Hydraulic Fracturing

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Environmental Issues Concerning Hydraulic Fracturing, Volume One captures the state-of-the-art research currently used to evaluate the potential impact of unconventional gas and oil gas extraction processes. Topics in this comprehensive guide on the topic include chapters on The Human Health Implications of Unconventional Oil and Gas Development, The use of Noble Gas Analysis and other Forensic Techniques in Characterizing Contamination Pathways Associated with Oil and Gas Development, Well Integrity, Contamination Mechanisms and Groundwater Impacts Associated with Unconventional Oil and Gas Development, and Advances in Fracturing and Well Construction: Improving Efficiency and Reducing Risks. This serial explores a wide breadth of emerging and state-of-the-art technologies used to study the potential environmental impact and various processes in the massive industrial process of shale exploration and resource extraction. Covers a wide breadth of emerging and state-of-the-art technologies Includes contributions from an International board of authors Provides a comprehensive set of reviews, covering the potential impact of unconventional gas and oil gas extraction processes

Hydraulic fracturing, commonly referred to as “fracking,” is a technique used by the oil and gas industry to mine hydrocarbons trapped deep beneath the Earth’s surface. The principles underlying the technology are not new. Fracking was first applied at the commercial level in the United States as early as 1947, and over the decades it has been applied in various countries including Canada, the UK, and Russia. The author worked with engineering teams as early as the mid-1970s in evaluating ways to improve oil recovery from this practice. By and large fracking was not an economically competitive process and had limited applications until the early 2000s. Several factors altered the importance of this technology, among them being significant technological innovations in drilling practices with impressive high tech tools for exploration, well construction and integrity, and recovery along with discoveries of massive natural gas reserves in the United States and other parts of the world. These factors have catapulted the application of the technology to what is best described as the gold rush of the 21st century, with exploration and natural gas plays proceeding at a pace that seemingly is unrivaled by any historical industrial endeavor. But this level of activity has invoked widespread criticism from concerned citizens and environmental groups in almost every nation across the Globe. This outstanding new volume offers the industry a handbook of environmental management practices that can mitigate risks to the environment and, through best practices and current technologies, to conform to the current standards and regulations that are in place to provide the world with the energy it needs while avoiding environmental damage. For the new hire, veteran engineer, and student alike, this is a one-of-a-kind volume, a must-have for anyone working in hydraulic fracturing.

High volume hydraulic fracturing of deep shale deposits has transformed the oil and gas industry, catapulting the United States (U.S.) into the biggest oil and natural gas producer in the world, surpassing Russia as of June 2015. Hydraulic fracturing has been a game changer providing an important measure of energy independence for the U.S. As one expert put it, "Shale deposits are a gift from God." Hydraulic fracturing operations in North Dakota, in the Marcellus formation in Pennsylvania, West Virginia, and Ohio, and in multiple other states are the subject of increased media, public, and regulatory attention. New potential shale plays across the U.S. are also being examined, including the Monterey shale formation in California where hydraulic fracturing is a timely and significant environmental issue. Concurrent with the increased development of unconventional hydrocarbon resources are concerns over perceived risks to the environment that have been raised at hydraulic fracturing locations throughout the U.S. These biogeochemical changes occurring in the millions of gallons of hydraulic fracturing wastewater creates a unique dilemma for the disposal and potential reuse of these waters. Traditional disposal options are now less available due to public concern over safety risks, so water reuse is becoming the go-to solution, often requiring new treatment technologies to make the water suitable for reuse in the hydraulic fracturing process. This book focuses on these issues fracking poses as well as the solutions to make it viable.

Natural gas plays a key role in our nation's clean energy future. Recent advances in drilling technologies-including horizontal drilling and hydraulic fracturing-have made vast reserves of natural gas economically recoverable in the US. Responsible development of America's oil and gas resources offers important economic, energy security, and environmental benefits. Hydraulic fracturing is a well stimulation technique used to maximize production of oil and natural gas in unconventional reservoirs, such as shale, coalbeds, and tight sands. During hydraulic fracturing, specially engineered fluids containing chemical additives and proppant are pumped under high pressure into the well to create and hold open fractures in the formation. These fractures increase the exposed surface area of the rock in the formation and, in turn, stimulate the flow of natural gas or oil to the wellbore. As the use of hydraulic fracturing has increased, so have concerns about its potential environmental and human health impacts. Many concerns about hydraulic fracturing center on potential risks to drinking water resources, although other issues have been raised. In response to public concern, the US Congress directed the US Environmental Protection Agency (EPA) to conduct scientific research to examine the relationship between hydraulic fracturing and drinking water resources. This study plan represents an important milestone in responding to the direction from Congress. EPA is committed to conducting a study that uses the best available science, independent sources of information, and a transparent, peer-reviewed process that will ensure the validity and accuracy of the results. The Agency will work in consultation with other federal agencies, state and interstate regulatory agencies, industry, non-governmental organizations, and others in the private and public sector in carrying out this study. Stakeholder outreach as the study is being conducted will continue to be a hallmark of our efforts, just as it was during the development of this study plan. The overall purpose of this study is to elucidate the relationship, if any, between hydraulic fracturing and drinking water resources. More specifically, the study has been designed to assess the potential impacts of hydraulic fracturing on drinking water resources and to identify the driving factors that affect the severity and frequency of any impacts. Based on the increasing development of shale gas resources in the US, and the comments EPA received from stakeholders, this study emphasizes hydraulic fracturing in shale formations. Portions of the research, however, are also intended to provide information on hydraulic fracturing in coalbed methane and tight sand reservoirs. The scope of the research includes the hydraulic fracturing water use lifecycle, which is a subset of the greater hydrologic cycle. For the purposes of this study, the hydraulic fracturing water lifecycle begins with water acquisition from surface or ground water and ends with discharge into surface waters or injection into deep wells. Specifically, the water lifecycle for hydraulic fracturing consists of water acquisition, chemical mixing, well injection, flowback and produced water (collectively referred to as "hydraulic fracturing wastewater"), and wastewater treatment and waste disposal.

Hydraulic Fracturing (Fracking) - Procedures, Issues, and Benefits

The Operations and Environmental Consequences of Hydraulic Fracturing

Geomechanics and Hydraulic Fracturing for Shale Reservoirs

Hydraulic Fracturing

Environmental Impacts of Hydraulic Fracturing

Fracking, or hydraulic fracturing to give its proper name, has become part of our lives recently, due to the massive exploitation of America’s shale oil and gas fields. Along the way it has stirred up controversy, with passionate opponents fighting against the oil companies. The fight has generated a lot of heat, but not much understanding. This guide, written by some-one who knows what he is talking about takes a detached, neutral view of the subject. Without pushing a view for or against, it provides the factual background you need to form an opinion of your own. An Informed and Neutral Introduction Like most people I have heard of fracking, but did I really understand what it was? To answer honestly, no. I knew it had something to do with mining and was perhaps destructive to the land. To me, it was just one of those words of the moment. This guide has given me a real sense and understanding of what fracking is. It allowed me, someone who has no experience in this field, to learn about the pros and cons of fracking, without having the good and bad of it forced down my throat. If you want an informed and neutral introduction into fracking, then this is the guide for you. ~ Debbie Prewer

Revised to include current components considered for today’s unconventional and multi-fracture grids, Mechanics of Hydraulic Fracturing, Second Edition explains one of the most important features for fracture design — the ability to predict the geometry and characteristics of the hydraulically induced fracture. With two-thirds of the world’s oil and natural gas reserves committed to unconventional resources, hydraulic fracturing is the best proven well stimulation method to extract these resources from their more remote and complex reservoirs. However, few hydraulic fracture models can properly simulate more complex fractures. Engineers and well designers must understand the underlying mechanics of how fractures are modeled in order to correctly predict and forecast a more advanced fracture network. Updated to accommodate today’s fracturing jobs, Mechanics of Hydraulic Fracturing, Second Edition enables the engineer to: Understand complex fracture networks to maximize completion strategies Recognize and compute stress shadow, which can drastically affect fracture network patterns Optimize completions by properly modeling and more accurately predicting for today’s hydraulic fracturing completions Discusses the underlying mechanics of creating a fracture from the wellbore Enhanced to include newer modeling components such as stress shadow and interaction of hydraulic fracture with a natural fracture, which aids in more complex fracture networks Updated experimental studies that apply to today’s unconventional fracturing cases

A guide to environmental and communication issues related to fracking and the best approach to protect communities Environmental Considerations Associated with Hydraulic Fracturing Operations offers a much-needed resource that explores the complex challenges of fracking by providing an understanding of the environmental and communication issues that are inherent with hydraulic fracturing. The book balances the current scientific knowledge with the uncertainty and risks associated with hydraulic fracking. In addition, the authors offer targeted approaches for helping to keep communities safe. The authors include an overview of the historical development of hydraulic fracturing and the technology currently employed. The book also explores the risk, prevention, and mitigation factors that are associated with fracturing. The authors also include legal cases, regulatory issues, and data on the cost of recovery. The volume presents audit checklists for gathering critical information and documentation to support the reliability of the current environmental conditions related to fracking operations and the impact fracking can have on a community. This vital resource: Contains the technical information and mitigation recommendations for safety and environmental issues related to hydraulic fracturing Offers an historical overview of conventional and unconventional oil and gas drilling Explains the geologic and technical issues associated with fracking of tight sand and shale formulations Presents numerous case studies from the United States EPA and other agencies Discusses issues of co-produced waste water and induced seismicity from the injection

of wastewater Written for environmental scientists, geologists, engineers, regulators, city planners, attorneys, foresters, wildlife biologists, and others, Environmental Considerations Associated with Hydraulic Fracturing Operations offers a comprehensive resource to the complex environmental and communication issues related to fracking. Natural gas plays a key role in our nation's clean energy future. The United States has vast reserves of natural gas that are commercially viable as a result of advances in horizontal drilling and hydraulic fracturing technologies, which enable greater access to gas in rock formations deep underground. These advances have spurred a significant increase in the production of both natural gas and oil across the country. Responsible development of America's oil and gas resources offers important economic, energy security, and environmental benefits. However, as the use of hydraulic fracturing has increased, so have concerns about its potential human health and environmental impacts, especially for drinking water. In response to public concern, the US House of Representatives requested that the US Environmental Protection Agency (EPA) conduct scientific research to examine the relationship between hydraulic fracturing and drinking water resources. In 2011, the EPA began research under its Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources. The purpose of the study is to assess the potential impacts of hydraulic fracturing on drinking water resources, if any, and to identify the driving factors that may affect the severity and frequency of such impacts. Scientists are focusing primarily on hydraulic fracturing of shale formations to extract natural gas, with some study of other oil-and gas-producing formations, including tight sands, and coalbeds. The EPA has designed the scope of the research around five stages of the hydraulic fracturing water cycle. Each stage of the cycle is associated with a primary research question: Water acquisition: What are the possible impacts of large volume water withdrawals from ground and surface waters on drinking water resources? Chemical mixing: What are the possible impacts of hydraulic fracturing fluid surface spills on or near well pads on drinking water resources? Well injection: What are the possible impacts of the injection and fracturing process on drinking water resources? Flowback and produced water: What are the possible impacts of flowback and produced water (collectively referred to as "hydraulic fracturing wastewater") surface spills on or near well pads on drinking water resources? Wastewater treatment and waste disposal: What are the possible impacts of inadequate treatment of hydraulic fracturing wastewater on drinking water resources? This report describes 18 research projects underway to answer these research questions and presents the progress made as of September 2012 for each of the projects. Information presented as part of this report cannot be used to draw conclusions about potential impacts to drinking water resources from hydraulic fracturing. The research projects are organized according to five different types of research activities: analysis of existing data, scenario evaluations, laboratory studies, toxicity assessments, and case studies.

Hydraulic Fracturing Explained

Hydraulic Fracture Mechanics

Hydraulic Fracturing Wastewater

Adjusting to the Shale Revolution in a Green World

Procedures, Issues, and Benefits

Many aspects of hydraulic proppant fracturing have changed since its innovation in 1947. The main significance of this book is its combination of technical and economical aspects to provide an integrated overview of the various applications of proppants in hydraulic fracturing, and gravel in sand control. The monitoring of fractures and gravel packs by well-logging and seismic techniques is also included. The book's extensive coverage of the subject should be of special interest to reservoir geologists and engineers, production engineers and technologists, and well log analysts.

Important Hydraulic fracturing news! There has never been a Hydraulic fracturing Guide like this. It contains 224 answers, much more than you can imagine; comprehensive answers and extensive details and references, with insights that have never before been offered in print. Get the information you need--fast! This all-embracing guide offers a thorough view of key knowledge and detailed insight. This Guide introduces what you want to know about Hydraulic fracturing. A quick look inside of some of the subjects covered: Muskwa Formation - Gas production, Project PACER, Patagonia - Geology, Shale gas - Geology, Hydraulic fracturing in the United States - Ohio, Hydraulic fracturing in the United States - Oil and gas supply, Guar, Hydraulic fracturing in the United States - Hydraulic fracturing in quarrying, Safe Drinking Water Act - 2005 amendment, Hydraulic fracturing in the United States - Municipal Level, Oil well - Completion, ProPublica - Criticism, Tommy Lee Jones - Personal life, Hydraulic fracturing by country - Germany, Hydraulic fracturing in the United States - Massive hydraulic fracturing, Environmental impact of hydraulic fracturing - Air emissions, Natural gas - Production, Gasland, Environmental impact of hydraulic fracturing in the United States - Water usage, Hydraulic fracturing by country - United Kingdom, Fracking - Economic effects, Shale gas - Economics, Energy Policy Act of 2005 - Criticism, George P. Mitchell - Career, Environmental impact of hydraulic fracturing - Health risks, Environmental impact of hydraulic fracturing - Policy and science, Safe Drinking Water Act - Proposed amendments, Steven Chu - Secretary of Energy, Environmental impact of hydraulic fracturing in the United States - Health effects, Hydraulic fracturing in the United States - Voluntary disclosure of additives, and much more...

Hydraulic fracturing (also known as "fracking" or "hydrofracking") has helped to expand natural gas production in the United States, unlocking large natural gas supplies in shale and other unconventional formations across the country. As a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades. According to new estimates by the Energy Information Administration (EIA), the United States possesses natural gas resources sufficient to supply the United States for approximately 110 years. As the use of hydraulic fracturing has grown, so have concerns about its environmental and public health impacts. One concern is that hydraulic fracturing fluids used to fracture rock formations contain numerous chemicals that could harm human health and the environment, especially if they enter drinking water supplies. The opposition of many oil and gas companies to public disclosure of the chemicals they use has compounded this concern. Last Congress, the Committee on Energy and Commerce launched an investigation to examine the practice of hydraulic fracturing in the United States. As part of that inquiry, the Committee asked the 14 leading oil and gas service companies to disclose the types and volumes of the hydraulic fracturing products they used in their fluids between 2005 and 2009 and the chemical contents of those products. This report summarizes the information provided to the Committee.

Hydraulic Fracturing in Unconventional Reservoirs: Theories, Operations, and Economic Analysis, Second Edition, presents the latest operations and applications in all facets of fracturing. Enhanced to include today ' s newest technologies, such as machine learning and the monitoring of field performance using pressure and rate transient analysis, this reference gives engineers the full spectrum of information needed to run unconventional field developments. Covering key aspects, including fracture clean-up, expanded material on refracturing, and a discussion on economic analysis in unconventional reservoirs, this book keeps today's petroleum engineers updated on the critical aspects of unconventional activity. Helps readers understand drilling and production technology and operations in shale gas through real-field examples Covers various topics on fractured wells and the exploitation of unconventional hydrocarbons in one complete reference Presents the latest operations and applications in all facets of fracturing

Fracking

HYDRAULIC FRACTURING

Commercial Demands vs. Water, Wildlife, and Human Ecosystems

Evaluation, Implementation, and Challenges

Hydraulic Fracturing Chemicals and Fluids Technology

The book explores the theoretical background of one of the most widespread activities in hydrocarbon wells, that of hydraulic fracturing. A comprehensive treatment of the basic phenomena includes: linear elasticity, stresses, fracture geometry and rheology. The diverse concepts of mechanics are integrated into a coherent description of hydraulic fracture propagation. The chapters in the book are cross-referenced throughout and the connections between the various phenomena are emphasized. The book offers readers a unique approach to the subject with the use of many numerical examples.

Hydraulic fracturing, or "fracking" as it is commonly known, refers to the practice of using liquids at very high pressures to fragment rock, thereby allowing natural gas to be harvested. This process increases energy resources but also has some negative environmental impacts as well. This book looks at the environmental impact. The first section looks at fracturing and the water supply, the second section looks at ecosystems and wildlife, while the final section examines the possible effects on human ecosystems and human health.

Petroleum engineers continue to need cost saving and environmentally sustainable products and methods for today ' s hydraulic fracturing operations. Hydraulic Fracturing Chemicals and Fluid Technology, Second Edition, continues to deliver an easy-to-use manual of fluid formulations to meet specific job needs. Enhanced with more environmental aspects, this reference helps engineers and fluid specialists select and use the appropriate chemicals for any hydraulic fracturing job. New information concerning nanotechnology applications such as wellbore sealant and proppants are added to enhance operations in a sustainable manner while saving on production costs. Other updates include low recovery of fracturing water in shale, surfactants for waterless hydraulic fracturing, and expanded produced water treatment. Rounding out with updated references and patents for easy reference, Hydraulic Fracturing Chemicals and Fluid Technology, Second Edition, gives engineers a critical guide on selecting better products to boost productions while strengthening environmental enhancement and consideration. Gain insight with new information surrounding environmental contamination and produced water treatment methods Save on production costs with new nanoparticle-enhanced fluids and applications Eliminate guesswork with systematic approach to fluid technology organized by project need

Hydraulic Fracturing is a unique oil and gas reservoir stimulation technique that has positioned itself as the industry ' s choice for developing Tight/Shale Oil and Gas fields. Together with horizontal well, this technology unlocks impervious shale rocks - releasing crude oil and natural gas that otherwise would not have been possible by using conventional exploration and production methods. This detailed 2nd Edition has many illustrations, giving readers solid foundation in the procedures, issues, benefits, and reverse benefits associated with current shale reservoir development using Hydraulic Fracturing (Fracking). Book contents, among others, include a concise explanation on: * Natural Gas/crude oil (Conventional and Unconventional) * Formation Preparation for Hydraulic Fracturing * Well Drilling Process * Well Completion Process (Perforation) * Horizontal Well: The Preferred Well Configuration for Fracking * Hydraulic Fracturing – Procedures, etc. * Offshore Fracking: Quietly on the rise * Common Misconception of Fracking Technique * Environmental Concerns of Hydraulic Fracturing * Benefits and reverse benefits of Hydraulic Fracturing * Winners and losers when oil and gas prices fall * Eco-Friendly Alternatives to Hydraulic Fracturing Those who use this book include Technical/Nontechnical persons, students, and all that are following the trend in the global oil and gas industry. Readers are given a good footing on the procedures, issues, and benefits concerning " Hydraulic Fracturing (Fracking) " .

Cancer and Health Risks from Underground Injection Natural Gas Production, Marcellus Shale Gas Fracking and Hydrofrac - House Committee Report

Hydraulic Fracture Modeling

Environmental Considerations Associated with Hydraulic Fracturing Operations

Proceedings of the First Japan-United States Joint Seminar on Hydraulic Fracturing and Geothermal Energy, Tokyo, Japan, November 2-5, 1982, and Symposium on Fracture Mechanics Approach to Hydraulic Fracturing and Geothermal Energy, Sendai, Japan November 8-9, 1982

Chemicals Used in Hydraulic Fracturing

This book provides a balanced discussion about the wastewater generated by hydraulic fracturing operations, and how to manage it. It includes an in-depth discussion of the hydraulic fracturing process, the resulting water cycle, and the potential risks to groundwater, soil, and air. The “fracking” process involves numerous chemicals that could potentially harm human health and the environment, especially if they enter and contaminate drinking water supplies. Treatment, reuse, and disposal options are the focus, and several case studies will be presented. The book also discusses the issues of the large amounts of water required for drilling operations, the impacts on water-sensitive regions.

Hydraulic Fracturing Impacts and Technologies: A Multidisciplinary Perspective serves as an introduction to hydraulic fracturing and provides balanced coverage of its benefits and potential negative effects. Presenting a holistic assessment of hydraulic fracturing and its environmental impacts, this book chronicles the history and development of unconventional oil and gas production and describes the risks associated with the use of these technologies. More specifically, it addresses hydraulic fracturing’s use and dependence on large amounts of water as a fracturing medium. It examines the limits of reusing flowback and produced water, explores cost-effective ways to clean or effectively dispose of water used in fracturing, and provides suggestions for the efficient use, discovery, and recycle potential of non-potable water. Utilizing a team of experts from industry and academia, the text provides readers with a multiple lens approach—incorporating various perspectives and solutions surrounding this evolving technology. This book: Leads with an overview of hydraulic fracturing operations and technologies Considers a variety of legal issues associated with hydraulic fracturing Summarizes human health and environmental risks associated with hydraulic fracturing operations Discusses the analytes chosen by researchers as possible indicators of groundwater contamination from unconventional drilling processes Presents strategies for reducing the freshwater footprint of hydraulic fracturing Discusses water treatment technologies and solutions to recycle and reuse produced waters, and more Hydraulic Fracturing Impacts and Technologies: A Multidisciplinary Perspective brings together experts from disciplines that include petroleum, civil, and environmental engineering; environmental sciences chemistry toxicology; law; media; and communications; and provides readers with a multidisciplinary outlook and unbiased, scientifically credible solutions to issues surrounding hydraulic fracturing operations.

Hydraulic Fracturing effectively busts the myths associated with hydraulic fracturing. It explains how to properly engineer and optimize a hydraulically fractured well by selecting the right materials, evaluating the economic benefits of the project, and ensuring the safety and success of the people, environment, and equipment. From data estimation

Hydraulic fracturing has been and continues to be a major techno logical tool in oil and gas recovery, nuclear and other waste disposal, mining and particularly in-situ coal gasification, and, more recently, in geothermal heat recovery, particularly extracting heat from hot dry rock masses. The understanding of the fracture process under the ac tion of pressurized fluid at various temperatures is of fundamental scientific importance, which requires an adequate description of thermomechanical properties of subsurface rock, fluid-solid interaction effects, as well as degradation of the host rock due to temperature gradients introduced by heat extraction. Considerable progress has been made over the past several years in laboratory experiments, analytical and numerical modeling, and in-situ field studies in various aspects of hydraulic fracturing and geothermal energy extraction, by researchers in the United States and Japan and also elsewhere. However, the results have been scattered throughout the literature. Therefore, the time seemed ripe for bringing together selected researchers from the two countries, as well as observers from other countries, in order to survey the state of the art, exchange scientific information, and establish closer collaboration for further, better coordinated scientific effort in this important area of research and exploration.

Hydraulic Fracturing Operations

Numerical Simulation in Hydraulic Fracturing: Multiphysics Theory and Applications

Hydraulic Fracturing Impacts and Technologies

The Future of Hydraulic Fracturing on Federally Managed Lands

Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources

Hydraulic Fracture Modeling delivers all the pertinent technology and solutions in one product to become the go-to source for petroleum and reservoir engineers. Providing tools and approaches, this multi-contributed reference presents current and upcoming developments for modeling rock fracturing including their limitations and problem-solving applications. Fractures are common in oil and gas reservoir formations, and with the ongoing increase in development of unconventional reservoirs, more petroleum engineers today need to know the latest technology surrounding hydraulic fracturing technology such as fracture rock modeling. There is tremendous research in the area but not all located in one place. Covering two types of modeling technologies, various effective fracturing approaches and model applications for fracturing, the book equips today’s petroleum engineer with an all-inclusive product to characterize and optimize today’s more complex reservoirs. Offers understanding of the details surrounding fracturing and fracture modeling technology, including theories and quantitative methods Provides academic and practical perspective from multiple contributors at the forefront of hydraulic fracturing and rock mechanics Provides today’s petroleum engineer with model validation tools backed by real-world case studies

This final report provides a review and synthesis of available scientific information concerning the relationship between hydraulic fracturing activities and drinking water resources in the United States. The report is organized around activities in the hydraulic fracturing water cycle and their potential to impact drinking water resources. The stages include: (1) acquiring water to be used for hydraulic fracturing (Water Acquisition), (2) mixing the water with chemical additives to prepare hydraulic fracturing fluids (Chemical Mixing), (3) injecting the hydraulic fracturing fluids into the production well to create fractures in the targeted production zone (Well Injection), (4) collecting the wastewater that returns through the well after injection (Produced Water Handling), and (5) managing the wastewater via disposal or reuse methods (Wastewater Disposal and Reuse). EPA found scientific evidence that hydraulic fracturing activities can impact drinking water resources under some circumstances. The report identifies certain conditions under which impacts from hydraulic fracturing activities can be more frequent or severe.

America has vaulted to the forefront of production of oil and gas, due to the technological combination of hydraulic fracturing ("fracking") and horizontal drilling. This technology has enabled the United States to tap into its vast reserves of shale oil and gas, which in 2014 drove the United States to produce the most crude oil annually since 1986. Fracking has been employed in the oil and gas industry since 1947, and is a "well stimulation technique" in which an "artificial fracture" is created and then "fluid [and propping agents] [are] pumped into the production casing, through the perforations (or open hole), and into the targeted formation at pressures high enough to cause the rock within the targeted formation to fracture." Citing public concern about whether fracking can contaminate underground water sources, whether there is adequate management of well, and whether chemicals used for fracking should be disclosed, the Bureau of Land Management (BLM) undertook a rulemaking process to address fracking on federal lands. The final rule was announced on March 20, 2015, and was to become effective on June 24, 2015. Four states, Colorado, North Dakota, Utah, and Wyoming, energy trade associations, and two tribes, the Southern Utes and the Ute Tribe of Uintah and Ouray County, have filed lawsuits challenging the BLM's final rule on hydraulic fracturing.

This book is intended as a reference book for advanced graduate students and research engineers in shale gas development or rock mechanical engineering. Globally, there is widespread interest in exploiting shale gas resources to meet rising energy demands, maintain energy security and stability in supply and reduce dependence on higher carbon sources of energy, namely coal and oil. However, extracting shale gas is a resource intensive process and is dependent on the geological and geomechanical characteristics of the source rocks, making the development of certain formations uneconomic using current technologies. Therefore, evaluation of the physical and mechanical properties of shale, together with technological advancements, is critical in verifying the economic viability of such formation. Accurate geomechanical information about the rock and its variation through the shale is important since stresses along the wellbore can control fracture initiation and frac development. In addition, hydraulic fracturing has been widely employed to enhance the production of oil and gas from underground reservoirs. Hydraulic fracturing is a complex operation in which the fluid is pumped at a high pressure into a selected section of the wellbore. The interaction between the hydraulic fractures and natural fractures is the key to fracturing effectiveness prediction and high gas development. The development and growth of a hydraulic fracture through the natural fracture systems of shale is probably more complex than can be described here, but may be somewhat predictable if the fracture system and the development of stresses can be explained. As a result, comprehensive shale geomechanical experiments, physical modeling experiment and numerical investigations should be conducted to reveal the fracturing mechanical behaviors of shale.

Theories, Operations, and Economic Analysis

Hydraulic fracturing and geothermal energy

Hydraulic Fracturing in Unconventional Reservoirs

Mechanics of Hydraulic Fracturing

Hydraulic Fracturing for Oil and Gas

"This final report provides a review and synthesis of available scientific information concerning the relationship between hydraulic fracturing activities and drinking water resources in the United States. The report is organized around activities in the hydraulic fracturing water cycle and their potential to impact drinking water resources. The stages include: (1) acquiring water to be used for hydraulic fracturing (Water Acquisition), (2) mixing the water with chemical additives to prepare hydraulic fracturing fluids (Chemical Mixing), (3) injecting the hydraulic fracturing fluids into the production well to create fractures in the targeted production zone (Well Injection), (4) collecting the wastewater that returns through the well after injection (Produced Water Handling), and (5) managing the wastewater via disposal or reuse methods (Wastewater Disposal and Reuse). EPA found scientific evidence that hydraulic fracturing activities can impact drinking water resources under some circumstances. The report identifies certain conditions under which impacts from hydraulic fracturing activities can be more frequent or severe."-- Source other than Library of Congress.

Rocks mechanics legend Erle Donaldson, along with colleagues Waqi Alam and Nasrin Begum from the oil and gas consultant company Tetrahedron, have authored this handbook on updated fundamentals and more recent technology used during a common hydraulic fracturing procedure. Meant for technical and non-technical professionals interested in the subject of hydraulic fracturing, the book provides a clear and simple explanation of the technology and related issues to promote the safe development of petroleum reserves leading to energy independence throughout the world.

The expansion of unconventional petroleum resources in the recent decade and the rapid development of computational technology have provided the opportunity to develop and apply 3D numerical modeling technology to simulate the hydraulic fracturing of shale and tight sand formations. This book presents 3D numerical modeling technologies for hydraulic fracturing developed in recent years, and introduces solutions to various 3D geomechanical problems related to hydraulic fracturing. In the solution processes of the case studies included in the book, fully coupled multi-physics modeling has been adopted, along with innovative computational techniques, such as submodeling. In practice, hydraulic fracturing is an essential project component in shale gas/oil development and tight sand oil, and provides an essential measure in the process of drilling cuttings reinjection (CRI). It is also an essential measure for widened mud weight window (MWW) when drilling through naturally fractured formations; the process of hydraulic plugging is a typical application of hydraulic fracturing. 3D modeling and numerical analysis of hydraulic fracturing is essential for the successful development of tight oil/gas formations: it provides accurate solutions for optimized stage intervals in a multistage fracking job. It also provides optimized well-spacing for the design of zipper-frac wells. Numerical estimation of casing integrity under stimulation injection in the hydraulic fracturing process is one of major concerns in the successful development of unconventional resources. This topic is also investigated numerically in this book. Numerical solutions to several other typical geomechanics problems related to hydraulic fracturing, such as fluid migration caused by fault reactivation and seismic activities, are also presented. This book can be used as a reference textbook to petroleum, geotechnical and geothermal engineers, to senior undergraduate, graduate and postgraduate students, and to geologists, hydrogeologists, geophysicists and applied mathematicians working in this field. This book is also a synthetic compendium of both the fundamentals and some of the most advanced aspects of hydraulic fracturing technology.

There is a strong need for innovation and the development of viable renewable energy sources. Recent technological advances now allow natural gas supplies—previously believed inaccessible or nonexistent—to be discovered, mined, and processed for both industrial and consumer use. The technology, a controversial process that is alternatively called hydraulic fracturing, fracking, fracing, or hydrofracking, has greatly expanded natural gas production in the United States. Presenting a balanced discussion, Environmental Impacts of Hydraulic Fracturing is a comprehensive guide to all aspects of hydraulic fracturing used to extract natural gas, along with gas exploration and production in various shale fields. As the use of hydraulic fracturing has grown, concerns about its environmental and public health impacts have also increased—one of the most significant concerns being the fluids that are injected into rock formations to cause the fracturing contain potentially hazardous chemical additives. The book covers all facets of the issue, including ongoing controversies about the environmental and operator safety issues arising from possible water pollution, drinking water contamination, on-the-job safety hazards, and harmful chemical exposure to workers and residents near well areas. The author discusses both the pros and cons of hydraulic fracturing, explaining the process in great detail. He describes the benefits of hydraulic fracturing and its importance in making the United States energy independent by drilling for its own resources, as well as the potential impacts to the surrounding environment. The text also includes suggestions and recommendations on how to mitigate environmental damage. Arguably the first book of its kind, this is the go-to text on the use and impacts of hydraulic fracturing.

Fracking 101

Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States

Handbook of Hydraulic Fracturing

Improved Engineering of Unconventional Shale Reservoirs

The Effects of Induced Hydraulic Fracturing on the Environment

Hydraulic fracturing is a technique used to recover oil and natural gas from underground low permeability rock formations. Hydraulic fracturing involves pumping fluids (primarily water and a small portion of chemicals, along with sand or other proppant) under high pressure into rock formations to crack them and allow the resources inside to flow to a production well. The technique has been the subject of controversy because of the potential effects that hydraulic fracturing and related oil and gas production activities may have on the environment and health. This book focuses on selected legal issues related to the use of hydraulic fracturing. It examines some of the requirements for hydraulic fracturing contained in major federal environmental laws and also provides an overview of issues involving state pre-emption of local zoning authority, as well as state law.

Presents an up-to-date description of current and new hydraulic fracturing processes Details Emerging Technologies such as Fracture Treatment Design, Open Hole Fracturing, Screenless Completions, Sand Control, Fracturing Completions and Productivity Covers Environmental Impact issues including Geological Disturbance; Chemicals used in Fracturing; General Chemicals; Toxic Chemicals; and Air, Water, Land, and Health impacts Provides many process diagrams as well as tables of feedstocks and their respective products

This book presents both sides of a very controversial subject intoday’s media: induced hydraulic fracturing, or“fracking.” It covers the technology and methods usedin hydraulic fracturing in easy-to-understand language, for theengineer and layperson

alike, presenting the environmental effectsof hydraulic fracturing.
Investigators with the House Committee on Energy and Commerce have discovered that oil and gas service companies conducting hydraulic fracturing for shale gas production used more than 2500 fracturing products containing 750 chemicals, some of which are toxic and carcinogenic. This report lists every chemical disclosed by the industry, and reveals that some of the chemicals remain proprietary and cannot be identified. According to the report: Hydraulic fracturing has helped to expand natural gas production in the United States, unlocking large natural gas supplies in shale and other unconventional formations across the country. As a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades. According to new estimates by the Energy Information Administration (EIA), the United States possesses natural gas resources sufficient to supply the United States for approximately 110 years. As the use of hydraulic fracturing has grown, so have concerns about its environmental and public health impacts. One concern is that hydraulic fracturing fluids used to fracture rock formations contain numerous chemicals that could harm human health and the environment, especially if they enter drinking water supplies. The opposition of many oil and gas companies to public disclosure of the chemicals they use has compounded this concern. Last Congress, the Committee on Energy and Commerce launched an investigation to examine the practice of hydraulic fracturing in the United States. As part of that inquiry, the Committee asked the 14 leading oil and gas service companies to disclose the types and volumes of the hydraulic fracturing products they used in their fluids between 2005 and 2009 and the chemical contents of those products. This report summarizes the information provided to the Committee. Between 2005 and 2009, the 14 oil and gas service companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. Overall, these companies used 780 million gallons of hydraulic fracturing products - not including water added at the well site - between 2005 and 2009. Some of the components used in the hydraulic fracturing products were common and generally harmless, such as salt and citric acid. Some were unexpected, such as instant coffee and walnut hulls. And some were extremely toxic, such as benzene and lead. Appendix A (included in this reproduction) lists each of the 750 chemicals and other components used in hydraulic fracturing products between 2005 and 2009. This is a privately authored news service and educational publication of Progressive Management. Our publications synthesize official government information with original material - they are not produced by the federal government. They are designed to provide a convenient user-friendly reference work to uniformly present authoritative knowledge that can be rapidly read, reviewed or searched. Vast archives of important data that might otherwise remain inaccessible are available for instant review no matter where you are. This e-book format makes a great reference work and educational tool. There is no other reference book that is as convenient, comprehensive, thoroughly researched, and portable - everything you need to know, from renowned experts you trust. For over a quarter of a century, our news, educational, technical, scientific, and medical publications have made unique and valuable references accessible to all people. Our e-books put knowledge at your fingertips, and an expert in your pocket!

Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources
Hydraulic Proppant Fracturing and Gravel Packing
Fundamentals and Advancements
Hydraulic Fracturing 224 Success Secrets - 224 Most Asked Questions on Hydraulic Fracturing - What You Need to Know
Environmental Issues Concerning Hydraulic Fracturing

Since the first edition of Fracking was published, hydraulic fracturing has continued to be hotly debated. Credited with bringing the US and other countries closer to “energy independence,” and blamed for tainted drinking water and earthquakes, hydraulic fracturing (“fracking”) continues to be one of the hottest topics and fiercely debated issues in the energy industry and in politics. Covering all of the latest advances in fracking since the first edition was published, this expanded and updated revision still contains all of the valuable original content for the engineer or layperson to understand the technology and its ramifications. Useful not only as a tool for the practicing engineer solve day-to-day problems that come with working in hydraulic fracturing, it is also a wealth of information covering the possible downsides of what many consider to be a very valuable practice. Many others consider it dangerous, and it is important to see both sides of the argument, from an apolitical, logical standpoint. While induced hydraulic fracturing utilizes many different engineering disciplines, this book explains these concepts in an easy to understand format. The primary use of this book shall be to increase the awareness of a new and emerging technology and what the various ramifications can be. The reader shall be exposed to many engineering concepts and terms. All of these ideas and practices shall be explained within the body. A science or engineering background is not required.
Hydraulic Fracturing Explained: Evaluation, Implementation, and Challenges provides updated fundamentals and more recent technology used during a common hydraulic fracturing procedure. Meant for technical and non-technical professionals interested in the subject of hydraulic fracturing, the book provides a clear and simple explanation of the technology and related issues to promote the safe development of petroleum reserves leading to energy independence throughout the world. The developments of hydraulic fracturing technology were coupled to the excitement of the rapid discoveries of gas-shale around the world that could suddenly be produced economically and efficiently. The goal of this book is to advance hydraulic fracturing technology that is effective in its purpose and sustainable in its impacts on communities and environments by bringing together hydraulic fracturing experts not only from the oil and gas industry, but also from other application areas of hydraulic fracturing such as mining and geothermal energy production.
Microseismic Imaging of Hydraulic Fracturing: Improved Engineering of Unconventional Shale Reservoirs (SEG Distinguished Instructor Series No. 17) covers the use of microseismic data to enhance engineering design of hydraulic fracturing and well completion. The book, which accompanies the 2014 SEG Distinguished Instructor Short Course, describes the design, acquisition, processing, and interpretation of an effective microseismic project. The text includes a tutorial of the basics of hydraulic fracturing, including the geologic and geomechanical factors that control fracture growth. In addition to practical issues associated with collecting and interpreting microseismic data, potential pitfalls and quality-control steps are discussed. Actual case studies are used to demonstrate engineering benefits and improved production through the use of microseismic monitoring. Providing a practical user guide for survey design, quality control, interpretation, and application of microseismic hydraulic fracture monitoring, this book will be of interest to geoscientists and engineers involved in development of unconventional reservoirs.

Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources
Legal Issues and Relevant Laws
Environmental Issues
Further Investigations into the Environmental Considerations and Operations of Hydraulic Fracturing
Treatment, Reuse, and Disposal