

Chapter 2 of the book delves into reservoir engineering and its application in the petroleum industry.

Reservoir engineering combines scientific principles with subsurface geology, mathematics, physics, and chemistry to optimize the extraction of oil and gas from reservoirs. The primary oil recovery method involves extracting oil naturally or using artificial lift devices, recovering only 5% to 15% of a well's potential. Submersible pumps and multiphase pumps are utilized to enhance recovery rates and reduce wellhead pressure. Secondary oil recovery techniques like gas injection, thermal recovery, chemical injection, and waterflooding help extract additional reserves. Gas injection involves forcing gases into a well to reduce oil viscosity and increase flow. Thermal recovery, using steam or fire, can boost oil production but raises environmental concerns due to energy requirements and carbon footprint. Chemical injection injects chemicals to enhance production, albeit with varying results and environmental risks. Waterflooding, although less popular, involves drilling an injection well near the reservoir to push oil towards the surface. This method increases oil recovery by about 10% but requires significant water usage and expertise. Enhanced oil recovery (EOR) methods like chemical flooding, gas flooding, microbial processes, thermal processes, and novel methods aim to recover leftover oil post-primary and secondary recovery stages. Each EOR method has its benefits and challenges, influencing their adoption in industry practices. Reservoir simulation tools are crucial for designing and predicting the performance of EOR projects using advanced computing capabilities. The book also discusses geographical locations of crude oil sources, such as North Sea crudes, United States crudes, OPEC Reference Basket or West African crudes, and Persian Gulf crudes, detailing their properties like sulfur content and API gravity. The detailed exploration of EOR methods, primary and secondary recovery techniques, and the properties of various crude oil sources provides insights into the complex processes involved in reservoir engineering. By leveraging technological advancements, such as submersible pumps, gas injection, and reservoir simulation, the petroleum industry can enhance recovery rates, reduce environmental impacts, and optimize oil and gas production from reservoirs. Reservoir engineers play a vital role in applying these methods to ensure efficient and sustainable extraction of hydrocarbons to meet global energy demands while minimizing environmental repercussions.