

Water Arabia 2009

Industrial wastewater treatment & reuse in the Gulf region

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Waste water treatment and water re-use protect the environment and makes water resources more sustainable

Sustainability and Environment in Arabia

Sustainability

- 77% of total water abstraction comes from aquifers
- 4 times more ground water abstraction than renewable water
- 85% of water usage for agriculture



Environment:

- Arabian Gulf temperature and salinity increases
- Depletion of groundwater supplies
- Higher energy consumption and CO2 emissions

- Protection and conservation of precious water resources, including surface water and groundwater
- Protect human health and the environment
- Manage quality and quantity of water, while reducing demand on fresh water supplies



The requirements, needs and complexity of wastewater treatment systems varies considerable by industry

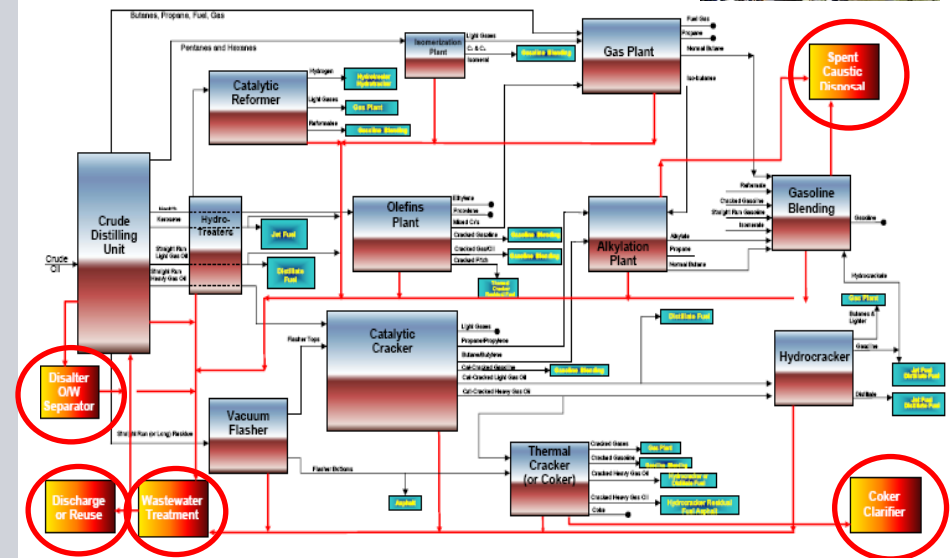


- Oil & Gas Production
- Petroleum Refining
- Petrochemicals
- Chemical Manufacturing



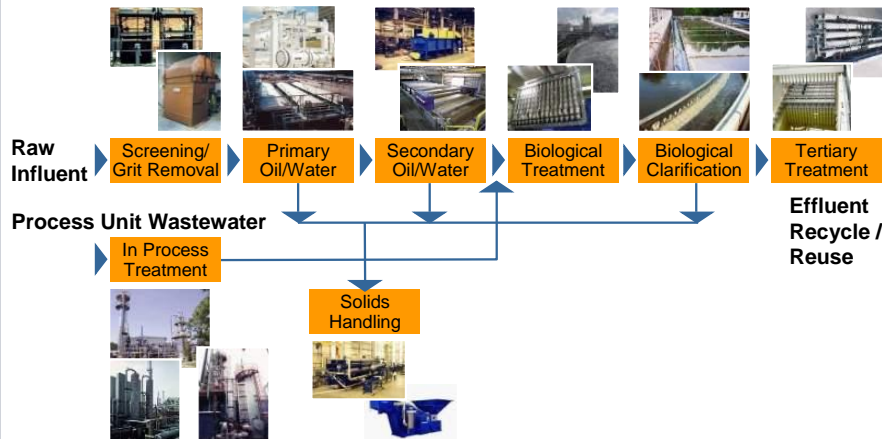
- Steel Making
- Food Processing
- Pharmaceuticals
- Microelectronics
- Mining

In depth process knowledge
e.g. refinery waste and
wastewater sources



Specific solution building requires detailed knowledge about every component

Typical petroleum refinery central wastewater treatment solution



Treatability and pilot studies capabilities



Industrial Wastewater Reuse

Water re-use for irrigation

- Most common type of water re-use projects
- Typically easiest way of water re-use



Industrial process re-use/recycling

- Industrial process water re-use with zero liquid discharge target
- Water re-used for same process or boiler feed, cooling etc.



Indirect potable re-use

- Water re-use to sustain water levels in aquifers
- No additional infrastructure necessary



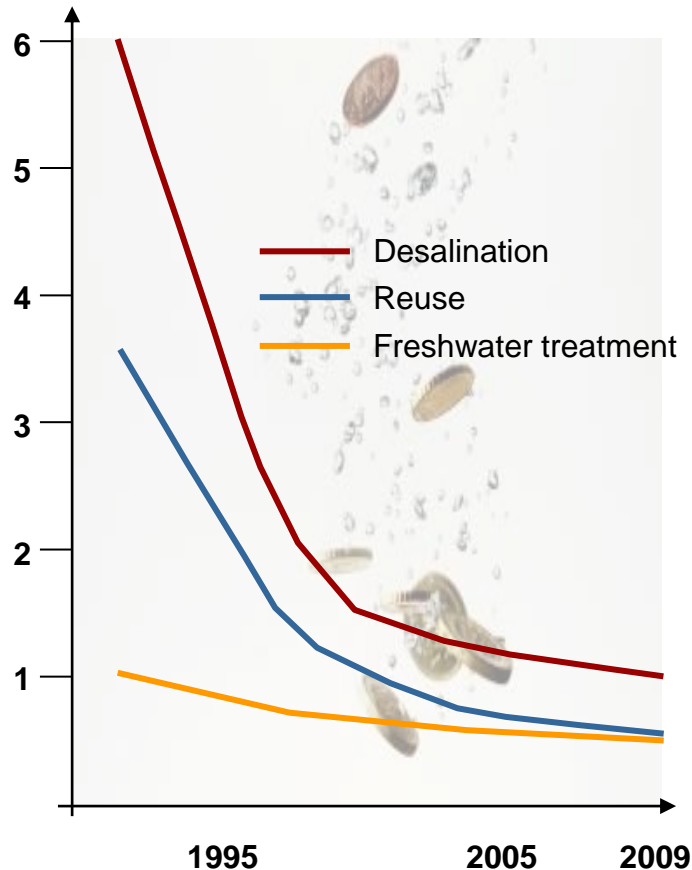
Direct potable re-use

- Limited cultural acceptance
- Technically doable
- Additional infrastructure necessary



Water re-use is typically more economical than desalination

Water price trends in the desalination market (\$/m³)



Benefits

- Sustainable and reliable resource
- Almost closed cycle
- Complementary to existing infrastructure

Drawbacks

- Sometimes separate infrastructure required

Re-use of petroleum refinery wastewater for boiler feed costs \$0.4-0.5/M3



Water currently discharged



Cost of Desalinated Water Using Seawater RO - \$1.25/M3 (Evaporation is 20% more)

Additional technologies required to reuse the treated wastewater for boiler feed water includes media filtration, activated carbon and reverse osmosis

Cost of RO quality water: \$0.50/M3

Water currently re-used for irrigation



Additional technologies required to reuse the wastewater for boiler feed water includes activated carbon and reverse osmosis

Cost of RO quality water: \$0.40/M3

Wastewater Reuse Projects can be executed as mobile or capital solutions with long term service contracts



- Retrofit and technology upgrade
- Long-term and mobile services



Success Strategies in the Water Business

Some Key Lessons:

- Environmental benefits to wastewater reuse
- Consider all points of reuse in a facility
- Design and technology selection critical to success
- Economics make reuse good business sense

Siemens Value proposition:

- Global leader in industrial and municipal re-use projects
- Global leader in Water and Waste water treatment for Oil & Gas customers
- Broadest portfolio and detailed customer process knowledge
- Large base of references around the world

Thank you for your attention!

**Taking care
of the world's water**

