Experiences in the Reuse of Wastewater in the Middle East

6th December 2006
AGENDA

• The rising demand for clean water

• Turning wastewater into clean water

• Water re-use case studies
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THE SCALE OF GLOBAL NEED

• Over 1.1 billion people lack access to improved water supplies.
• Over 2.6 billion people lack access to improved sanitation
• These are often the poorest in society
• More than 2 million children die each year from disease
• Improving access to safe drinking water and sanitation would deliver very real public health benefits
• Water is central to sustainable development

Source: UN 2006
WHY WATER REUSE

• Continuous population growth.

• Contamination of both surface and ground waters by industrial effluent and untreated domestic sewage.

• Uneven distribution of water resources.

• Periodic drought have forced water agencies to search for innovative source of water supply.
Global Water
97% Seawater
3% Freshwater

Global Freshwater
87% Not Accessible
13% Accessible

MENA
1% of accessible freshwater in the world
5% of world population

...and there are substantial disparities within MENA

GLOBAL WATER SCARCITY - 2050

- OK on average
- Water shortages
- Severe water shortages
- Some areas prone to severe water shortages

Source: Fischer and Heilig, 1997
GLOBAL RELATIVE RAINFALL

MENA Region has the lowest rainfall
FRESHWATER AVAILABILITY FALLING TO CRISIS LEVELS IN MENA

Per capita freshwater availability

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NON-CONVENTIONAL TECHNOLOGY OPTIONS

- Wastewater
  - Full Recycling Technology
    - Clean water
- Grey water
  - Simple Recycling Technology
    - Semi-clean water
# REUSED WATER HAS MANY USES

<table>
<thead>
<tr>
<th>FULL RECYCLING</th>
<th>GREY WATER RECYCLING</th>
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<tr>
<td>• Direct potable use</td>
<td>• Domestic grey water</td>
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<tr>
<td>• Indirect potable use</td>
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<td>– Aquifer recharge</td>
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<td>– Reservoir recharge</td>
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<td>– Surface water recharge</td>
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<td>• Industrial use</td>
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<td>– Cooling tower make up</td>
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<td>– Paper mills</td>
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<td>• Agriculture</td>
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<td>– Unrestricted</td>
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<td>• Municipal</td>
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<td>– Road washing</td>
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<td>– Car washing</td>
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MEMBRANE BIOREACTOR TECHNOLOGY

- State of the art technology that doesn’t require chlorination, tertiary treatment or sludge digestion
- Over 1,500 plants operational or under construction
- Small footprint, approximately 50% of that required for Extended Aeration
- Extremely good, odourless, and consistent treated effluent, that can be used for un-restricted irrigation and district cooling towers applications
MEMBRANE BIOREACTOR TECHNOLOGY

- Easy to operate and maintain
  - Less manpower
  - Lower operational costs
- Plants can be installed completely underground, semi underground or above ground
- No noise
- Minimum sludge production

Cross Flow Filtration
Mixed liquor flows parallel to the membrane surface, while water permeates through the membrane. Cross flow prevents the membrane surface from fouling.
WASTEWATER GENERATION AND REUSE
Only 1% of Wastewater Generated is Reused

Source: Global Water Intelligence
Global water reuse capacity will rise from 19.4 million m³ in 2005 to 33.7 million m³ in 2010 and to 54.5 million m³ in 2015, a 181% increase over the decade.

The largest growth market will be: China, USA, MENA (Middle East and North Africa), Western Europe and South Asia.
Total capital investment in the sector will be US$28 billion;

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PALM ISLAND
Advanced underground water reuse

• Fully underground 22,000 m$^3$/d
• No odour or noise
• High quality effluent
EMAAR THE GREENS AND EMIRATES HILLS
Upgrading and retrofitting an existing system

Existing Installation

• Designed to cater for The Greens community housing only, with a capacity of 3,000m³/day

• Utilises Extended Aeration Activated Sludge process without tertiary treatment

• Uses online irrigation filters instead of tertiary sand filters

• No odour control system

Specific Client Requirements

• Upgrade capacity of existing plant without operation interruption:
  – 3,000 m³/day to 10,000 m³/day

• Produce high quality TSE suitable for un-restricted irrigation applications

• Odourless and noise free plant

• Low footprint
DUBAI INVESTMENT PARK
A simple outsourcing example

• The first BOOT sewage treatment plant in the UAE

• Built in modular phases, starting with 100m$^3$/day in 1999

• Ultimate capacity of 40,000m$^3$/day

• Designed to cater for all DIP wastewater requirements

• High quality effluent produced used for irrigation purposes

• Significant ongoing savings to the park, and improved environmental impact
Commitment to a Cleaner Environment

Metito