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Sustainable Oil Well Cementing: Materials, Methods, and Environmental Protection

Advancing Eco-efficient Materials and Technologies for Well Integrity

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This book is a comprehensive and forward-thinking analysis of sustainable cementing practices in oil wells that are essential to well integrity in modern petroleum engineering. Increased environmental concerns and stricter regulatory requirements have forced traditional well-cementing approaches to adapt to today's sustainability objectives. This book describes the use of state-of-the-art materials such as geopolymers, pozzolanic systems, industrial by-products (fly ash and slag), and nanomaterials to maintain mechanical properties (strength) and durability while reducing carbon emissions. It also includes innovative design and placement/cementing techniques, as well as enhancement strategies designed to improve cementing operational performance and reduce environmental impact. Additionally, the book highlights the contributions of digital technologies, such as artificial intelligence, machine learning, and IoT-based monitoring systems, in increasing the precision and reliability of cementing operations. Furthermore, life cycle assessment (LCA) and circular economy principles will be integrated into this analysis to evaluate the environmental impacts of materials across their life cycle, from production to abandonment. This book will provide petroleum engineers, researchers, students, and policymakers with practical and technical information for implementing environmentally sustainable cementing solutions that ensure long-term well integrity and operational excellence.

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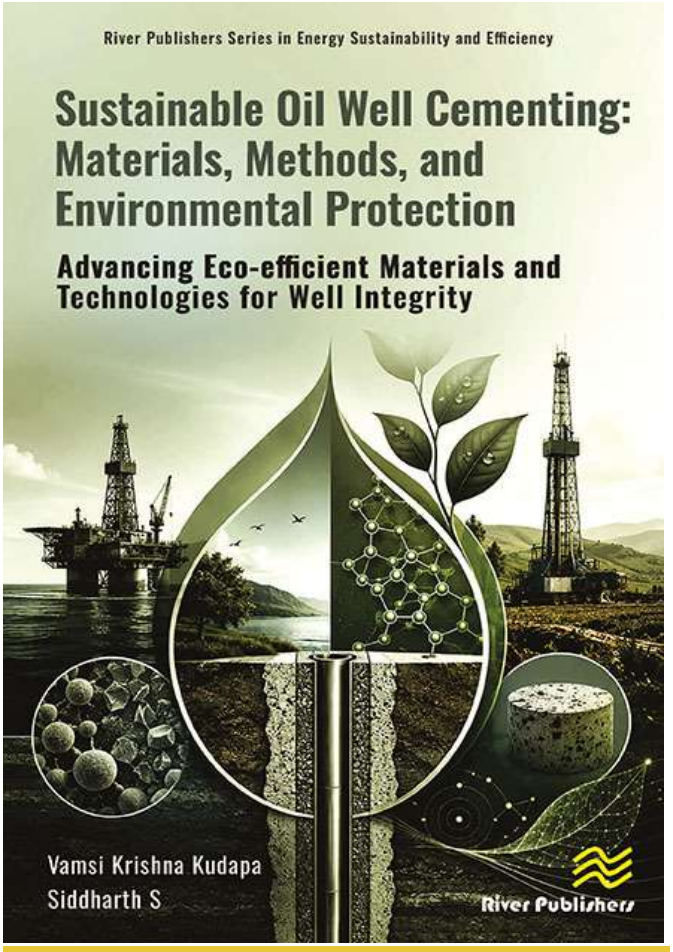

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