Invitation to Submit

Advances in Measurement and Modelling Approaches Related to Flow and Storage in the Subsurface: Experimental, Simulation, and Intelligent Methods
Guest Editors: Dr. Pål Østebø Andersen, Prof. Dr. Ingebret Fjelde and Dr. Yangyang Qiao
Deadline: 18 April 2024

Energy Geotechnics and Geostructures—2nd Edition
Guest Editors: Dr. Peng Pei and Dr. Fa-Qiang Su
Deadline: 30 April 2024

Coal Conversion Processes: 2nd Edition
Guest Editors: Dr. Panagiotis Grammelis and Dr. Aristeidis Nikolopoulos
Deadline: 30 April 2024

Energy from Coal Mining: Technology, Simulations and Experiments
Guest Editors: Prof. Dr. Susana Torno Lougedo
Deadline: 18 May 2024

Subsurface Energy and Environmental Protection
Guest Editors: Prof. Dr. Xiaopu Wang, Dr. Bin Pan, Dr. Naser Golsanami, Dr. Yujie Yuan and Dr. Yujing Du
Deadline: 31 May 2024

Coalbed Methane Exploration and Production
Guest Editors: Prof. Dr. Jie Zhu and Prof. Dr. Bo Wang
Deadline: 10 June 2024

Research on Coalbed Methane and Coal-Measure Gas: Exploration, Exploitation, and Utilization
Guest Editors: Dr. Rui Li and Dr. Shuaifeng Lyu
Deadline: 28 June 2024

Advanced Coal Mining and Coal Utilization Technologies
Guest Editors: Prof. Dr. Chun Zhu, Dr. Jianhua Yan and Dr. Fei Wu
Deadline: 31 August 2024

Failure and Multiphysical Fields in Geo-Energy
Guest Editor: Dr. Yongliang Wang
Deadline: 31 December 2024

Topical Collection

Board Members' Collection Series: Clean Coal Extraction and Using
Guest Editors: Prof. Dr. Pavel A. Strizhak and Dr. Manoj Khandelwal

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Section Information:

The fossil fuel industry must act as a responsible partner in the transition process to a sustainable energy system by making efforts to reduce its environmental footprint within acceptable limits. The optimization of oil and gas recovery and coal mining with responsible environmental footprint requires new resource extraction technologies. Ideally, these will be validated in bottom-up development models that will give valuable insight into the ability of the fossil fuel industry to support the transition process to a sustainable energy system.

Anthropogenic energy supply systems contribute to climate change, which is why carbondioxide sequestration by the fossil fuel industry is important. Fossil fuels are expected to fill the supply gap, while renewable energy supply systems are being phased in at ever faster speeds. Everyone working in today's energy business realizes the shortcomings and finiteness of fossil energy resources. Meanwhile, the fossil fuel industry must allow for a smooth energy transition such as not to derail the global economic system.

Scope:

Example topic areas within the scope of our journal's Geo-Energy Section are listed below. This list is neither exhaustive nor exclusive.

- Reservoir Characterization and Modeling
- Geomechanics for Energy and the Environment
- Sequestration of Carbon Dioxide
- Geothermal Energy Extraction
- Petroleum Exploration and Production
- Energy from Coal Formations

Section Geo-Energy

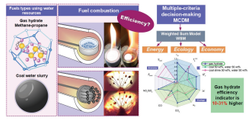
Feature Papers

DOI:10.3390/en15124188

Prospects of Using Gas Hydrates in Power Plants

Authors: Dmitrii Antonov, Olga Gaidukova, Galina Nyashina, Dmitrii Razumov and Pavel Strizhak

Abstract: By adding water to fuels, several objectives are pursued, with the main ones being to stabilize combustion, minimize the anthropogenic gaseous emissions, homogenize and stabilize the fuel, as well as improve its fire and explosion safety. Water can be injected into the furnace as droplets or vapor and introduced as part of fuel samples. Water often serves as a coupling or carrier medium for the delivery of the main fuel components. In this paper, we compare the combustion behaviors of high-potential slurry fuels and gas hydrates. We also analyze the contribution of in slurries and gas hydrates to the combustion process. The values of relative combustion efficiency indicators are determined for gas hydrates and slurry fuels. The conditions are identified in which these fuels can be burned effectively in power plants. The research findings can be used to rationalize the alternative ways of using water resources, i.e., gas hydrate powder and promising composite fuel droplets. The results can also help predict the conditions for the shortest possible ignition delay, as well as effective combustion of gas hydrates as the most environmentally friendly new-generation alternative fuel.

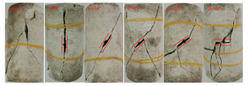


DOI:10.3390/en15041518

Energy Evolution and Damage Mechanism of Fractured Sandstone with Different Angles

Authors: Xinwei Li, Zhishu Yao, Xiaohu Liu and Xianwen Huang

Abstract: To explore the influence of crack angle on the mechanical properties, energy evolution, and damage evolution of sandstone, uniaxial loading tests were conducted on sandstones with different crack angles. Through the stress–strain curve, the influence of the crack angle on the mechanical properties was analyzed. Based on energy theories and principles, the influence of crack angle on the energy conversion mechanism was analyzed. Based on crack angle and dissipated energy, a damage model considering the initial damage to the fractured sandstones was established. The following conclusions were drawn: (1) The strength and elastic modulus of sandstone decrease with an increase in crack angle, and Poisson's ratio increases with an increase in crack angle; prefabricated cracks affect the crack initiation position, and accelerate the formation of fracture surfaces. (2) The stress–strain curve was divided into compaction stage, elastic stage, yield stage, and failure stage. The larger the crack angle, the longer the yield stage and the shorter the failure stage. (3) At the peak point, the elastic energy, dissipated energy, and input energy of fractured sandstone always decrease with an increase in crack angle; the energy consumption ratio increases with an increase in crack angle; and the energy storage ratio decreases with an increase in crack angle. (4) The damage variable shows a trend of slow accumulation–steady accumulation–rapid accumulation; the crack angle affects the initial damage of the specimen, and the dissipated energy affects the variation trend of the damage variable.

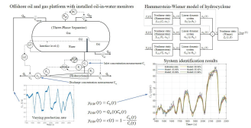


DOI:10.3390/en16207095

Hammerstein–Wiener Model Identification for Oil-in-Water Separation Dynamics in a De-Oiling Hydrocyclone System

Authors: Stefan Jespersen, Zhenyu Yang, Dennis Severin Hansen, Mahsa Kashani and Biao Huang

Abstract: To reduce the environmental impact of offshore oil and gas, the hydrocarbon discharge regulations tend to become more stringent. One way to reduce the oil discharge is to improve the control systems by introducing new oil-in-water (OiW) sensing technologies and advanced control. De-oiling hydrocyclones are commonly used in offshore facilities for produced water treatment (PWT), but obtaining valid control-oriented models of hydrocyclones has proven challenging. Existing control-oriented models are often based on droplet trajectory analysis. While it has been demonstrated that these models can fit steady-state separation efficiency data, the dynamics of these models have either not been validated experimentally or only describe part of the dynamics. In addition to the inlet OiW concentration, they require the droplet size distribution to be measured, which complicates model validation as well as implementation. This work presents an approach to obtain validated nonlinear models of the discharge concentration, separation efficiency, and discharge rate, which do not require the droplet size distribution to be measured. An exhaustive search approach is used to identify control-oriented polynomial-type Hammerstein–Wiener (HW) models of de-oiling hydrocyclones based on concentration measurements from online OiW monitors. To demonstrate the effectiveness of this modeling approach, a PI controller is designed using the Skogestad internal model control (SIMC) tuning rules to control the discharge OiW concentration directly. The identification experiment emulates an offshore PWT system with installed OiW monitors, which is realistic with the legislative incentive to include online OiW discharge measurements. The proposed approach could enable the application of OiW-based control on existing offshore PWT facilities, resulting in improved de-oiling performance and reduced oil discharge.



DOI:10.3390/en16176410

Water-Cut Measurement Techniques in Oil Production and Processing—A Review

Authors: Bushra Kamal, Zahra Abbasi and Hassan Hassanzadeh

Abstract: Water cut is a vital monitoring and surveillance parameter with great significance in oil production operations and processing. Water-cut measurements are also challenging due to the significant variations and the harsh measurement environment. The objective of this article is to review the current water-cut measurement techniques and suggest future areas that are expanding to overcome existing measurement challenges. Commercially available online methods such as capacitance-based sensors, tomography techniques, gamma densitometry, ultrasonic meters and infrared meters, and the traditional laboratory offline methods, are discussed, along with their principle of operation, detection range, and sensing resolution. Also, the discussed techniques are summarized, highlighting their main advantages and limitations. Furthermore, future trends and research areas, such as Artificial Intelligence (AI), soft computing, Metamaterials, and Nuclear Magnetic Resonance (NMR), which are integrated with water-cut measurements, are briefly mentioned. The current research hotspots are directed toward integrating full-range measurements with multi-parameter detection, high sensitivity, and reliability.