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Special Issue Reprint

Applications of Intelligent Models in the Petroleum Industry

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This Reprint presents cutting-edge research on intelligent drilling, reservoir engineering, and data-driven optimization in oil and gas development. It features 17 original studies covering real-time model predictive control (MPC) for downhole rotary valves and managed pressure drilling, physics-informed neural networks for bottomhole pressure prediction, and intelligent cable-controlled injection-production systems. The collection also includes advanced seismic attribute fusion using convolutional neural networks, polymer injector flow simulation with improved viscosity models, and paleoenvironmental analysis of organic-rich shales. Other contributions address in situ foam systems for enhanced oil recovery, tight sandstone gas geochemistry, fine-scale water injection control, braided river reservoir morphology simulation, well depth tracking via parallel neural networks, high-resolution seismic inversion, XGBoost models for CO₂ water-alternating-gas processes, mud weight window prediction, hybrid frameworks for high-water-cut well production forecasting, and geology-informed deep learning for well-log correlation. The Reprint demonstrates how modern control theory, machine learning, and numerical simulation are integrated to solve practical challenges in drilling, completion, production, and reservoir management. It serves as a valuable reference for researchers, engineers, and graduate students interested in smart oilfield technologies and automated petroleum engineering.

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