on applications and cases studies of ground source heat pumps in moderate and cold climates It details technical aspects as well as the most common and uncommon application fields of basic system configurations The principles of system integrations and applications in moderate and cold climates are also presented each followed by case studies This comprehensive work is aimed at designers of HVAC systems as well as geological mechanical and chemical engineers implementing environmentally friendly heating and cooling technologies for buildings

Electromagnetic Methods in Geophysics Fabio Giannino, Giovanni Leucci, 2021-08-31 Discover the utility of four popular electromagnetic geophysical techniques In GeoRadar FDEM TDEM and AEM Methods accomplished researchers Fabio Giannino and Giovanni Leucci deliver an in depth exploration of the theory and application of four different electromagnetic geophysical techniques ground penetrating radar the frequency domain electromagnetic method the time domain electromagnetic method and the airborne electromagnetic method The authors offer a full description of each technique as they relate to the economics planning and logistics of deploying each of them on site The book also discusses the potential output of each method and how it can be combined with other sources of below and above ground information to create a digitized common point cloud containing a wide variety of data Giannino and Leucci rely on 25 years of professional experience in over 40 countries around the world to provide readers with a fulsome description of the optimal use of GPR FDEM TDEM and AEM demonstrating their flexibility and applicability to a wide variety of use cases Readers will also benefit from the inclusion of A thorough introduction to electromagnetic theory including the operative principles and theory of ground penetrating radar GPR and the frequency domain electromagnetic method FDEM An exploration of hardware architecture and surveying including GPR FDEM time domain electromagnetic method TDEM and airborne electromagnetic AEM surveying A collection of case studies including a multiple geophysical archaeological GPR survey in Turkey and a UXO search in a building area in Italy using FDEM li Discussions of planning and mobilizing a campaign the shipment and clearance of survey equipment and managing the operative aspects of field activity Perfect for forensic and archaeological geophysicists GeoRadar FDEM TDEM and AEM Methods will also earn a place in the libraries of anyone seeking a one stop reference for the planning and deployment of GDR FDEM TDEM and AEM surveying techniques Geothermal Energy Marc A. Rosen, Seama Koohi-Fayegh, 2016-11-18 Comprehensively covers geothermal energy systems that utilize ground energy in conjunction with heat pumps to provide sustainable heating and cooling The book describes geothermal energy systems that utilize ground energy in conjunction with heat pumps and related technologies to provide heating and cooling Also discussed are methods to model and assess such systems as well as means to determine potential environmental impacts of geothermal energy systems and their thermal interaction The book presents the most up to date information in the area It provides material on a range of topics from thermodynamic concepts to more advanced discussions of the renewability and sustainability of geothermal energy systems Numerous applications of such systems are also provided Geothermal Energy

Sustainable Heating and Cooling Using the Ground takes a research orientated approach to provide coverage of the state of the art and emerging trends and includes numerous illustrative examples and case studies Theory and analysis are emphasized throughout with detailed descriptions of models available for vertical and horizontal geothermal heat exchangers Key features Explains geothermal energy systems that utilize ground energy in conjunction with heat pumps to provide heating and cooling as well as related technologies such as thermal energy storage Describes and discusses methods to model and analyze geothermal energy systems and to determine their potential environmental impacts and thermal interactions Covers various applications of geothermal energy systems Takes a research orientated approach to provide coverage of the state of the art and emerging trends Includes numerous illustrative examples and case studies The book is key for researchers and practitioners working in geothermal energy as well as graduate and advanced undergraduate students in departments of mechanical civil chemical energy environmental process and industrial engineering **Hillslope**

**Hydrology and Stability** Ning Lu,Jonathan W. Godt,2013-01-17 A cutting edge quantitative approach to understanding hydro mechanical processes behind rainfall induced landslides for graduate students researchers and professionals

Rainfall-Induced Soil Slope Failure Lulu Zhang,Jinhui Li,Xu Li,Jie Zhang,Hong Zhu,2018-09-03 Rainfall induced landslides are common around the world With global climate change their frequency is increasing and the consequences are becoming greater Previous studies assess them mostly from the perspective of a single discipline correlating landslides with rainstorms geomorphology and hydrology in order to establish a threshold prediction value for rainfall induced landslides analyzing the slope s stability using a geomechanical approach or assessing the risk from field records Rainfall Induced Soil Slope Failure Stability Analysis and Probabilistic Assessment integrates probabilistic approaches with the geotechnical modeling of slope failures under rainfall conditions with unsaturated soil It covers theoretical models of rainfall infiltration and stability analysis reliability analysis based on coupled hydro mechanical modelling stability of slopes with cracks gravels and spatial heterogenous soils and probabilistic model calibration based on measurement It focuses on the uncertainties involved with rainfall induced landslides and presents state of the art techniques and methods which characterize the uncertainties and quantify the probabilities and risk of rainfall induced landslide hazards Additionally the authors cover The failure mechanisms of rainfall induced slope failure Commonly used infiltration and stability methods The infiltration and stability of natural soil slopes with cracks and colluvium materials Stability evaluation methods based on probabilistic approaches The effect of spatial variability on unsaturated soil slopes and more Mechanical Engineering ,1959 *Government Reports Announcements & Index* ,1995 **International Aerospace Abstracts** ,1965 Spring Meeting American Geophysical Union. Meeting,1999 **Comprehensive Dissertation Index** ,1984 **Current Environmental Engineering Summaries** Engineering Information, Inc,1993

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