Produced water management - A mathematical model to trade-off economic cost and environmental impact for infrastructure utilisation

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This research provides an overview on several areas related to produced water management including cost, treatment methods, recycling options and environmental impact. Produced water is a type of water that has been trapped in different quantities in underground formations. After extracting crude oil and during the production process, the associated water from underground formations is known as produced water. This type of water is by far the largest volume by product or waste stream associated with oil and gas production. It is likely containing high level of total dissolved solids because of its longer residence time under the ground in addition to the smaller flow rate. Moreover, many efforts have been paid globally to decrease the high salinity level in produced water by applying desalination technologies as sustainable water management solution.

Oilfield water management is one of the most challenging system and it follows a non-linear relationship between its components. We formulate and develop a mixed-integer mathematical model to a small case study related to Kuwait Oil Company for an optimal design and operations of produced water management. We show how the results allow studying the economic cost as well as environmental impact related to produced water management system.