ارامكو السعودية
Saudi Aramco

Saudi Aramco Efforts in Oily Wastewater Treatment and Reuse

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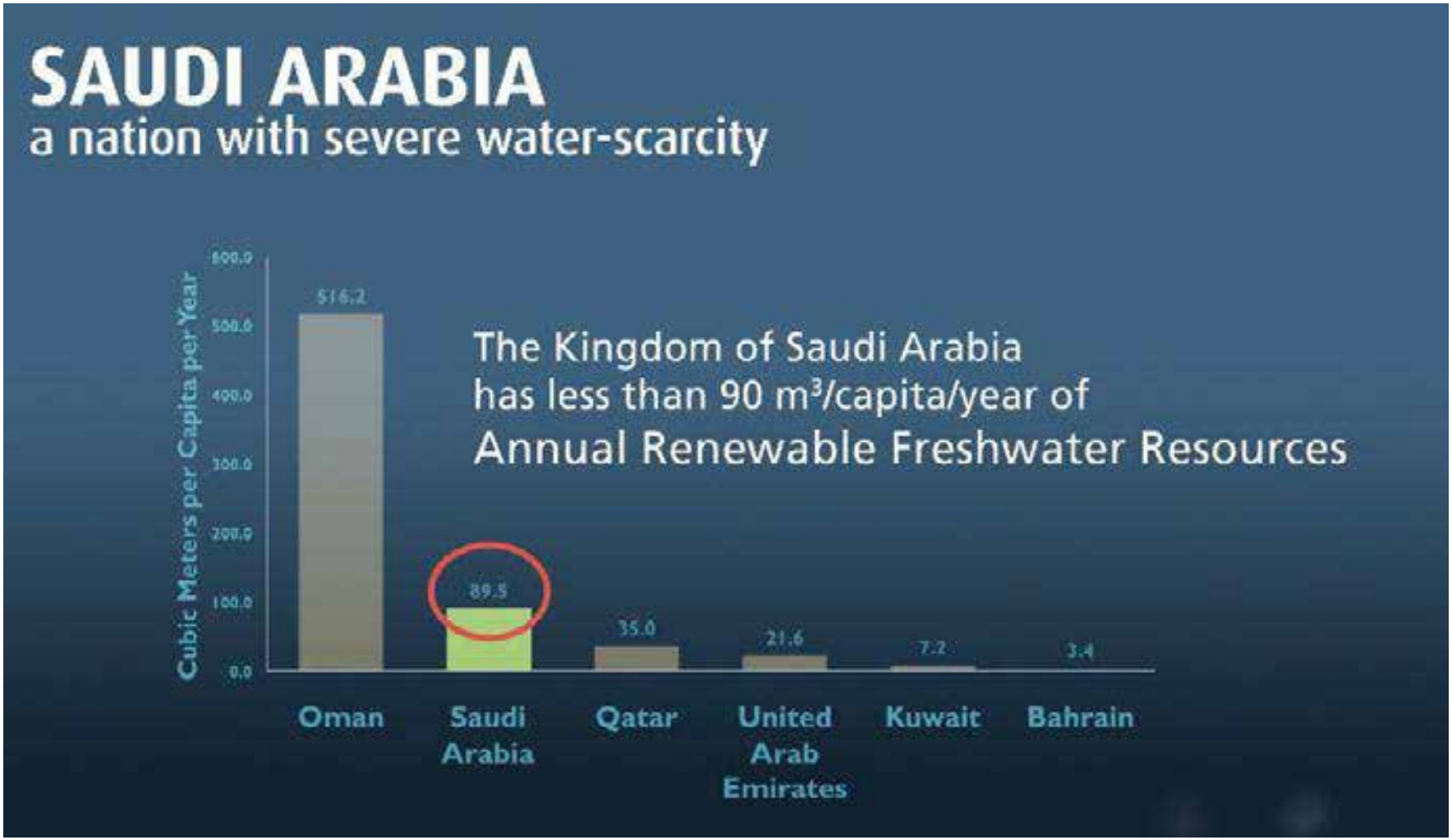
Outline

- Background
- Saudi Aramco Wastewater Generation
- Saudi Aramco Standards & Regulations
- Typical Oily Wastewater Treatment Technologies
- Oily wastewater Reuse
- Saudi Aramco Wastewater Re-use Plans
- Conclusions

Water Resources in Saudi Arabia

Renewable Freshwater Resources In Kingdom



Types & Sources of Wastewater

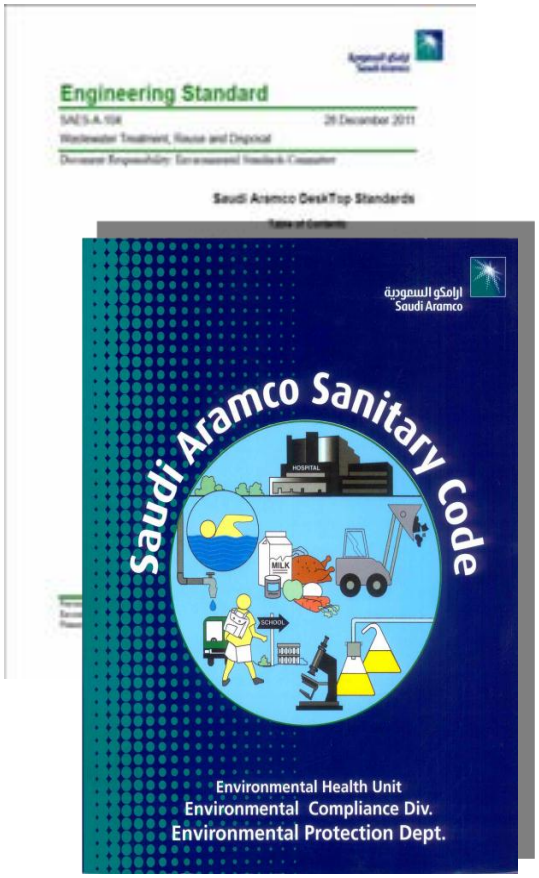
Wastewaters Generation Rates

- Saudi Aramco is generating over 31 MMCMY of oily water sewer effluents

- Saudi Aramco is generating over 47 MMCMY of sanitary wastewater

Saudi Aramco Standards

- **SAES-A-104**
  Wastewater Treatment, Reuse and Disposal
- **GI 151.006**
  Saudi Aramco Sanitary Code – Section # 2
- **GI – Water Conservation**
  (Under Approval)
- **SAES-A-120**
  Regulated Vendors List for Wastewater Treatment Equipment
- ***Wastewater Equipment SAMSS***
  (Under Development)



What is the Company doing?

- **Effective Wastewater Treatment and Disposal**
- **Implementing a Water Conservation Program**

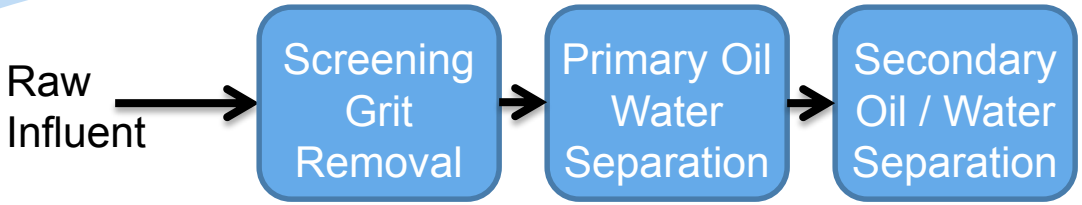
Typical Oily Wastewater Treatment System

Primary Oil/Water Separator

- Removal of large amount of oil and suspended solids from wastewater.
- Effluent requirements are typically 100 -300 ppm oil and TSS.

- API Separator –Most Common
- CPI Separator

Typical Oily Wastewater Treatment System



Secondary Oil/Water Separation Treatment Objectives

- Treatment objective is typically 30 to 5 ppm oil, dependent upon discharge requirements, or downstream treatment processes.

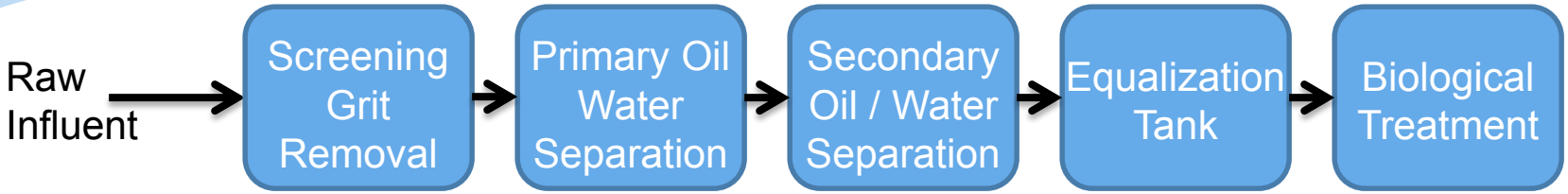
- Dissolved Air/Gas Flotation Separator (DAF or DGF Separators) –Most Common-pre-dissolves Gas in Wastewater-
- Induced Air/Gas Flotation Separator (IAF or IGF Separators) Gas is Dispersed into Small Bubbles in Wastewater.
- Walnut Shell Filter –Least Common

Typical Oily Wastewater Treatment System

Wastewater Equalization Tank

- Smooth out variations in flow and contaminants
- Minimize hydraulic shock loading to process equipment

Typical Oily Wastewater Treatment System

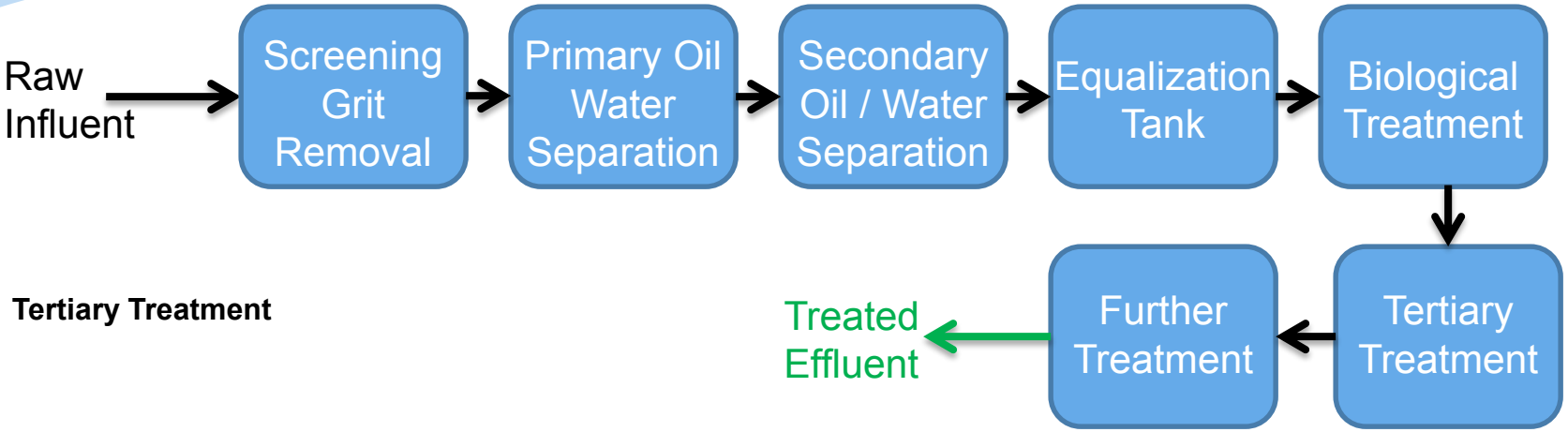


Biological Treatment

- In this process bacteria will react with Organic Chemicals and Nutrients in Oxygen present to produce Carbon Dioxide and Cell Mass .

- Conventional Activated Sludge
- MBR
- MBBR

Typical Oily Wastewater Treatment System



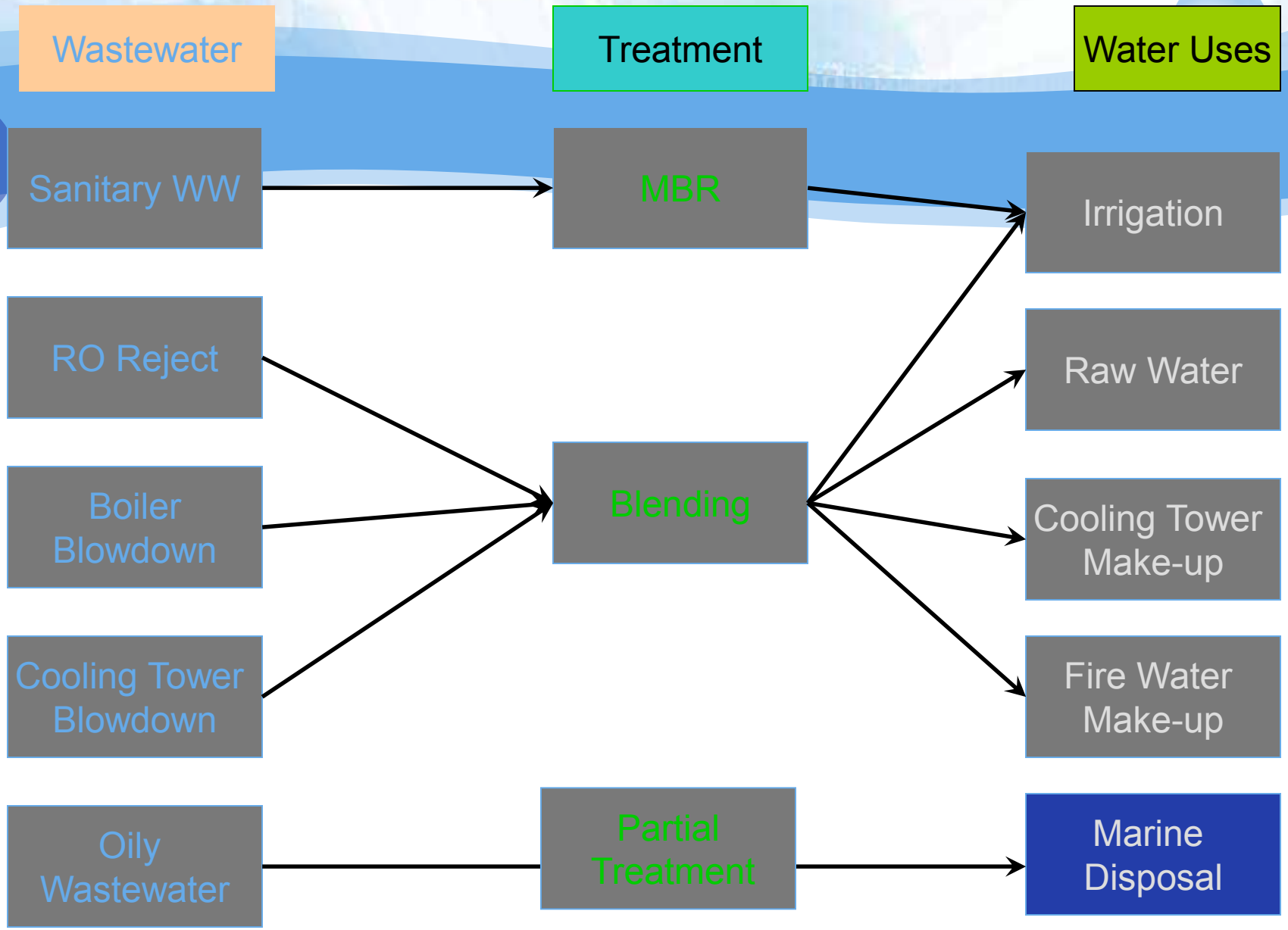
Tertiary Treatment

- Typical Applications
  - Provide additional treatment to meet strict wastewater discharge requirements.
  - Provide additional treatment to allow wastewater to be reused.

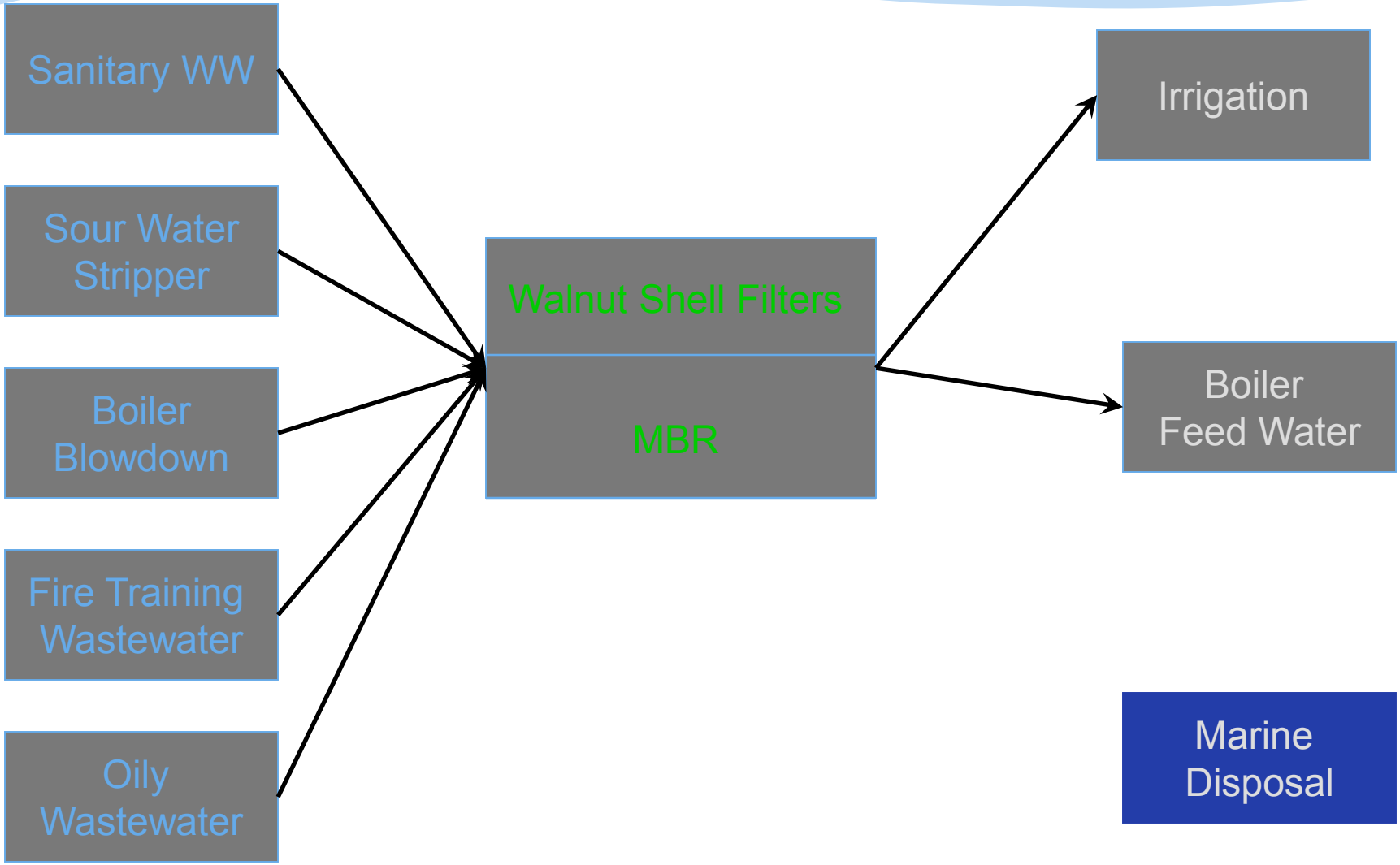
- Typical Treatment Methods
  - Filtration Membranes
  - Activated Carbon

Reuse – New High Tech

- Industrial Reuse
  - Combine Sanitary & Oily Wastewater
  - API & Walnut Shell Filters
  - MBR Treatment
  - Further Reuse



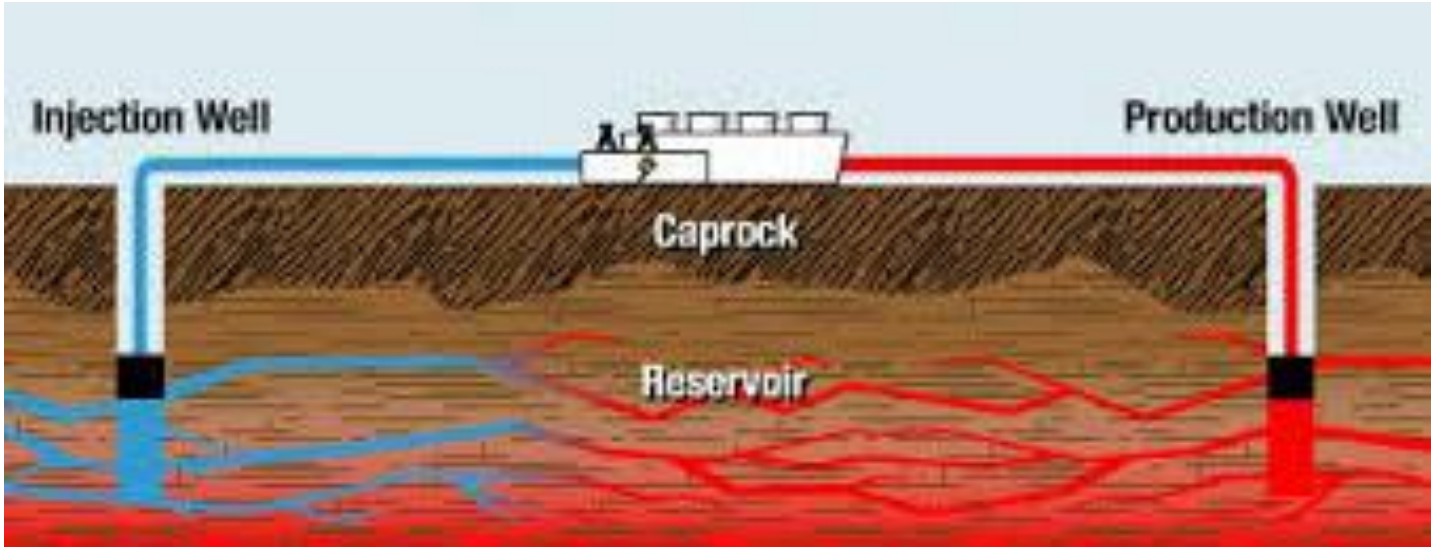
Previous Plan



Oil Field Pressure Maintenance

Production Well → GOSP's → Treatment → Pressure Maintenance

Treatment to Control Oil & TSS in 100 ppm

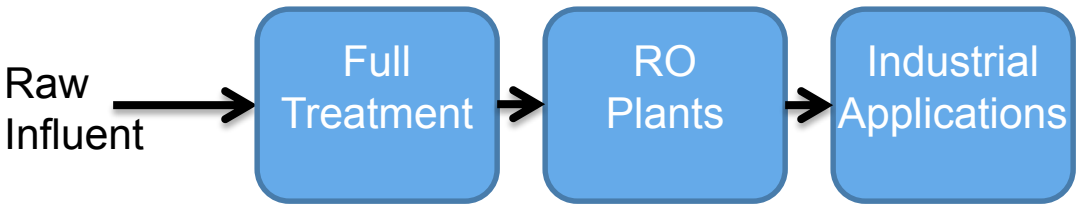


Saudi Aramco Research Outcome

EcoRight technologies:

- New Patent
- Biological treatment system for oily wastewater
- It is a next generation carbon-assisted biological treatment system incorporating the use of granular activated carbon (GAC) in the aeration tank(s).

Saudi Aramco New Projects



- Refineries Projects
- Oily Wastewater system Upgrade

Wastewater Reuse Plans

- Implement the New Water Conservation GI
- Implement the Groundwater Equation Value to new project
- Oily Sewer Effluents Reuse
  - Oil Field Pressure Maintenance
  - Process Utility Water

Conclusions

- ***The Company goal is to conserve valuable water resources.***
- ***The Company uses state-of-the-art processes to treat industrial and sanitary wastewater.***
- ***Typical Oily Wastewater Treatment Technologies for reuse***
- ***New Patent as outcome from the Company researches***
- ***Implement the Water Conservation Program***

Thank you …