Geiger

Advanced Onshore Screening Technology and Recent Case Studies for Open-Channel/Tunneled Seawater Intakes

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Water Intake Technology - Systems and Solutions/Components

18-19. October 2017

Karlsruhe

DME-Seminar S-004-2017 – Presentation 01
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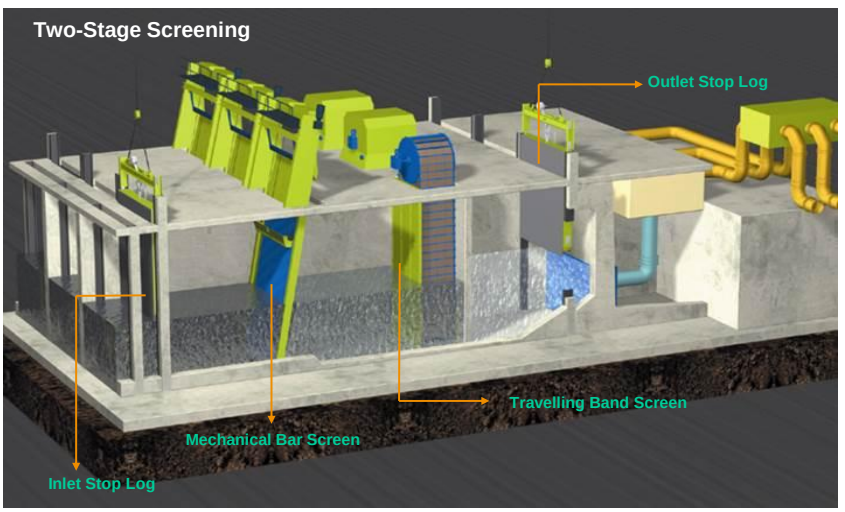
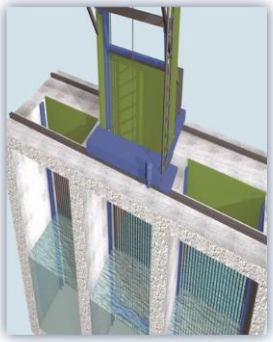
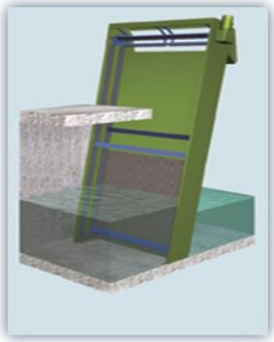
Typical Layout of Open-Channel Water Intakes



Types of bar screens

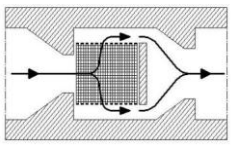
- Cable-operated Trash Raking Machine
- Chain-operated Bar Screen with with Revolving rakes
- Overhead Gantry Single-rake Mobile Screen

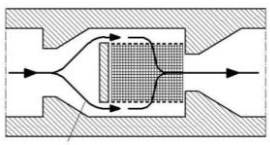


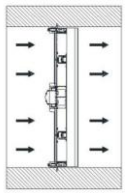


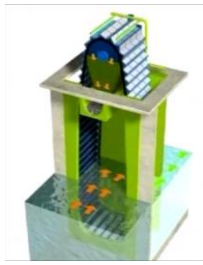
Types of flow patterns in fine screens

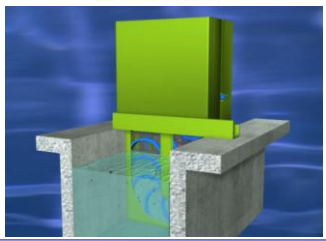
- Center-Flow In-to-out
- Dual-Flow Out-to-in
- Through-Flow MultiDisc®





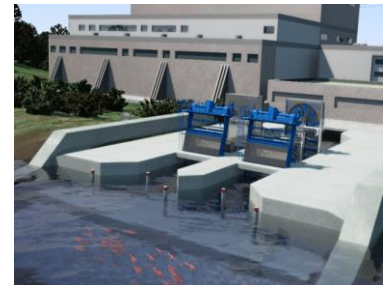






Purpose of Modern Onshore Water Intake Screening Systems

1. **As interface with open sea – protect intake pumps and downstream treatment equipment**
2. **Reduce CAPEX and OPEX**
3. **Provide high reliability as crucial portion of a desalination plant**
4. **Comply with local regulation, especially concerning protection of aquatic life**



1. Protection of Intake Pumps and Downstream Equipment

1.1 Efficient removal of debris from the incoming water:

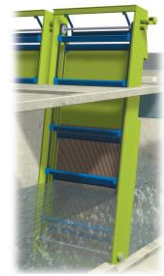
A. Trash removal capacity adjusted to the expected quantity of debris
B. No Carry-over of trash to the clean water side (typical problem of traditional Through-flow screens)

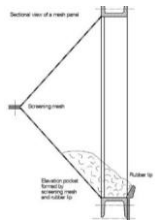
1.2 Fine bar spacing/mesh opening to reduce backwash/cleaning in downstream filtration stages:

A. Bar spacing of modern bar screens can be reduced down to 1-2mm
B. Mesh opening of travelling band screens can be reduced down to 0.20-0.25mm

1.1A Trash removal capacity adjusted to the quantity of debris

- **Use of high-capacity trash transportation systems**
  - E.g. the Revolving Chain Screen can remove huge quantities of debris even in the most severe conditions (>60m³/h)
  - Center-flow travelling band screens with Trash removal capacity adjusted to the expected quantity of debris





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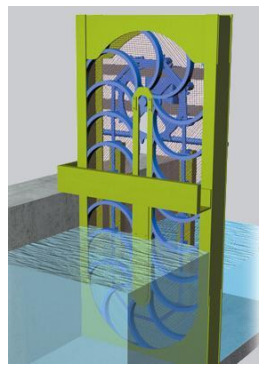
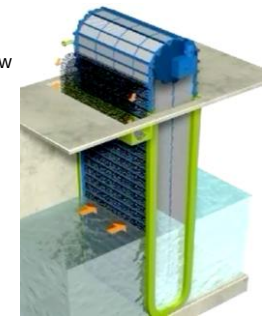
1.1B No Carry-over of trash to the clean water side

- **Zero-Carryover solution with Geiger MultiDisc Travelling Screen**
  - Transport of trash to the clean water side physically not possible

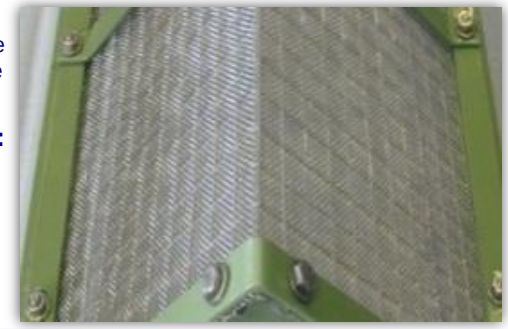
Debris carry-over in traditional trough-flow screens





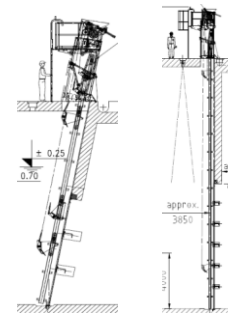
1.2A-B Fine Bar Spacing and Mesh Openings

- **Fine Bar Spacing:**
  - Rule of thumb: 1/10 ratio between spacings of first and second screening stage
  - Bar spacings as small as 6mm with hydraulically enhanced bar profiles (Tear-drop shape)
  - Bar spacings <6mm with wedge-wire and plastic brushes as cleaning rake
- **Mesh opening down to 0.2mm:**
  - Efficient sealing system
  - Support mesh

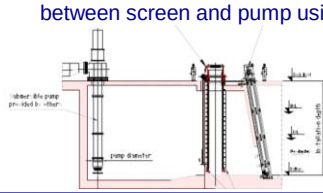


2. Reduced CAPEX and

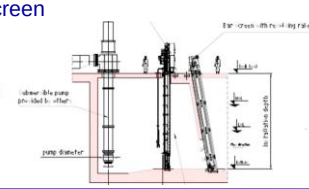
- **Material Choice:**
  - E.g. ss316L + Cathodic Protection instead of Super Duplex (risky without cathodic protection)
- **Vertical Bar Screens:**
  - Reduced footprint results in shorter concrete channel
- **Low turbulence Fine Screens:**
  - Possible reduction of up to 50% of the distance between screen and pump using MultiDisc Screen



Typical Layout

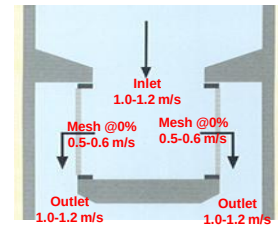


Compact Layout with MultiDisc®

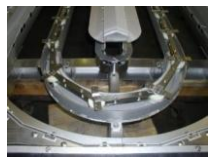


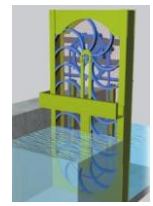
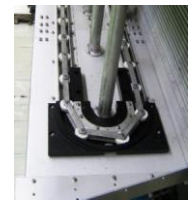
2. Reduced OPEX

- **Low headloss design:**
  - Reduce design velocities before and through the screens result in power savings and less wear&tear
  - Use of single-pass through-flow screens



- **Low maintenance design:**
  - No moving parts permanently under water
  - Reduce moving components (single carrier chain, no V-belts, etc.)
  - Maintenance-free chains
  - Long component lifetime



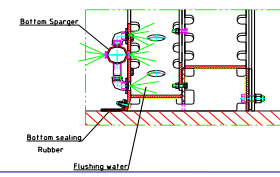




3. High reliability as crucial portion of a desalination plant

- **Preference for proven technologies from reputed suppliers**
- **Involve suppliers to apply recognized industry design standards (type of screens, velocities, redundancy, etc.)**
- **Adopt smart solutions to improve reliability:**
  - Internal cleaning systems for spray water nozzles in fine screens
  - Plastic chain rollers and sprockets
  - Bottom sparger for silt removal

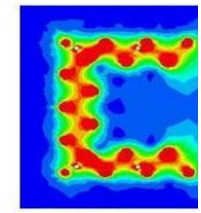




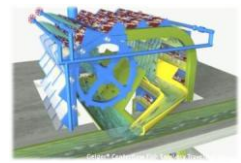


4. Local regulation - Protection of Aquatic Life

- **First approach: barrier to avoid entrance in the water intake system**
  - Light barriers
  - Sound barriers
  - Electrical pulsing barriers



- **Second approach: return captured organisms to the water source**
  - Fish collection and return systems for bar screens and fine screens
  - Immobilization system



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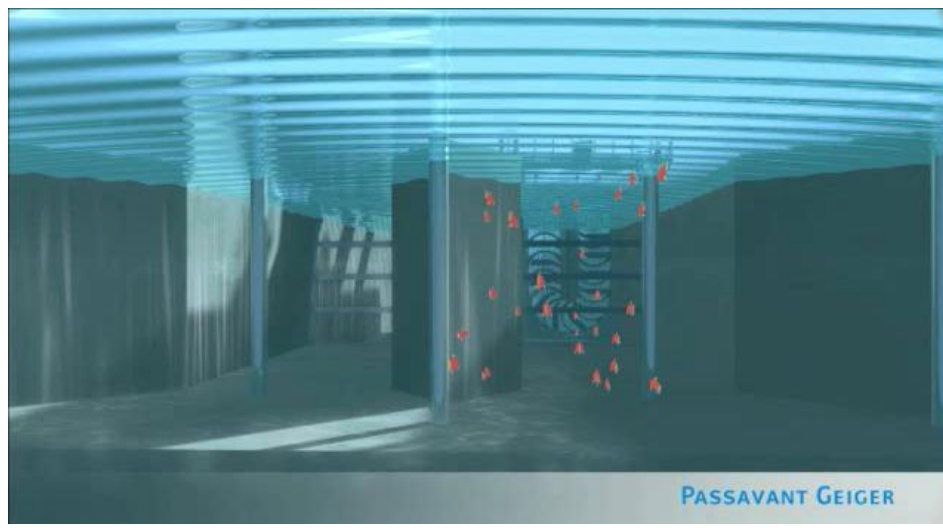
4. Local regulation - Protection of Aquatic Life



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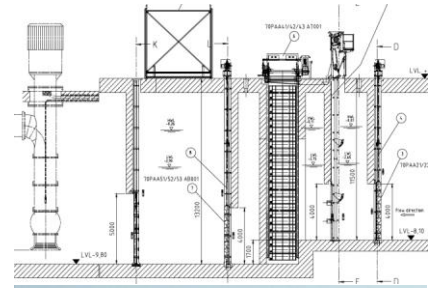
1. Case Study – Ras Abu Fontas A3 SWRO+Power – Qatar

Machines	Material
3 Geiger® Cable-Operated Grab Cleaners	Wetted parts: ss316L Non-wetted parts: Painted carbon steel
3 Geiger® Centre-Flow Travelling Band Screens	Mainly stainless steel (316L)
Technical Data	
Flow Rate	20,000 m³/h per line
Bar screen spacing	50mm
TBS mesh opening	3.5mm
Geiger® Cathodic Corrosion Protection System	With impressed current



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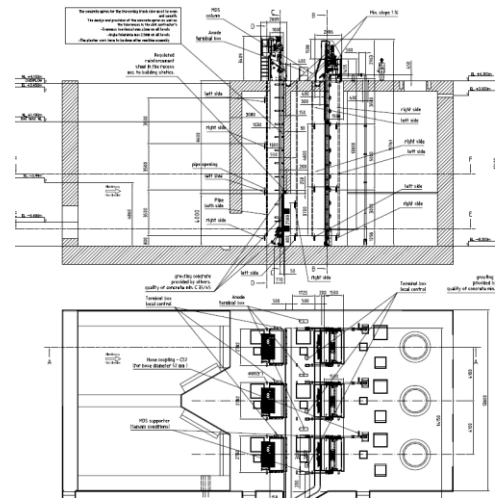
2. Case Study – Barka 4 IWP SWRO – Oman

Machines	Material
3 Geiger® Cable-Operated Rake Cleaners	Duplex steel (2205)
3 Geiger MultiDisc® 500	Duplex steel (2205) Chain sprocket/teeth: Superduplex (2570)
Technical Data	
Flow Rate	13,678 m³/h per line
Bar screen spacing	50mm
TBS mesh opening	5.0mm
Geiger® Cathodic Corrosion Protection System	With impressed current



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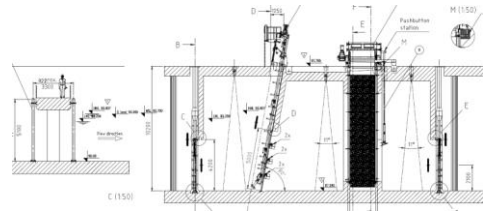
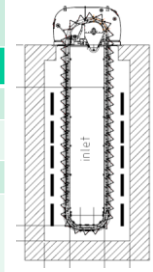
3. Case Study – Punta Catalina CFPP – Dom. Republic

Machines	Material
4 Geiger® Cable-Operated Rake Cleaners	Wetted parts: ss316L Non-wetted parts: Painted carbon steel
4 Geiger® Centre-Flow TBS with fish return system	Mainly stainless steel (316L)
Fish Electr. Barrier	Duplex electrodes (2205)
Technical Data	
Flow Rate	40,000 m³/h per line
Bar screen spacing	30mm
TBS mesh opening	5.0mm
Geiger® Cathodic Corrosion Protection System	With sacrificial anodes





Thank you very much for your attention

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