

Preface

I still remember the day vividly. It was 2019, and I was in Dubai, visiting a customer at their reverse osmosis seawater desalination plant in the United Arab Emirates. They were grappling with serious problems caused by biofouling, an issue that had become a persistent challenge in their operations. As I stood there, interpreting the plots of normalized permeate flow, normalized salt rejection, and pressure drop they shared with me, the problem and its causes were crystal clear in my mind. Since 2013, I had dedicated myself to studying biofouling and organic fouling in reverse osmosis membranes. This focus allowed me to recognize patterns and solutions with ease. Eager to help, I wanted to share everything I knew with the customer so they could improve their plant's operations and experience peace of mind, free from the endless hassles fouling imposes on operators. But in that moment, I realized something important: there was no single, comprehensive resource I could point to, no book or guide that captured all the plots, equations, and insights I had accumulated over years of study. That realization sparked an idea: to write a book that would bring together all this knowledge in one accessible place. A resource not just for plant operators but also for the broader scientific community. This book is the result of that idea. It is structured into sixteen chapters, each designed to stand on its own for quick consultation, yet together they tell a cohesive story. The journey begins with the basics and fundamentals, laying the groundwork by explaining the key equations that govern fouling. From there, it progresses to explore the critical parameters that influence biofouling and the innovative technologies developed to address it, following their evolution through the stages of technological readiness. By understanding these parameters, we can devise effective solutions to mitigate and even prevent biofouling in reverse osmosis membranes. My hope is that this book serves as a valuable tool for anyone facing these challenges, helping them navigate the complexities of fouling with greater confidence and clarity.

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