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Sommario/riassunto	Swelling elastomers are being increasingly used as sealing elements in many applications in the petroleum industry. Pre- and post-swelling material characterization and performance analysis under actual field conditions are very important before the actual deployment of swell packers. The main theme of this research monograph is the performance analysis of swelling elastomer seals used in petroleum drilling and development applications, using all three investigation methods: experimental, numerical, and analytical. The major contributions and applications of this work include insight into the behavior of swelling elastomers and understanding of the swelling phenomenon, performance analysis and optimal selection of swelling elastomers for a given set of field conditions, and design improvement of swelling elastomer packers and other sealing applications.