The oil and gas industries are one of the major producers of wastewater streams. Most of this water is disposed either through subsurface reinjection or surface discharge after some treatment. There is a growing interest in the reuse of produced water from oil and gas fields due to limited availability of freshwater resources. However, the poor quality of the produced water is a big challenge for its reuse. The characteristics of produced waters are highly complex, variable, and are dependent on field location, nature of reservoir, type of hydrocarbons produced, and field chemicals added. Good sampling and analytical methodology are required to better understand the needs for water treatment options, to evaluate environmental impact, and to explore feasibility of produced water reuse. In addition to that, quality assurance and quality control (QA/QC) protocols are essential for wastewater characterization. The presentation will address the importance of proper sampling and analytical protocols that are relevant to produced water recycling. Also, analytical data validation, which is a critical component of QA/QC, will be discussed.

Thermal desalination process is proven to be robust for large scale installation and meet specific water quality requirement, but it needs high energy cost with serious environmental concerns related to discharge of brine. On the other hand, membrane processes have started gaining market acceptance due to improvement in membrane chemistry, efficient pre-treatment and smaller footprint, but still face many challenges when implemented in high salinity and bio-fouling sea water conditions, like the Arabian Gulf. Current desalination research trend include increasing the top brine temperature in thermal process, combating algal blooms for membrane process, and introducing innovative hybrid processes.

Membrane Distillation (MD) is one of the innovative emerging techniques for desalination of sea water. The driving force in MD is due to vapour pressure difference. The potential advantage of MD process is that feed solutions having temperature much lower than its boiling point under atmospheric pressure can be applied. MD process produces high quality effluent and leverages low grade waste heat and can also be coupled with renewable energy systems. Thus, MD can be efficiently used to recover additional product water from RO and thermal desalination process brines. This will augment the production of water from existing desalination facilities (RO and Thermal) as well as reduce the brine volume discharge and minimize impact to environment. The key challenges in improving the MD process are membrane, process modelling, design, module optimization and recovery of low grade waste heat. A consortium of industry, academic institution, technology providers and water utilities was recently formed in Qatar to evaluate the suitability of MD technology for sea water desalination in the region. The research study is carried out in multi phases including bench scale studies, model development, low grade waste heat evaluation and pilot scale demonstration. Bench scale studies results and evaluation of various technologies will be presented. The project outcome would be sustainable augmentation of water production, reduced environmental impact and capacity building in the State of Qatar.